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Introduction

Congratulations on your purchase of the Delta 410 PCI Audio Card designed and built by M Audio. The Delta 410 is an excellent choice for audio production utilizing your PC or Macintosh computer, and will interface easily with “prosumer” recording gear as well as consumer playback devices.

Even if you are experienced in digital recording, please take the time to read this manual. It will give you valuable information on installing your new card and the supporting software, plus help you to fully understand the function and usability of the Delta 410. Once you’re up and running, you will quickly discover the power and brilliance, both in sound and design, of your Delta 410 PCI Audio Card.

What’s in the Box?

Your Delta 410 box contains:

- This instruction manual.
- The Delta 410 breakout cable.
- The Delta 410 PCI host adapter card.
- CD containing drivers & Delta Control Panel software for Windows 2000/ME/98/95/NT and for Macintosh OS 8.5.1 or higher.
- M Audio Warranty Registration card.

About the Delta 410 Digital PCI Audio Card

The Delta 410 functions as a 4-input, 10-output digital recording/playback interface. Two analog inputs and eight analog outputs plus coaxial S/PDIF I/O give you the highest quality analog (unbalanced) and digital I/O available -- all up to 24-bit data width and any sampling rate from 8kHz to 96kHz.

You can connect your instrument, mixer, or pre-amp to the Delta 410’s RCA input jacks located on the breakout cable to monitor and record incoming audio. You can also record a digital audio signal from your DAT, MiniDisc, CD, or external A/D converter via the Delta 410’s S/PDIF input, located on the PCI host card. The 410 also includes the comprehensive Delta Control Panel software, giving you ultimate control over routing as well as many other Delta settings such as master clock and S/PDIF copy protection.

Within the Delta 410’s PCI chip is a hardware digital mixer. Controlled by the included Delta Control Panel software, it may handle all of your mixdown needs, give you extra control of all left, right and stereo levels, as well as pans, solos, and mutes, or simply give you an alternate or headphone mix.

Quick Start Guide

There may not be any instant tips or tricks for understanding and using an audio interface that is as versatile as the Delta 410. However, we may be able to include some “straight talk” to help light the way.

On the PC: Following the installation procedures for both the Delta hardware and software will enable the 410 for use in Windows. The Delta 410 will become your Windows sound card simply by going to My Computer | Control Panel | Multimedia, and changing Audio settings to one of the Delta stereo pairs. In this way, the Delta card will be the default audio device for your Windows and other media players.

On the Mac: Following the installation procedures for both the Delta hardware and software will enable the 410 to be configured for use in a music program that utilizes the ASIO drivers supplied with the Delta. Additionally, the Delta 410 can be used in the Apple Sound Manager for your system sounds or in a music/recording program that directs itself to the Sound Manager. The Delta 410 will become your Macintosh’s audio device simply by going to the Apple menu | Control Panel | Sound, and changing audio settings from “built-in” to the Delta. In this way, the Delta card will be the default audio device for your Apple applets and a variety of media players. If you wish only to use the Delta with an ASIO compliant music program, leave this setting to “built-in.”

You will, however, need a music/recording software application to take full advantage of the Delta 410 as a production tool, and most likely that software will need to analyze and configure the Delta 410--this usually occurs when first launching the program after the Delta 410 has been installed. On the PC, the 410 is also capable of playing an encoded surround sound signal to the S/PDIF output using some of the DVD player applications that exist on the market. This usually takes some audio output configuration within the program.

The Delta Control Panel controls many of the card’s settings, and includes controls for the digital mixer that is contained on the Delta card. While all of those settings may seem daunting at first, it may help to know that by using only the default settings, the card is ready to playback audio files from your computer. This can be done from a media player or from your music application, provided the outputs are set to a Delta output port and the software and card are properly configured.

You will be able to hear the Delta inputs under certain conditions. Using a recording program that utilizes the ASIO or EASI drivers with the Delta 410, or (in Windows) using the Windows WDM drivers with programs that take full advantage of them, will allow you to monitor the Delta inputs *through* the program, and thereby continue to use the default settings in the Delta Control Panel. When using the Delta card and monitoring in this fashion, there is always some degree of latency, or delay between the the actual input signal and the monitoring of that input signal.

Another way to approach this is by directly monitoring those inputs. This can be done in the Delta Control Panel's "Patchbay/Router" page by selecting the Delta input and connecting it to the Delta output. You can also use the Delta panel's Monitor Mixer to send the signal at the inputs to the Delta outputs, as well as mix those signals with the software outputs, i.e., your music software sending audio to the Delta outputs. This, and other recording/monitoring scenarios are covered in the Tutorials section toward the end of the manual.

Product Features & Specifications

- 4x10 24-bit/96khz full-duplex recording interface.
- PCI host card with external, color-coded breakout cable.
- 2x8 analog I/O, unbalanced on gold-plated RCA connectors, with output line level adjustments selectable within the Delta Control Panel.
- S/PDIF digital I/O on gold-plated RCA connectors located on the PCI card. A variety of settings, including AC3 or DTS surround and copy protection schemes, can be set via the Delta Control Panel.
- High dynamic range (A-weighted measured): D/A 101.5 dB, A/D 99.6 dB.
- Low distortion (measured THD @ 0dBFS): A/D and D/A less than 0.002%.
- Frequency Response: 22-22kHz, -0.2,-0.4dB @48kHz; 22-40kHz, -0.2,-0.7dB @96kHz
- All data paths support up to 24bit/96kHz performance, no upgrades necessary.
- Comprehensive digital mixing, routing, and monitoring capabilities with included Delta Control Panel software.
- Hardware sample-accurate sync will allow linking of multiple Delta units.
- Windows 2000/ME and 95/98 multi-card, multi-client drivers with ASIO1 and ASIO2 multi-card, GSIF and EASI drivers included; Windows NT multi-card drivers also included.
- Macintosh control panel and drivers with ASIO1, ASIO2, and legacy ASIO support for OS 8.5.1 or higher.

Minimum System Requirements

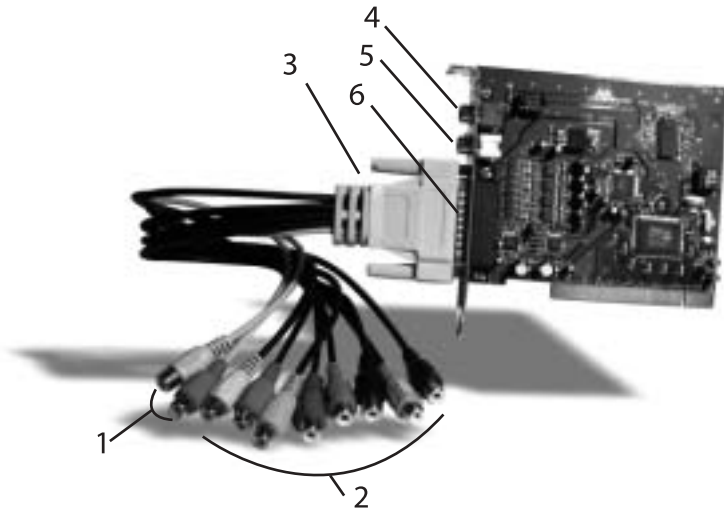
Windows

- Windows 95, 98, NT, 2000 or ME
- Pentium III 500Mhz - (96kHz operation)
- Pentium II 400 - (48kHz operation)

- 128 MB of PC100 RAM - (96kHz operation)
64 MB of SDRAM - (48kHz operation)
UDMA EIDE or ATA 33/66

Macintosh

- 128 MB of PC100 RAM for 96kHz operation.
64MB SDRAM for 48kHz or less.
- Mac G3 or G3 accelerator with 128 MB of RAM recommended. Some faster Power PCs will perform adequately.
- UDMA EIDE or fast SCSI HDD recommended.



Breakout Cable:

1. Analog Inputs 1-2: These jacks input analog audio from a variety of external sources. Each jack is RCA coaxial and is compatible with RCA coaxial (unbalanced) connections. These cables are tan in color, with the jacks colored tan for left and red for right.
2. Analog Outputs 1-8: These jacks output analog audio to a variety of external targets. Each jack is RCA coaxial and is compatible with RCA coaxial (unbalanced) connections. These cables are black in color, with the jacks multi-colored for convenience.
3. Host Cable connector: This 25-pin female D-sub connector is used to attach the breakout cable to the PCI host card's male D-sub connector.

PCI Host Adapter Card:

4. Coaxial S/PDIF Input: This RCA connector receives an S/PDIF stereo signal from your coaxial S/PDIF digital source such as a DAT, MiniDisc player or external A/D converter.
5. Coaxial S/PDIF Output: This RCA connector sends an S/PDIF stereo signal to your coaxial S/PDIF digital target device such as a DAT, MiniDisc player or external D/A converter.
6. Host Cable connector: This 25-pin D-sub connector attaches to the supplied breakout cable to allow communication between the PCI host card and external devices.

Hardware Installation

To mechanically install the Delta 410, do the following:

1. Turn off your computer.
2. Remove the computer's cover and position the computer so that you may easily access its PCI slots.
3. Select the PCI slot where you will install your Delta 410 PCI host card. Make sure the slot is a PCI slot. If you don't know what "PCI slot" means, check the owner's manual for your computer. PCI slots are distinguishable from ISA slots by being shorter and set back farther from the outside of the computer, however some newer computers have only PCI slots.
4. Before removing the Delta 410 PCI host card from its protective anti-static bag, touch the metal power supply case of the computer in order to dissipate any static electricity your body may have accumulated. You might want to pick up a grounding wrist strap (available from electronics stores like Radio Shack) if you want to be doubly sure you aren't carrying a static charge that could damage the card.
5. Remove the metal bracket that covers the access hole on the back of the computer. This bracket is usually fastened to the computer with a single screw.
6. Position the Delta 410 PCI host card over the target PCI slot and fit the card loosely over it with the card in the upright position. Press the card gently but firmly downward into the slot until the card is completely and squarely seated in the slot. If the card seems difficult to seat, a slight rocking motion may help.
7. Screw the Delta 410 PCI host card's metal bracket down into the screw hole on the back of your computer using the screw you removed in step 5 above.
8. Place the cover back on your computer.

