Pro Tools® |HD User Guide

Version 9.0

Legal Notices

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Documentation Feedback

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contents

chapter 1

Welcome to Pro Tools|HD

Pro Tools®|HD provides high-definition digital audio recording, editing, signal processing, mixing, and I/O capabilities.

This guide covers installation of Pro Tools|HD hardware on Mac and Windows platforms. For information about installing Pro Tools software, see the *Pro Tools Installation Guide* included with your Pro Tools software package.

Pro Tools|HD Systems

Pro Tools|HD systems come in the following basic hardware configurations:

Pro Tools|HD Systems

Pro Tools|HD systems are available in the following configurations:

Pro Tools|HD 1

- Pro Tools|HD Accel Core card

Pro Tools|HD 2 Accel

- Pro Tools|HD Accel Core card
- Pro Tools|HD Accel card

Pro Tools|HD 3 Accel

- Pro Tools|HD Accel Core card
- Two Pro Tools|HD Accel cards

Pro Tools|HD Expanded Systems

- Pro Tools|HD Accel Core card
- More than three (and up to seven) Pro Tools|HD Accel cards (requires an expansion chassis)

Pro Tools|HD System Packages

All Pro Tools|HD systems packages include the following:

- Pro Tools|HD Accel Core card
- One or more Pro Tools|HD Accel cards (with Pro Tools|HD 2 Accel and Pro Tools|HD 3 Accel systems)
- A DigiLink™ cable for connecting the Pro Tools|HD Accel Core card to an audio interface (one additional DigiLink cable is included with each additional Pro Tools|HD Accel card)
- TDM FlexCable™ to connect multiple Pro Tools|HD cards (multi-card systems only—a TDM FlexCable is included with each additional Pro Tools|HD Accel card)
- Pro Tools Software Installer package
- An iLok USB key
- An Activation Card with an Activation code for a Pro Tools HD license
- Registration Information Card

- This *User Guide*, covering installation and configuration of Pro Tools|HD systems
- *Pro Tools|HD Card Quick Setup*, covering basic hardware installation
- *Health and Safety Guide*

All Pro Tools|HD systems require at least one Pro Tools|HD audio interface (sold separately). See "Pro Tools|HD Audio Interfaces" on page 9.

Pro Tools|HD Capabilities

Pro Tools HD running on Pro Tools|HD hardware provides the following capabilities:

- Up to 160 channels of I/O depending on your system and the number of audio interfaces.
- Up to a total of 192 voiced audio tracks (up to 512 voiceable audio tracks)
- Up to 160 Auxiliary Input tracks
- Up to 64 Master Fader tracks
- Up to 128 VCA Master tracks
- Up to 512 MIDI tracks
- Up to 128 Instrument tracks
- Up to 64 video tracks per session
- 16-bit or 24-bit audio resolution, at sample rates up to 192 kHz
- Up to 7.1 surround mixing capability
- Automatic Delay Compensation
- Non-destructive, random-access editing and mix automation
- Audio processing with up to 10 TDM or RTAS plug-ins per track, depending on your computer's capabilities
- Up to 10 hardware inserts per track
- Up to 10 sends per track
- Up to 256 internal mix busses for routing and mixing

For detailed information about Pro Tools software functionality, see the Pro Tools Reference Guide (Help > Pro Tools Reference Guide).

Audio Recording and Playback Capabilities

Pro Tools HD software runs on the following Pro Tools|HD hardware systems:

Pro Tools|HD 1

Pro Tools|HD 1 systems provide recording and playback of 24-bit or 16-bit audio files with the following voiced track counts:

- Up to 96 tracks at 44.1 kHz or 48 kHz
- Up to 48 tracks at 88.2 kHz or 96 kHz
- Up to 24 tracks at 176.4 kHz or 192 kHz

Pro Tools|HD 2 Accel and HD 3 Accel

Pro Tools|HD 2 Accel and HD 3 Accel systems provide recording and playback of 24-bit or 16-bit audio files with the following voiced track counts:

- Up to 192 tracks at 44.1 kHz or 48 kHz
- Up to 96 tracks at 88.2 kHz or 96 kHz
- Up to 36 tracks at 176.4 kHz or 192 kHz

Pro Tools|HD Expanded Systems

Pro Tools|HD systems support up to seven Pro Tools|HD cards in systems using an expansion chassis. With at least six Pro Tools|HD cards, Pro Tools supports up to ten Pro Tools|HD audio interfaces. For more information, see the *Expanded Systems Guide*.

System Requirements and Compatibility

Pro Tools|HD systems can be used with a qualified Windows or Mac computer running Pro Tools HD software.

A DVD drive is required to use the Pro Tools Installer disc.

Avid can only assure compatibility and provide support for hardware and software it has tested and approved.

For complete system requirements and a list of qualified computers, operating systems, hard drives, and third-party devices, visit:

www.avid.com/compatibility

iLok USB Key Authorization

Pro Tools|HD systems include an iLok USB key and an Activation code (on the included Activation card) for your Pro Tools HD software.

⚠ *An authorized iLok must be inserted in an available USB port on your computer to run Pro Tools.*

Pro Tools software is authorized using the iLok USB Smart Key (iLok) from PACE Anti-Piracy.

iLok

An iLok can hold hundreds authorizations for all of your iLok-enabled software. Once an iLok is authorized for a given piece of software, you can use the iLok to authorize that software on any computer.

⚠ *An authorized iLok must be inserted in an available USB port on your computer to run Pro Tools HD.*

For information about installing and authorizing your Pro Tools HD software, see the printed Pro Tools Installation Guide included with your Pro Tools Software Package.

MIDI Requirements

Pro Tools works with most USB and FireWire MIDI interfaces and controllers. For a list of supported USB and FireWire MIDI interfaces and controllers, visit:

www.avid.com/compatibility

Hard Drive Requirements

For optimal audio recording and playback, all Pro Tools|HD systems require one or more qualified hard drives.

Initialize your hard drives with the Disk Utility application included with Apple System software (Mac) or using Windows Disk Management (Windows).

Avoid Recording to the System Drive

Recording to your system drive is not recommended. Recording and playback on a system drive may result in lower track counts and fewer plug-ins.

If you have multiple hard drives in your system, use DigiBase to designate the system drive as a Playback or Transfer only drive for optimal performance. For more information about using DigiBase, see the Pro Tools Reference Guide.

Registration

Review the enclosed Registration Information Card and follow the instructions on it to quickly register your purchase online. By registering, you become eligible to receive the following:

- Information regarding technical support
- Software update and upgrade notices
- Limited warranty on hardware

Conventions Used in This Guide

All of our guides use the following conventions to indicate menu choices and key commands:

Convention	Action
File > Save	Choose Save from the File menu
Control+N	Hold down the Control key and press the N key
Control-click	Hold down the Control key and click the mouse button
Right-click	Click with the right mouse button

The names of Commands, Options, and Settings that appear on-screen are in a different font.

The following symbols are used to highlight important information:

User Tips are helpful hints for getting the most from your Pro Tools system.

Important Notices include information that could affect your Pro Tools session data or the performance of your Pro Tools system.

Shortcuts show you useful keyboard or mouse shortcuts.

Cross References point to related sections in the Pro Tools Guides.

About www.avid.com

The Avid website (www.avid.com) is your best online source for information to help you get the most out of your Pro Tools system. The following are just a few of the services and features available.

Product Registration Register your purchase online.

Support and Downloads Contact Avid Customer Success (technical support); download software updates and the latest online manuals; browse the Compatibility documents for system requirements; search the online Knowledge Base or join the worldwide Pro Tools community on the User Conference.

Training and Education Study on your own using courses available online or find out how you can learn in a classroom setting at a certified Pro Tools training center.

Products and Developers Learn about Avid products; download demo software or learn about our Development Partners and their plug-ins, applications, and hardware.

News and Events Get the latest news from Avid or sign up for a Pro Tools demo.

Pro Tools Accelerated Videos Watch the series of free tutorial videos. Accelerated Videos are designed to help you get up and running with Pro Tools and its plug-ins quickly.

chapter 2

Pro Tools Hardware Overview

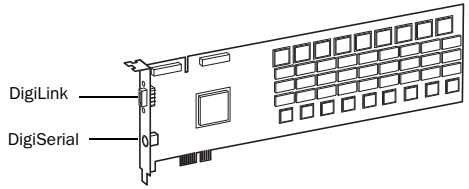
This section describes each hardware component of a Pro Tools|HD system. The number of Pro Tools|HD cards in your system will differ depending on your system configuration.

Pro Tools|HD Hardware

HD Accel Core Card

All Pro Tools|HD systems include a Pro Tools|HD Accel Core PCIe card.

The HD Accel Core card provides up to 96 voiceable tracks of direct-to-disk recording and playback, as well as DSP power for mixing and plug-in processing. The Pro Tools|HD Accel Core card supports up to 24-bit, 192 kHz sessions.



Accel Core card

DigiLink Port

The HD Accel Core card includes a single DigiLink port for connecting up to 32 channels of audio input and output to your Pro Tools|HD system.

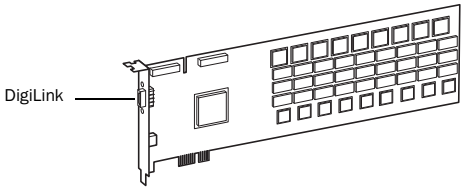
DigiSerial Port

The DigiSerial port on the HD Accel Core card is for connecting a SYNC peripheral. This connector is an 8-pin mini-DIN.

⚠ *The DigiSerial port on an HD Accel Core card does not support MachineControl connections.*

HD Accel Card

A Pro Tools|HD Accel PCIe card is included in Pro Tools|HD 2 Accel system and two are included with a Pro Tools|HD 3 Accel system. Additional Pro Tools|HD Accel cards can be purchased separately to expand the capabilities of your Pro Tools|HD system. HD Accel cards provide additional DSP and I/O connectivity, and require the presence of an HD Accel Core card in the system. In systems using an expansion chassis, Pro Tools supports up to six Pro Tools|HD Accel cards in addition to the Pro Tools|HD Accel Core card.



HD Accel card

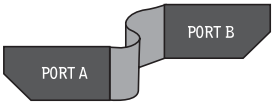
DigiLink Port

The HD Accel card includes a single DigiLink port for connecting up to 32 channels of audio input and output to your Pro Tools|HD system.

TDM FlexCable

The TDM FlexCable is used to connect a pair of cards in your Pro Tools system so they can share data along the TDM bus. One FlexCable comes with each Pro Tools|HD Accel card.

⚠ *The TDM FlexCable is a flexible printed circuit board with delicate traces. Do not overbend, twist, or pinch the cable. Doing so may cause unpredictable behavior in Pro Tools as well as harm to your system.*



TDM FlexCable

DigiLink Mini and DigiLink Cables

Use DigiLink cables to connect 192 I/O, 192 Digital I/O, 96 I/O, and 96i I/O audio interfaces to Pro Tools|HD cards. Use DigiLink cables with a DigiLink to DigiLink Mini adapter cable to connect HD I/O, HD OMNI, and HD MADI audio interfaces to Pro Tools|HD cards.

DigiLink Cable Length Specifications

There are six different lengths of DigiLink cables:

- 18″ (0.46m), included with 192 I/O, 192 Digital I/O, 96 I/O, and 96i I/O
- 12′ (3.6m) (included with Pro Tools|HD cards)
- 25′ (7.62m) (sold separately)
- 50′ (15.25m), the maximum length supported for 176.4 kHz and 192 kHz sessions (sold separately)
- 100′ (30.5m), the maximum length supported by 88.2 kHz and 96 kHz sessions (sold separately)

DigiLink to DigiLink Mini Adapter Cables

Use DigiLink to DigiLink Mini adapter cables to connect HD I/O, HD OMNI, and HD MADI to Pro Tools|HD cards. You can also use DigiLink to DigiLink Mini adapter cables to connect older HD peripherals (such as 192 I/O) to the Expansion port of HD I/O and HD OMNI.

There are two types of DigiLink to DigiLink Mini adapter cables:

- 12″ DigiLink female to DigiLink Mini male, included with each interface
- 12″ DigiLink Mini female to DigiLink male

For more information about DigiLink Mini and DigiLink Mini to DigiLink cables, visit the Avid website (www.avid.com).

DigiLink Mini Cable Length Specifications

There are six different lengths of DigiLink Mini cables:

- 18″ (0.46m), included with HD I/O, HD OMNI, and HD MADI
- 12′ (3.6m) (sold separately)
- 25′ (7.62m) (sold separately)
- 50′ (15.25m), the maximum length supported for 176.4 kHz and 192 kHz sessions (sold separately)
- 100′ (30.5m), the maximum length supported by 88.2 kHz and 96 kHz sessions (sold separately)

Pro Tools|HD Audio Interfaces

To record and play audio with Pro Tools HD, you must have at least one Pro Tools|HD audio interface connected to the Pro Tools|HD Accel Core card.

HD OMNI Audio Interface

HD OMNI is a professional digital audio interface designed for use with Pro Tools|HD systems. HD OMNI provides a compact preamp, monitoring, and I/O solution for music production and recording, and post production studios.

HD OMNI Features

HD OMNI provides up to 8 discrete channels of Pro Tools input and output, with 4-segment LED meters for input or output (selectable).

