PCI-822

User's Guide

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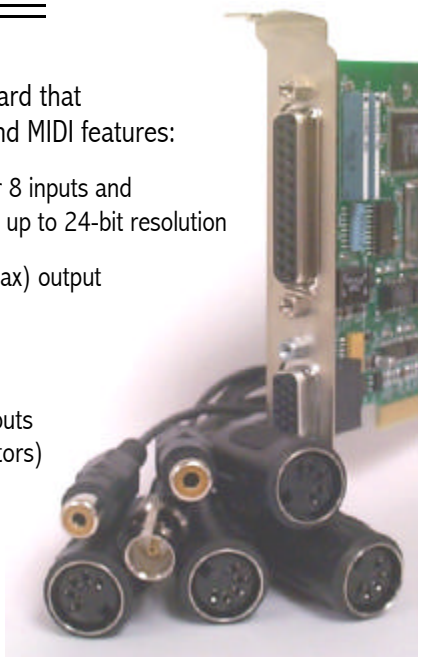
Contents

continued➔

Introduction



The PCI-822™ is a PCI soundcard that integrates these digital audio and MIDI features:

- TDIF-1 (DB-25) connector for 8 inputs and 8 outputs of digital audio with up to 24-bit resolution
- RCA (coax) input and RCA (coax) output for 2-channel SPDIF audio
- BNC word clock output
- 2 MIDI inputs and 2 MIDI outputs (standard DIN-5 MIDI connectors)

The PCI-822 supports 44.1 and 48 kHz sample rates, and can also lock to digital audio inputs from 39–51 kHz.

The Windows 95/98 driver can dynamically resample 8, 11.025, 16, 22.05 and 32 kHz digital audio output for playback through high-quality external converters.

The PCI-822 has a software control panel for digital audio input status, sample rate selection, and clock source control.

The PCI-822's ASIO driver provides low-latency performance when adjusting parameters and monitoring inputs with applications such as Cubase VST. The PCI-822 also has a direct GigaSampler® Interface (GSIF) driver.

The TDIF-1 connector on the PCI-822 can be connected to any device that supports TDIF, including digital mixers such as the TM-D1000, the TASCAM IF-TAD converter for TDIF/ADAT translation, TDIF-compatible tape machines such as the DA-38/78/88/98, and external A/D-D/A converters.

In addition to this User's Guide, your PCI-822 package should contain:

- PCI-822 circuit board
- Breakout cable that connects to the 15-pin connector on the PCI-822, providing 2 RCA (coax) connectors for SPDIF in/out, 1 BNC connector for word clock out, and 4 standard 5-pin MIDI connectors (2 in, 2 out)
- CD-ROM containing Macintosh and Windows drivers for the PCI-822, and GigaSampler LE software (from Nemesys™ Music Technology)
- Two CD-ROMs containing Soundware Demos for use with GigaSampler
- TASCAM warranty card

Technical Support

If you have any problems or questions that aren't addressed in the Troubleshooting chapter or elsewhere in this Guide, there are three ways to get more help:

- Refer to the TASCAM web site for information on current revisions, answers to frequently asked questions, and additional documentation. The web site is available every day, 24 hours a day. (http://www.tascam.com/products)
- Send specific questions via email to custser@teac.com.
- For time-critical questions, you can call TASCAM's USA tech support number (1-323-726-0303, x617). Phone support is normally provided weekdays from 8:30 am to 5:30 pm PST.

Connectors and Cables

The PCI-822 includes several types of connectors. Here are some suggestions for using them.

— TDIF cables —

A TDIF cable provides 8 channels of digital audio in both directions, with up to 24-bit resolution. It also carries clocking signals that are used for synchronizing the transmission and reception of the audio. TDIF cables are constructed in very specific ways to carry this high-speed digital audio data reliably.

> **WARNING:** Use only cables that are specifically made for TDIF interfaces. Similar computer-type cables will not provide reliable operation. TDIF connectors have metric fastening screws. The non-metric 4-40 screws found on computer-type cables are incompatible.

True TDIF cables are available from manufacturers such as Cable-Up. Here are the part numbers and lengths available:

CU/PW88DS	½m (2')
CU/PW88D	1m (3')
CU/PW88DM	3m (10')
CU/PW88DL	5m (16')

— Word clock cables —

The 15-pin PCI-822 breakout cable has a BNC connector for word clock output. Word clock signals contain high frequencies and should be transmitted on 75-ohm coax cables for reliability. Usually, a BNC connector is used for word clock. A 75-ohm video cable with BNC connectors works well.

— SPDIF cables —

The 15-pin PCI-822 breakout cable includes RCA (coax) connectors for stereo SPDIF (Sony/Philips Digital Interface Format) digital audio.

Standard audio cables with RCA connectors have twisted-pair wire rather than coaxial cable, and are not recommended for use with SPDIF signals. Although they have the correct connector on each end, and may work over short distances, they are not reliable for SPDIF data streams. The reason is related to the differences between audio and SPDIF signals — audio signals contain frequencies in the tens of kiloHertz, but SPDIF signals contain frequencies in the tens of megaHertz, much like a video signal.

> **Note:** For reliable SPDIF connections, especially over distances longer than a meter, use only 75-ohm coax video cables or cables that are manufactured specifically for SPDIF use.

Since SPDIF inputs and outputs look the same, make sure you check the labels on the molded connectors of the PCI-822 breakout cable, and connect your 75-ohm coax cables to the correct connectors.

— MIDI cables —

The 15-pin PCI-822 breakout cable also provides four DIN-5 MIDI connectors for use with standard 5-pin MIDI cables. Since MIDI inputs and outputs look the same, make sure you check the labels on the molded connectors of the PCI-822 breakout cable and connect your MIDI cables to the correct ports.

Windows Installation

WARNING: The components in your computer and on the PCI-822 board are sensitive to electrostatic discharge. Follow these precautions to avoid damage caused by static electricity —

- Leave the PCI-822 board in its anti-static wrapping until you're properly grounded.
- To become grounded, make sure the computer is off but leave its power cord plugged in. Remove the cover, and touch the computer's metal chassis.
- Only handle the PCI-822 board by its edges and metal bracket.

MIDI limitation (for Windows 95 only)

Windows 95 can only support up to 11 MIDI input ports and 11 MIDI output ports, which can be hardware MIDI ports and/or software MIDI devices that appear as MIDI ports to Windows 95 (MIDI devices in soft synths or virtual keyboards, for example).

Adding the PCI-822 MIDI ports may put your Windows 95 system beyond the limit, causing it to crash with the "blue screen" message "MSGSRV32 caused a general protection fault…"

If you're running Windows 95, and you already have 8 or more MIDI ports in your system, follow this procedure to work around the bug:

1. Temporarily disable the MIDI devices in your system, and then reboot the computer.
2. Install the PCI-822 card, as described on the next page.
3. Open the System tab of the PCI-822 control panel, and disable the PCI-822 MIDI ports (by setting the MIDI Mode to 'Disabled').
4. Re-enable your other MIDI ports, and then reboot the computer.

Installing in Windows 95/98

The PCI-822 requires one PCI slot in your computer.

1. Make sure the computer is off (but leave its power cord plugged in), and then remove its cover.

2. Using a screwdriver, remove the blank metal bracket from an empty PCI slot in the computer, and verify that the motherboard has no protruding components that would obstruct the PCI-822 connectors.

3. Insert the PCI-822 board into the empty PCI slot, and secure the PCI-822 bracket with a mounting screw.

4. Attach the PCI-822 breakout cable to the 15-pin connector, using the screws on each side of the connector to secure it firmly.

5. Replace the cover, and restart your computer. As it starts up, Windows detects the presence of the new hardware, and automatically opens an installation wizard. In Windows 95, it's the "Update Device Driver" wizard. In Windows 98, it's the "Add New Hardware" wizard.

6. Follow the instructions in the wizard, letting Windows search for the best driver for your device. You'll need to insert the PCI-822 CD-ROM into your CD-ROM drive and click the "Next" button as the wizard leads you through the driver installation process.