IMPORTANT: Complete the attachment of your Delta 410 breakout cable to the PCI card before powering up your computer. Never

**attach the breakout cable to the PCI card while the computer is on.
Doing so could damage the PCI card and void the warranty.**

With your computer turned off, it is now time to connect the Delta 410 breakout cable to the PCI host card that you have just installed. You may at this time also want to connect to audio gear that you using in conjunction with your Delta 410.

Delta Driver Software Installation - for PC

The Delta 410 system includes a driver CD for Windows 2000/ME/98/95/NT (and Macintosh, too), containing all Windows drivers and Delta Control Panel software. To install these on your system, please follow these steps:

Windows 2000 Installation

1. After installing the Delta 410 hardware, boot your system and start Windows. During the Windows boot procedure, new hardware will be automatically detected by the Add New Hardware Wizard. Click 'Next>'.
2. The 'Add New Hardware Wizard' will now ask how you want to find the driver. "Search for the best driver for your device" is already selected. Click 'Next>'.
3. Windows will give you a selection of locations to search. Make sure that only "Choose a Path" is checked, or click on the check box to do so. Insert the Driver CD into your CD ROM drive. Type in the drive letter of your CD drive (we will assume here that it is D:\) and the path to the Delta drivers, which will be D:\Delta Series\Wdm. Click 'Next>'.
4. The 'Wizard' reports that its Windows driver file search has found the M Audio Delta 410. Click Next>.
5. Windows is now ready to install the driver files from the specified location. Click Next>. Windows will start to copy the files and show you a progress report screen.
6. The Wizard reports that Windows has finished installing the software. Click 'Finish'. Your Delta 410 is ready for action.

After completion of the driver installation, Windows may require you to restart Windows. If it does request a restart, remove the Drivers CD Disk from the CD drive and respond "Yes." The system will restart and your Delta 410 is ready for play.

Windows 98 Installation

1. After installing the Delta 410 hardware, boot your system and start Windows. During the Windows boot procedure, new hardware will be automatically detected by the Add New Hardware Wizard as shown here. Click 'Next>'.



2. The 'Add New Hardware Wizard' will now ask how you want to find the driver. "Search for the best driver for your device" is already selected. Click 'Next>'.
3. Windows will give you a selection of locations to search. Make sure that only "Choose a Path" is checked, or click on the check box to do so. Insert the Driver CD into your CD ROM drive. Type in the drive letter of your CD drive (we will assume here that it is D:\) and the path to the Delta drivers, which will be D:\Delta Products\Delta98. Click 'Next>'.
4. The 'Wizard' reports that its Windows driver file search has found the M Audio Delta 410. Click Next>.
5. Windows is now ready to install the driver files from the specified location. Click Next>. Windows will start to copy the files and show you a progress report screen.
6. The Wizard reports that Windows has finished installing the software. Click 'Finish'. Your Delta 410 is ready for action.

After completion of the driver installation, Windows may require you to restart Windows. If it does request a restart, remove the Drivers CD Disk from the CD drive and respond "Yes". The system will restart and your Delta 410 is ready for play.

Windows 95 Installation

1. After installation of the Delta 410 hardware, boot your system and start Windows. During the Windows boot procedure, new hardware will be automatically detected.
2. Choose the Install of "driver from disk provided by hardware manufacturer," then click OK.
3. An 'Install From Disk' will prompt you to copy files from the A:\ drive. Insert the Driver software CD into your CD ROM drive.

Type in the drive letter of your CD drive (we will assume here that it is D:\) and the path to the Delta drivers, which will be D:\Delta Products\Delta98 (these drivers also work in Win95). Click 'Next>'.

4. Windows will start to copy files, with a progress indicator on the screen. Once this process completes itself, your Delta 410 will be ready for action.

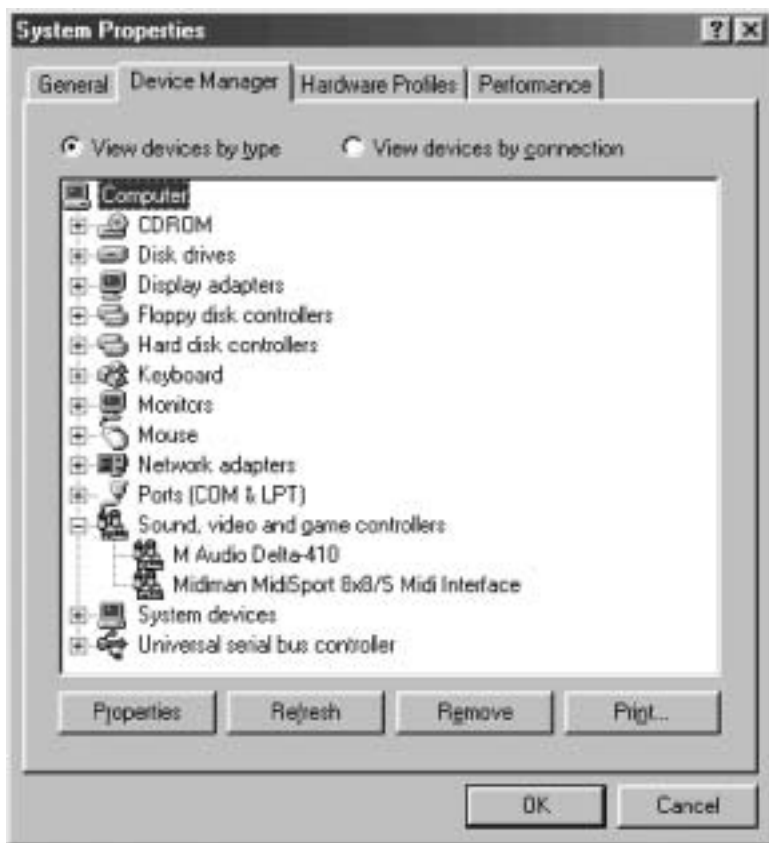
After completion of the driver installation, Windows may require you to restart Windows. If it does request a restart, remove the Drivers CD Disk from the CD drive and respond "Yes". The system will restart and your Delta 410 is ready for play.

Windows NT Installation

1. Power up your computer after physically installing the Delta 410 interface card.
2. Go to Start | Settings | Control Panel and double click on 'Multimedia.'
3. Click the 'Devices' tab, then click the 'Add' button.
4. "Unlisted or Updated Driver" will be highlighted at the top of the list. Click OK.
5. The 'Install Driver' box will prompt you to insert the driver disk, and the A: prompt will appear as the path. Insert the Drivers CD into your CD ROM drive. Type in the drive letter of your CD drive (we will assume here that it is D:\) and the path to the Delta drivers, which will be D:\Delta Products\DeltaNT. Click OK.
6. The "M Audio Delta Interface Card" driver will appear in the Add Unlisted or Updated Driver dialog box. Click OK.
7. Windows NT will require you to restart your computer for the changes to take effect. Choose "Restart Now." Upon restart, your Delta 410 will be ready for use.

Verifying Windows Driver Installation

Windows displays the Delta 410 driver status in the Device Manager page of the System Properties dialog box. The Device Manager page is opened via the Windows Start button: select Start | Settings | Control Panel | System | Device Manager. With the Device Manager displayed, click on the "+" next to "Sound, video and game controllers" to open a list of devices, the Delta 410 being a device of that nature. Below is an example view of the Device Manager.



This example shows the M Audio Delta 410 and Midiman MidiSport 8x8/S entries in the Windows Device Manager device list. The Delta 410 is properly installed with no conflicts, as is the MidiSport 8x8/S. If you do not see your M Audio Delta 410 in your Device Manager in this fashion, please jump ahead to the "Troubleshooting" section of this manual.

Verifying Delta Control Panel Software Installation

In Windows, open the Windows Control Panel (do so via Start | Settings | Control Panel). If your Delta 410 hardware and Delta Control Panel software are properly installed, the Windows Control Panel should display an "M Audio Delta H/W" icon. By double-clicking on that icon, you can launch the Delta Control Panel software. For convenience, you may also create a shortcut on your desktop by dragging a copy of the "M Audio Delta H/W" icon from the Control Panel to your Windows desktop using your mouse or trackball. After completing the drag operation, a dialog box will ask you if you wish to create a shortcut -- click on

‘Yes’. Once the shortcut is installed, all you have to do is double-click on the shortcut icon on your desktop to launch the Delta Control Panel software.

NOTE: When using a music software program that is ASIO capable, launch the Delta Control Panel software from within that program. Some of the control panel functions will be controlled from within that program, such as master clock setting and sample rate, so it is desirable to launch the music program first, and then the Delta Control Panel from the the program’s “launch” or “control panel” button. Without the music program open however, it is okay to open the Delta panel from your desktop or other location.