Analog I/O

- 24-bit analog-to-digital (A/D) and digital-to-analog (D/A) converters, with support for sample rates up to 192 kHz
- 2 high-quality Mic/DI preamps (Channels 1–2)
- 2 combined XLR and 1/4-inch TRS front panel inputs for microphone and instrument level input
- 2 XLR back panel microphone inputs
- 2 1/4-inch TRS Send and 2 1/4-inch TRS Return back panel jacks for hardware inserts on channels 1 and 2
- 4 analog TRS line level back panel inputs (Channels 1–4)

⚠ *HD OMNI provides multiple analog input connections, but only provides up to four channels of simultaneous analog input for Pro Tools.*

- Soft Clip and Curv limiting circuits to protect against clipping on analog input
- 8 channels of analog back panel output using a DB-25 breakout cable (sold separately) with variable output gain
- 2 channels of analog back panel output using TRS (Mirrors channels 1–2 or 7–8 on DB-25 connector)
- Front panel stereo 1/4″ headphone jack

Digital I/O

- 8 channels of AES/EBU output (up to 192 kHz Single Wire) using a DB-25 breakout cable (sold separately)
- 2 channels of AES/EBU XLR input (up to 192 kHz Single Wire)
- 2 channels of S/PDIF RCA input and output (up to 192 kHz)
- 8 channels of ADAT TOSLINK input and output
- Support for ADAT S/MUX Optical for sample rates of 88.2 kHz, 96 kHz, 176.4 kHz, and 192 kHz
- Support for two channels of S/PDIF Optical with sample rates of up to 96 kHz
- Real-time sample rate conversion (SRC) on Digital Inputs 1–2 of either AES/EBU, S/PDIF, or Optical (S/PDIF)

⚠ *SRC is not supported with ADAT S/MUX.*

Monitoring

- An additional stereo "CUE" output path in Pro Tools for headphone monitoring from the front panel headphone jack
- Front panel Control Room (MAIN/ALT) and Headphone monitoring volume control
- Flexible monitoring with fold-down from all stereo and surround formats (up to 7.1 surround)
- Input mixer for low latency direct monitoring of a variety of incoming signals (configured in the Pro Tools Hardware Setup)

Synchronization

- Loop Sync input and output for connecting additional Pro Tools|HD interfaces and peripherals
- External Clock input and output for synchronizing HD OMNI with external Word Clock devices

For more information about HD OMNI, see the HD OMNI Guide.

HD I/O Audio Interface

HD I/O is a multichannel digital audio interface designed for use with Pro Tools|HD systems. HD I/O features extremely high quality 24-bit analog-to-digital (A/D) and digital-to-analog (D/A) converters, and supports sample rates of up to 192 kHz.

HD I/O comes in three standard configurations:

- 8 x 8 x 8 (8 analog in, 8 analog out, and 8 digital in and out)
- 16 x 16 analog in and out
- 16 x 16 digital in and out

You can also add or remove HD I/O Analog Expansion cards (ADC and DAC) and HD I/O Digital Expansion cards for custom configurations.

HD I/O Features

HD I/O provides up to 16 discrete channels of Pro Tools input and output, with 4-segment LED meters for input and output.

Analog I/O

- Up to sixteen channels of 24-bit D/A and A/D converters for superior analog input and output at sample rates of 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, and 192 kHz with Analog In and Analog Out HD I/O cards
- Soft Clip and Curv limiting circuits to protect against clipping on analog input

Digital I/O

- Up to sixteen channels of 24-bit digital I/O, using AES/EBU, TDIF DB-25, or Optical at sample rates of 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, and 192 kHz with a Digital HD I/O card
- Real-time sample rate conversion on digital inputs with a Digital I/O card (up to sixteen channels of AES/EBU, Optical, or TDIF)
- Support for S/MUX Optical for sample rates of 88.2 kHz and higher
- Support for 2 channels of S/PDIF Optical (enclosed) with sample rates of up to 96 kHz
- 2 channels of AES/EBU I/O (enclosed) with support for sample rates up to 192 kHz
- 2 channels of 24-bit-capable S/PDIF I/O (enclosed) with support for sample rates up to 192 kHz

Synchronization

- Loop Sync input and output for connecting additional Pro Tools|HD interfaces and peripherals
- External Clock input and output for synchronizing HD I/O with external Word Clock devices

Expandability

- Optional addition of I/O cards to expand analog or digital I/O
- Simultaneous use of multiple Pro Tools|HD audio interfaces to further expand system input and output (for more information see the *Expanded Systems Guide*)

For more information about HD I/O, see the HD I/O Guide.

HD MADI Digital Audio Interface

HD MADI is a 64-channel, digital audio interface designed for use with Pro Tools|HD systems. HD MADI supports the Multichannel Audio Digital Interface (MADI) format and sample rates of up to 192 kHz. HD MADI provides simplified connectivity between your Pro Tools|HD system and MADI-compatible audio equipment, such as routers, digital mixing consoles, and converters.

HD MADI Features

- 2 MADI Optical and Coaxial inputs and 2 MADI Optical and Coaxial outputs for up to 64 discrete channels of digital input and output (32 channels per DigiLink Mini port)
- Supports sample rates of 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, and 192 kHz
- 24- or 16-bit resolution
- Sample Rate Conversion (SRC) on input or output
- Front panel clock and SRC indicators
- Front panel signal present LEDs for input and output
- BNC Word Clock I/O for synchronizing HD MADI with external 1x Word Clock

- BNC Loop Sync I/O for synchronizing HD MADI with additional Pro Tools|HD audio interfaces and peripherals (such as HD I/O, HD OMNI, or SYNC HD)
- Dedicated BNC Word Clock input and XLR AES/EBU input (clock input only) for external MADI synchronization (when using SRC on output)
- Clock support for the following formats: Internal, Loop Sync, Word Clock, AES/EBU, and MADI
- Varispeed modes (supports both 64- and 56-channel standards)

For more information about HD MADI, see the HD MADI Guide.

192 I/O Audio Interface

192 I/O™ is a multichannel digital audio interface designed for use with Pro Tools|HD systems. 192 I/O features high quality 24-bit analog-to-digital (A/D) and digital-to-analog (D/A) converters, and supports sample rates of up to 192 kHz.

You can also add or remove analog cards (ADC and DAC) and digital cards for custom configurations.

192 I/O Features

- Supports sample rates up to 192 kHz
- Supports both analog and digital connections, including AES/EBU, S/PDIF, TDIF, and ADAT Optical:
  - Digital (Digital I/O Card): 8 channels, DB-25 (AES/EBU and TDIF), or one pair of Lightpipe (ADAT Optical) connectors; Expandable up to 16 of channels digital I/O with the addition of the 192 Digital expansion card
  - Analog: 8 channels, DB-25 (balanced) connectors, inputs selectable between +4 dBu or –10 dBV, outputs +4 dBu only; Expandable up to 16 analog inputs or 16 outputs using an optional 192 AD or 192 DA expansion card, respectively
  - Digital (Enclosure): 2 channels, XLR (AES/EBU) connectors; 2 channels RCA (S/PDIF) connectors
  - Optical (Enclosure): 8 channels, one pair of Lightpipe (ADAT Optical) connectors (switchable to 2 channels, S/PDIF)
- Loop Sync In and Out for connecting Pro Tools|HD interfaces and peripherals
- External Clock In and Out receive or send 1x Word clock

For more information, see the 192 I/O Guide.

192 Digital I/O Audio Interface

192 Digital I/O™ is a multichannel digital audio interface designed for use with Pro Tools|HD systems, and supports sample rates of up to 192 kHz.

192 Digital I/O Features

- Supports sample rates up to 192 kHz
- Supports digital connections, including AES/EBU, S/PDIF, TDIF, and ADAT Optical:
  - Digital (2 Digital I/O Cards): 16 channels, DB-25 (AES/EBU and TDIF), or two pairs of Lightpipe (ADAT Optical) connectors
  - Digital (Enclosure): 2 channels, XLR (AES/EBU) connectors; 2 channels RCA (S/PDIF) connectors
  - Optical (Enclosure): 8 channels, one pair of Lightpipe (ADAT Optical) connectors (selectable to 2 channels, S/PDIF)
- Loop Sync In and Out for connecting Pro Tools|HD interfaces and peripherals
- External Clock In and Out receive or send 1x Word clock

For more information, see the 192 Digital I/O Guide.

96 I/O Audio Interface

96 I/O™ is a multichannel digital audio interface designed for use with Pro Tools|HD systems. 96 I/O features high quality 24-bit analog-to-digital (A/D) and digital-to-analog (D/A) converters, and supports sample rates of up to 96 kHz.

96 I/O Features

- Supports sample rates up to 96 kHz
- Supports analog and digital connections, including AES/EBU, S/PDIF, and ADAT optical:
  - Analog: 8 channels, 1/4-inch TRS (balanced or unbalanced) connectors, +4 dBu or –10 dBV
  - Digital: 2 channels, XLR (AES/EBU) connectors; 2 channels, RCA (S/PDIF) connectors
  - Optical: 8 channels, one pair of Lightpipe (ADAT Optical) connectors (switchable to 2 channels, S/PDIF)
  - External Clock In and Out receive or send 1x Word clock

For more information, see the 96 I/O Guide.

96i I/O Audio Interface

96i I/O™ is a multichannel digital audio interface designed for use with Pro Tools|HD systems. 96i I/O features high quality 24-bit analog-to-digital (A/D) and digital-to-analog (D/A) converters, and supports sample rates of up to 96 kHz.

96i I/O Features

- Supports sample rates up to 96 kHz
- 16 discrete channels of input, and 2 channels of output, with 4-segment LED meters on each channel. Audio inputs and outputs include:
  - 16 channels of 24-bit, 96-kHz capable analog input, with adjustable input sensitivity
  - 2 channels of 24-bit, 96-kHz capable analog output, with selectable operating level
  - 2 channels of 24-bit, 96 kHz-capable digital S/PDIF RCA input and output
- Loop Sync In and Out for connecting Pro Tools|HD interfaces and peripherals
- External Clock In and Out receive or send 1x Word clock

For more information, see the 96i I/O Guide.

Expanded Pro Tools|HD Systems

You can expand your Pro Tools|HD system by adding Pro Tools|HD cards to your computer, either directly in the computer or using an expansion chassis. Expanding your Pro Tools system provides increased track counts, adds to the amount of possible plug-in and mixer processing, and lets you connect additional audio interfaces. With support for up to 7 Pro Tools|HD cards in a single system, a Pro Tools|HD system can support up to 160 channels of simultaneous input and output.

For more information, see the Expanded Systems Guide.

Additional Pro Tools|HD Hardware

Pro Tools HD also supports the following Pro Tools|HD hardware options.

- Synchronization peripherals:
  - SYNC HD™
  - SYNC I/O™
- PRE™ (Eight-channel microphone preamp)
- MIDI I/O™ (10 x 10 USB MIDI interface)
- Worksurfaces and control surfaces:
  - D-Command®
  - D-Control™
  - C|24™
  - Command|8®
  - Euphonix controllers with EUCON

chapter 3

Installing Pro Tools|HD Hardware

To install Pro Tools|HD hardware, first install Pro Tools|HD cards. For systems with more than one card, connect the cards using TDM FlexCables. Once the cards are installed, connect Pro Tools|HD audio interfaces.

To install cards into an expansion chassis, see the Expanded Systems Guide.

Install Pro Tools software only after you have installed your Pro Tools|HD hardware. For information on installing Pro Tools software, see the Pro Tools Installation Guide that came with you Pro Tools Software package.

Installing Pro Tools|HD Cards in a Mac Pro

The PCI Express-equipped Mac Pro has three *PCI Express* (PCIe) slots (named slots 2, 3, and 4). The PCI Express slot numbers increase from *bottom to top* as you face the open computer case from the side. Install the Pro Tools|HD Core card into PCIe slot 2.

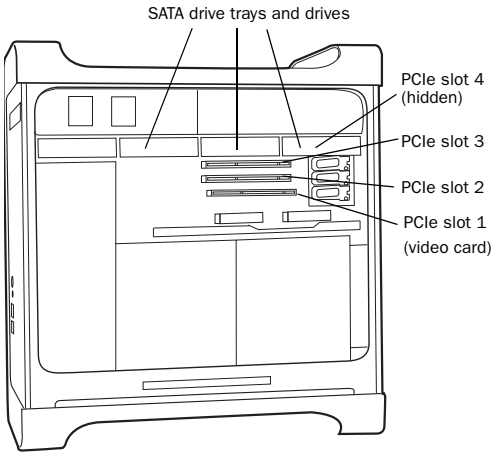


Figure 1. Mac Pro

Follow these instructions carefully to avoid damaging the card and its components.

To install Pro Tools cards in a Mac Pro:

1 Turn off your computer and any peripherals. Leave your computer's power cable plugged in so the computer is grounded.

2 Disconnect all cables attached to the computer (such as hard drives, displays, USB and FireWire devices) except for the power cable.

3 Lay the computer on its side so the access panel is facing up

4 Open the computer case using the latch located on the back of the computer.

5 Remove the clamp that secures the metal access port covers to the chassis.

6 Remove the metal access port covers for the slots you want to use.

7 Remove your computer's SATA drive trays. If any extra SATA drives are installed, remove them also. Refer to your computer's documentation for information on removing SATA drives and SATA drive trays.

⚠ *Before handling any card, discharge static electricity from your clothes or body by touching a grounded metal surface, such as the power supply case inside your computer with the power cable connected.*

8 Install the Pro Tools|HD Core card into the lowest-numbered slot in the computer (slot 2). This will be the slot closest to the video card, as shown in Figure 1 on page 15.

Do the following:

- Hold the card above slot 2 at a slight angle so that the front of the card is higher than the back of the card (where the card's DigiLink connector is located), as in Figure 2.