   Note (for Windows 98 only): To avoid an installation bug in Windows 98, choose the top option (Search for the best driver for your device) when the 'Add New Hardware Wizard' asks 'What do you want Windows to do?'. Then click the 'Next' button and select 'CD-ROM drive' from the list of locations to search.

7. When the wizard indicates that the PCI-822 Audio Device is installed, click the "Finish" button.

8. After the installation is finished, remove the CD-ROM and keep it in a safe place in case you ever need to re-install the PCI-822.

When the PCI-822 is installed, its icon appears in the Windows Taskbar (usually near the bottom right of the screen). Double-clicking the icon opens the PCI-822 control panel.

Installing GigaSampler LE

To install GigaSampler LE on your computer, insert the "PCI-822 Software Drivers" CD-ROM into your CD-ROM drive, and make sure you have the CD Key from the back of the CD-ROM jewel case. Open the file called "SETUP.EXE" and follow its instructions.

You'll find tutorial information for GigaSampler LE in the "Docs" folder and by running the TUTORIAL.HLP file. Two additional CD-ROMs of demo soundware for GigaSampler are also included in the PCI-822 package.

Note: The MIDI-to-audio latency in GigaSampler is affected by the "Buffer Size" setting in the System tab of the PCI-822 control panel. Smaller buffer sizes provide lower latency but increase the risk of audio glitches. The default value is 256 samples, but many systems work well with the Buffer Size set to 128 samples.

Updating the PCI-822 Software in Windows

You can download the latest version of the PCI-822 software from the TASCAM web site. To install the latest version of the software:

1. Go to the web site (http://www.tascam.com) and download the latest software, which is contained in a compressed (zip) file. If necessary, you can also download a copy of WinZip (from http://www.winzip.com).
2. Insert a blank, formatted floppy disk into your computer's floppy drive.
3. Open the zip file, and extract the enclosed PCI-822 files onto a floppy disk (and then leave the disk in the floppy drive).
4. Open the Windows Control Panel (Start→Settings→Control Panel), and double-click the System icon.
5. When the System window appears, select the "Device Manager" tab.
6. Click the '+' next to "Sound, video, and game controllers" to open that part of the device tree.
7. Select "PCI-822 Wave and MIDI Driver," and click 'Properties.'
8. When the PCI-822 Properties window appears, select the "Driver" tab.
9. Click the 'Update Driver…' button, and follow the wizard's instructions, letting Windows search for the best driver for your device.

Uninstalling the PCI-822 in Windows

To uninstall the PCI-822, you need to remove the driver and control panel software, and remove the PCI-822 hardware.

— Removing the software —

1. Open the Windows Control Panel (Start→Settings→Control Panel), and double-click the System icon.
2. When the System window appears, select the "Device Manager" tab.
3. Click the '+' next to "Sound, video, and game controllers" to open that part of the device tree.
4. Select "PCI-822 Wave and MIDI Driver," and click 'Remove.'
5. When prompted to "Confirm Device Removal," click 'OK' to remove the driver software.
6. To remove the control panel software, open the Windows\System folder and delete the "P822Pnl.cpl" file.

— Removing the hardware —

1. Make sure the computer is off (but leave its power cord plugged in), and then remove its cover.
2. Remove the mounting screw that holds the PCI-822 bracket in the computer.
3. Lift the PCI-822 board straight out of its PCI slot, and put the board into an antistatic bag.
4. Replace the blank metal bracket and the computer's cover, and restart your computer.

Macintosh Installation

WARNING: The components in your computer and on the PCI-822 board are sensitive to electrostatic discharge. Follow these precautions to avoid damage caused by static electricity —

- Leave the PCI-822 board in its anti-static wrapping until you're properly grounded.
- To become grounded, make sure the computer is off but leave its power cord plugged in. Remove the cover, and touch the computer's metal chassis.
- Only handle the PCI-822 board by its edges and metal bracket.

Installing in the Macintosh

The PCI-822 requires one PCI slot in your computer.

1. Make sure the computer is off (but leave its power cord plugged in), and then remove its cover or open its side panel.
2. Using a screwdriver, remove the blank metal bracket from an empty PCI slot in the computer, and verify that the motherboard has no protruding components that would obstruct the PCI-822 connectors.
3. Insert the PCI-822 board into the empty PCI slot, and secure the PCI-822 bracket with a mounting screw.
4. Replace the cover or close the side panel, and restart the computer.
5. Attach the PCI-822 breakout cable to the 15-pin connector, using the screws on each side of the connector to secure it firmly.
6. When the Macintosh desktop appears, insert the PCI-822 CD-ROM into the CD-ROM drive.
7. When the CD-ROM window appears, open it and double-click the "PCI-822 Mac Installer" icon, and follow its instructions.
8. After installation, run the "PCI-822 Installation Test" (in the PCI-822 Driver Files folder) to verify that the installation was successful.

Updating the PCI-822 Software on the Macintosh

You can download the latest version of the PCI-822 software from the TASCAM web site. To install the latest version of the software:

1. Go to the web site (http://www.tascam.com) and download the latest software, which is contained in a compressed (hqx) file.
2. If your browser didn't automatically expand the file, use a BinHex expander (such as Stuffit Expander) to expand the hqx file. If necessary, you can download a copy of Stuffit Expander from the Aladdin website (http://www.aladdinsys.com).
3. Double-click on the "PCI-822 Mac Installer" icon, and follow its instructions.

Uninstalling from the Macintosh

To uninstall the PCI-822, you need to remove the driver and control panel software, and remove the PCI-822 hardware.

1. To remove the software, delete the following files:
   Desktop → PCI-822 Driver Files folder
   System Folder → Control Panels → PCI-822
   System Folder → Extensions → PCI-822SharedLibrary.dll
   System Folder → OMS Folder → PCI-822 OMS Driver
   System Folder → Preferences → PCI-822 Settings
   Application ASIO Folder → ASIO PCI-822 16-bit
   Application ASIO Folder → ASIO PCI-822 24-bit
2. Make sure the computer is off (but leave its power cord plugged in), and then remove its cover or open the side panel.
3. Remove the mounting screw that holds the PCI-822 bracket in the computer.
4. Lift the PCI-822 board straight out of its PCI slot, and put the board into an antistatic bag.
5. Replace the blank metal bracket and the computer's cover or side panel, and restart your computer.

Software Reference

The PCI-822 has both Macintosh and Windows 95/98 drivers. The Macintosh PCI-822 control panel includes two tabs — Clock/Device Status, and System. The Windows PCI-822 control panel includes three tabs — Clock/Device Status, Patchbay, and System. Each tab contains several sections, each with one or more fields.

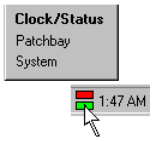
Macintosh Control Panel

On a Macintosh, you can open the PCI-822 control panel by selecting 'Control Panels > PCI-822' from the Apple menu. For convenience, you may want to make an alias on your desktop for the control panel:

1. Open the System folder on your hard drive.
2. Open the Control Panels folder, and click once on the PCI-822 icon to select it.
3. Select 'Make Alias' from the File menu.
4. Drag the new alias icon to the desired location on your desktop.

Windows Control Panel

Whenever the PCI-822 is installed in your system, an icon with two bars appears in the Windows Taskbar (usually at the bottom of the screen). The top bar lights red whenever any PCI-822 input is active, and blinks whenever an active input has an error (see the "Clock/Device Status Tab" section for details about input errors). The bottom bar lights green whenever any PCI-822 output is active.

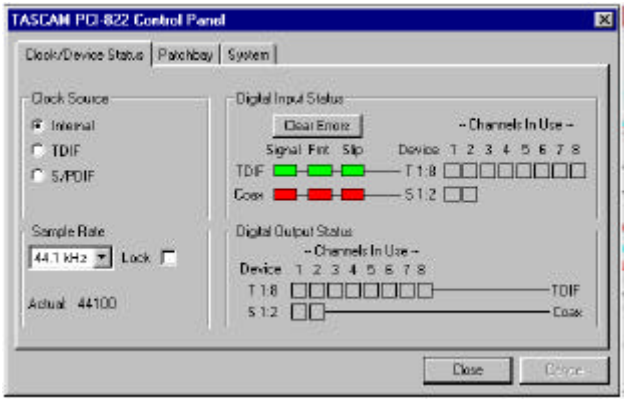


Double-clicking on the icon opens the Clock/Device Status tab of the PCI-822 control panel. You can also right-click on the icon to display a menu that lets you go directly to any of the three tabs.