Delta Driver Software Installation - for Mac

1. Open the System folder on your Macintosh hard drive. In the System folder, locate the Extensions folder.
2. On you Drivers CD disk, open the Mac Delta Drivers folder. Place the extension file "Delta 410 Driver" in your Extensions folder by clicking on it and dragging it to the Extensions folder.
3. If you are using a music program that uses ASIO drivers, it will also have an ASIO folder within the application’s folder. In your Mac Delta Drivers folder you will find three Delta 410 ASIO drivers. For Cubase versions 4.x, use the "ASIO2 Delta410" driver. For Metro, or earlier versions of Cubase, use the "ASIO Delta410v3" driver. For any music program that is not ASIO2 capable, use the “ASIO Delta 410” driver instead (check your program’s documentation). Place the file "ASIO Delta" in your program's ASIO folder by clicking on it and dragging it to the ASIO folder.
3. Drag the "DeltaPanel PPC" file onto your Macintosh hard drive. You can run the Delta Control Panel from any place that's convenient, though music software applications that use ASIO will allow you to launch the Delta panel from within the program. If not, we suggest creating an alias to the control panel by highlighting it and pressing Command (Apple key)+M. Then, drag the alias to the desktop.
4. With the Delta 410 PCI card installed, restarting the computer will load the Delta 410 extension. You will be able to visually see the Delta extension icon pass by as your system loads extension.
5. Go to the Apple menu | Control Panel | Sound. You should see the “built-in” sound icon, plus the Delta icon if your Delta 410 is properly installed. If your music program does use ASIO, you may want to leave the Sound Manager driver set to "built-in" for both Sound In and Sound Out. If your program does not use ASIO (check your software’s documentation) and you will be using the Sound Manager to communicate with your Delta 410, set Sound In and Sound Out to “Delta.” See the section “Hardware Settings Page” in the Delta 410

“Control Panel Software” section for information on selecting Sound Manger inputs and outputs.

Delta Control Panel Installation - for Mac

The Delta Control Panel may be placed anywhere on your hard drive, or any partition of your hard drive that you find convenient. Once the control panel file has been dragged from the CD onto your hard drive, you may double click it to launch the Delta Control Panel software. You may also create an alias to the control panel by highlighting it, then holding Apple key+M. This alias can then be placed on your desktop.

NOTE: When using a music software program that is ASIO capable, launch the Delta Control Panel software from within that program. Some of the control panel functions will be controlled from within that program, such as master clock setting and sample rate, so it is desirable to launch the music program first, and then the Delta Control Panel from the the program's "launch" or "control panel" button. Without the music program open however, it is okay to open the Delta panel from your desktop or other location.

Delta System Basics

Delta's Analog Inputs/Outputs

The Delta 410 PCI Audio Card's analog inputs and outputs are compatible with a wide variety of audio products. The Delta Control Panel software allows you to configure the signal level of each analog output individually, or all analog outputs as a group. Signal level settings of "Consumer" and "-10" are available. The 'Consumer' setting is preferred for semi-pro audio equipment and some consumer equipment that can accept a 'hotter' signal than the '-10' setting. The 'Consumer' setting offers approximately 6dB more headroom than does the '-10' setting. Semi-pro and consumer device signal levels vary from manufacturer-to-manufacturer and even product-to-product, so a little experimentation between Consumer and -10 settings may be required for optimal results.

NOTE: In order to preserve its high dynamic range and minimize distortion, the Delta 410 does not have microphone pre-amplifiers built into it. Therefore direct connection to a microphone is not recommended. Instead run the microphone signal through a microphone pre-amp (such as the M-Audio "Audio Buddy™" or M-Audio "DMP3™") and then connect the pre-amp output to the input of the Delta 410.

All analog jacks on the Delta 410 breakout cable are of the RCA (coaxial) variety. The RCA jacks allow connection to unbalanced (typically semi-pro or consumer) connections.

The Digital Monitor Mixer

The Delta 410 PCI Audio Card has a hardware digital audio mixer built into its PCI controller chip. It accepts digital audio streams from all hardware inputs and all outgoing software audio devices, mixes them with 36-bit internal precision and then provides the mixed output to one or more locations. For the purpose of monitoring, the output of the mixer may be routed, via the control panel's Patchbay/Router page, to the first set of Delta 410 analog outputs (OUT1/OUT2 as a stereo pair) and/or the S/PDIF digital output. At the same time, the mixer may be used for stereo mix-down, with the mixer's output recorded into the user's application software. The digital audio mixer is configured and controlled by the included Delta Control Panel Software.

The Patchbay / Router

In addition to the built-in monitor mixer, the Delta 410 PCI Audio Card includes an output patchbay/router. The patchbay/router allows each output (analog or digital) to be connected to a variety of input sources. The 410's outputs may accept audio from software sources (these output devices are visible in your audio software applications) or from hardware sources such as the analog and digital inputs or the monitor mixer. This capability makes the Delta 410 quite flexible for playing and monitoring any audio file format, or directly connecting inputs to outputs for system test purposes.

Synchronization

For proper operation, the entire Delta 410 system is always synchronized to a single master clock. The master clock is chosen via the Delta Control Panel software, or may be set from within your ASIO or EASI application. This clock may be derived from the Delta 410's internal crystal oscillators or the S/PDIF In. Most of the time the master clock is taken from the internal crystal oscillators. However, the S/PDIF option is used in situations where the Delta 410 must be synchronized to external digital audio or sample rates derived from an external S/PDIF device.

Using the initial default setting, the master clock is derived from the internal crystal oscillators. Operation in this mode is similar to that of a generic sound card – for instance, when a sound file is played through the Delta drivers, the software application playing the sound file is responsible for setting the sample rate in the sound card's hardware. The Delta 410 supports these sample rates by using either of its internal crystal oscillators and dividing the rate of that oscillator by some value to derive the proper sample rate.

In situations where S/PDIF In is being used, the Delta 410 must be configured to get its master clock from the S/PDIF In data stream. The reason for this is simple – an S/PDIF data stream coming from an external source is rarely going to be in sync with the Delta 410 (or other digital audio devices in the system for that

matter), even if the sample rates are set the same. If the master clock were set to use the internal crystal, then the incoming S/PDIF audio would have "pops," "crackles," and other undesirable audio artifacts present in it. Instead, setting the master clock to "S/PDIF In" will synchronize the Delta 410 to the S/PDIF input data and its digital audio will be transferred properly.

Finally, the S/PDIF In option may be used to operate the Delta 410 at non-standard sample rates. When the S/PDIF option is selected, the Delta 410's sample rate will automatically match that of the incoming S/PDIF data stream.

NOTE: When the S/PDIF In is selected as the master clock source, the Delta 410 mixer's frequency response will be affected by whatever sample rates you inject at the S/PDIF In. This is because (1) the digital mixer operates at the same sample rate as the rest of the board, and (2) sample rate and frequency response are directly correlated.

Using the Delta 410 with your Music Software Application

Once the Delta 410's hardware and driver software are properly installed, it is ready for use with your music application software. Some of these applications may require you to highlight or enable the Delta 410 drivers within the program, and others may have a utility that analyzes or profiles the audio cards in your system and enables the drivers. Your software should have an audio device driver setup page.

WINDOWS MME AUDIO INPUT DEVICES: All Delta 410 analog and S/PDIF inputs may be used simultaneously for a total of 4 input channels. Within your software application(s), the names of the Delta 410 audio input devices are:

PCM In 1/2 Delta-410

S/PDIF In Delta-410

Mon. Mixer Delta-410

The PCM In devices allow recording a stereo stream directly from the specified analog input pairs. The S/PDIF In device allows you to record a stereo stream directly from the S/PDIF input. The Mon. Mixer device allows stereo recording from the digital "monitor" mixer built-into the Delta 410. The audio data recorded from this device is the mix of input and output streams that is set up in the Delta Control Panel software's Monitor Mixer page (see Delta 410 Control Panel Software section).

Note that all of the input devices are stereo. Your application software may break these down further to "left" and "right" mono devices. Therefore you may see them as "Left PCM In 1/2 Delta-410, Right PCM In 1/2 Delta-410", "Left S/PDIF In Delta-410, Right S/PDIF In Delta-410", or "Left Mon. Mixer Delta-410, Right Mon. Mixer Delta-410," etc. from within your recording software.

WINDOWS MME AUDIO OUTPUT DEVICES: All Delta 410 analog and S/PDIF outputs may be used simultaneously for a total of 10 output channels. Within your software application(s), the names of the Delta 410 audio output devices are:

WavOut 1/2 Delta-410

WavOut 3/4 Delta-410

WavOut 5/6 Delta-410

WavOut 7/8 Delta-410

WavOut S/PDIF Delta-410

All WavOut devices allow playing a stereo audio stream to the analog hardware outputs (for WavOut 1/2, 3/4, 5/6, 7/8), the S/PDIF hardware output (for WavOut S/PDIF), and/or into the hardware router or mixer. Your application software may break each of these stereo devices down further to "left" and "right" mono devices. Therefore you may see them as "Left WavOut 1/2 Delta-410, Right WavOut 1/2 Delta-410", or "Left WavOut S/PDIF Delta-410, Right WavOut S/PDIF Delta-410", etc. from within your music software. Other software will handle the outputs as stereo pairs, but allow you to pan audio left or right within the pair.

Note that each device name begins with "WavOut." This is to remind you that these are software devices, and not always connected directly to output hardware. Instead they are connected to the Delta 410's internal patchbay/router and may be sent to one of many destinations. For more on the patchbay/router, see the Patchbay/Router section of the Delta Control Panel software discussion.

ASIO or EASI DRIVER INPUT DEVICES: When using the ASIO or the EASI audio drivers with music programs that support this type of audio, the input devices are displayed as mono devices. Within these software applications, the names of the Delta 410 audio input devices are:

Analog In1 Delta-410

Analog In2 Delta-410

S/PDIF In L Delta-410

S/PDIF In R Delta-410

Mon. Mixer L Delta-410

Mon. Mixer R Delta-410

Notice the S/PDIF In and Monitor Mixer names include "L" and "R" characters. "L" indicates the left channel of the stereo stream, while "R" indicates right channel.