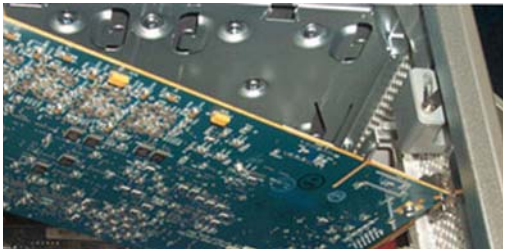


Figure 2. Holding the card above the slot at an angle

- With the card at an angle, rest the card's back bracket against the edge of the chassis, where the computer's slot access port is located.
- Carefully slide the front of the card down into slot 2's grey plastic PCIe card support (where the slot numbers appear), as in Figure 3.

Figure 3. Sliding the front of the card into PCIe card support

- With the card's PCIe connectors facing down, carefully slide the card straight down and firmly seat the PCIe connector into the slot 2 PCIe slot, making sure that all card components on the front of the card have clearance from the grey plastic PCIe card support, as in Figure 4.

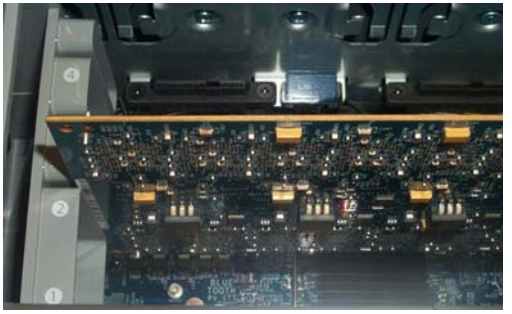


Figure 4. PCIe card installed

⚠ *Do not force the card into the PCIe card support slot. When you have the correct installation angle, the card should slide in easily. If you do not have the correct angle, reposition the card.*

9 Install the first Pro Tools|HD Accel card (if any) in the second slot (slot 3).

10 Install the second Pro Tools|HD Accel card (if any) in slot 4.

11 Check to be sure that your cards are installed in the proper order for your system, starting with the lowest numeric slot:

- Display card for your computer monitor
- Pro Tools|HD Core card
- Any additional Pro Tools|HD Accel cards (optional)
- Avid-approved video capture card (optional)
- Host Bus Adapter (HBA) card (optional)

12 Replace the SATA drives.

13 Reattach the clamp that secures the cards and the slot covers to the chassis.

⚠ *The card's PCIe connectors will not seat completely until you have replaced the clamp that secures the cards and the metal access port covers to the chassis.*

Installing Pro Tools|HD Cards in a Windows Computer

This section shows how to install Pro Tools|HD cards into a PC.

For the latest slot order and configurations for Windows computers, visit www.avid.com. It is recommended that you print out the information for your specific model of computer before opening the computer and installing Pro Tools hardware.

Disabling Driver Signing Warnings

Before you install Pro Tools|HD cards, temporarily disable the Driver Signing warning option for Windows XP. This expedites and automates much of the installation process. If you do not temporarily disable this option, warning messages (that you are installing an unsigned driver) will appear for each DSP chip detected during software installation.

To disable the warning option on Windows:

1 Right-click on My Computer and choose Properties.

2 Click the Hardware tab in the System Properties dialog.

3 Click the Driver Signing button.

4 Select "Ignore—Install the software anyway and don't ask for my approval."

5 Click OK to close the Driver Signing Options window.

6 Click OK to close the System Properties dialog.

7 Shut down the computer.

Installing Pro Tools|HD Cards in a PC

To install Pro Tools cards:

1 Turn off your computer and any peripherals. Leave your computer's power cable plugged in so the computer is grounded.

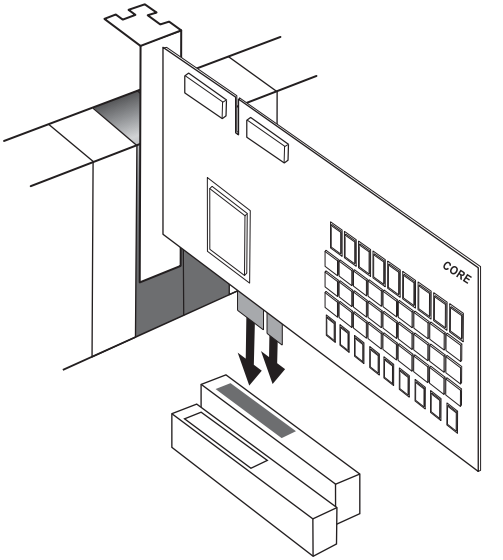
2 Disconnect all cables attached to the computer (such as hard drives, displays, USB and FireWire devices) except for the power cable.

3 Open the computer case.

4 Remove the metal access port cover behind the slot you want to use by removing the screw and sliding the cover out from the access port.

⚠ *Before handling any card, discharge static electricity from your clothes or body by touching a grounded metal surface, such as the power supply case inside your computer.*

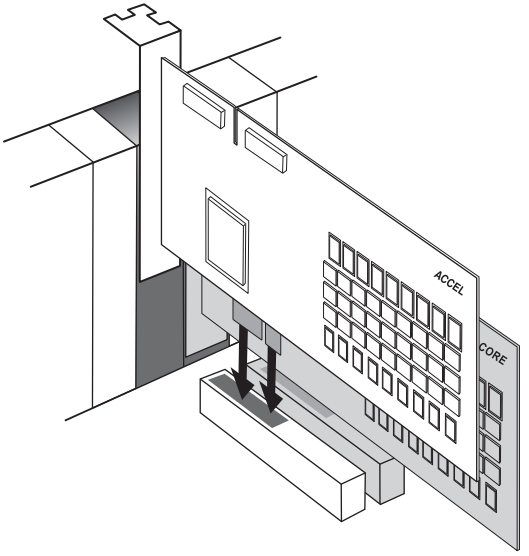
5 Install the HD Core card in the recommended PCIe slot (typically this is the first PCIe slot, closest to the video card).



Installing the HD Core card in your PC

6 If you are installing additional Pro Tools cards (or other cards), do the following, otherwise, skip to the next step.

- Install the first Pro Tools|HD Accel card in the next consecutive PCIe slot.
- Install any remaining Pro Tools|HD Accel cards in the remaining consecutive PCIe slots.



Installing an HD Accel card in your PC

7 If you have no additional cards to install, do the following:

- Secure the card in place with the slot access port screw you removed earlier.
- Close the computer case.
- Skip to "Connecting Audio Interfaces" on page 20.

8 Check to be sure that your cards are installed in the proper order for your system (note that this may vary depending on your machine):

- Display card for your computer monitor
- HD Core card
- HD Accel cards (optional)
- Host Bus Adapter (HBA) card (optional)

9 Secure each card in place with the slot access port screws you removed earlier.

Connecting TDM Flex Cables

In systems that include more than one card, you must connect all the Pro Tools|HD cards to each other with TDM FlexCables.

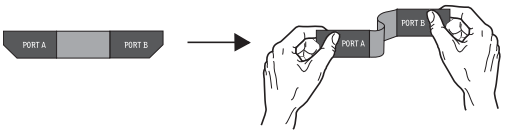
Each Pro Tools|HD card has two ports along the top of the card, labeled *Port A* and *Port B*. The FlexCable has two connectors, also labeled Port A and Port B, to ensure proper connection. Data communication across multiple cards is achieved by connecting Port B of the first card to Port A of the next card with a TDM FlexCable.

The first FlexCable always goes from Port B on the core card to Port A on the first expansion card, as described in the following steps.

The slot numbering in your computer determines whether you will be working right-to-left or left-to-right when connecting cards. Refer to the instructions below for your model of computer.

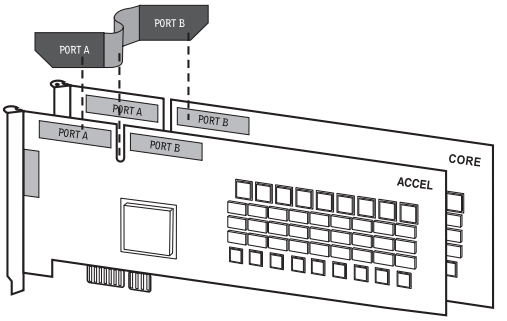
To connect Pro Tools|HD cards:

1 Shape the FlexCable before installing it on the card by holding the cable with its printed side facing you, and moving the Port B portion of the cable away from you and outwards, as shown below. Do not bend the cable more than you need to, as you may damage the traces in the cable.



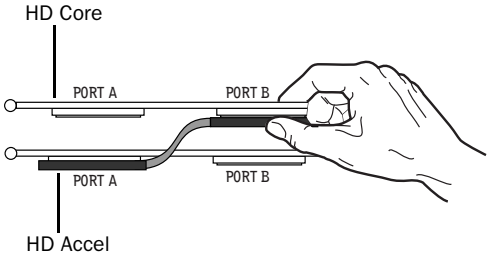
Preparing TDM FlexCable for installation

2 Slide the FlexCable into the notch of the core card, so that the Port B connector of the FlexCable can be aligned with Port B of the core card; and the Port A connector of the FlexCable can be aligned with Port A of the second card, as shown below.



Inserting TDM FlexCable

3 Connect the Port A connector of the FlexCable to Port A on the second card. Push gently but firmly until the cable is fully connected to the card. Attach the other end of the FlexCable (labeled Port B) to Port B on the core card.



Top view of two cards connected with TDM FlexCable

4 Verify the connection. Make sure the FlexCable ports seat flat against the sockets on the cards, and are firmly attached.

5 For systems with more than two cards, connect each additional card to its preceding card. Use FlexCables to connect card pairs together, as described above, until all cards are connected. (Each Pro Tools|HD card is packaged with a FlexCable.)

6 Close the computer case.

Connecting Audio Interfaces

Each Pro Tools|HD audio interface provides several different input and output options. For example, HD OMNI supplies up to 8 channels of input and output to your Pro Tools system, HD I/O supplies up to 16 channels of input and output, and HD MADI provides up to 64 channels. Audio interfaces can be connected directly to Pro Tools|HD cards, or through the Expansion ports on other Pro Tools|HD audio interfaces.

⚠ *At least one Pro Tools|HD audio interface must be connected to the Pro Tools|HD Core card for Pro Tools to launch.*

Each Pro Tools|HD card supports up to 32 channels. To get a full 32 channels of I/O from one card, you can connect, or *daisy-chain*, a second 16-channel Pro Tools|HD I/O to the first 16-channel Pro Tools|HD I/O that is connected directly to the Pro Tools|HD card.

Refer to the *HD OMNI Guide*, *HD I/O Guide*, *HD MADI Guide*, *192 I/O Guide*, *192 Digital I/O Guide*, *96 I/O Guide,* or *96i I/O Guide* for specific details regarding:

- Front and back panel connectors and indicators
- Installation of optional expansion I/O cards (HD I/O and 192 I/O only)

To connect Pro Tools|HD audio interfaces:

1 Do one of the following depending on the audio interface you are connecting:

- If you are using a single HD OMNI, HD I/O, 192 I/O, 192 Digital I/O, 96 I/O, or 96i I/O, connect its Primary Port to the HD Core card with the DigiLink cable provided with the card (for HD OMNI and HD I/O you must also use the included DigiLink to DigiLink Mini adapter cable).

You must attach at least one HD OMNI, HD I/O, 192 I/O, 192 Digital I/O, 96 I/O, or 96i I/O to your system in order for Pro Tools to launch.

Pro Tools HD supports only one HD OMNI per system. If you are connecting HD OMNI to your Pro Tools|HD system, it is generally recommended that you connect it directly to the Pro Tools|HD Core card.

- If you are connecting HD MADI to your system, connect HD MADI Primary Port 1 to the DigiLink Port on the first available Pro Tools|HD card using the DigiLink cable provided with the card and the DigiLink Mini to DigiLink adapter cable included with HD MADI. If you have a Pro Tools|HD 2 or greater system, connect HD MADI Primary Port 2 to the DigiLink Port on the next available Pro Tools|HD card using the DigiLink cable provided with the card and the DigiLink Mini to DigiLink adapter cable included with HD MADI.

2 Connect additional Pro Tools|HD audio interfaces to subsequent Pro Tools|HD cards, or daisy-chain the interfaces (by connecting the Primary Port of the secondary interface to the Expansion Port of the primary interface).

If you are connecting 96 I/O or 96i I/O audio interfaces to your system in addition to HD OMNI, HD I/O, 192 I/O (or 192 Digital I/O), be sure to connect the HD OMNI, HD I/O, 192 I/O, or 192 Digital I/O to your HD Core card as the primary interface, followed by any additional HD I/O, 192 I/O, or 192 Digital I/O connected to subsequent Pro Tools|HD cards. Then connect 96 I/O interfaces to subsequent cards, or to other interfaces, then connect 96i I/O interfaces.

You can also connect a single Pro Tools|HD interface to each Pro Tools|HD card in your system using the provided DigiLink cables. (Note that there is no advantage or disadvantage to this configuration over daisy-chaining interfaces.)

Connecting Loop Sync

If you are using two or more Pro Tools|HD audio interfaces or a SYNC peripheral, Loop Sync must be connected to maintain proper clock among the devices.

To make Loop Sync connections:

1 Connect the Loop Sync Out of each interface to the Loop Sync In of the next interface with the BNC cables included in your I/O packaging.