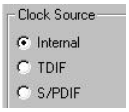
To open the PCI-822 control panel from the Start menu, navigate to Settings→Control Panel, and double-click on the "PCI-822" icon.

Clock/Device Status Tab

The Clock/Device Status tab contains four sections — Clock Source, Sample Rate, Digital Input Status, Digital Output Status.



— Clock Source —



The audio clock can come from one of three sources.

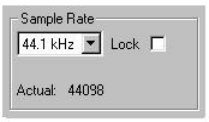
Internal — With this setting, the computer is the sample clock master, running at either 44.1 or 48kHz, depending on the Sample Rate selection.

TDIF — With this setting, the TDIF device connected to the PCI-822 DB-25 connector is the sample clock master.

S/PDIF — With this setting, the stereo SPDIF device connected to the PCI-822 coax input is the sample clock master.

For more information about audio clocks and sample rates, see ‘Synchronization’ later in this Guide.

— Sample Rate —

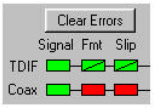


In this section, a drop-down box lets you select the expected sample rate (44.1 or 48kHz). If the 'Lock' box is checked, then applications can only use the selected sample rate. For example, if the sample rate is locked at 48kHz and you try to play a 44.1kHz sound, an error message appears (although it may not clearly state that the sample rate is incorrect). The Sample Rate section also displays the actual current sample rate as measured by the computer.

It's normal for the actual rate display to vary over time, since the computer timer used for the measurement is not very precise. A variable actual rate display does not mean that your audio clock is unstable.

— Digital Input Status —

This section displays the audio input status in the form of error indicators, and shows which input channels are in use.



On the left are three rectangular error indicators for each of the PCI-822 inputs (TDIF and Coax).

A red indicator represents an error, and green means "good to go." A slash across a green indicator means that at least one error was detected since the errors were last cleared. To remove all slashes, click 'Clear Errors.'

From left to right, the indicators are:

Signal — green = input signal active
red = input signal inactive

Format (Fmt) — green = valid digital audio format detected
red = error in digital audio signal format

Slip — green = the PCI-822 is locked to incoming audio clock
red = the PCI-822 sample rate is different than the incoming audio clock

If the PCI-822 sample rate is almost the same as the incoming audio clock, but not perfectly locked, the Slip indicator flashes red periodically. A slash appears across the green indicator until you click 'Clear Errors.' See "Synchronization" later in this Guide for more details about slip errors.

The TDIF and SPDIF inputs are mapped directly to the recording devices (T 1:2, T 3:4, T 5:6, T 7:8, and S 1:2) that you'll use within your audio applications.

The 'Channels In Use' indicators show activity on each input channel. If an input channel is open or in use, its indicator is bright red.

— Digital Output Status —

This section shows which output channels are active. When an output channel is playing data, its indicator is bright green.

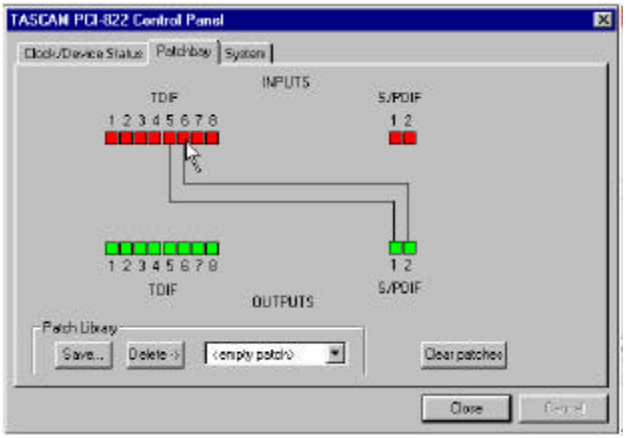
— Hardware Status (Macintosh only) —

On the Macintosh, this section displays status information about the PCI-822 hardware.

Patchbay Tab (Windows only)

The Patchbay tab lets you route any of the PCI-822 audio inputs to any of its audio outputs. You can use the Patchbay tab both for input monitoring and for real-time digital audio format conversions.

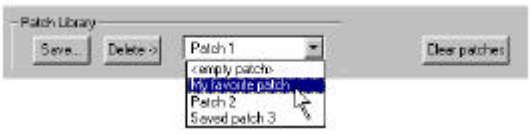
For example, you can monitor the PCI-822 “TDIF 5:6” inputs through the SPDIF coax outputs, as shown here.



The PCI-822 inputs appear in the top row of icons; outputs appear in the bottom row. To create a patch, click on an input icon and then click on an output icon, or drag the cursor from an input to an output. Lines automatically appear to indicate the routing(s).

To delete a particular routing, double-click on its input or output icon. To undo all the current routings, click the “Clear patches” button.

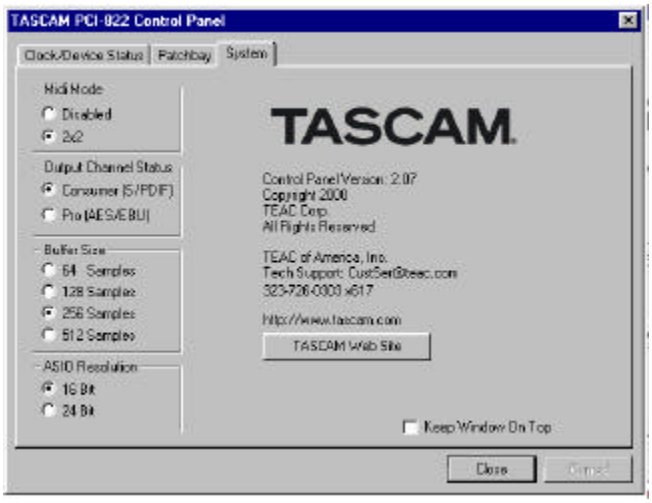
To save the current routings in the Patch Library, click “Save…” and type a name for the patch. You can then restore those routings by selecting the saved patch from the drop-down box.



To remove a saved patch from the Library, select the patch in the drop-down box and then click the “Delete” button.

System Tab

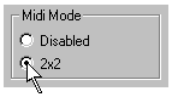
In addition to displaying the PCI-822 software version and contact information for TASCAM, the System tab lets you enable the MIDI ports and set other options. Clicking the 'TASCAM Web Site' button accesses our web site if your PC has an internet link and web browser.



The System tab also has a checkbox labelled "Keep Window On Top." When the box is checked, the control panel remains in front of other windows on your screen.

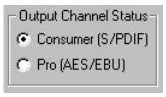
— MIDI Mode (Windows only) —

To enable the PCI-822 MIDI ports, set the MIDI mode to '2x2' and then reboot the computer. To disable the MIDI ports, set the MIDI mode to 'Disabled' and then reboot the computer.



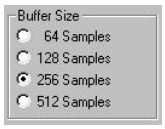
WARNING: Windows 95 crashes if the system exceeds 11 MIDI devices. If you're running Windows 95, and your system includes other MIDI devices, please see "MIDI Limitation (for Windows 95 only)" in the Installation chapter of this Guide.

— Output Channel Status —



The Output Channel Status section lets you set the channel status bits for the PCI-822 coax outputs to either Consumer (SPDIF) or Pro (AES/EBU). The default is SPDIF. If you have an external SPDIF-to-AES/EBU level converter, you can use it with the Pro (AES/EBU) setting to generate true AES/EBU output from the PCI-822.

— Buffer Size —



The Buffer Size indicates how often data is processed between the PCI-822 hardware and its driver. Smaller buffer sizes yield faster response times (lower latency), which most noticeably affect audio functions such as monitoring inputs in the Patchbay, using output from GigaSampler or the ASIO driver in Cubase VST. Larger buffer sizes provide more protection against audio glitches. The default setting is 256 samples. We recommend that you set the buffer size as large as possible while attaining suitable latency for your audio.

Note: You must close all audio applications before you change the buffer size or ASIO resolution. The new setting takes effect when you restart the application(s).