ASIO or EASI DRIVER OUTPUT DEVICES: The Delta 410's ASIO and EASI output devices appear in stereo pairs. Because each device is stereo, you may see "left" and "right" references within your software application. This allows the

application to pan audio left and right under software control. To send a signal to a Delta ASIO output 1 (for example) as a mono output send, one would choose "Analog 1/2 Delta-410" for that track's output port, and then pan that output hard left. These outputs are named as follows:

Analog 1/2 Delta-410

Analog 3/4 Delta-410

Analog 5/6 Delta-410

Analog 7/8 Delta-410

S/PDIF L/R Delta-410

WINDOWS MULTIMEDIA SETTINGS: Windows may be set up to use the Delta 410 as its default audio device, allowing system sounds to be sent out the Delta 410. This also enables you to use the Delta 410 with the sound applets included with Windows. To set this up, go to Control Panel | Multimedia. In the Audio Properties page, set the Playback and Recording devices to the Delta 410 input and output devices of your choice.

MACINTOSH SOUND MANAGER INPUTS AND OUTPUTS: The Apple Sound Manager limits the user to one stereo pair for input and one stereo pair for output. Within your music software, the device selection when using the Sound Manager drivers for input and output will be "Sound Manager" both for input source and for output port.

To select the Sound Manager driver, open the Apple Menu and go to Control Panel | Sounds. For both "Sound In" and "Sound Out," click and highlight the Delta icon, then exit. You may select which Delta hardware stereo input pair and stereo output pair will be used for the Sound Manager's Sound In and Sound Out in the Delta Control Panel "Hardware Settings Page" (see section, "Hardware Settings Page" under "Delta Control Panel"). Whichever stereo pair you select, the software input and output device selection within your music program will remain the same.

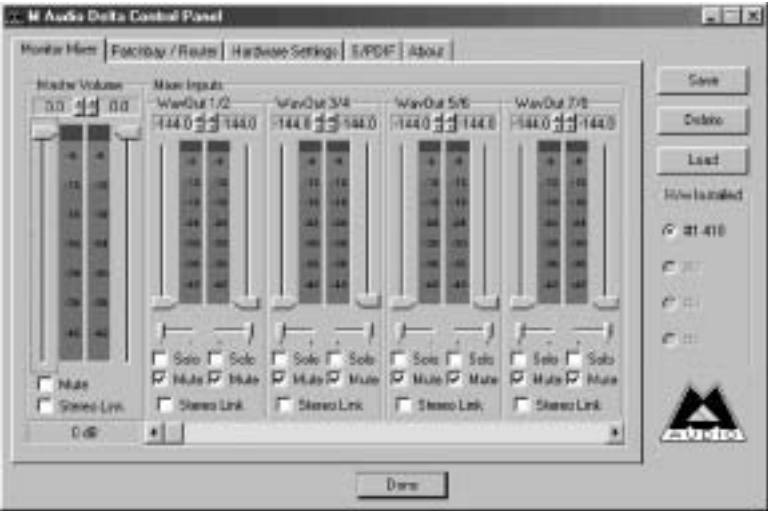
Delta 410 Control Panel Software - PC

Once the Delta 410 is properly installed, an "M Audio Delta H/W" icon will be displayed in your Windows Control Panel. By double-clicking on that icon, you will launch the Delta Control Panel software. You may also launch the Delta Control Panel software from the desktop if you have previously created a shortcut there (see "Verifying Delta Control Panel Software Installation" section for instructions on how to do this). Once the Delta Control Panel software has been opened, you will see the main panel and its several tabs. To display a desired page, click on its tab. Below are functional descriptions of each page.

NOTE: When using a music software program that is ASIO capable, launch the Delta Control Panel software from within that program. There will be a button in the ASIO or Audio setup page that will allow you to do so. Some of the control panel functions will be controlled from within that program, such as master clock setting and sample rate, so it is desirable to launch the music program first, and then the Delta Control Panel from the the program's "launch" or "control panel" button. Without the music program open however, it is okay to open the Delta panel from your desktop or other location.

Monitor Mixer Page

The Monitor Mixer is the first page that appears when the Delta Control Panel is opened, and controls the digital mixer built into the Delta 410's PCI controller chip. As described in previous sections, the output of this mixer may be assigned to the OUT1/OUT2 analog outputs and/or the S/PDIF Out digital output (this selection is made in the Patchbay Router page). At the same time, the mixer outputs may be recorded in stereo by software.



The Monitor Mixer Page is essentially a collection of volume level faders, audio level (or 'peak') meters, and solo/mute controls. For each mixer output and input channel there is one of each: a volume fader, a peak meter, a solo control, and a mute control.

LEVEL FADERS: Each volume fader may be controlled by dragging the fader 'handle' vertically with the mouse, or by clicking on the 'handle' to make it active and then adjusting it with the up/down cursor keys of your computer

keyboard. Because the mixer has no gain, these faders only attenuate (reduce) the signal levels. The highest setting is 0dB, or 'Unity Gain.' The default fader setting is the quietest setting, -144dB, which essentially mutes the audio. A pair of level faders may be "ganged" so that both channels may be adjusted together as a stereo pair.

Also, at the top of each fader and meter is a fader level "fine adjustment" control. Clicking on the small "up" and "down" arrows will adjust the corresponding fader setting in 0.5dB increments. Next to each fine adjustment control is a numerical fader readout that is always current and active.

PEAK METERS: Each peak meter indicates an audio signal level in "dB relative to full-scale." This means that a full-scale signal is referred to as "0 dB" and a signal that is 12dB "quieter" than full-scale is referred to as "-12dB." The meters are vertically color-coded into three sections: green, yellow and red. The green section represents a safe zone, ranging from approximately -48dB to -12dB. Most audio signals should appropriately fill this section of the meter. The yellow section ranges from -12dB to -3dB as the signal approaches a 'hotter' level. For best capture resolution, recording in this area is both safe and advised. The red section of the meter ranges from -3dB to 0dB. On the input level meters, a 0dB condition indicates overload and audio clipping may occur. Therefore be careful to adjust the incoming audio levels so that they do not peak in the red section too long (you might use the monitoring capability of the Delta 410 to let your ears be the judge). On all output level meters, 0dB indicates full-scale output. Unlike the inputs, clipping is impossible on the outputs because of the 36-bit resolution built into the mixer hardware.

MASTER VOLUME: At the left side of the Monitor Mixer page, you will see the 'Master Volume' faders and peak meters. These faders have the longest 'throw' and highest meter resolution of any level controls in the mixer page. They control the overall stereo level of the mixer output. The peak meters indicate the output signal levels with respect to full-scale and are directly affected by the settings of the master volume faders.

MIXER INPUTS: The 'Mixer Inputs' are inputs to the monitor mixer. These inputs accept hardware audio streams (directly from the Delta's analog and digital input ports) and software audio streams (digital audio generated in software to be output). This combination of streams makes the monitor mixer extremely flexible. Each mixer input channel has its own level fader and may be panned anywhere in the left/right stereo field. Each input also has its own peak meter. The peak meters indicate the incoming "pre-fader" levels of the incoming audio and are therefore not affected by the fader settings. However, the input faders do affect the levels of the signals exiting the mixer and you will see the affect of the input faders on the output "Master Volume" peak meters.

Because of the large number of mixer inputs, not all inputs are displayed simultaneously. You may use the scroll bar at the bottom of the Delta Control Panel to scroll the view left or right. On the PC, from far left to right the inputs are labeled "WavOut 1/2" through "WavOut 7/8," then "WavOut S/PDIF." These inputs accept the digital audio streams being sent from your software application (or Windows) to the driver devices with those same names. Each name begins with "WavOut" to remind you that these are software streams and may not necessarily be routed to any physical outputs (see Patchbay/Router Page).

Further to the right are more channels, labeled "H/W In S/PDIF" and "H/W In 1/2." These mixer inputs are audio streams from the physical Delta 410 hardware inputs, hence the "H/W" at the front of each label.

PAN: Each mixer input may be individually panned anywhere in the stereo output mix. A pan control is positioned directly under each input channel peak meter and has the appearance of a small vertical pointer. To make a coarse adjustment, click on the pan control with your mouse and drag it to the desired position. For finer adjustment (in 1% increments), you may click on the pan control to make it active, and then use the left/right or up/down cursor keys on your computer keyboard. Either way, while the pan setting is being adjusted, its value will appear numerically in the Master Volume's status box (below the Master Volume Stereo Gang control) as a percentage from left pan to right pan: -100% represents far left, +100% represents far right, and 0% represents the center.

SOLO: Each mixer input channel has a "Solo" checkbox associated with it. Clicking on and activating a Solo box will solo the selected channel by essentially muting all other signals. When more than one channel has Solo selected, all solo channels will be summed to the solo 'buss' (path), which is what one might consider an 'in place' solo as opposed to a PFL, or pre-fader listen (levels and pans still apply). Deactivating all solo boxes will return all input channels to their previous mute/unmute states.

MUTE: Every mixer input channel has a "Mute" checkbox associated with it. Clicking on and activating the Mute box will remove that signal from the stereo buss. Deactivating the Mute box will add the signal back into the stereo buss.

STEREO GANG: All input channel pairs have a "Stereo Gang" capability. Clicking on and activating the Stereo Gang checkbox will link (or "gang") the left/right faders so that both channels may be adjusted together as a stereo pair.