2 Connect the Loop Sync Out of the last interface to the Loop Sync In of the primary interface or SYNC peripheral.

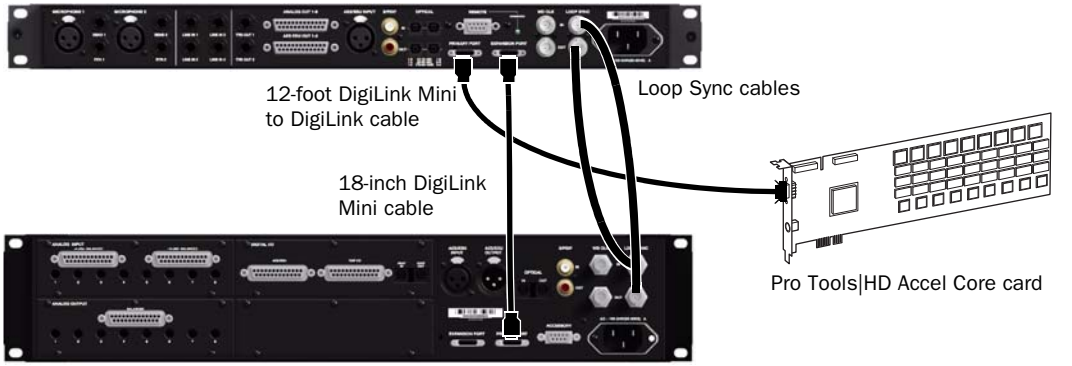


Figure 5. Making DigiLink and Loop Sync connections with HD OMNI and HD I/O.

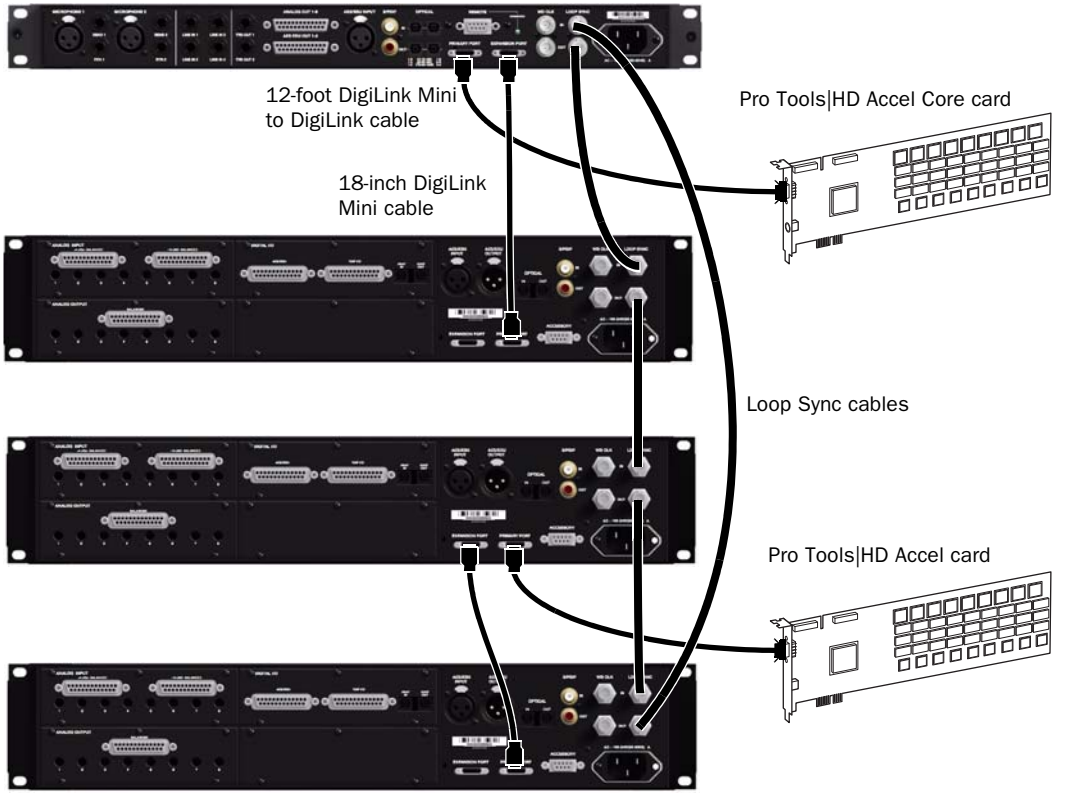


Figure 6. Making DigiLink and Loop Sync connections with HD OMNI and three HD I/Os

Maximum I/O Configurations

Pro Tools|HD supports up to a maximum combination of ten total of the following audio interfaces:

- HD OMNI (only one HD OMNI is supported in a single Pro Tools|HD system)
- HD I/O (up to ten HD I/O can be used simultaneously—requires five HD cards)
- HD MADI (up to three HD MADI can be used simultaneously—requires six HD cards)
- 192 I/O (up to ten 192 I/O can be used simultaneously—requires five HD cards)
- 192 Digital I/Os (up to ten 192 Digital I/O can be used simultaneously—requires five HD cards)
- 96 I/Os (up to ten 96 I/O can be used simultaneously—requires five HD cards)
- 96i I/Os (up to five 96i I/Os can be used simultaneously)

For examples of connecting multiple I/Os, see Figure 5 and Figure 6 on page 22.

⚠ *Pro Tools|HD audio interfaces need room at their sides to maintain proper air flow for cooling. Do not block the sides of the unit or disconnect the internal fan. If the units are rack-mounted in a case, remove the case lids or doors before operating the system. Failure to do so can result in the units overheating very quickly, which can permanently damage sensitive components.*

Installing and Authorizing Pro Tools HD Software

Once you have installed your Pro Tools|HD hardware, you can install and authorize your Pro Tools HD software.

For complete installation and authorization instructions, see the *Pro Tools Installation Guide* that came with your Pro Tools Software package.

Configuring Your Pro Tools System

After you have installed, authorized, and launched Pro Tools software, you can configure your Pro Tools system to meet the specific needs of your studio. For detailed information on configuring your Pro Tools software, see the *Pro Tools Reference Guide* (which is available from the Help menu in Pro Tools).

appendix a

Configuring Core Audio (Mac OS X Only)

Core Audio Driver Capabilities

The CoreAudio Driver is a multi-client, multi-channel sound driver that lets Core Audio–compatible applications record and play back through Pro Tools hardware.

Full-duplex recording and playback of 24-bit audio is supported at sample rates up to 96 kHz, depending on your Pro Tools hardware and CoreAudio client application.

The Pro Tools CoreAudio Driver provides up to 8 channels of I/O with Pro Tools|HD systems. Only the first, primary audio interface is supported.

Visit www.avid.com for the latest CoreAudio drivers for Pro Tools hardware, as well as current known issues.

Limitations of the CoreAudio Driver

The CoreAudio Driver has the following limitations:

◆ Pro Tools HD is not a CoreAudio application and therefore requires exclusive access to Pro Tools hardware. You cannot use CoreAudio applications and Pro Tools HD at the same time. To use Pro Tools HD, make sure you quit any CoreAudio applications before starting Pro Tools HD. To use a CoreAudio application, make sure you quit Pro Tools HD before starting any CoreAudio application.

◆ The CoreAudio Driver cannot be used to preview sound files from the Mac Finder. When a sound file is located in the Mac OS X navigation window, a QuickTime transport bar is displayed next to it. The QuickTime transport bar lets you audition the sound file. The sound will always play back though the Mac's built-in audio controller (through the Mac speaker or headphone jack). However, if you double-click a sound file, the QuickTime application will launch. The QuickTime application *can* use the CoreAudio Driver for playback.

◆ The CoreAudio Driver cannot be used for playback of Mac System Sounds.

Installing the CoreAudio Driver

The CoreAudio Driver is installed by default when you install Pro Tools. The CoreAudio Driver can also be installed as a standalone driver on Mac systems that do not have Pro Tools software installed. The installer for the standalone CoreAudio Driver is available on the Driver Installers disc that came with your Pro Tools Software package, or from our website (www.avid.com).

⚠ *If you uninstall Pro Tools, the CoreAudio Driver is automatically uninstalled at that time.*

To install the standalone CoreAudio Driver:

1 Ensure that your Pro Tools|HD hardware is correctly installed.

2 Do one of the following:

- Insert the Driver Installers Disc that came with your Pro Tools Software package in your computer.

– or –

- Download the standalone CoreAudio driver installer from our website (www.avid.com).

3 Locate and double-click the Install HD Family Driver.mpkg.

4 Follow the on-screen instructions to complete the installation.

5 When the installation is complete, click Restart.

CoreAudio Manager

You can configure the CoreAudio Driver using CoreAudio Manager, or from within most third-party CoreAudio-compatible client applications (such as BIAS Peak or Ableton Live). Refer to the manufacturer's documentation for more information.

Some applications (such as Apple's iTunes or QuickTime Player), also require that you configure either the Apple Sound Preferences or Apple Audio MIDI Setup (AMS) to use the CoreAudio Driver.

The CoreAudio Manager is configured to autohide when first launched. To bring it to the foreground, click on its icon in the dock.

The Core Audio Manager is not used by Pro Tools. It is only used by other CoreAudio applications.

Accessing the CoreAudio Manager

The CoreAudio Manager application launches automatically when the first client application accesses the CoreAudio Driver.

CoreAudio Manager

CoreAudio Manager cannot be accessed under the following circumstances:

- When Pro Tools HD is running
- When another application is using Direct IO

To ensure proper playback with the CoreAudio Driver, launch the CoreAudio Manager first, making sure that its status is "Connected."

Preventing an Application from Accessing CoreAudio Driver

You can prevent an application from accessing the CoreAudio Driver by holding down the Shift key just before the application would access the CoreAudio Driver, typically during launch of the application. Certain applications (such as Apple Mail and iChat), do not access the CoreAudio application until they first play a sound, so you will need to hold down the Shift key just prior to sound playback in order to prevent the use of Pro Tools hardware for playback.

Using the CoreAudio Manager

Use CoreAudio Manager to change the CoreAudio Buffer Size setting, access the Hardware Setup dialog for your Pro Tools hardware and control volume and mute for the CoreAudio Driver. CoreAudio Manager also identifies your Pro Tools hardware, the supported number of Input and Output Channels and the number of attached clients (applications).

Buffer Size

You may select from the following buffer sizes (depending on your Pro Tools hardware):

- 64 samples
- 128 samples
- 256 samples
- 512 samples
- 1024 samples
- 2048 samples

◆ Small buffers have the advantage of low latency in the record monitor path, but also are more taxing on your computer's CPU and could contribute to dropouts in your audio during record or playback. (Latency is the time delay between a signal entering the audio inputs and leaving the outputs during recording.)

◆ Larger buffers have the advantage of making the CoreAudio Driver more immune to audio dropouts during playback and recording, but can cause a noticeable delay when monitoring your inputs in the recording process. In some CoreAudio-client applications, performing various tasks will interrupt the CoreAudio Driver and may result in clicks and pops in audio playback or recording. Choosing medium or large buffers (such as 512 or 1024) can help alleviate this problem.

Changing the Buffer Size for the CoreAudio Driver does not affect the H/W Buffer Size setting in the Pro Tools Playback Engine dialog.

To configure CoreAudio Hardware Buffer Size:

1 Double-click the CoreAudio Manager file (located in /Applications/Digidesign/).

2 From the Buffer Size pop-up menu, select the desired CoreAudio buffer size (in samples). Generally, smaller buffer sizes are preferable. However, if you experience any problems with performance (such as clicks and pops during recording or playback), try increasing the CoreAudio Buffer Size setting. You can also change the buffer size from within the client application if it is the only client attached to the CoreAudio Driver. Once two or more clients are active, you will not be able to change the sample rate or the buffer size.

HW Setup Button

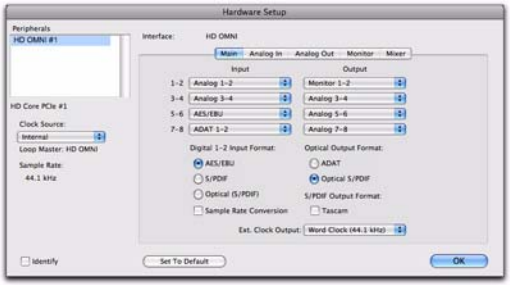
The HW Setup button opens the Hardware Setup dialog for your Pro Tools hardware. The HW Setup button is only available when no clients are using the CoreAudio Driver.

To configure CoreAudio HW Setup:

1 Quit any CoreAudio client applications.

2 Double-click the Digi CoreAudio Manager file (located in /Applications/Digidesign/).

3 Click the HW Setup button to open the Hardware Setup dialog.



Hardware Setup dialog, Pro Tools HD (HD OMNI shown)

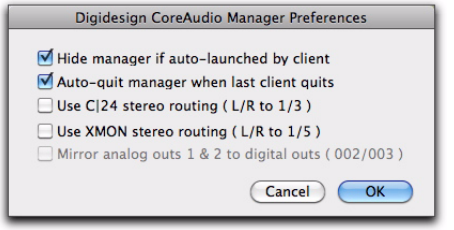
4 Configure the Hardware Setup dialog for your Pro Tools hardware. If you have more than one audio interface connected to a Pro Tools|HD system, be sure to select and configure only the primary audio interface connected to the HD Core card.

For more information on the Hardware Setup dialog, refer to the Pro Tools Reference Guide.

5 When you are finished, click OK to close the Hardware Setup dialog.

Prefs Button

The Prefs button opens the CoreAudio Manager Preferences dialog for the Manager application. There are several options available for control and configuration of the Manager application. When finished setting these options, click OK to close the CoreAudio Manager Preferences windows.



CoreAudio Manager Preferences

Hide Manager if Auto-Launched by Client Enable this option to hide the Manager panel after the first client application accesses the CoreAudio Driver. To open the Manager panel, click on the CoreAudio Manager application icon in the Dock.

Auto-Quit Manager when Last Client Quits Enable this option to make the Manager application quit when there are no longer any clients using the CoreAudio Driver.

Use C|24 Stereo Routing (L/R to 1/3) When using C|24, enable this option to configure the CoreAudio Driver to output through the C|24 standard stereo routing (outputs 1 and 3).

Use XMON Stereo Routing (L/R to 1/5) When using D-Control or D-Command, enable this option to configure the CoreAudio Driver to output through the D-Control or D-Command standard stereo routing (outputs 1 and 5).