— ASIO Resolution —

You can set the resolution for recording and playback to either '16 bit' or '24 bit' when using the ASIO driver in applications such as Cubase VST. You may also need to set the resolution in the application itself. For example, to record and play 24-bit audio in Cubase VST, you have to enable its '24-bit' button.

You can use 24-bit resolution when recording or playing 16-bit digital audio, but it is slightly less efficient than using 16-bit resolution.

On the Macintosh, the PCI-822 has two different ASIO drivers — one for 16-bit audio, and one for 24-bit audio. Either can be selected within an ASIO-compatible application.

Using the PCI-822

This chapter provides some basic set-up information to help you connect the PCI-822 card to many popular digital tape machines, mixers, and external converters.

In addition to using the proper cables with the correct connectors, it's important to have exactly one audio clock master and to have all other digital devices follow that master.

Synchronization

Every digital audio system operates at a particular sample rate, such as 44,100 samples per second (44.1kHz) for audio CDs. The sample rate can be explicitly transmitted between devices (through a TDIF cable or by BNC word clock) or it can be embedded in a digital audio stream that uses a self-clocking format (SPDIF or AES/EBU). The sample rate can also be derived from NTSC or PAL video signals.

When two or more digital audio devices transfer data, one and only one of them should be used to set the sample rate. This device can have a variety of names — system clock source, sync source, sample clock master, audio clock master, or word clock source. The master device uses an internal oscillator to set the sample rate. All other devices must be synchronized (slaved) to the sample clock master, so their digital clocks are locked to the master clock.

No two oscillators run at exactly the same rate, even if they're both 44.1kHz oscillators (for example). Therefore, if two devices in a system are set to internal sync, each using its own internal oscillator, one is inevitably a bit faster than the other. As a result, samples are lost or duplicated during the transfer, corrupting the audio.

When one device (the slave) gets its sample rate from another device (the master), we say that the slave device is locked to the master. In contrast, when two devices are operating at independent sample rates, they are slipping relative to each other. When multiple sample rates are detected, some devices mute, some generate clicks and pops, and some exhibit completely erratic behavior.

Some devices (such as CD players and DAT machines when they're playing) are automatically set to "Internal" sync, and therefore must be the master device. To transfer audio from a DAT machine or CD player to the computer, you must select "SPDIF" as the clock source in the PCI-822 control panel.

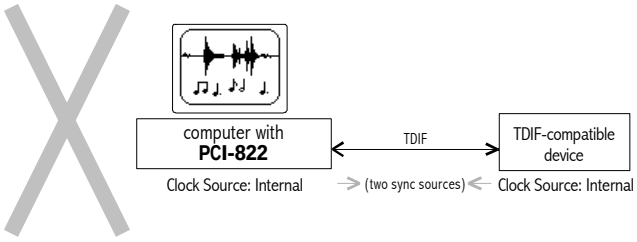
Some devices (such as a DAT machine when it's recording) must be slaved to another device. To transfer audio from the computer to a DAT machine, you must set the PCI-822 clock source to "Internal."

Other devices (such as most digital mixers and multitrack tape machines, and the PCI-822) can be either the master or a slave. In each usable system, exactly one device is set to "Internal" sync, and all other devices are slaved to that device.

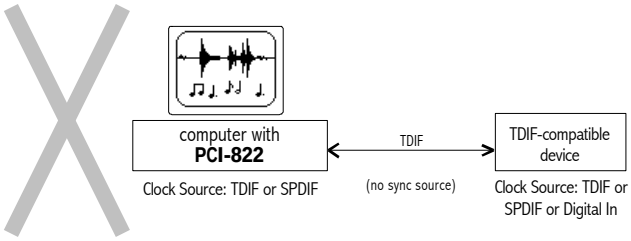
REMEMBER! Any digital audio system must always have exactly one sample clock master, which should determine the sample rate for all devices in that system. If the sample rates aren't locked, you'll hear glitches, dropouts, or nothing at all, and the PCI-822 control panel will display slip errors in the Digital Input Status section.

Unusable Clock Settings

The setup shown below does not work, because both devices are set to “Internal” (there are too many clock masters in the system).



The setup shown below also does not work, because each device is expecting a sync signal from the other device (neither device is set to “Internal” so there is no clock master in the system).



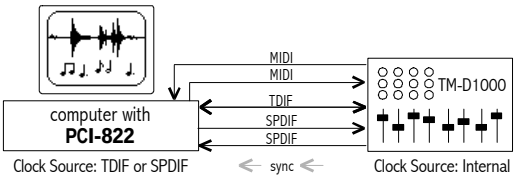
TM-D1000 Digital Mixer

The PCI-822 can be used with a variety of digital mixers, and it's an especially good match for the TASCAM TM-D1000.

Typically, you'd use a TDIF cable, 2 SPDIF cables, and 2 MIDI cables to connect a PCI-822 and a TM-D1000, so you can transmit up to ten digital audio input and output channels between the computer and mixer, and also record and play mixer automation data via MIDI.

Either the TM-D1000 or the PCI-822 can be the clock master. Since the TM-D1000 reverts to internal clocking whenever its digital inputs are absent (for example, before your computer boots up), it's usually most convenient to make the TM-D1000 the audio clock master:

1. On the TM-D1000, hold SHIFT and press OPTION.
2. Rotate the DATA ENTRY knob until "System" is displayed under the "Option" menu, and then press ENTER.
3. When "Master Clock Select" is displayed, press ENTER again.
4. Rotate the DATA ENTRY knob to select the desired clock source, and then press ENTER. The options are:
   Internal[48k] – 48kHz internal
   Internal[44.1k] – 44.1kHz internal
   TDIF-1 A – the TDIF input
   Digital In A – the SPDIF input
5. Press ESCAPE/RECALL three times to return to normal operation.



Note: If you have the TM-D1000's optional digital audio expansion board that provides a second TDIF connection and more SPDIF I/O, please refer to its documentation for details on using its features.

By default, channels 1–8 on the TM-D1000 can be sent directly to its TDIF output (and therefore to the PCI-822). If you want to send channels 9–16 instead, you first need to assign those channels to the mixer's Direct Outs:

1. Hold SHIFT and press OPTION.
2. Rotate the DATA ENTRY knob until "Setup" is displayed under the "Option" menu, and then press ENTER.
3. Rotate the knob until "TDIF-1 A Direct Out" is displayed, and press ENTER again.
4. Rotate the knob until "Ch 9-16" is displayed, and press ENTER again.
5. Press ESCAPE/RECALL three times to return to normal operation.

To send a mixer channel directly to the TDIF output (and to the PCI-822), press the desired CH SEL button (within 1–8 or 9–16) and then press the DIRECT OUT button. All direct outputs are either Pre EQ or Post Input Fader as determined by the setting in Option→Setup→Direct Out mode.

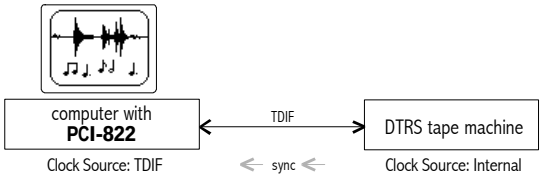
The settings in Option→Setup→Ch1-8 Input (and Ch9-16 Input) determine the source of each TM-D1000 channel input. The settings are Analog In, Digital In A, or TDIF-1 A. Press the DATA ENTRY knob to cycle through the channels, and rotate it to select the desired setting. Remember to press ENTER after changing any value.

To send the SPDIF outputs from the PCI-822 to the mixer, set the TM-D1000 channel inputs to Digital In A. To send the TDIF outputs from the PCI-822 to the mixer, set the TM-D1000 channel inputs to TDIF-1 A.

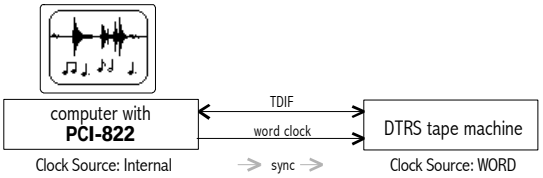
DTRS Multichannel Tape Machines

Although the DA-88/38/98 and 78HR differ in some ways, any one of them can be connected to the PCI-822 via a single TDIF cable.