Patchbay/Router Page

The Patchbay/Router page allows you to connect each of the Delta 410's hardware outputs (4 pairs of analog outputs and 1 pair of digital output channels) to specific audio sources within the Delta 410 board. To display this page, click the "Patchbay/Router" tab of the Delta Control Panel.

The leftmost vertical column of Patchbay/Router page, "H/W Out 1/2," connects this analog stereo pair to one of five stereo sources:

1. The default setting, "WavOut 1/2", connects ports OUT1 and OUT2 to your music software or Windows multimedia applet. In other words, when music software plays audio to the device named "WavOut 1/2 Delta-410" it will be routed directly to the "hardware" analog outputs 1 & 2 of your 410 breakout cable.
2. The second option, "Monitor Mixer", connects ports OUT1 and OUT2 to the outputs of the Delta 410 monitor mixer. For more information of the capabilities of the monitor mixer, please see the section "Monitor Mixer Page".
3. The third option, "S/PDIF In", connects ports OUT1 and OUT2 directly to the hardware S/PDIF input on the Delta 410 PCI host card. The left channel of the S/PDIF In is routed to OUT1 and the right channel of the S/PDIF In is routed to OUT2.
4. The fourth option, "S/PDIF In (L/R Rev.)", functions identically to the third option, except that the left and right channels are swapped. Therefore in this mode, the left channel of the S/PDIF In is routed to OUT2 and the right channel of the S/PDIF In is routed to OUT1.
5. Selection five connects the hardware analog input 1 & 2 directly to the 410's hardware analog outputs 1 & 2. In other words, if "H/W In 1/2" were selected, any signal present at the IN1 RCA jack will be copied to OUT1, and any signal present at the IN2 RCA jack will be copied to OUT2.

The next three vertical columns of the Patchbay/Router page (from left to right), "H/W Out 3/4," "H/W Out 5/6," and "H/W Out 7/8," connect these hardware analog outputs to one of four sources. Since the three columns function identically, we'll use "H/W Out 3/4" as the example:

1. The default setting, "WavOut 3/4", connects ports OUT3 and OUT4 to your music software or Windows multimedia applet. In other words, when music software plays audio to the device named "WavOut 3/4 Delta-1010" it will be routed directly to the "hardware" analog outputs 3 & 4 of your 10 breakout cable.
2. The second option, "S/PDIF In", connects ports OUT3 and OUT4 directly to the hardware S/PDIF input on the Delta 1010 PCI host card. The left channel of the S/PDIF In is routed to OUT3 and the right channel of the S/PDIF In is routed to OUT4.
3. The third option, "S/PDIF In (L/R Rev.)", functions identically to the second option, except that the left and right channels are swapped. Therefore in this mode, the left channel of the S/PDIF In is routed to OUT4 and the right channel of the S/PDIF In is routed to OUT3.

4. Option four connects the hardware analog inputs 1 & 2 directly to the 1010's hardware analog outputs 3 & 4. In other words, if "H/W In 1/2" were selected, any signal present at the IN1 RCA jack will be copied to OUT3, and any signal present at the IN2 RCA jack will be copied to OUT4.

The rightmost vertical column of Patchbay/Router page, "H/W Out S/PDIF," connects the Delta 410's hardware S/PDIF outputs to one of five sources:

1. The default setting, "WavOut S/PDIF", connects the S/PDIF Out port to your music software or Windows multimedia applet. In other words, when music software plays audio to the device named "WavOut S/PDIF Delta-410" it will be routed directly to the hardware S/PDIF output on your Delta 410 PCI host card.
2. The second option, "Monitor Mixer", connects the S/PDIF Out port to the outputs of the Delta 410 monitor mixer. For more information on the capabilities of the monitor mixer, please see the section "Monitor Mixer Page".
3. The third option, "S/PDIF In", connects the S/PDIF Out port directly to the hardware S/PDIF input on the Delta 410 PCI host card. The left channel of the S/PDIF In is routed to the left channel of S/PDIF Out and the right channel of the S/PDIF In is routed to the right channel of S/PDIF Out.
4. The fourth option, "S/PDIF In (L/R Rev.)", functions identically to the third option, except that the left and right channels are swapped. Therefore in this mode, the left channel of the S/PDIF In is routed to the right channel of S/PDIF Out and the right channel of the S/PDIF In is routed to the left channel of S/PDIF Out.
5. Selection five connects the hardware analog inputs 1 & 2 directly to the 410's S/PDIF Out port. In other words, if "H/W In 1/2" were selected, any signal present at the IN1 RCA jack will be sent to the left channel of the S/PDIF Out, and any signal present at the IN2 RCA jack will be sent to the right channel of the S/PDIF Out.

At this point, you may begin to realize the versatility of the Monitor Mixer and the Patchbay/Router, and the relationship between the two. You may want to re-read this section and make some practice adjustments within the Delta Control Panel software to become proficient in routing and mixing, as well as check out the Tutorials section toward the end of this manual. If somewhere in the process you become confused, you may always restore the default settings to use the card as a straight 4-in 10-out device -- just choose the topmost option in each of the Patchbay/Router columns.

Hardware Settings Page

The Hardware Settings page of the Delta Control Panel gives you control over miscellaneous features of the Delta 410. To display this page, click the "Hardware Settings" tab of the Delta Control Panel.

MASTER CLOCK: This section allows you to select the source of the board's master clock: Internal Xtal (crystal) or S/PDIF In. Master clock operation is outlined in the Synchronization section of this manual. Internal Xtal is the default setting. Be sure to select "S/PDIF In" if you will be recording or monitoring an S/PDIF stream, or if you wish to synchronize your digital audio with a S/PDIF source device.

NOTE: If "S/PDIF In" is selected as the master clock source, be sure to supply a valid S/PDIF signal to the board's active S/PDIF input. Otherwise, erratic timing and/or improper sample rates will be experienced.

Once a master clock source has been selected, its synchronization status is continually monitored and displayed below the master clock radio buttons. If internal crystal is selected, the status display will always say "Locked." On the other hand, if S/PDIF In is selected as the master clock source, the control panel will display "Locked" only when a valid S/PDIF signal is detected. It will display "Unlocked" when there is no signal at the selected input, or when the signal is corrupt or invalid for any reason.

CODEC SAMPLE RATE: This section indicates the present board sample rate, as set by application software. The sample rate selected here will be used to drive the digital mixer and all outputs. The "Rate Locked" checkbox is used to force a sample rate upon the system. It is disabled by default to allow software access to all supported sample rates. When checked, it causes the driver to only operate at the selected sample rate. This means that any application that attempts to open the Delta 410 driver at a sample rate other than the one selected here will fail to do so and will post an error message. "Reset Rate When Idle" is selected when you want the sample rate to return to a particular setting when a software application is not actively using the board. This is particularly handy for keeping the digital mixer running at a specific sample rate.

NOTE: Because the digital monitor mixer runs at the sample rate of the rest of the board, and because sample rate directly affects frequency response, it may be desirable to keep the sample rate at or above 44.1 kHz while using the monitor mixer. This is accomplished by enabling "Reset Rate When Idle" and selecting a sample rate of 44.1 kHz or greater.

S/PDIF SAMPLE RATE: When using S/PDIF In as your master clock, this section tells the driver what the expected S/PDIF input sample rate is. The section is only displayed when the board is set to use S/PDIF In as the master clock

source. From the list, select the sample rate closest to that of the S/PDIF input data. The sample rate selected here will be the only sample rate available to the software applications. Therefore, you must set your audio software application to this same sample rate or else the application will display an error message.

NOTE: When S/PDIF In is the master clock source, the digital monitor mixer will run at the sample rate received at the S/PDIF In. Since frequency response and sample rate are directly related, the mixer frequency response will be directly related to the sample rate of the S/PDIF input data.

MULTITRACK DRIVER DEVICES: The Delta 410 drivers intelligently synchronize the beginning of recording and playback across all audio devices on the board. When using application software that is capable of using multiple channels simultaneously, select "Single and In-Sync" to ensure that all audio channels will begin playback and/or recording at the same time. Otherwise select "Independent" to allow the audio channels to play independently – this setting may be desirable if more than one application needs to access the Delta 410 simultaneously.

The selection "Multi-card Sync" will remain grayed out until a second Delta PCI card (of which there are a variety) is installed in the system. When you wish to synchronize two (or more, up to four) Delta cards, select Multi-card Sync on the second and successive cards. Then, select S/PDIF as your master clock, and connect the S/PDIF output of the first card to the S/PDIF input of the second card, etc. This ensures that when the application goes into record or playback, it waits until all audio ports are open before it commences with recording or playback of audio.

DMA BUFFER SIZES: This section specifies the amount of system memory dedicated to digital audio buffering. Setting a buffer size that is too small may result in clicks or pops in the audio stream as some data may be lost. Larger buffers cause slightly more latency but prevent the pops and clicks that might occur with smaller buffer sizes – the default settings are recommended but you may desire to tweak these default settings to suit your tastes. This buffer size must be set in the Delta Control Panel before you launch your music software. When using ASIO with the Delta 410, set the buffer size in the control panel, then exit the control panel. After doing so, launch your music software.

VARIABLE OUTPUT LEVELS: Two selections are available for setting the output line level for all of the Delta 410 analog output ports. Eight faders are also available for setting each level individually while the "Mono" radio button is selected, or in stereo pairs after selecting the "Stereo" radio button.

Clicking the button labeled "Consumer" will snap all of the eight faders to their maximum setting. This represents a line level of -4dBV, and will work well when interfacing with audio gear that can accept a slightly hotter input signal. The Consumer setting does not actually increase the output level, but rather gives the Delta 410 more headroom in order to output a hotter signal.