Mirror Analog Outs 1 & 2 to Digital Outs (003, 003 Rack, 003 Rack+, Digi 002, or Digi 002 Rack Only) When using 003, 003 Rack, 003 Rack+, Digi 002, or Digi 002 Rack, enable this option to mirror the main outputs through the digital outputs that are selected in the Hardware Setup dialog. (This option is grayed out for Pro Tools|HD systems.)

Connect Button

The Connect button is available when the CoreAudio Manager is launched and cannot connect with the Pro Tools hardware (such as when Pro Tools is launched and the hardware is disconnected or disabled). Before trying to connect, make sure to quit Pro Tools and make sure that your hardware is connected and turned on. You can then click on the Connect button to acquire the hardware.

⚠ *If any application is launched prior to pressing the Connect button and you want that application to use the CoreAudio Driver for playback, you will need to quit and relaunch the application for it to connect properly to the CoreAudio Manager.*

Quit Button

Use the Quit button to quit the CoreAudio Manger. Be sure to quit any client applications before using the Quit button in the Manager. If any applications are currently attached to the Manager application when quitting, you may get an error message indicating that the Pro Tools hardware is no longer available. You may have to change the application's preferences to use different hardware for playback or possibly quit and relaunch the application for proper playback to be resumed.

Configuring a Pro Tools|HD Audio Interface for Third-Party Applications

When using a Pro Tools|HD interface with an application other than Pro Tools HD (such as Apple GarageBand), you can configure hardware settings through the audio preference settings available in that application.

To configure hardware settings through a client application (such as Apple GarageBand):

1 Choose CoreAudio for Audio Output and Audio Input.

2 Select a buffer size for your system by selecting an Optimize For option (Maximum/Large buffer size or Minimum/Small buffer size).

◆ Small buffers have the advantage of low latency in the record monitor path, but also are more taxing on your computer's CPU and could contribute to dropouts in your audio during record or playback. (Latency is the time delay between a signal entering the audio inputs and leaving the outputs during recording.)

◆ Larger buffers have the advantage of making the CoreAudio Driver more immune to audio dropouts during playback and recording, but can cause a noticeable delay when monitoring your inputs in the recording process. In some CoreAudio-client applications, performing vari-

ous tasks will interrupt the CoreAudio Driver and may result in clicks and pops in audio playback or recording. Choosing a large buffer can help alleviate this problem.

Refer to the documentation for your third-party application to learn more about how these options affect that application.

Configuring the Apple Sound Preferences or Apple Audio MIDI Setup

(Required for Using Qualified Pro Tools System Interface with Apple iTunes or QuickTime Player)

To use your Pro Tools hardware with certain CoreAudio-compatible playback applications (such as Apple iTunes or QuickTime Player), you will need to configure either Sound Preferences or Audio MIDI Setup in addition to CoreAudio Manager. However, for most CoreAudio-compatible client applications (such as BIAS Peak or Ableton Live) this is unnecessary, because you can configure the CoreAudio Buffer Size setting and input and output channels from within the client application.

Apple Sound Preferences

To configure the Apple Sound Preferences:

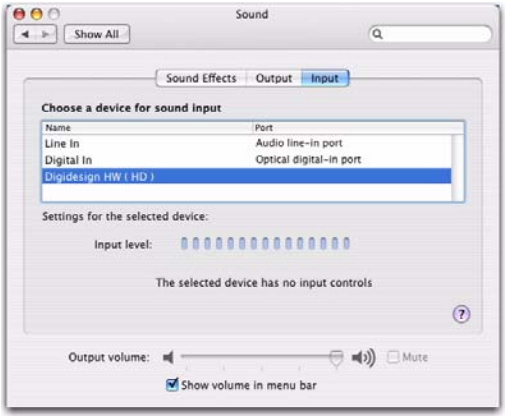
1 Launch System Preferences (Apple menu > System Preferences).

2 Click Sound.

3 Click Output and select Digidesign HW (HD) as the device for sound output.

Sound Preferences, Output settings

4 Click Input and select Digidesign HW (HD) as the device for sound input.



Sound Preferences, Input settings (Pro Tools HD shown)

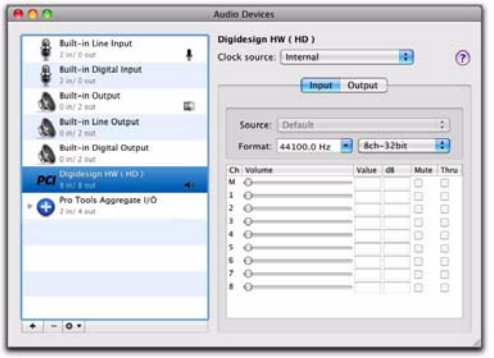
5 Quit System Preferences.

Apple Audio MIDI Setup

To configure the Apple Audio MIDI Setup:

1 Launch Audio MIDI Setup (located in Home/Applications/Utilities).

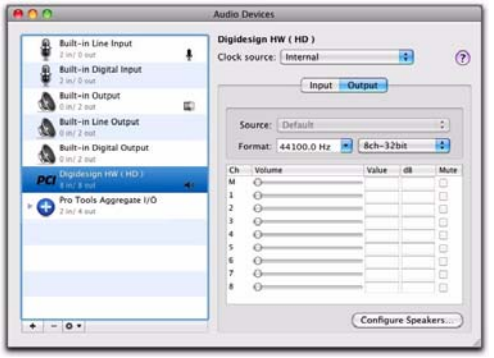
2 In the Audio Devices window, click the Input tab.



Apple Audio MIDI Setup application, Audio Devices Input settings

3 From the Audio Devices list on the left, select Digidesign HW (HD).

4 In the Audio Devices window, click the Output tab.



Apple Audio MIDI Setup application, Audio Devices Output settings

5 From the Audio Devices list on the left, select Digidesign HW (HD).

6 In the Audio Input or Audio Output page, select the Format (sample rate). Note that the input sample rate and output rate are linked.

For information on configuring MIDI devices in AMS, see the Pro Tools Reference Guide

7 Choose Audio MIDI Setup > Quit Audio MIDI Setup.

appendix b

Configuring ASIO (Windows Only)

ASIO Driver Capabilities

The ASIO Driver is a single-client, multichannel sound driver that allows third-party audio programs that support the ASIO Driver standard to record and play back through qualified Pro Tools audio interfaces.

Full-duplex playback of 24- and 16-bit audio are supported at sample rates up to 96 kHz, depending on your Pro Tools hardware and ASIO-client program used (such as Cubase or Reason).

The Pro Tools ASIO Driver provides up to 8 channels of I/O with Pro Tools|HD systems. Only the first, primary audio interface is supported.

Visit www.avid.com for the latest ASIO drivers for Pro Tools hardware, as well as current known issues.

Limitations of the ASIO Driver

The ASIO Driver cannot be used with multiple applications at the same time. Only one application at a time can use the ASIO Driver. Be sure to disable the Windows system sounds. It is also recommended that you use a separate sound card for games or other general work.

Installing the ASIO Driver

The ASIO Driver is installed by default when you install Pro Tools. The ASIO Driver can also be installed as a standalone driver on Windows systems that do not have Pro Tools software installed. The installer for the standalone ASIO Driver is available on the Drivers Installer disc that came with your Pro Tools Software package, or from our website (www.avid.com).

If you uninstall Pro Tools, the ASIO Driver is automatically uninstalled at that time.

To install the standalone ASIO Driver:

1 Ensure that your Pro Tools|HD hardware is correctly installed.

2 Do one of the following:

- Insert the Driver Installers Disc that came with your Pro Tools Software package in your computer.

– or –

- Download the standalone ASIO driver installer from our website (www.avid.com).

3 Locate and double-click the HD Family Driver Setup.exe.

4 Follow the on-screen instructions to complete the installation.

5 When the installation is complete, click Finish to quit the installer and restart your computer.

ASIO Driver Control Panel

Configuring ASIO Driver settings can be done using the ASIO Control Panel, which is accessed within some third-party ASIO-compatible client applications.

Accessing the ASIO Driver Control Panel

To access the ASIO Driver Control Panel from a third-party application:

- Refer to your ASIO-client program's documentation.

The ASIO Driver Control Panel cannot be accessed under the following circumstances:

- When Pro Tools is running.
- When playing or recording in an audio program that does not support the ASIO Driver.
- When using a third-party audio program that has an option to keep the ASIO Driver open even when you are not playing or recording. (You must close the audio program before you can open the ASIO Driver Control Panel.)

Example with Ableton Live

For example, with Ableton Live, click the Hardware Setup button in the Audio Preferences.

Setup Example, using Ableton Live

Using the ASIO Driver Control Panel

From the ASIO Driver Control Panel, you can change the Buffer Size setting or access the Hardware Setup dialog for your Pro Tools hardware.

ASIO Control Panel

Buffer Size

You may select from the following buffer sizes (depending on your Pro Tools hardware):

- 64 samples
- 128 samples
- 256 samples
- 512 samples
- 1024 samples
- 2048 samples

◆ Small buffers have the advantage of low latency in the record monitor path. (Latency is the time delay between a signal entering the audio inputs and leaving the outputs during recording.)

◆ Larger buffers have the advantage of making the ASIO Driver more immune to audio dropouts during playback and recording.

In some ASIO-compatible audio programs, performing various tasks will interrupt the ASIO Driver and may result in clicks and pops in audio playback or recording. Choosing medium or large buffers (such as 256, 512, or 1024) can help alleviate this problem.

Changing the Buffer Size setting for the ASIO Driver does not affect the H/W Buffer Size settings in the Pro Tools Playback Engine dialog.

Device

The Device setting is always set to your installed Pro Tools hardware.

Advanced Button

The Advanced button opens the Hardware Setup dialog for the Pro Tools hardware that you are using.

Hardware Setup dialog, Pro Tools HD I/O shown

For more information on the Hardware Setup dialog, refer to the Pro Tools Reference Guide or the User Guide that came with your Pro Tools system.

appendix c

DSP-Induced Delays in Mixing

This appendix provides an overview of DSP-induced mixer delays, and explains how you can compensate for these delays to improve time and phase alignment of audio in complex or critical mixing situations.

Introduction to DSP-Induced Delay

In all digital systems, DSP processing causes signal delays of varying amounts. These DSP-induced delays can vary from as short as several microseconds to as long as several milliseconds, depending on the type of processing or routing being performed.

Do not confuse signal processing-induced delays with monitoring latency or time domain effects processing (such as delay, echo, reverb, and other desirable delay effects).

Each plug-in, hardware insert, and mixer assignment on a track delays that track by an amount equal to the total of all DSP-delay factors.

In some cases, signal processing delays matter only if you use a real-time TDM plug-in on one channel of a stereo or multichannel signal but not the others. This imparts an unequal amount of delay to the signals on that channel, which subsequently may cause undesirable cancellation of certain frequencies.

Audible symptoms of phase issues include comb-filtering and loss of high frequencies.

In simple terms, DSP-induced delay can cause audio to arrive at the main output (or a submix output) at different times. To maintain time alignment, you can *compensate* for DSP-induced delays.

When to Compensate

You may only really need to compensate for delays between tracks where phase coherency must be maintained (as with instruments recorded with multiple microphones or stereo pairs). If you are working with mono signals, and the accumulated delays are small (just a few samples, for example), you probably do not need to worry about compensating for delays.

However, larger sessions with higher track and voice counts, many plug-ins, and/or complex mixer routing can benefit when DSP-induced delays are compensated to maintain phase coherent time alignment.

In any session, if you want to maintain absolute time alignment across all tracks you should always compensate for signal processing delays.

Delay Compensation should be enabled during playback and mixing so that all tracks' outputs are correctly time-aligned.

Using Delay Compensation

Pro Tools provides automatic Delay Compensation for managing DSP delays from plug-in and hardware inserts, and mixer routing (bussing and sends). With Delay Compensation enabled, Pro Tools maintains phase coherent time alignment between tracks that have plug-ins with differing DSP delays, tracks with different mixing paths, tracks that are split off and recombined within the mixer, and tracks with hardware inserts.

To maintain phase coherent time alignment, Delay Compensation should always be enabled during playback and mixing. Delay Compensation should also be enabled in most recording situations.

For more information on using Delay Compensation, see the Pro Tools Reference Guide (Help > Pro Tools Reference Guide).

appendix d

TDM Mixing and DSP Usage

Benefits of TDM II

TDM (or *time division multiplexing*) technology is based on the concept of a single, high-speed data *highway*, or *bus* that transmits data between your Pro Tools CPU, Pro Tools cards, and the DSP chips on the cards.

Pro Tools|HD cards feature enhanced TDM II architecture. The TDM II architecture provides many advantages over the original TDM (or TDM I) architecture in terms of its mixing capacity and flexibility.

In TDM systems, individual channels from sources such as audio tracks, sends, or busses are sent out from Pro Tools audio cards, and combined together or *multiplexed* onto the TDM bus so that all signals can travel simultaneously and can be accessed within a single sample period. At the receiving end, the audio cards can listen to any connection on the bus, and take whatever data they need.

The TDM bus runs fast enough to accommodate many audio signals at the same time. Each separate audio signal or *stream*, takes up a single *time slot* on this multiplexed bus.

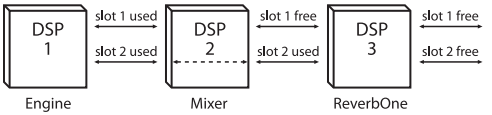
One of most powerful features of the TDM architecture is that a single time slot can be used to "broadcast" data to many destinations simultaneously.

With TDM II, not only can it send data to many destinations simultaneously, but it can also send signals both bi-directionally and "privately" between DSP chips, which effectively provides a much greater number of available time slots. This provides a greater potential number of connections for routing, processing and mixing audio signals within Pro Tools.