If you want the tape machine to be the clock master (set to Internal), set the PCI-822 clock source to 'TDIF' (in the Clock/Device Status tab of the PCI-822 control panel).



If you want the PCI-822 to be the clock master, set its clock source to 'Internal,' and connect a 75-ohm word clock cable from the PCI-822 word clock output to the word clock input on the DTRS tape machine. Then press the CLOCK button on the tape machine (or WORD SYNC on the DA-38) to set the clock source to WORD.



If either of the two sample rate indicators on the tape machine blinks, then your tape is formatted at a different sample rate than the incoming clock source. Either change the sample rate on the computer, or use another tape.

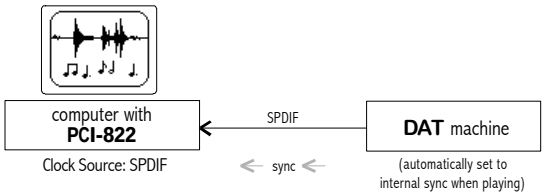
To record digital input on the DTRS machine, press the DIGITAL IN switch. Other features of the DA-98 and DA-78HR, such as input routing and SPDIF I/O, are covered in their owner's manuals.

Any of these multitrack tape machines can also be used as either an 8-channel A/D or an 8-channel D/A converter by setting it to monitor its analog (for A/D) or digital (for D/A) inputs. Unfortunately, you cannot use both the A/D and D/A converters simultaneously.

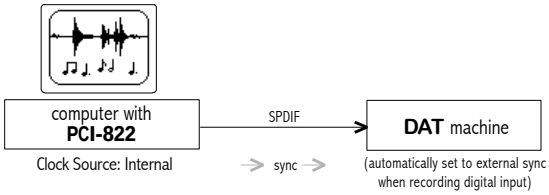
DAT Tape Machines

Any DAT tape machine acts as the audio clock master when it's playing, and as a slave when it's recording digital input (but not analog input).

To record from a DAT machine into the PCI-822, connect a SPDIF cable from the DAT's coax output to the PCI-822 coax input, set the PCI-822 clock source to 'SPDIF,' press PLAY on the DAT, and then record within your computer audio application. You can also use your DAT machine as an A/D converter in this mode. Without pressing PLAY, you can just set the DAT machine to monitor its analog inputs, passing the audio through to the PCI-822 for recording on the computer.



To send audio from the computer to a DAT machine such as the TASCAM DA-20mkII, connect a SPDIF cable from the PCI-822 coax output to the DAT machine's coax input, set the PCI-822 clock source to 'Internal,' select the DAT's coax (digital SPDIF) input, and press the RECORD button to put the DAT into record-pause mode. At this point, the meters on the DAT machine will show the incoming digital audio data. In record-pause mode, you can also use the DAT as a D/A converter, playing audio from the computer through the DAT's analog outputs. To turn off pause mode and begin recording on the DAT, press the PAUSE button.



IF-TAD Converter

The TASCAM IF-TAD provides an 8-channel bi-directional interface between TDIF and ADAT lightpipe devices. Connect a TDIF cable from the PCI-822 to the IF-TAD, and connect ADAT optical cables between the IF-TAD and your ADAT-compatible gear. Either the PCI-822 or your ADAT device can be the clock master.

For example, you can connect an original ADAT tape machine to an IF-TAD converter which is connected to the PCI-822, and then transfer audio between the computer and the ADAT machine.

To transfer audio from an ADAT tape into the computer, set the PCI-822 clock source to 'TDIF,' press PLAY on the ADAT, and then record within your computer audio application. To send audio from the computer to the ADAT, set the PCI-822 clock source to 'Internal,' press the "Dig In" button on the ADAT, and then start recording. (On more recent ADAT tape machine, you'd also press the "Clock Select" button to set its clock source to Dig In 44.1 or Dig In 48.) If the clock settings aren't correct, both "DATA" LEDs on the IF-TAD will blink.

IF-AE8 Converter

The TASCAM IF-AE8 converts digital audio between TDIF and AES/EBU formats. Its clock source can be any of its inputs: word clock, TDIF, or any of its AES/EBU input pairs.

To receive an AES/EBU input that is the clock master on input 1/2 (such as from a high-performance A/D converter with AES/EBU output), set the IF-AE8 clock source to DIGITAL IN 1/2 and set the PCI-822 clock source to "TDIF" in its control panel. To send audio from the computer to the IF-AE8's AES/EBU outputs, set the PCI-822 clock source to "Internal" and set the IF-AE8's clock source to TDIF.

MA-AD8 Converter

The TASCAM MA-AD8 converts 8 channels of microphone pre-amps to an 8-channel TDIF signal. It also has word clock in and thru, phantom mic power, and a TDIF pass-through connection.

The MA-AD8 is always slaved to either its word clock input or the main TDIF connection (DIGITAL I/O 1). To use it with the PCI-822, connect a TDIF cable from the PCI-822 to the MA-AD8's DIGITAL I/O 1 port, set the MA-AD8's CLOCK switch to "TDIF-1," and set the PCI-822 clock source to "Internal." The PCI-822 TDIF input status indicators should be all green, and the "LOCKED" LED on the MA-AD8 should be lit.

Although a word clock cable could be connected from the PCI-822 output to the MA-AD8 input, it's not necessary since the TDIF cable carries the same clock information.

IF-DA8 Converter

The TASCAM IF-DA8 provides 8 channels of line-level output from a TDIF connection. Its clock source can be either the TDIF connection or a word clock input. To use it with the PCI-822, connect a TDIF cable from the PCI-822 to the IF-DA8's "DIGITAL I/O 2" TDIF connector, set the IF-DA8's clock source to "D I/O 2," and set the PCI-822 clock source to "Internal."

If you want to use the IF-DA8 and MA-AD8 simultaneously with the PCI-822, connect one TDIF cable from the PCI-822 to the MA-AD8's "DIGITAL I/O 1" connector, and connect another TDIF cable from the MA-AD8's "DIGITAL I/O 2" connector to the IF-DA8's "DIGITAL I/O 2" connector. In this configuration, the MA-AD8 passes the output from the PCI-822 through to the IF-DA8.

Troubleshooting on the Mac

This section describes some possible problems, and suggestions for resolving them. You can also check the TASCAM web site (http://www.tascam.com) for driver updates and other information.

- **MIDI ports don't appear**

Verify that OMS is installed on your computer.

Verify that you've run "OMS Set-Up" and enabled the PCI-822 MIDI ports.

- **PCI-822 audio devices don't appear**

Verify that the PCI-822 ASIO driver files have been copied into the correct location for the application you're trying to use.

Run the "PCI-822 Installation Test" to verify that the card was installed correctly.

- **No audio output (can't hear any audio playback)**

Verify that the playback device selected in your application corresponds to the PCI-822 output you're using.

In the PCI-822 control panel (Digital Output Status section), verify that the 'Channels In Use' icons are all green for the outputs you're using.

Check the analog signal path to make sure the signal gets to your headphones/speakers.

- **No audio input (can't record audio)**

Verify that the record device selected in your application corresponds to the PCI-822 input you're using.

Check the input error indicators in the Clock/Device Status tab of the PCI-822 control panel —

SIGNAL: If "Signal" is red, verify that the cable is properly connected from the output of the source device to the PCI-822 input, and that the source device is actually playing audio.

FMT: If "Fmt" is red, the digital audio input format doesn't match the selected PCI-822 input.

SLIP: If "Slip" is red, check the clock source settings. Verify that one (and only one) device is set to "Internal" and that all other devices are slaved to that device. Some devices (such as DAT machines) are automatically set to "Internal" sync, so to record from one of them, you need to set the PCI-822 clock source to SPDIF.

In the PCI-822 control panel (Digital Input Status section), verify that the 'Channels In Use' icons are all red for the inputs you're using.

See the "Software Reference" and "Using the PCI-822" chapters earlier in this guide for more details.

- **Computer locks up or has audio glitches**

Try reducing the number of open ASIO inputs or outputs to reduce the CPU load.