Clicking the button labeled “-10dBV” will snap all eight faders to a location twelve increments below the maximum setting, effectively lowering the output line level by 6dB. This represents a line level that will interface well with equipment that will not accept the hotter signal. As a general rule of thumb, if you have the outputs set to the Consumer level and you find that you have to turn the record or input level on the receiving device down to a very low setting, try decreasing the output line level to the -10dBV setting and turning up the record or input level. Sometimes a little experimentation is in order to find the best setup for your situation.

At any time, the individual faders may be set to vary the output level to a particular port or ports. You can use the Consumer and -10dBV buttons as a starting point, or operate independently of them. The faders can be set incrementally in .5dB steps, of which there are 18. If working in surround sound, these faders can be used to calibrate speakers for monitoring purposes. If using the 410 outputs for different purposes, the faders allow you to address multiple targets individually.

S/PDIF Page

The S/PDIF page of the Delta Control Panel configures the S/PDIF output format and displays the status of the S/PDIF input. To display this page, click the "S/PDIF" tab of the Delta Control Panel software.

DIGITAL INPUT: This group box displays the current S/PDIF input status. The Delta 410's S/PDIF receiver is capable of recognizing a valid input signal versus an invalid, corrupt or non-present one. When a valid signal is detected at S/PDIF In, this group box displays "Valid Input Detected." When an invalid signal is detected or no signal is present, the group box displays "Invalid or Not Present." Below this message are two 'grayed-out' buttons: "Coax(RCA)" and "Optical." These are functions of the Delta DiO 2496, another product in the M Audio Delta line, one with both optical and coaxial S/PDIF inputs. These controls do not apply to the Delta 410.

DIGITAL OUTPUT FORMAT: Within the "Digital Output Format" group, you choose the digital audio format of the S/PDIF output. The default setting, "Consumer," is a true S/PDIF format and is recognized by all consumer devices. The alternate "Professional" setting is an AES/EBU type data stream, but electrically S/PDIF. This is a work-around that is recognized by some but not all AES/EBU devices.

For both consumer and professional output formats, the "Advanced" checkbox will allow you to force a few particular status bits in the outgoing S/PDIF signal. The advanced option is for expert users only; however, if you decide to go exploring, change a few bit settings and get lost, you can always select the "Restore Defaults" button to restore the outgoing status bits to their factory settings. When "Consumer" and "Advanced" are both selected, the group "Consumer Format Advanced Settings" will appear. When "Professional" and

"Advanced" are both selected, the group "Professional Format Advanced Settings" will appear. These groups are described below:

CONSUMER FORMAT ADVANCED SETTINGS (Copy Mode): Copy protection, also known as Serial Copy Management System (SCMS), is written into the S/PDIF subcode, a reserved part of the S/PDIF digital stream that is independent of the actual audio data being transmitted. It can be used to inhibit the amount of copies that can be made, or allow for unlimited copying. Three SCMS modes are available. "Original (Copy Permitted)" indicates that the source material may be copied by a receiving device. "1st Generation" indicates that the source material is a first generation copy. Most devices that are capable of recording will reject material with this SCMS mode set. The final option is "No SCMS" which may be used to override the other two modes and allow a recording device to successfully record the audio data. Different manufacturers' products may interpret these codes differently and require you to set these bits by "trial-and-error" until proper operation is achieved.

CONSUMER FORMAT ADVANCED SETTINGS (Emphasis): This status bit is used to indicate if pre-emphasis has been applied to the outgoing digital audio signal. The default is "None" and rarely will any user want to set the value to "50/15uSec" unless the transmitted audio has been encoded with 50/15uSec pre-emphasis.

PROFESSIONAL FORMAT ADVANCED SETTINGS (Data Type): The user may assign the outgoing data as audio or non-audio data. Many devices ignore this setting. The obvious default is "audio," however, choosing "non-audio" is appropriate if you wish to send an AC3 signal (Dolby Digital 5.1 surround sound) out of the S/PDIF output. Some software DVD players are capable of this, as well as AC3 or Dolby Digital encoding software.

PROFESSIONAL FORMAT ADVANCED SETTINGS (Emphasis): The user may choose to indicate or not indicate if pre-emphasis has been applied to the outgoing digital audio signal. The default is "None" and rarely will any user want to set the value to "CCITT" or "50/15uSec" unless the transmitted audio has been encoded with one of those types of pre-emphasis.

About Page

The "About" page, while displaying the handsome M Audio logo and applicable copyright information, also reports the driver version and control panel software version. If you have Internet browsing capabilities and are currently connected to the Internet, clicking on the Midiman copyright will link you to the M Audio / Midiman web site (PC only).

Save, Delete, Load Buttons; H/W Installed

At the rightmost side of the Delta Control Panel are the Save, Load and Delete

buttons as well as an "installed hardware" set of radio buttons. These controls appear regardless of what Delta Control Panel page is being displayed.

SAVE, DELETE, LOAD: The Delta Control Panel always retains the last settings entered. However the Save, Delete, and Load functions expand this capability to store different sets of control panel settings using different configuration file names. These configurations are then available for recall at a later date and time.

Clicking the 'Save' button brings up a dialog box prompting you to name the current configuration. Once you have done this, click 'OK', and your current configuration has been saved to disk. If you decide that you no longer need a particular configuration, click the 'Delete' button. Highlight the name of the configuration file that you wish to delete, and click the 'OK' button. To recall or reload a saved configuration, click the 'Load' button. Highlight the name of the configuration file that you wish to recall, and click 'OK'. Those settings will now appear in the Delta Control Panel and the driver will automatically update the hardware.

H/W INSTALLED: Up to four Delta cards may be installed in a system at one time. This section displays all installed Delta cards, and allows you to select which particular card is under the control of the control panel software. To select a card for configuration, click the radio button to the left of that particular card in the "H/W Installed" list.

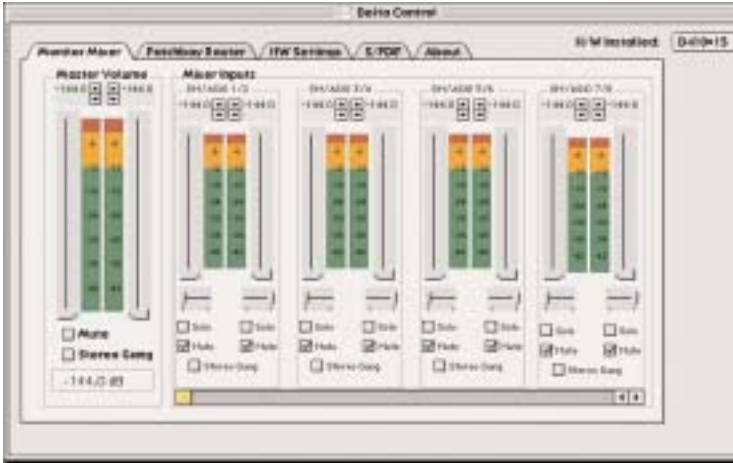
Delta 410 Control Panel Software - Mac

The Delta Control Panel must be placed on the hard drive by dragging the application from the Drivers CD. Once this is done, an alias may be created by highlighting the Delta Control Panel on the hard drive and pressing the Apple key+M. Then, this alias may be dragged to the desktop. Double clicking either will launch the control panel. Once the Delta Control Panel software has been opened, you will see the main panel and its several tabs. To display a desired page, click on its tab. Below are functional descriptions of each page.

NOTE: When using a music software program that is ASIO capable, launch the Delta Control Panel software from within that program. There will be a button in the ASIO or Audio setup page that will allow you to do so. Some of the control panel functions will be controlled from within that program, such as master clock setting and sample rate, so it is desirable to launch the music program first, and then the Delta Control Panel from the the program's "launch" or "control panel" button. Without the music program open however, it is okay to open the Delta panel from your desktop or other location.

Monitor Mixer Page

The Monitor Mixer is the first page that appears when the Delta Control Panel is opened, and controls the digital mixer built into the Delta 410's PCI controller chip. As described in previous sections, the output of this mixer may be assigned to the OUT1/OUT2 analog outputs and/or the S/PDIF Out digital output (this selection is made in the Patchbay Router page). At the same time, the mixer outputs may be recorded in stereo by software.



The Monitor Mixer Page is essentially a collection of volume level faders, audio level (or 'peak') meters, and solo/mute controls. For each mixer output and input channel there is one of each: a volume fader, a peak meter, a solo control, and a mute control.

LEVEL FADERS: Each volume fader may be controlled by dragging the fader 'handle' vertically with the mouse, or by clicking on the 'handle' to make it active and then adjusting it with the up/down cursor keys of your computer keyboard. Because the mixer has no gain, these faders only attenuate (reduce) the signal levels. The highest setting is 0dB, or 'Unity Gain.' The default fader setting is the quietest setting, -144dB, which essentially mutes the audio. A pair of level faders may be "ganged" so that both channels may be adjusted together as a stereo pair.

Also, at the top of each fader and meter is a fader level "fine adjustment" control. Clicking on the small "up" and "down" arrows will adjust the corresponding fader setting in 0.5dB increments. Next to each fine adjustment control is a numerical fader readout that is always current and active.