TDM II

With TDM II, there is a separate TDM I/O bus between each DSP chip on the Pro Tools cards, each with up to 512 bi-directional time slots at a session sample rate of 44.1 or 48 kHz (both between DSPs on each card, and between the DSPs that communicate between cards). The DSP chips are arranged serially, with a TDM I/O bus connecting one chip to the next. This means that every TDM II connection need only use time slots between the two DSPs that are being connected. See Figure 7 on page 40.

So, using the same example as above, if an audio track has a Reverb One plug-in insert, a time slot is used between the Engine DSP (sending out the audio track) and the DSP with the Reverb One instance. If the Reverb One insert is handled by a DSP that is physically next to the DSP handling mixing tasks, as shown in the illustration below, this leaves time slot 2 available for use between DSP 3 through DSP 9, and subsequent Pro Tools|HD cards.



Time slot usage on Pro Tools|HD hardware

The maximum consumption of the time slots for a single connection occurs when the audio must be sent between the first and last DSP in the system. In this instance, a time slot between each DSP is used to reach the last DSP in the chain.

Another example of how TDM II is more efficient than TDM I is to imagine a single HD Core card with one Engine chip and two Mixer chips. The DSPs with plug-in instances associated with the first Mixer do not need to communicate with the second Mixer, therefore the time slot numbers used can be re-used by the second Mixer to communicate with other DSPs loaded with other plug-ins.

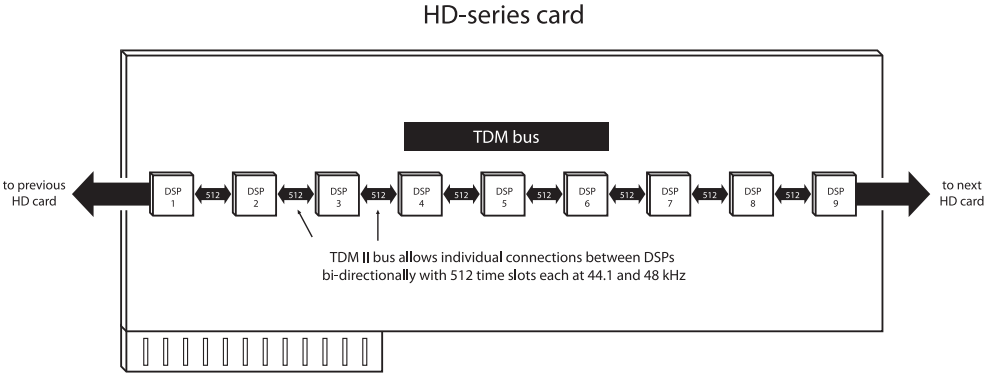


Figure 7. TDM bus on Pro Tools|HD hardware

DSP Allocation

Digital Signal Processing (or DSP) capability is one of the most powerful elements of your system. The DSP chips in your system provide the real-time processing power for your TDM Mixer and plug-ins. There is a limit, depending on your system, to how many functions a single DSP chip can power at once. This section contains some guidelines for getting the most from your available DSP capacity.

DSP Allocation Basics

As in the analog world, every send bus or output mix that you use demands that a summing mixer exist for that group. On an analog console, the number of these summing mixers is fixed by the physical layout of the console. In the Pro Tools mix environment, this number is variable, and depends on the number of output mixes or sends that you choose to create. Pro Tools allocates DSP power as it is needed to build the mixers for each session.

We describe certain mixing or signal processing functions as "using one DSP" or "using two DSPs." This refers to the fact that there are 9 DSP chips on each HD card.

Each chip on a card can only power a certain number of processing functions. If you have a single Pro Tools|HD card, and you create a big enough TDM mixer and use enough sends or plug-ins, you will eventually use up or "max out" the DSP capacity of that card.

Mixing and DSP Usage

Pro Tools builds a TDM mixer every time a session is opened. Note that the term "mixer channel" applies to audio tracks (total voiceable tracks), Auxiliary Input tracks, and sends and returns that use any of the 256 internal busses. When you go beyond a certain number of mixer channels, Pro Tools will use another DSP to create additional mixer capacity.

Master Faders do not use additional DSP power.

DSP Manager

Pro Tools software includes the *DSP Manager*, a software component that optimizes the use of DSP capacity on Pro Tools|HD systems.

When you have an Pro Tools|HD card in your system, if your current DSP usage is approaching the capacity of the card, and you then try to add a mixer channel or assign a plug-in, the DSP Manager will automatically try to make room for the new mixer or plug-in on the Pro Tools|HD card. It does this by reallocating the existing TDM mixers and plug-ins to use the available DSP capacity on the Pro Tools|HD card as efficiently as possible.

Monitoring DSP Usage

The System Usage window provides a display of DSP usage. With these indicators as your guide, you can try different mixer setups and different arrangements of plug-ins, sends, and Auxiliary Inputs to maximize your use of available DSP power.

Pro Tools HD also maintains a Plug-in and Mixer cache for allocated DSP when closing and opening sessions. While this does not change the time it takes to open the first session after you launch Pro Tools, it does result in being able to open and close all subsequent Pro Tools sessions quickly, especially when using the Revert To Saved command or when opening similarly configured sessions.

As long as Pro Tools is running, the DSPs will only be completely purged if you open a session with a different sample rate or one with different Playback Engine settings.

About Processing Bandwidth

Meters in the System Usage window indicate how much of your system's processing power is being used in processing audio, and when writing and playing back automation.

As these meters approach their limits, native processing and recording, or playback of automation data can be affected. If CPU or PCI Activity are high, a system error may occur. If Disk Activity is high, Pro Tools may miss playback of some automation data during particularly dense periods of activity, such as while using the Bounce to Disk command.

System Activity Meters

PCI Displays the amount of PCI bus activity.

CPU (RTAS) Displays the amount of CPU processing activity for RTAS processing.

CPU (Elastic) Displays the amount of processing activity for Real-Time Elastic Audio processing.

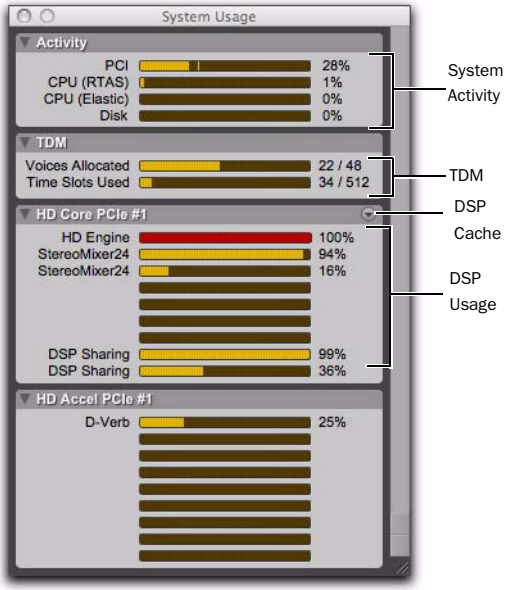
Disk Displays the amount of hard disk processing activity.

Additional Meters

TDM Voices Allocated Displays the total number of TDM voices that can be allocated and the number of voices currently allocated. This includes all voices whether they are allocated explicitly or dynamically, as well as any voices used for routing RTAS processing.

TDM Time Slots Used Displays the total number of TDM Time Slots available and the number of TDM Time Slots currently used.

DSP Usage (HD Accel Core, HD Core, HD Accel, and HD Process) Displays the percentage of how much of each DSP chip on each Pro Tools|HD card is currently being used for mixer configurations and TDM plug-ins.



System Usage window

To monitor the usage of DSP resources during a Pro Tools session:

- Choose Window > System Usage.

DSP Cache

Pro Tools HD also maintains a Plug-in and Mixer cache for allocated DSP when closing and opening sessions. While this does not change the time it takes to open the first session after you launch Pro Tools, it does result in being able to open and close all subsequent Pro Tools sessions quickly, especially when using the Revert To Saved command or when opening similarly configured sessions.

As long as Pro Tools is running, the DSPs will only be completely purged if you open a session with a different sample rate or one with different Playback Engine settings.

When using DSP caching, the System Usage window may not always accurately show the DSP resources your session is currently using. For an accurate display of current DSP usage, you can either disable DSP caching or purge the DSP cache.

To enable (or disable) DSP Caching:

1 Open the System Usage window (Windows > System Usage).

2 Click the DSP Cache pop-up menu and select (or deselect) Use DSP Cache.

To purge the DSP cache:

1 Open the System Usage window (Windows > System Usage).

2 Click the DSP Cache pop-up menu and select (or deselect) Purge Cache. This refreshes the System Usage display.

Another feature available for DSP management is Active and Inactive switching. See the Pro Tools Reference Guide for more information.

Setting Up Sessions to Use DSP Efficiently

The dynamically configurable mixing environment in Pro Tools lets you make choices based on the type of setup you want to have—such as how many inputs you want for your mixer, how many plug-ins you want to use, or how many sends you need.

For example, you could allocate all of your DSP power to create a large mixer with dozens of channels—but you would not be able to use as many busses, sends, or TDM plug-ins. Alternatively, you could create a mixer with a smaller number of mixer channels plus some sends and Auxiliary Inputs for returns, and TDM plug-ins on several tracks.

RTAS (Real-Time AudioSuite) plug-ins, as well as AudioSuite plug-ins, do not use DSP and are always available. Refer to the Audio Plug-Ins Guide for more information.

You can set up your session by choosing one of the session templates supplied with your system as a starting point, or by building it from scratch. If you are starting from scratch, a good rule of thumb is to start by building your mixer first, since at least one of the DSPs in your system is automatically dedicated to mixing. Start with audio tracks, then add sends and Auxiliary Inputs, and finally add plug-ins as available DSP allows. Master Faders do not use additional DSP power.

DSP Usage and Mixer Plug-Ins

Understanding Mixers

Pro Tools|HD systems include two types of mixer plug-ins: stereo and surround (both of which are available with dither or without). Pro Tools uses these plug-ins to create "dynamic mixers," meaning that the mixer size can *expand* or *contract* as mix channels are added or deleted in Pro Tools. More channels take up more DSP power from your Pro Tools hardware. This is different from hardware mixing consoles where hardware (analog or digital) creates "fixed" mix configurations consisting of an unchangeable number of master outputs, busses or sends.

DSP allocation for mixing in a Pro Tools|HD system is based on the concept of DSP summing mixers. Every send bus or output mix that you use requires that a summing mixer exists for those signals. Every single signal path that is mixed together requires the use of a mixer plug-in (whether a main output that goes to hardware, a bus or a send). This is even true for an individual signal that travels from hard disk to an individual hardware output. These individual dynamic mixers are created using the appropriate TDM mixer plug-in (stereo or surround) that is installed in your Plug-Ins folder.

An "input" can be an audio track, send, or internal bus connection. Adding an output or bus path (mono or multichannel) adds the requirement for DSP power to mix the signals together.

Each Pro Tools|HD card has nine DSPs, which can power a certain number of signal processing tasks. DSP resources are dynamically allocated as the number of mixers and inputs increases.

The TDM mixer provides basic building blocks by which applications such as Pro Tools can create a wide variety of mixer configurations.

Mono and Stereo

Each TDM mono or stereo mixer is of the dimensions "N x 2," meaning that it mixes a variable number of inputs to an output pair. For example: A session with six tracks routed to Output 1–2 would require a single 6 x 2 mixer. If one of the six tracks is assigned to Output 3–4, however, two mixers are required—one 5x2 mixer routed to Output 1–2, and one 1x2 mixer routed to Output 3–4.

Multichannel Surround

Each Surround mixer can have a variable number of outputs as well as a variable number of inputs. For example, the 7.1 format requires eight outputs. A single mono track assigned to a 7.1 Output or Bus path would require a 1x8 mixer, while one mono and one stereo track assigned to a 7.1 Output or Bus path would require a 3x8 mixer.

The important concept here is that every output (whether they are I/O or bus outputs) requires that a mixer exists for that output. This means that creating a send to bus 1 requires that a mixer be created for the bus 1–2 outputs, and that mixer will have one input.

Mixing with Sends and Busses

Each send will add an input to the destination output pair. For example, a send to output 1 will add another input to the output 1–2 mixer. If the send destination doesn't already have a mixer for its output pair, then a new mixer will be created. A send to bus 3 will make a 1x2 mixer for bus 3 if no other bus 3 sources have been created yet.

In addition, adding a new track and assigning its input to a bus source will create a mixer for that bus pair if there is not one already.

For example, creating a new Auxiliary Input track and setting its input to bus 5 will create a 1x2 mixer for bus 5, even if no sources have been created yet.

Submixing

When the number of channels that must be mixed exceeds the capacity of a single DSP, additional "main" mixers are created automatically, along with summing submixers (which sum together the "main" mixers). The use of submixers allows large mix configurations to be created.

For example, on a Pro Tools|HD system, when a Stereo mixer running at 44.1 kHz needs to grow to more than 68 inputs, a submixer is created along with another "main mixer" that provides "n" number of inputs beyond 68. Both the original 68x2 mixer and the new "N x 2" mixer which provides additional inputs are routed to a submixer, and its outputs are sent to their final destination (such as Output 1–2 on your main audio interface).

Note that any small delays (on the order of a few samples) that are created remain equal between these main mixers because they are summed together by means of submixers, and are not cascaded.

The total number of voiceable tracks supported by your particular Pro Tools configuration will ultimately determine the maximum number of channels for your TDM mixer.

Mixers and DSP Hardware

Different mixer plug-ins are available, each of which uses DSP power at slightly different rates on the different audio cards (and their DSP chips), as shown in the following tables.