• Clicks and pops

Audio artifacts, also known as clicks and pops, can be caused by a variety of conditions. Here are some suggestions for eliminating clicks and pops.

— Synchronization —

The most common cause of glitches in the audio is an incorrect clock source setting. For digital audio recording or playback, it's important to remember that there must be one and only one audio clock master in your digital audio system.

For example, if you're using an external multichannel A/D converter which is running on its internal clock, then the converter is the audio clock master, and the soundcard must be locked to that master by setting the card's Clock Source to the appropriate setting. If the A/D converter is connected to the card via the TDIF connector, set the Clock Source to "TDIF" in the PCI-822 control panel. If the A/D converter is transmitting audio to the RCA (coax) connector, set the PCI-822 Clock Source to "SPDIF" in the control panel.

If both the external A/D converter and the digital soundcard are set to Internal (both are trying to be clock masters), then the recording will contain clicks at regular intervals. Tick ... tick ... tick. The rate of these clicks is determined by how closely matched the internal clocks of the external converter and the soundcard are. When this problem occurs, the SLIP indicator for that input (in the PCI-822 control panel) flashes red at regular intervals. Similar synchronization errors can also occur on playback.

For more information about synchronizing digital audio components, please refer to "Using the PCI-822" earlier in this Guide.

— Hardware buffer size —

The PCI-822 card has a programmable hardware buffer size in the System tab of its control panel. The Buffer Size setting controls how many audio samples are transferred at a time between the card and your computer's motherboard.

In general, the default setting (256 samples) is recommended, but sometimes increasing this buffer size will eliminate glitches due to the behavior of another device on the PCI bus. Before changing the Buffer Size setting, shut down any open audio applications.

— Software buffer size —

Each software application has its own mechanism for adjusting the buffer sizes that the application uses to send and receive blocks of sample data from the audio card's driver. These settings can have a dramatic effect on a variety of factors, such as the maximum number of tracks your system can record/play, and the latency of on-screen fader changes. Using a larger buffer size reduces the likelihood of glitches, and increases the delay between an on-screen change and its audible effect.

Consider the recommendations of the audio software manufacturer, and then experiment with these settings. The goal is a balance between the low latency afforded by a small number of relatively small buffers, and the safety of a large number of large buffers.

— Too many tracks —

Depending on the audio application you're using, you may get clicks and pops if you're trying to run more audio tracks than your system can comfortably handle. You can test this by copying a "problem" project and then removing some tracks from the copy. If the reduced project then plays without problems, try defragmenting your hard disk. If the problem persists, make sure you've explored the other causes of clicks and pops described in this chapter before rushing out to buy a new hard disk or system.

Troubleshooting in Windows

This section describes some possible problems, and suggestions for resolving them. You can also check the TASCAM web site (http://www.tascam.com) for driver updates and other information.

- **Just installed the PCI-822 and it doesn't work**

There's probably an IRQ conflict. If so, the channel output status icons (on the Clock/Device tab of the PCI-822 control panel) will be dark green rather than bright green when you try to play a sound.

The PCI-822 is designed properly for IRQ sharing, but some other devices aren't. You can resolve the problem by moving PCI-822 to a different IRQ — power down the computer, move the PCI-822 card to a different PCI slot, and then reboot the computer.

- **No MIDI in/out**

In the PCI-822 Windows driver, the MIDI ports can be disabled. To enable the MIDI ports, open the System tab of the PCI-822 control panel, select MIDI 2x2, and then reboot the computer.

- **No audio output (can't hear any audio playback)**

Verify that the playback device selected in your application corresponds to the PCI-822 output you're using.

In the PCI-822 control panel (Digital Output Status section), verify that the 'Channels In Use' icons are all green for the outputs you're using.

Check the analog signal path to make sure the signal gets to your headphones/speakers.

If the output "Channels In Use" icons are dark green (rather than bright green), there's probably an IRQ conflict. Power down the computer, move the PCI-822 card to a different PCI slot, and reboot the computer.

- **No audio input (can't record audio)**

Verify that the record device selected in your application corresponds to the PCI-822 input you're using.

Check the input error indicators in the Clock/Device Status tab of the PCI-822 control panel —

SIGNAL: If "Signal" is red, verify that the cable is properly connected from the output of the source device to the PCI-822 input, and that the source device is actually playing audio.

FMT: If "Fmt" is red, the digital audio input format doesn't match the selected PCI-822 input.

SLIP: If "Slip" is red, check the clock source settings. Verify that one (and only one) device is set to "Internal" and that all other devices are slaved to that device. Some devices (such as DAT machines) are automatically set to "Internal" sync, so to record from one of them, you need to set the PCI-822 clock source to SPDIF.

In the PCI-822 control panel (Digital Input Status section), verify that the 'Channels In Use' icons are all red for the inputs you're using.

See the "Software Reference" and "Using the PCI-822" chapters earlier in this guide for more details.

If the input "Channels In Use" icons are dark red (rather than bright red), there's probably an IRQ conflict. Power down the computer, move the PCI-822 card to a different PCI slot, and reboot the computer.

- **Computer locks up or has audio glitches**

Try reducing the number of open ASIO inputs or outputs to reduce the CPU load.

• Clicks and pops

Audio artifacts, also known as clicks and pops, can be caused by a variety of conditions. Here are some suggestions for eliminating clicks and pops.

— Synchronization —

The most common cause of glitches in the audio is an incorrect clock source setting. For digital audio recording or playback, it's important to remember that there must be one and only one audio clock master in your digital audio system.

For example, if you're using an external multichannel A/D converter which is running on its internal clock, then the converter is the audio clock master, and the soundcard must be locked to that master by setting the card's Clock Source to the appropriate setting. If the A/D converter is connected to the card via the TDIF connector, set the Clock Source to "TDIF" in the PCI-822 control panel. If the A/D converter is transmitting audio to the RCA (coax) connector, set the PCI-822 Clock Source to "SPDIF" in the control panel.

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For more information about synchronizing digital audio components, please refer to "Using the PCI-822" earlier in this Guide.

— Hard drives —

If you're using an IDE (ATA, UDMA) drive, and getting clicks and pops, make sure that DMA is enabled for that drive. Many drives are installed without DMA enabled, which can make a HUGE difference in performance. To enable DMA:

1. Navigate to the Device Manager (Start→Settings→Control Panel→System→Device Manager).
2. Click the "+" next to "Disk drives."
3. Double-click on the listing for your hard drive.
4. Go to the "Settings" tab, and make sure that "DMA" is checked under Options.
5. If you changed the setting, you'll need to reboot the computer for the change to take effect.

Also, we do not recommend trying to record audio to an IDE slave drive. IDE controllers can have one master drive and one slave drive. Many systems have two IDE controllers, each running one master drive. That's fine. But slave drives can be much less responsive and can easily cause audio glitches.

Note that SCSI drives have none of these problems. If you have a SCSI drive, make sure that you're using a good bus-mastering SCSI adapter. Other adapters, without bus-mastering, do not have sufficient performance and can cause audio problems.

— WinModems and network cards —

In general, few problems are caused by modems installed in computer audio systems. However, some people occasionally encounter problems with "WinModem" devices. These modems are usually less expensive than standard modems, but they can consume CPU power, sometimes to the detriment of the digital audio program you're trying to run simultaneously.

If you have a WinModem, and you suspect that it's causing problems, you can either power down and remove it temporarily), or disable it in the Device Manager (Start→Settings→Control Panel→System→ Device Manager→Modems, then choose "Disable in this hardware profile").

Audio problems are rarely attributed to a network card, but if you're suspicious that your network card is causing glitches, you can temporarily disable it in the Device Manager.

— CD-ROM auto-insert notification —

Your CPU may be frequently checking the CD-ROM or DVD drive to determine whether a disk has been inserted. This behavior can easily disrupt your audio, usually on a periodic basis (at intervals of several seconds).

See "Tuning the System" later in this Guide for details about disabling auto-insert notification. If you ever re-install Windows on your system, check the auto-insert setting again, because it can be automatically enabled when Windows is installed.