PEAK METERS: Each peak meter indicates an audio signal level in "dB relative to full-scale." This means that a full-scale signal is referred to as "0 dB" and a

signal that is 12dB "quieter" than full-scale is referred to as "-12dB." The meters are vertically color-coded into three sections: green, yellow and red. The green section represents a safe zone, ranging from approximately -48dB to -12dB. Most audio signals should appropriately fill this section of the meter. The yellow section ranges from -12dB to -3dB as the signal approaches a 'hotter' level. For best capture resolution, recording in this area is both safe and advised. The red section of the meter ranges from -3dB to 0dB. On the input level meters, a 0dB condition indicates overload and audio clipping may occur. Therefore be careful to adjust the incoming audio levels so that they do not peak in the red section too long (you might use the monitoring capability of the Delta 410 to let your ears be the judge). On all output level meters, 0dB indicates full-scale output. Unlike the inputs, clipping is impossible on the outputs because of the 36-bit resolution built into the mixer hardware.

MASTER VOLUME: At the left side of the Monitor Mixer page, you will see the 'Master Volume' faders and peak meters. These faders have the longest 'throw' and highest meter resolution of any level controls in the mixer page. They control the overall stereo level of the mixer output. The peak meters indicate the output signal levels with respect to full-scale and are directly affected by the settings of the master volume faders.

MIXER INPUTS: The 'Mixer Inputs' are inputs to the monitor mixer. These inputs accept hardware audio streams (directly from the Delta's analog and digital input ports) and software audio streams (digital audio generated in software to be output). This combination of streams makes the monitor mixer extremely flexible. Each mixer input channel has its own level fader and may be panned anywhere in the left/right stereo field. Each input also has its own peak meter. The peak meters indicate the incoming "pre-fader" levels of the incoming audio and are therefore not affected by the fader settings. However, the input faders do affect the levels of the signals exiting the mixer and you will see the affect of the input faders on the output "Master Volume" peak meters.

Because of the large number of mixer inputs, not all inputs are displayed simultaneously. You may use the scroll bar at the bottom of the Delta Control Panel to scroll the view left or right. From far left to right the inputs are labeled "SM/ASIO 1/2" through " SM/ASIO 7/8," then "SM/ASIO S/PDIF." These inputs accept the digital audio streams being sent from your software application (or the Sound Manager) to those driver devices. Each name begins with "SM/ASIO" to remind you that these are software streams and may not necessarily be routed to any physical outputs, and need to be connected (see Patchbay/Router Page).

Further to the right are more channels, labeled "H/W In S/PDIF" and "H/W In 1/2." These mixer inputs are audio streams from the physical Delta 410 hardware inputs, hence the "H/W" at the front of each label.

PAN: Each mixer input may be individually panned anywhere in the stereo output mix. A pan control is positioned directly under each input channel peak meter and has the appearance of a small vertical pointer. To make a coarse adjustment, click on the pan control with your mouse and drag it to the desired position. For finer adjustment (in 1% increments), you may click on the pan control to make it active, and then use the left/right or up/down cursor keys on your computer keyboard. Either way, while the pan setting is being adjusted, its value will appear numerically in the Master Volume's status box (below the Master Volume Stereo Gang control) as a percentage from left pan to right pan: -100% represents far left, +100% represents far right, and 0% represents the center.

SOLO: Each mixer input channel has a "Solo" checkbox associated with it. Clicking on and activating a Solo box will solo the selected channel by essentially muting all other signals. When more than one channel has Solo selected, all solo channels will be summed to the solo 'buss' (path), which is what one might consider an 'in place' solo as opposed to a PFL, or pre-fader listen (levels and pans still apply). Deactivating all solo boxes will return all input channels to their previous mute/unmute states.

MUTE: Every mixer input channel has a "Mute" checkbox associated with it. Clicking on and activating the Mute box will remove that signal from the stereo buss. Deactivating the Mute box will add the signal back into the stereo buss.

STEREO GANG: All input channel pairs have a "Stereo Gang" capability. Clicking on and activating the Stereo Gang checkbox will link (or "gang") the left/right faders so that both channels may be adjusted together as a stereo pair.

Patchbay/Router Page

The Patchbay/Router page allows you to connect each of the Delta 410's hardware outputs (4 pairs of analog outputs and 1 pair of digital output channels) to specific audio sources within the Delta 410 board. To display this page, click the "Patchbay/Router" tab of the Delta Control Panel.

The leftmost vertical column of Patchbay/Router page, "H/W Out 1/2," connects this analog stereo pair to one of five stereo sources:

1. The default setting, "SM/ASIO 1/2", connects ports OUT1 and OUT2 to your music software or Sound Manager applet (provided that Out 1/2 is your selection for Sound Manager output. See next section, Hardware Settings Page"). In other words, when music software plays audio to the device named "Sound Manager" or "Analog 1/2 Delta-410," it will be routed directly to the "hardware" analog outputs 1 & 2 of your 410 breakout cable.

2. The second option, "Monitor Mixer", connects ports OUT1 and OUT2 to the outputs of the Delta 410 monitor mixer. For more information of the capabilities of the monitor mixer, please see the section "Monitor Mixer Page."
3. The third option, "S/PDIF In", connects ports OUT1 and OUT2 directly to the hardware S/PDIF input on the Delta 410 PCI host card. The left channel of the S/PDIF In is routed to OUT1 and the right channel of the S/PDIF In is routed to OUT2.
4. The fourth option, "S/PDIF In (L/R Rev.)", functions identically to the third option, except that the left and right channels are swapped. Therefore in this mode, the left channel of the S/PDIF In is routed to OUT2 and the right channel of the S/PDIF In is routed to OUT1.
5. Selection five connects the hardware analog input 1 & 2 directly to the 410's hardware analog outputs 1 & 2. In other words, if "H/W In 1/2" were selected, any signal present at the IN1 RCA jack will be copied to OUT1, and any signal present at the IN2 RCA jack will be copied to OUT2.

The next three vertical columns of the Patchbay/Router page (from left to right), "H/W Out 3/4," "H/W Out 5/6," and "H/W Out 7/8," connect these hardware analog outputs to one of four sources. Since the three columns function identically, we'll use "H/W Out 3/4" as the example:

1. The default setting, "SM/ASIO 3/4", connects ports OUT3 and OUT4 to your music software or Sound Manager applet (provided that Out 3/4 is your selection for Sound Manager output. See next section, Hardware Settings Page"). In other words, when music software plays audio to the device named "Sound Manager" or Analog 3/4 Delta 410" it will be routed directly to the "hardware" analog outputs 3 & 4 of your 410 breakout cable.
2. The second option, "S/PDIF In", connects ports OUT3 and OUT4 directly to the hardware S/PDIF input on the Delta 1010 PCI host card. The left channel of the S/PDIF In is routed to OUT3 and the right channel of the S/PDIF In is routed to OUT4.
3. The third option, "S/PDIF In (L/R Rev.)", functions identically to the second option, except that the left and right channels are swapped. Therefore in this mode, the left channel of the S/PDIF In is routed to OUT4 and the right channel of the S/PDIF In is routed to OUT3.
4. Option four connects the hardware analog inputs 1 & 2 directly to the 1010's hardware analog outputs 3 & 4. In other words, if "H/W In 1/2" were selected, any signal present at the IN1 RCA jack will be copied to OUT3, and any signal present at the IN2 RCA jack will be copied to OUT4.

The rightmost vertical column of Patchbay/Router page, "H/W Out S/PDIF," connects the Delta 410's hardware S/PDIF outputs to one of five sources:

1. The default setting, "SM/ASIO S/PDIF", connects the S/PDIF Out port to your music software or Sound Manager applet (provided that S/PDIF is your selection for Sound Manager output. See next section, Hardware Settings Page"). In other words, when music software plays audio to the device named "Sound Manager" or "S/PDIF Delta-410," it will be routed directly to the hardware S/PDIF output on your Delta 410 PCI host card.
2. The second option, "Monitor Mixer", connects the S/PDIF Out port to the outputs of the Delta 410 monitor mixer. For more information on the capabilities of the monitor mixer, please see the section "Monitor Mixer Page."
3. The third option, "S/PDIF In", connects the S/PDIF Out port directly to the hardware S/PDIF input on the Delta 410 PCI host card. The left channel of the S/PDIF In is routed to the left channel of S/PDIF Out and the right channel of the S/PDIF In is routed to the right channel of S/PDIF Out.
4. The fourth option, "S/PDIF In (L/R Rev.)", functions identically to the third option, except that the left and right channels are swapped. Therefore in this mode, the left channel of the S/PDIF In is routed to the right channel of S/PDIF Out and the right channel of the S/PDIF In is routed to the left channel of S/PDIF Out.
5. Selection five connects the hardware analog inputs 1 & 2 directly to the 410's S/PDIF Out port. In other words, if "H/W In 1/2" were selected, any signal present at the IN1 RCA jack will be sent to the left channel of the S/PDIF Out, and any signal present at the IN2 RCA jack will be sent to the right channel of the S/PDIF Out.

At this point, you may begin to realize the versatility of the Monitor Mixer and the Patchbay/Router, and the relationship between the two. You may want to re-read this section and make some practice adjustments within the Delta Control Panel software to become proficient in routing and mixing, as well as check out the Tutorials section toward the end of this manual. If somewhere in the process you become confused, you may always restore the default settings to use the card as a straight 4-in 10-out device -- just choose the topmost option in each of the Patchbay/Router columns.

Hardware Settings Page

The Hardware Settings page of the Delta Control Panel gives you control over miscellaneous features of the Delta 410. To display this page, click the "Hardware Settings" tab of the Delta Control Panel.

MASTER CLOCK: This section allows you to select the source of the board's master clock: Internal Xtal (crystal) or S/PDIF In. Master clock operation is outlined in the Synchronization section of this manual. Internal Xtal is the default setting. Be sure to select "S/PDIF In" if you will be recording or monitoring an S/PDIF stream, or if you wish to synchronize your digital audio with a S/PDIF source device.