See "Mixer Plug-ins" on page 47.

In Pro Tools|HD systems, the number of available mixers per DSP chip is based on the type of card and session sample rate.

HD Accel card, Standard mixers

Mixer	Sample Rate (kHz)	Usage per Chip
Stereo	44.1 and 48	124x2
	88.2 and 96	54x2
	176.4 and 192	16x2
Surround, 5.1	44.1 and 48	46x6
	88.2 and 96	34x6
	176.4 and 192	8x6
Surround, 7.1	44.1 and 48	34x8
	88.2 and 96	25x8
	176.4 and 192	4x8

HD Accel card, Dithered mixers

Mixer	Sample Rate (kHz)	Usage per Chip
Stereo Dithered	44.1 and 48	113x2
	88.2 and 96	54x2
	176.4 and 192	16x2
Surround Dithered, 5.1	44.1 and 48	44x6
	88.2 and 96	27x6
	176.4 and 192	8x6
Surround Dithered, 7.1	44.1 and 48	34x8
	88.2 and 96	20x8
	176.4 and 192	4x8

48-Bit Mixing Precision

The Pro Tools mixer plug-ins use a register area inside of the DSPs on the hardware to hold a full 48-bits of precision when mixing signals together. This allows a fader to be lowered in level without any loss of resolution. (Even if the fader is lowered almost to the bottom, all 24 of the original 24 bits of the signal are preserved.)

Mixer Headroom

Use of 48-bit precision when mixing allows the mixer to be designed to provide a very large amount of headroom, which allows the faders on the Pro Tools mixer to be placed in the "sweet spot" position without clipping.

Mixer plug-ins provided with Pro Tools|HD systems provide 48-bit precision with 48 dB of headroom. This means that on the "input" side of the bus (where signals are summed together), signals can never clip (even if channel faders are set to a full +12 dB of gain).

However, the "output" side of the summing mixer (where the signal is sent in the 24-bit world of a digital output or onto the TDM bus) *can* clip. You can use a Master fader (which does not "cost" any DSP) to scale the output level of any mix summing point (a bus or physical output). The master fader's meters will tell you if you are clipping the mix bus, and the fader can be used to safely scale the level to avoid clipping, with no loss of quality.

If you are mixing larger numbers of signals together, always use a master fader so that you can monitor levels for the bus (using the master fader meter), and to trim the result to avoid clipping. Since Master faders cost no DSP, there is no reason not to use them.

Note that clipping the "input" side of a mixer is *not* a concern on Pro Tools|HD systems. It is virtually *impossible* to clip the input of any Pro Tools|HD mixer plug-in, because the 48 dB of headroom provided prevents any possibility of overload, even with a maximum number of inputs being fed by full-code signals with fader gains at maximum. While it *is* possible to clip the "output" side of the mixer, you can safely use a Master Fader to trim your mix bus back to avoid clipping (by simply examining the Master Fader meter for clipping, and pulling back the fader until it disappears; make sure that any plug-ins you may have on the Master Fader inserts are not the cause as well). The 48-bit precision of the mixer allows gain adjustment on the Master Fader with no loss of data integrity or audio quality, so there is no need to trim the individual input faders back to avoid clipping.

Mixer Automatiion

Volume automation on all mixer versions is near sample-accurate (as is pan automation on the stereo versions). In addition, DAE provides 24-bit interpolated values between mix breakpoints, which provides near "analog-like" resolution. This process of interpolation means that a smooth "data series" is created between any two breakpoints that you specify in Pro Tools. DAE calculates these smooth transitions on the DSP hardware with 24-bit precision, which provides extremely smooth volume changes. In addition, DAE "de-zippers" any "live input" to the mixer so that fast, real-time fader changes that come in from fader movements (on the Pro Tool user interface or control surfaces), do not cause audible artifacts as the mixer tries to "catch up" to fast changes that it receives.

Stereo and Surround Dithered Mixers

The Stereo Dithered and Surround Dithered mixer plug-ins provide non-correlated dither in addition to other basic attributes of the mixers described above. Every output summing point (whether to an internal bus or an physical output) is dithered in these mixers. This technique is used to avoid any possibility of audible artifacts caused by truncation of extremely low level data that occurs when signals pass from the 48-bit world of a TDM mixer to the 24-bit world of a TDM bus connection or a hardware output. Any material that is truncated, lies below –144 dBFs (reflecting 24-bit of dynamic range).

There is dissension in the audio community as to whether or not artifacts that fall within this area are actually audible in some way. (The normal dynamic range of human hearing is generally accepted to fall within a range of around 120 dB, from the threshold of audibility to the threshold of pain.)

Avid has developed a mixer that provides all of the benefits of the standard stereo and surround mixer plug-ins, but also provide uncorrelated dither on any summed output. This provides a steady dither "noise floor" at extremely low level, which causes any truncation artifacts to be converted into steady white noise. However, the addition of uncorrelated dither requires more DSP horsepower. As a result, the channel instance count from the dithered versions of the mixers is around 15% lower (or more) than the non-dithered standard versions (this varies with sample rate and mixer type).

For this reason, we offer both types of mixer plug-in. You may want to use the standard non-dithered mixer in most applications because of its greater efficiency (allowing you to mix more channels without running out of DSP power), or the dithered mixer because of its theoretical advantages.

A Note About Dithering to 16-Bit and Dither Plug-ins

The Dithered mixers provide 24-bit dither at their summing points. When creating a final mix that results to 16-bits (for example, for CD mastering), final dithering should still be handled by plug-ins that provide dither. To properly dither the final mix result, insert a dither plug-in on the post-fader inserts of a Master fader. Details about dither and proper usage of the dither plug-ins can be found in the *Pro Tools Reference Guide*.

Mixer Plug-ins

Pro Tools|HD systems come with four different mixers: Stereo, Surround, Stereo Dithered, and Surround Dithered.

The standard Stereo and Surround Mixer plug-ins are installed by default. When you run your Pro Tools Installer, a copy of the Stereo Dithered and Surround Dithered mixers are placed in the folder "Plug-ins (Unused)."

Plug-in Features

Standard Surround and Stereo Mixers

Both the Surround and Stereo Mixer plug-ins provide the following:

- 24-bit digital output, from an audio interface output or Bounce to Disk. Mix level scaling stores 48-bit results, using a 56-bit accumulator for maximum precision.
- 48 dB of mix headroom.
- Output clip indication.
- Multichannel mixing formats for surround (Surround Mixer only).

Surround Dithered and Stereo Dithered Mixers

Both the Surround Dithered and Stereo Dithered Mixer plug-ins provide the following:

• The same features as the standard Pro Tools|HD Stereo and Surround mixers, with the addition of non-correlated dither to any output or bus send.

⚠ *When using Dolby Digital encoders or Dolby E, you can only use the non-dithered mixer. The Dithered mixer will not allow proper playout of Dolby Digital or Dolby E out of an output.*

Switching Mixer Plug-ins

To switch TDM Mixer plug-ins:

1 Quit Pro Tools.

2 Do one of the following:

- On Windows systems, open the "Plug-ins (Unused)" folder (Program Files\Common Files\Digidesign\DAE).

– or –

- On Mac systems, open the "Plug-ins (Unused)" folder on your Startup drive (Library/Application Support/Digidesign).

3 Locate the Mixer plug-in that you want to use, and drag it to the Plug-ins folder.

4 Open the "Plug-ins" folder, locate the Mixer plug-in version that you no longer want to use, and drag it to the "Plug-ins (Unused)" folder.

5 Launch Pro Tools.

Mixer Usage Guidelines

The following conditions apply to mixing with Pro Tools|HD systems.

◆ One DSP chip is automatically dedicated to mixing in the TDM environment.

◆ As you reach the basic mixer limits for a single DSP chip, the system will automatically begin allocating DSP resources from another chip (if available), making it unavailable for plug-ins.

◆ Each bus or send connection requires DSP to mix signals. This means that each send or Auxiliary Input that you create will require DSP power to mix the results.

DSP Usage with TDM Plug-Ins

To get the best results when using TDM plug-ins, keep in mind the following guidelines

◆ Pro Tools|HD systems use MultiShell™ technology, that lets any MultiShell compatible plug-in share DSP chips HD cards. Up to five types of MultiShell compatible plug-ins can share a single DSP chip.

Refer to the Audio Plug-Ins Guide for details on MultiShell plug-ins.

◆ Stereo DSP plug-ins generally use up twice as much DSP as mono plug-ins.

◆ Master Faders do not require additional DSP. Use them freely to control submix levels, send/bus output levels, and the master output level of your session.

The session templates provided with your system include several useful preconfigured session setups that make efficient use of DSP resources.

If your computer has unused slots, you can always increase your available DSP resources by adding additional HD cards to your Pro Tools|HD system.

appendix e

Troubleshooting

Backing Up Your Work

It is highly recommended that you back up your work on a regular basis, and especially before making changes to your system configuration.

Backing Up Your Session Data

Back up your session and audio data frequently. There are a variety of media that are suited to back up projects of various sizes, from automated tape backup systems to high-capacity optical drives, to CD/DVD burners.

The best way to back up an entire session is to use the Save Copy In command. This command lets you save the session file and all of its associated files to a new location.

You can also use the Auto Save Backup feature (in the Operation Preferences page) to have Pro Tools automatically save backups of the session file while you work.

Backing Up Your System Configuration

After configuring your system and Pro Tools, you should save an image of your system drive using a backup utility such as Norton Ghost (Windows) or Bombich Carbon Copy Cloner (Mac). By doing this, you can quickly restore your system configuration and settings if you encounter any problems.

Common Issues

Pro Tools Won't Launch

Problem

When you double-click the Pro Tools application or a Pro Tools session file, Pro Tools doesn't launch, or displays an error message.

Possible Solutions

◆ Check to be sure your computer has the required amount of RAM to launch Pro Tools. visit www.avid.com.

◆ Try a complete restart. Turn off your audio interfaces, computer peripherals and your computer, and then turn them on again in the proper sequence.

◆ If you tried to launch Pro Tools by double-clicking a Pro Tools session file, do the following:

- Close any error message.
- Double-click the Pro Tools application.
- In Pro Tools, choose File > Open Session to open the session.

◆ Reinstall the Pro Tools application, using the Pro Tools Installer disc.

Audio Interface Is Not Recognized

Problem

When you launch Pro Tools it does not recognize an audio interface, or a connected audio interface is not available.

Possible Solutions

◆ Turn off your computer and check to be sure your cables are properly and securely connected to your computer and to your audio interface.

◆ Verify that your Hardware Setup dialog settings are correct.

◆ If you only have one interface, make sure it is connected to the HD Core card.

◆ Make sure Loop Sync, SuperClock or other synchronization connections to your audio interface are correct. Disconnect the clock source from the interface and see if the problem persists.

Checking Your System with DigiTest

Before you use Pro Tools, you may want to run the DigiTest diagnostic application to ensure that all Pro Tools|HD cards in the system are recognized, installed in the proper order, and have valid TDM FlexCable connections.

The DigiTest utility performs diagnostic tests on the Pro Tools cards in your system. If DigiTest reports that any of your cards have failed, click the Info button next to that card. Write down the information that appears and report it to your local dealer or to Avid Customer Success.

Running DigiTest

DigiTest is installed with Pro Tools and resides in the following folder on your hard drive: Digidesign/Pro Tools/Pro Tools Utilities.

⚠ *Before you run DigiTest, lower the volume of all output devices. Very loud digital noise may be emitted during the test.*

For more information on the DigiTest application, see the DigiTest Guide.

To run DigiTest:

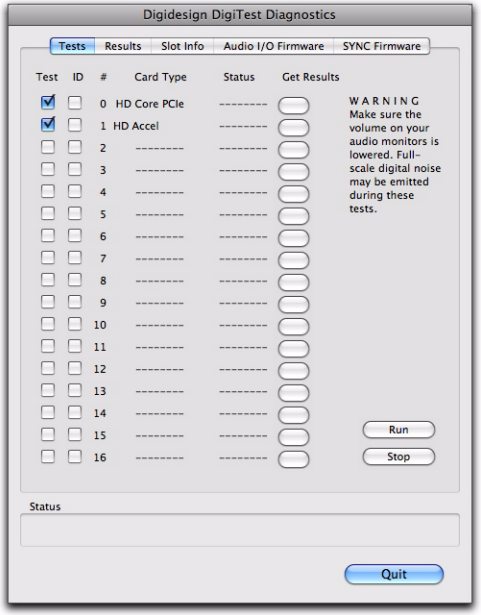
1 Quit Pro Tools if it is running.

2 Lower the volume of all output devices on your system.

3 Locate and double-click the DigiTest icon on your hard drive.

DigiTest opens and lists the supported cards it finds in your system, showing their corresponding slot locations.

If you have a large number of cards or audio interfaces, it may take a while for the DigiTest window to appear, as DigiTest scans for all cards and interfaces connected to the system.



DigiTest main test window

The order in which cards are listed within DigiTest may not match the actual slot locations of cards installed in your computer or expansion chassis. This is normal, and does not affect DigiTest operations in any way.

4 Select the cards in your system you want to test by selecting Test in the left hand column for each card.

5 Click Run.

If cards are not installed in the proper order, DigiTest will display error codes in the Status box of each card identified as being misconfigured.

The more cards and audio interfaces in your system, the longer the test will take.

6 When prompted, power cycle all Pro Tools peripherals in your system. Click Continue.

7 To test the interfaces connected to your system, check "Test I/O Box."

LEDs on your digital interfaces may light up during this test. This is normal.

8 When the test is finished, you can view the test results by doing one of the following:

- Click the Get Results button next to a card name.
- Click the Results tab and choose a card slot from the pop-up menu.