— Video card and hard disk adapter drivers —

Your video card and hard disk adapter each have drivers (software that supports hardware devices), and those drivers might be hogging the system and causing audio glitches. You can check this by recording while watching the Windows System Monitor follow the soundcard's performance. See "Tuning the System" later in this Guide for details about using the System Monitor. If you detect non-zero IRQ Misses in the middle of a recording, the most likely cause is a bad driver, and the most likely suspects are the video card and hard disk adapter drivers.

In Windows 95/98, you can run a similar test with patches enabled in the Patchbay but without doing any recording. If all is well, then the hard disk adapter driver is the most likely cause. If you still get IRQ Misses, then the video card driver is the most likely cause.

We recommend that you frequently check the manufacturers' web sites to see if there are more recent drivers that can be installed. Many problems can be eliminated by simply updating the drivers for the video card and/or hard disk adapter. Also, if your video card driver has a "PCI Retries" option (Control Panel→Settings→Display→Settings→Advanced), disable it.

— Hardware buffer size —

The PCI-822 card has a programmable hardware buffer size in the System tab of its control panel. The Buffer Size setting controls how many audio samples are transferred at a time between the card and your computer's motherboard.

In general, the default setting (256 samples) is recommended, but sometimes increasing this buffer size will eliminate glitches due to the behavior of another device on the PCI bus. Before changing the Buffer Size setting, shut down any open audio applications.

— Software buffer size —

Each software application has its own mechanism for adjusting the buffer sizes that the application uses to send and receive blocks of sample data from the audio card's driver. These settings can have a dramatic effect on a variety of factors, such as the maximum number of tracks your system can record/play, and the latency of on-screen fader changes. Using a larger buffer size reduces the likelihood of glitches, and increases the delay between an on-screen change and its audible effect.

Consider the recommendations of the audio software manufacturer, and then experiment with these settings. Ultimately, you're looking for a balance between the low latency afforded by a small number of relatively small buffers, and the safety of a large number of large buffers.

— Too many tracks —

Depending on the audio application you're using, you may get clicks and pops if you're trying to run more audio tracks than your system can comfortably handle. You can test this by copying a "problem" project and then removing some tracks from the copy. If the reduced project then plays without problems, try defragmenting your hard disk. If the problem persists, make sure you've explored the other causes of clicks and pops described in this chapter before rushing out to buy a new hard disk or system.

Tuning a Windows System

Because computers are general purpose operating systems, some of the default system settings may not be optimal for digital audio work. This chapter offers suggestions that may help improve the performance of your system.

Please check your audio application's documentation for additional performance tips. If you have Internet access, you may want to periodically check your software manufacturer's web site in addition to ours (http://www.tascam.com) for updated information.

Hard Drive and Adapter

One of the most important parts of a digital audio workstation is its hard drive and adapter. It used to be that you had to have a high-performance SCSI system in order to get enough bandwidth for digital audio work. Many high-end customers still use a SCSI system, and enjoy its flexibility. If you want to use a SCSI drive, it's important to have a solid bus-mastering SCSI adapter (preferably Ultra2 Wide), rather than a slave device.

SCSI subsystems are now rivaled in raw performance by "Ultra-DMA" IDE/ATA drives and adapters. Most new systems and motherboards come with at least a 33MHz version, which might be labeled ATA-33 or EIDE33 or UDMA33. There are also faster versions available (UDMA66 models).

The spindle rate of the hard drive significantly affects how quickly it can transfer data. Most inexpensive systems have a hard drive with a spindle rate of 5400rpm or slower. We strongly recommend using a hard drive with a spindle rate of at least 7200rpm. For maximum performance, you may want to consider a 10,000rpm drive.

Regardless of which drive you have, check the manufacturer's web site regularly to make sure you're using the latest software drivers for your hard drive.

If you're using an IDE drive, make sure it is enabled for DMA:

1. Navigate to the Device Manager (Start→Settings→Control Panel→ System→Device Manager).
2. Click the "+" next to "Disk drives."
3. Double-click on the listing for your hard drive.
4. Go to the "Settings" tab, and make sure that "DMA" is checked under Options.
5. If you changed the setting, you'll need to reboot the computer for the change to take effect.

Disk Fragmentation

We recommend that you defragment your disk regularly, especially after heavy editing sessions. Defragmenting reorganizes files into contiguous areas on the disk, so that the entire file can be accessed with a minimum number of head movements. One strategy is to leave the computer running and defragment the disk at the end of each day.

Data Compression

Don't use data compression on the drive that stores your digital audio. Although Windows 95/98 supports data compression (for example, the DriveSpace utility that comes with Microsoft's "Plus!" add-ons), the compression algorithms generally don't work well with digital audio. Furthermore, because the CPU spends time compressing and uncompressing your files, fewer CPU cycles are available for mixing tracks in your audio application.

Sporadic Disk Activity

Some applications think they're doing you a big favor by hanging around in the background until the last crucial 10 seconds of your mixdown, when they awaken and start pounding your disk.

Avoid applications and utilities that cause sporadic disk activity, such as Screen Savers, System Agent, CD-ROM "Auto-Insert" Notification, and Find Fast for Office. Here are some suggestions for thwarting those applications.

— Screen Savers —

Few things are worse than having your audio interrupted by the sudden appearance of a bunch of flying toasters (or some other screen saver). A screen saver is particularly vexing because its delay timer silently ticks away when you're not touching your mouse or keyboard (when you're printing your final mix to DAT, for example).

To disable the screen saver, consult its documentation, or try this procedure: open the Windows Control Panel, double-click the Display icon, select the "Screen Saver" tab, and click the down arrow next to the "Screen Saver" box. Select 'None' (the first entry) and then click 'OK' to confirm the selection.

— System Agent —

System Agent (included in the Microsoft Windows add-on) includes utilities that scan your disk for errors and perform disk defragmentation. System Agent allows you to schedule these activities so they occur at specific times or when you haven't used your computer for a period of time. To prevent these disk-intensive activities from occurring, we recommend that you either disable System Agent while doing your audio work (right-click its icon in the system tray of the Task Bar), or schedule the activities to occur when you're absolutely sure that you won't be trying to record and play audio.

— CD-ROM "Auto-Insert" Notification —

When this option is enabled, Windows may periodically poll your CD-ROM drive to see if you've changed CD's, causing the CD-ROM access light to blink about every five seconds. If Windows Explorer is open and detects a new CD, you'll experience a flurry of disk and CPU activity while the folder and filenames of the new CD are updated in the display. The CPU activity may cause dropouts in your audio.

If you don't load a CD during audio operations, you may not experience this problem, but it's a nice opportunity to rid your machine of that annoying flashing LED!

1. Open the Windows Control Panel (Start→Settings→Control Panel), and double-click the System icon.
2. When the "System Properties" dialog box appears, click the "Device Manager" tab and then click '+' to open the "CD-ROM" sub-tree. A list of installed CD-ROM drives appears (there may be only one in the list).
3. Double-click the line that describes your particular model of CD-ROM ("NEC CDR-74" for example).
4. When the "Properties" dialog box appears, click the "Settings" tab and uncheck 'Auto insert notification.'
5. Click 'OK' to confirm the change, and then close the Control Panel.

— Find Fast for Office —

If you use Microsoft's Office products (Word, Excel, PowerPoint, Schedule, or Access), the "Find Fast" utility was probably installed in the Windows Control Panel. The utility periodically scans your disks, building indices of all your Office documents so their names can be displayed quickly. Unfortunately, the indexing activity could pound your disks while you're trying to play back a multitrack recording.

To prevent Find Fast from running, you can either remove it permanently or disable it temporarily while you work on audio.

- To disable Find Fast permanently, open the Windows "Startup" folder and delete "Microsoft Office Find Fast Indexer." (You can use Windows Explorer to navigate to "C:\Windows\Start Menu\Programs\StartUp.")
- To disable Find Fast temporarily, open the Windows Control Panel (Start→Settings→Control Panel) and double-click the Find Fast icon. When the Find Fast window appears, select 'Pause Indexing' from the Index menu. When you want to enable Find Fast, select 'Pause Indexing' again.