9 In the Results page of the DigiTest window, click Show Failures Only to display failed tests for the selected card, or click Show All Results to display all test results for the selected card.

For descriptions of error codes, see "DigiTest Error Codes" on page 54

10 Click Quit to close DigiTest.

11 Restart your computer.

Errors and Undetected Cards

Complete the steps below if any of the following occur:

- DigiTest fails to launch.
- An error message has been displayed for a card in DigiTest.
- A supported card is installed but not automatically detected during DigiTest.

If a supported card is installed and is not automatically detected:

1 Quit DigiTest.

2 Turn off the entire Pro Tools system.

3 Reinstall the Pro Tools|HD cards.

4 Check the card seating.

5 Check the TDM FlexCable connections. Check the orientation of the cable from card to card (ports B to A), and check the integrity of the FlexCable connections to the cards.

6 Turn on the system.

7 Run DigiTest again.

DigiTest Error Codes

DigiTest Error Codes

Code	Description
Err3	Cards from different Pro Tools systems are incorrectly mixed. See the configuration chapters.
Err4	Cards marked with this error are installed in the wrong order. See the configuration chapters.
Err5	Too many cards of this type are installed in the system. Visit our website for compatibility information.
Err6	A card is installed in a reserve slot. For example, a Pro Tools|HD card is installed in the slot reserved for the Expansion Chassis Host Interface card. Refer to the configuration chapters, as well as related installation guides.
Err1220	SCSI Accelerator card is installed in the wrong slot. See the configuration chapters for correct location of the card.
Err1221	Expansion Chassis Host Interface card is installed in the wrong slot. See Expanded Systems Guide for correct location of the card.

Identifying Pro Tools|HD Cards with DigiTest

You can use DigiTest to identify which cards are in which slots in your system. This is especially useful if you have multiple Pro Tools|HD cards of the same type installed in your system.

To identify Pro Tools|HD cards with DigiTest

1 Quit Pro Tools if it is running.

2 Locate and double-click the DigiTest icon on your hard drive.

DigiTest opens and lists the supported cards it finds in your system.

3 Open your computer case or expansion chassis so you can see the top edge of the cards installed in your system.

4 In the DigiTest window, select the ID check box next to a card name. The green LED near the top edge of the corresponding card flashes.

Viewing Card Information with DigiTest

DigiTest can display identifying information such as serial number, date of manufacture, and firmware ROM version for each card in your system. This information is useful if you need to contact Avid Technical Support about your Pro Tools hardware.

To display information for a card in your system:

1 Quit Pro Tools if it is running.

2 Locate and double-click the DigiTest icon on your hard drive.

3 Click the Slot Info tab.

4 Choose a card slot from the pop-up menu.

Updating Audio Peripheral Firmware with DigiTest

If firmware updates are available for any of your Pro Tools|HD audio interfaces (HD I/O, HD OMNI, HD MADI, 192 I/O, 192 Digital I/O, 96 I/O, or 96i I/O), you can use DigiTest to perform the update. Within DigiTest, the Firmware Update page tells you the firmware version for the selected peripheral and lets you update to a newer version, if necessary.

To update the firmware in a Pro Tools|HD audio interface:

1 Quit Pro Tools if it is running.

2 Locate and double-click the DigiTest application on your hard drive.

3 Click the Firmware tab.

4 Choose a card slot from the pop-up menu. If any Pro Tools|HD audio interfaces are connected to the card, the Primary or Secondary options will become available in the HD Peripheral section of the Firmware page.

If any connected interfaces are not recognized, check the connections and power to each interface and click Re-Scan.

5 Under HD Peripheral, select Primary or Secondary to view the firmware version for the corresponding interface. The firmware version is displayed just below the HD Peripheral section of the Firmware page.

6 If the firmware version is not current, click Begin Update to update the firmware in the selected audio interface.

The status of the firmware update process is displayed in the status area at the bottom of the Firmware page.

7 After the update process is complete, click Quit to close DigiTest.

Performance Factors

There are several conditions that may adversely affect the performance of Pro Tools. These include:

Network Connections Close any network connections unless you are using them for network interchange of audio data.

Background Applications Any software utilities that run in the background or generate disk activity, such as virus protection, disk optimization, or file savers, should be turned off or removed.

Screen Savers Screen saver software should be completely disabled on your computer before running Pro Tools.

Power Saver Features Some automatic power saver features, such as those that spin down the system hard drive, can affect Pro Tools performance. These features should be turned off.

Before You Call Avid Customer Success

Register Your System

Register your purchase immediately after reviewing the Registration Information Card included with every Pro Tools system. Registering your purchase is the only way you become eligible to receive information about technical support and future upgrade offers.

Gather Important Information

Avid wants to help you resolve problems as quickly and efficiently as possible. If you have the following information handy when you contact Customer Success (technical support), it will make the diagnosis of your problem easier. Take a few minutes to collect the following basic information:

System Information

Computer

- Make, model, processor speed
- Amount of system RAM
- Operating system (version of Windows or Mac OS)
- Any Drivers, Disk Utilities, or other system-related applications you may have installed

Hardware

- Type of cards, interfaces, or peripherals
- Where the cards are installed
- PCIe card order in computer or chassis
- Interfaces connected to each card

Hard Drives

- Make, Model
- Drive size (GB)
- Drive speed (RPM)
- Drive type (SCSI, FireWire, IDE/ATA)
- Utility used to format the drive
- Number and size of partitions on the drive

Software

- Pro Tools software version
- Plug-in versions
- Other Avid software
- Additional plug-ins from Avid Development Partners

Other Hardware

Refer to the manufacturer's documentation for operational details.

The most common hardware additions include:

- SCSI host bus adapter (HBA) cards (manufacturer, model, settings)
- 1394 (FireWire) cards for Windows systems (manufacturer, model)
- Expansion Chassis (manufacturer, model, bridge chip type)
- Video Capture cards (manufacturer, model)

To verify that your hardware is qualified for use with your system, visit www.avid.com.

Other Software

If you are using other audio or video applications, refer to the manufacturer's documentation for operational details.

Make note of any other software that was running when a problem occurred.

Diagnostic Information

DigiTest

If you run DigiTest, be sure to make a note of any error codes or messages it generates.

Other Information

Note any DAE errors or other error codes you encounter. Additionally, note the ability to reproduce the problem under different conditions, for example, with another session, or after changing settings (such as the Hardware Buffer Size).

appendix 9

Compliance Information

Environmental Compliance

Disposal of Waste Equipment by Users in the European Union

This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city recycling office or the dealer from whom you purchased the product.

Proposition 65 Warning

⚠ *This product contains chemicals, including lead, known to the State of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.*

Perchlorate Notice

This product may contain a lithium coin battery. The State of California requires the following disclosure statement: "Perchlorate Material – special handling may apply, See www.dtsc.ca.gov/hazardouswaste/perchlorate."

Recycling Notice

EMC (Electromagnetic Compliance)

Avid declares that this product complies with the following standards regulating emissions and immunity:

- FCC Part 15 Class A
- EN55103-1 E4
- EN55103-2 E4
- AS/NZS 3548 Class A
- CISPR 22 Class A

FCC Compliance for United States

Radio and Television Interference

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

DECLARATION OF CONFORMITY
We, Avid, 75 Network Drive
Burlington, MA 01803, USA
650-731-6300
declare under our sole responsibility that the product HD Accel, HD Accel Core, HD Core, or HD Process complies with Part 15 of FCC Rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Communication Statement
NOTE: This equipment has been tested and found to comply with the limits for a Class A 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 instructions, 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 and correct the interference by one or more of the following measures:

- Reorient or locate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into 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.

Any modifications to the unit, unless expressly approved by Avid, could void the user's authority to operate the equipment.

Argentine Compliance

Australian Compliance

Canadian Compliance

This Class A digital apparatus complies with Canadian ICES-003

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada

Taiwan Compliance

警告使用者:
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

CE Compliance

(EMC and Safety)

Avid is authorized to apply the CE (Conformité Européenne) mark on this compliant equipment thereby declaring conformity to EMC Directive 89/336/EEC and Low Voltage Directive 2006/95/EEC.

Safety Compliance

Safety Statement

This equipment has been tested to comply with USA and Canadian safety certification in accordance with the specifications of UL Standards: UL60065 7th /IEC 60065 7th and Canadian CAN/CSA C22.2 60065:03. Avid Inc., has been authorized to apply the appropriate UL & CUL mark on its compliant equipment.

Warning

Important Safety Instructions

1) Read these instructions.

2) Keep these instructions.

3) Heed all warnings.

4) Follow all instructions.

5) Do not use this equipment near water.

6) Clean only with dry cloth.

7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

8) Do not install near any heat sources such as radiators, heat registers, stoves, or other equipment (including amplifiers) that produce heat.

9) Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

10) Protect power cords from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the equipment.

11) Only use attachments/accessories specified by the manufacturer.

12) For products that are not rack-mountable: Use only with a cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the equipment. When a cart is used, use caution when moving the cart/equipment combination to avoid injury from tip-over.

13) Unplug this equipment during lightning storms or when unused for long periods of time.

14) Refer all servicing to qualified service personnel. Servicing is required when the equipment has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the equipment, the equipment has been exposed to rain or moisture, does not operate normally, or has been dropped.

15) For products that are a Mains powered device:
The equipment shall not be exposed to dripping or splashing and no objects filled with liquids (such as vases) shall be placed on the equipment.

Warning! To reduce the risk of fire or electric shock, do not expose this equipment to rain or moisture.

16) For products containing a lithium battery:
CAUTION! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.

17) The equipment shall be used at a maximum ambient temperature of 40° C.

תאימות לתקני הבטיחות

הצהרת בטיחות

מכשיר זה נבדק ונמצא תואם לדרישות רישוי הבטיחות של ארצות הברית וקנדה, בהתאם למפרט של תקני UL: UL60065 7th /IEC 60065 7th וכן Canadian CAN/CSA C22.2 60065:03. Avid Inc. קיבלה אישור לסמן את מוצריה התואמים בסימון הרלוונטי של UL ו-CUL.

אזהרה

הוראות בטיחות חשובות

1) יש לקרוא את ההוראות.

2) יש לשמור את ההוראות במקום בטוח.

3) יש לשים לב לכל האזהרות.

4) יש לפעול בהתאם להוראות.

5) אין להשתמש במכשיר זה ליד מים.

6) יש לנקות את המכשיר רק באמצעות מטלית יבשה.

7) אין לחסום שום פתח אוורור. יש לבצע את ההתקנה בהתאם להוראות היצרן.

8) אין להתקין את המכשיר ליד מקורות חום כגון מקרנים, פתחי אוורור של מערכות הסקה מרכזיות, תנורים או פריטי ציוד אחרים (לרבות מגברים) המפיקים חום.

9) אין לעשות דבר שעלול להפריע לתכלית הבטיחותית של תקע מקוטב או תקע עם הארקה. תקע מקוטב מצויד בשני להבים, שאחד מהם רחב יותר. תקע עם הארקה מצויד בשני להבים ובנוסף בפין הארקה. הלהב הרחב או פין ההארקה נועדו לשמור על בטיחות המשתמש. אם התקע שסופק לא מתאים לשקע החשמל, יש להתייעץ עם חשמלאי לצורך החלפתו בתקע מתאים.

10) יש להגן על כבלי החשמל כדי למנוע קיפול או דריכה עליהם, וזאת במיוחד בסמוך לתקעים, למפצלי שקעים ובנקודות היציאה של כבלי החשמל מהמכשירים.

11) יש להשתמש אך ורק באבזרים אשר אושרו על-ידי היצרן.

12) כאשר מדובר במוצרים שלא ניתן להתקינם בארון ציוד: יש להשתמש בעגלות, מעמדים, חצובות מדפים או שולחנות המאושרים על-ידי היצרן או הנמכרים עם פריט הציוד הרלוונטי. כאשר מניחים את המכשיר על עגלה, יש לנקוט זהירות בעת הזזתה, כדי למנוע נפילה העלולה לגרום לפציעה.

13) יש לנתק את המכשיר משקע החשמל בזמן סערות ברקים או כאשר הוא לא בשימוש במשך תקופה ארוכה.

14) בכל טיפול במכשיר יש לפנות לאנשי שירות מוסמכים. טיפול נדרש כאשר המכשיר ניזוק בצורה כלשהי, לדוגמה במקרים הבאים: נזק לכבל או לתקע חשמל; שפיכת נוזלים או נפילת חפצים לתוך המכשיר; חשיפת המכשיר לגשם או ללחות; ליקוי בפעולתו הרגילה של המכשיר; נפילת המכשיר.

15) כאשר מדובר במוצרים המחוברים לרשת החשמל:
יש למנוע את חשיפת המכשיר לטפטוף או התזה של נוזלים. כמו כן, אין להניח על המכשיר חפצים המכילים נוזלים (כגון אגרטלים).

אזהרה! כדי לצמצם סכנה של אש או מכת חשמל, אין לחשוף את המכשיר לגשם או לחות.

16) כאשר המוצר מכיל סוללת ליתיום:
זהירות! קיימת סכנת התפוצצות אם החלפת הסוללה לא מתבצעת בצורה נכונה. יש להחליף את הסוללה רק בסוללה זהה או שוות ערך.

17) כאשר המוצר מצויד במתג הפעלה:
מתג ההפעלה הראשי נמצא על הלוח הקדמי של ה-HD MADI. יש להקפיד שהגישה אליו חופשית גם לאחר התקנת המכשיר.

18) אין להשתמש במכשיר כאשר טמפרטורת הסביבה עולה על 40° C.

index

I

M

P

R

S

T

W

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Technical Support (USA)
Visit the Online Support Center at
www.avid.com/support

Product Information
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