Multi-tasking

Computers can run many applications at once, but if you run more than one at a time, the performance of each individual application diminishes. Your audio applications are particularly heavy users of CPU cycles and disk bandwidth, so it's important to minimize the use of other high-demand applications. It's probably OK to run a word processor in the background while you're mixing down, but avoid applications that do a lot of computation or frequently access the hard disk.

File Caching

Windows 95/98 has built-in file caching which saves your most recently accessed data in memory. Since file caching is of limited use in digital audio applications, you may want to restrict the amount of memory reserved for file caching. Locate the SYSTEM.INI file in your Windows folder, and open the file in a text editor such as Notepad. Create (or find and edit) a section named "[VCache]" and make sure the MinFileCache and MaxFileCache are both set to:

4096 (for a computer with 32MB of RAM), -or-
8192 (for a computer with 64MB or more of RAM)

The values are given in kilobytes (KB) of RAM (2048 means 2MB of RAM).

WARNING: Do not use values for MinFileCache or MaxFileCache that begin to approach the amount of physical RAM in your machine. NEVER use values greater than the old Windows 3.1 limit of 24576 (24 MB). Microsoft specifically warns that it does not guarantee performance of the cache at sizes larger than this and disavows responsibility for data corruption or loss that may occur. So do we!

Other Caching Options

There are several other caching options which may affect your PC's audio performance —

- You may want to limit the amount of "Read-ahead optimization" performed by Windows. Open the Control Panel (Start→Settings→ Control Panel), and double-click the System icon. Select the "Performance" tab, and click the 'File System...' button. When the "File System Properties" dialog appears, select the "Hard Disk" tab, and move the 'Read-ahead optimization' slider all the way to the left.
- In the same dialog ("File System Properties"), you can specify the "Typical role of this machine." In most cases, you'll want it set to 'Desktop computer.'
- You may want to disable "write-behind caching." In the "File System Properties" dialog, select the "Troubleshooting" tab and check the box labelled 'Disable write-behind caching for all drives.'

32-bit Drivers

To obtain the best possible performance from your disk system, use 32-bit drivers. Generally, the Windows installation replaces real-mode drivers with 32-bit protected mode drivers. However, there may not have been any 32-bit drivers that were compatible with your hardware when Windows was released. To check the driver, open the Control Panel, double-click the System icon and select the "Performance" tab. If the "File System" status doesn't indicate "32-bit," contact the manufacturer of your disk controller to get a 32-bit protected mode driver and install it in your system.

Virtual Memory Swapfile

When the demands of multi-tasking exceed the limits of physical memory on your machine, Windows dynamically changes the size of the swapfile that it uses to hold code and data. You can improve audio performance by setting the swapfile parameters manually.

Open the Control Panel, double-click the System icon, select the "Performance" tab in the System Properties dialog, and click the "Virtual Memory…" button. When the "Virtual Memory" dialog appears, select "Let me specify my own virtual memory settings."

Set the following parameters in the dialog:

Hard disk: choose a disk other than the one you use for digital audio (if possible)
Minimum: set it to 2.0–2.5 times the size of your system memory
Maximum: set it to the same value you specified for minimum
Leave "Disable virtual memory" unchecked!

Click "OK" to confirm your choices, and close the Control Panel. After changing this setting, you'll be reminded that the new settings won't take effect until you restart Windows.

Video card

Many video cards hog the CPU or the PCI bus in order to improve their own performance. This can be at the expense of good real-time performance, which is critical for digital audio workstations.

Check the manufacturer's web site frequently to make sure you're using the latest drivers for your video card. Simply updating the video card drivers can eliminate problems and dramatically improve performance.

Graphics Acceleration

If you experience glitches during recording or playback, you may have a video driver problem. If so, try reducing the amount of graphics acceleration used by Windows. Open the Control Panel, double-click the System icon, select the "Performance" tab in the System Properties dialog, and click the "Graphics…" button. When the "Advanced Graphics Settings" dialog appears, move the "Hardware acceleration" slider all the way to the left. Click "OK" to confirm the setting, and close the Control Panel. After changing this setting, you'll be reminded that the new settings won't take effect until you restart Windows.

After you've rebooted, see if the glitching problem is gone. If so, you may want to experiment with other settings of the "Hardware acceleration" slider to regain some of the graphics performance.

Windows System Monitor

Windows includes a "System Monitor" utility that displays important performance information about your machine. If it's installed, you can usually find it by following this path in the Start menu:

Start→Programs→Accessories→System Tools→System Monitor

> What if you don't have System Monitor?
>
> System Monitor is optionally installed as part of Windows 95/98, but every Windows 95/98 PC can load it. Open the "Add/Remove Programs" control panel (Start→Settings→Control Panels→Add/Remove Programs). In the "Windows Setup" tab, scroll down and select "Accessories." Its check box will be gray if some of the accessories aren't installed. Click the 'Details…' button. Scroll through the list of programs and make sure "System Monitor" is checked. Click 'OK' and follow the installation instructions.

When the WaveCenter/PCI driver is loaded, it notifies Windows that it can collect statistics that indicate how well the system is responding to WaveCenter/PCI's requests to read and write audio data.

You can display these statistics and compare them with other important performance data —

1. Start the System Monitor application (Start→Programs→ Accessories→System Tools→System Monitor).
2. Click on the fourth icon in the tool bar (it looks like a funky blue mountain range) so that data will be displayed in "time-line" format.
3. Select "Add Item…" from the Edit menu.
4. In the "Category" box, click 'WaveCenter/PCI Performance.' The list on the right indicates which performance data can be displayed.
5. Select one or more items from the list and click 'OK.' The graphical display adds the statistics you selected. You may also want to select items from other parts of the system so you can correlate the performance of WaveCenter/PCI with other CPU and disk activity.

The following list describes the available statistics.

— IRQ Latency —

This statistic indicates the maximum number of audio samples that have elapsed between the time the WaveCenter/PCI hardware asked for service and the time Windows began to process the request. Typically it's less than 5.

Correlating the system's response time to interrupts with other system activity will help you determine if there are other installed devices that prevent WaveCenter/PCI from being serviced efficiently. To calculate the absolute latency (accurate to within one sample), divide the IRQ latency by the current sample rate.

— IRQ Misses —

Normally, this should be zero. An IRQ miss means the WaveCenter/PCI driver wasn't given enough time to transfer audio between your PC and the WaveCenter/PCI hardware, a severe problem indicating that something in the system is causing gross timing latencies that can't be overcome. The result can be brief audio dropouts or pops. Try to determine whether another device is active when the IRQ misses occur, and then correct the situation by removing that device or by not using it while also trying to transfer audio.

— Input Overruns —

This indicates how many errors occurred when WaveCenter/PCI was ready to transfer newly-recorded information to an application, but the application hadn't supplied a buffer in which to write the audio data. Input overruns are generally caused by an overloaded CPU or a disk system that can't keep up with the audio applications.

— Output Underruns —

This indicates the number of times that the driver ran out of data to send to the digital audio outputs. Generally, it means that the CPU or disk system couldn't keep up with the real-time demands of the application. It's normal to see a "blip" when playback stops, but an output underrun in the middle of playback indicates a problem.

PCI-822 Specifications

These specifications are subject to revision without notice.

Digital audio inputs	8 channels TDIF-1 format 2 channels SPDIF format on RCA (coax) input
Digital audio outputs	8 channels TDIF-1 format 2 channels SPDIF format on RCA (coax) output
MIDI I/O	2 MIDI inputs + 2 MIDI outputs; standard DIN-5 connectors
Word clock output	BNC connector; drives 75-ohm input to TTL levels
Sample rates	44.1 and 48 kHz internal; input tracking from 39–51 kHz
Audio data	16, 20, 24 bit resolution
Software	Windows 95/98 device driver (MME, ASIO, GSIF) MacOS 8.5 (or later) device driver (ASIO, OMS) Control panel for displaying status and setting options
System requirements	1 PCI slot
Dimensions	4.7" x 3.6" (12cm x 9.2cm), PCI short card

Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the User's Guide, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

Declaration of Conformity

TEAC America, Inc. declares that the multichannel digital I/O card called PCI-822 conforms to the following Directives and Standards:

Council Directives: 89/336/EEC, 73/23/EEC
Conformance Standards: EN55022 Class A, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-8, EN61000-4-11