NOTE: If "S/PDIF In" is selected as the master clock source, be sure to supply a valid S/PDIF signal to the board's active S/PDIF input. Otherwise, erratic timing and/or improper sample rates will be experienced.

Once a master clock source has been selected, its synchronization status is continually monitored and displayed below the master clock radio buttons. If internal crystal is selected, the status display will always say "Locked." On the other hand, if S/PDIF In is selected as the master clock source, the control panel will display "Locked" only when a valid S/PDIF signal is detected. It will display "Unlocked" when there is no signal at the selected input, or when the signal is corrupt or invalid for any reason.

CODEC SAMPLE RATE: This section indicates the present board sample rate, as set by application software. The sample rate selected here will be used to drive the digital mixer and all outputs. The "Rate Locked" checkbox is used to force a sample rate upon the system. It is disabled by default to allow software access to all supported sample rates. When checked, it causes the driver to only operate at the selected sample rate. This means that any application that attempts to open the Delta 410 driver at a sample rate other than the one selected here will fail to do so and will post an error message. "Reset Rate When Idle" is selected when you want the sample rate to return to a particular setting when a software application is not actively using the board. This is particularly handy for keeping the digital mixer running at a specific sample rate.

NOTE: Because the digital monitor mixer runs at the sample rate of the rest of the board, and because sample rate directly affects frequency response, it may be desirable to keep the sample rate at or above 44.1 kHz while using the monitor mixer. This is accomplished by enabling "Reset Rate When Idle" and selecting a sample rate of 44.1 kHz or greater.

S/PDIF SAMPLE RATE: When using S/PDIF In as your master clock, this section tells the driver what the expected S/PDIF input sample rate is. The section is only displayed when the board is set to use S/PDIF In as the master clock source. From the list, select the sample rate closest to that of the S/PDIF input data. The sample rate selected here will be the only sample rate available to the software applications. Therefore, you must set your audio software application to this same sample rate or else the application will display an error message.

NOTE: When S/PDIF In is the master clock source, the digital monitor mixer will run at the sample rate received at the S/PDIF In. Since frequency response and sample rate are directly related, the mixer frequency response will be directly related to the sample rate of the S/PDIF input data.

MULTITRACK DRIVER DEVICES: The Delta 410 drivers intelligently synchronize the beginning of recording and playback across all audio devices on the board. When using application software that is capable of using multiple channels simultaneously, select "Single and In-Sync" to ensure that all audio channels will begin playback and/or recording at the same time. Otherwise select "Independent" to allow the audio channels to play independently – this setting may be desirable if more than one application needs to access the Delta 410 simultaneously.

DMA BUFFER SIZES: This section specifies the amount of system memory dedicated to digital audio buffering. Setting a buffer size that is too small may result in clicks or pops in the audio stream as some data may be lost. Larger buffers cause slightly more latency but prevent the pops and clicks that might occur with smaller buffer sizes – the default settings are recommended but you may desire to tweak these default settings to suit your tastes. This buffer size must be set in the Delta Control Panel before you launch your music software. When using ASIO with the Delta 410, set the buffer size in the control panel, then exit the control panel. After doing so, launch your music software.

SOUND MANAGER: The Hardware Settings Page in the Delta Control Panel also contains software switches that allow you to select which Delta input and output stereo pair will be used by the Sound Manager, if and when you choose the Delta as the Sound Manager input and output device. If you go to the Apple menu | Control Panel | Sound and highlight the Delta icon for Sound In and Sound Out, then your Apple system sounds will be routed to the Delta hardware output that you have selected here, and Alert Sounds, if you choose to record, will receive their input from the Delta hardware input that you select here.

You will want to choose the Delta for input and output in the Sound control panel if your music program does not use ASIO and the Delta ASIO drivers. If you are using the ASIO drivers (see Mac Software Installation), you may want to leave the Sound control panel selection to "built-in." With the Sound control panel set to built-in, these Sound Manager settings in the Delta Control Panel will have no effect, and your system sounds will come from your internal sound card.

The Sound Manager driver limits you to using only one of the Delta 410 stereo input pairs for audio input and only one of the stereo output pairs for output. These do not need to be matched pairs- you can use inputs 1&2 for Sound In and S/PDIF for Sound Out, for example, or any combination that you choose. The following screen shot shows the Hardware Settings page on the Mac with the

Sound Manager I/O set to “Analog 1&2” for Input and “Analog 1&2” for Output. Once you have made a selection, go to the File menu and “Save as Preferences.”



VARIABLE OUTPUT LEVELS: Two selections are available for setting the output line level for all of the Delta 410 analog output ports. Clicking the button labeled “Consumer” will set all of the eight output ports to their maximum setting. This represents a line level of -4dBV, and will work well when interfacing with audio gear that can accept a slightly hotter input signal. The Consumer setting does not actually increase the output level, but rather gives the Delta 410 more headroom in order to output a hotter signal.

Clicking the button labeled “-10dBV” will set all eight output ports to a location twelve increments below the maximum setting, effectively lowering the output line level by 6dB. This represents a line level that will interface well with equipment that will not accept the hotter signal. As a general rule of thumb, if you have the outputs set to the Consumer level and you find that you have to turn the record or input level on the receiving device down to a very low setting, try decreasing the output line level to the -10dBV setting and turning up the record or input level. Sometimes a little experimentation is in order to find the best setup for your situation.

S/PDIF Page

The S/PDIF page of the Delta Control Panel configures the S/PDIF output format and displays the status of the S/PDIF input. To display this page, click the "S/PDIF" tab of the Delta Control Panel software.

DIGITAL INPUT: This group box displays the current S/PDIF input status. The Delta 410's S/PDIF receiver is capable of recognizing a valid input signal versus

an invalid, corrupt or non-present one. When a valid signal is detected at S/PDIF In, this group box displays "Valid Input Detected." When an invalid signal is detected or no signal is present, the group box displays "Invalid or Not Present." Below this message are two 'grayed-out' buttons: "Coax(RCA)" and "Optical." These are functions of the Delta DiO 2496, another product in the M Audio Delta line, one with both optical and coaxial S/PDIF inputs. These controls do not apply to the Delta 410.

DIGITAL OUTPUT FORMAT: Within the "Digital Output Format" group, you choose the digital audio format of the S/PDIF output. The default setting, "Consumer," is a true S/PDIF format and is recognized by all consumer devices. The alternate "Professional" setting is an AES/EBU type data stream, but electrically S/PDIF. This is a work-around that is recognized by some but not all AES/EBU devices.

For both consumer and professional output formats, the "Advanced" checkbox will allow you to force a few particular status bits in the outgoing S/PDIF signal. The advanced option is for expert users only; however, if you decide to go exploring, change a few bit settings and get lost, you can always select the "Restore Defaults" button to restore the outgoing status bits to their factory settings. When "Consumer" and "Advanced" are both selected, the group "Consumer Format Advanced Settings" will appear. When "Professional" and "Advanced" are both selected, the group "Professional Format Advanced Settings" will appear. These groups are described below:

CONSUMER FORMAT ADVANCED SETTINGS (Copy Mode): Copy protection, also known as Serial Copy Management System (SCMS), is written into the S/PDIF subcode, a reserved part of the S/PDIF digital stream that is independent of the actual audio data being transmitted. It can be used to inhibit the amount of copies that can be made, or allow for unlimited copying. Three SCMS modes are available. "Original (Copy Permitted)" indicates that the source material may be copied by a receiving device. "1st Generation" indicates that the source material is a first generation copy. Most devices that are capable of recording will reject material with this SCMS mode set. The final option is "No SCMS" which may be used to override the other two modes and allow a recording device to successfully record the audio data. Different manufacturers' products may interpret these codes differently and require you to set these bits by "trial-and-error" until proper operation is achieved.

CONSUMER FORMAT ADVANCED SETTINGS (Emphasis): This status bit is used to indicate if pre-emphasis has been applied to the outgoing digital audio signal. The default is "None" and rarely will any user want to set the value to "50/15uSec" unless the transmitted audio has been encoded with 50/15uSec pre-emphasis.

PROFESSIONAL FORMAT ADVANCED SETTINGS (Data Type): The user may assign the outgoing data as audio or non-audio data. Many devices ignore

this setting. The obvious default is "audio," however, choosing "non-audio" is appropriate if you wish to send an AC3 signal (Dolby Digital 5.1 surround sound) out of the S/PDIF output. Some software DVD players are capable of this, as well as AC3 or Dolby Digital encoding software.

PROFESSIONAL FORMAT ADVANCED SETTINGS (Emphasis): The user may choose to indicate or not indicate if pre-emphasis has been applied to the outgoing digital audio signal. The default is "None" and rarely will any user want to set the value to "CCITT" or "50/15uSec" unless the transmitted audio has been encoded with one of those types of pre-emphasis.

About Page

The "About" page, while displaying the handsome M Audio logo and applicable copyright information, also reports the driver version and control panel software version.

Save, Delete, Load Buttons; H/W Installed

To save your Delta control Panel settings, go to the File menu and select "Save," or "Save as." A dialog box will appear, prompting you to name the current configuration. Once you have done so, click the Save button. To save the current settings as your default, go to the File menu and choose "Save as Preferences."

In the upper right hand corner of the control panel is a "H/W Installed" drop-down list. At the time of this writing, the Delta Mac ASIO drivers will support only a single Delta device, and of course the Sound Manager will support only one stereo pair regardless of how many audio cards are installed in your system. The H/W Installed list will display "Delta 410" as the active device in the control panel.

Delta 410 Recording Tutorials

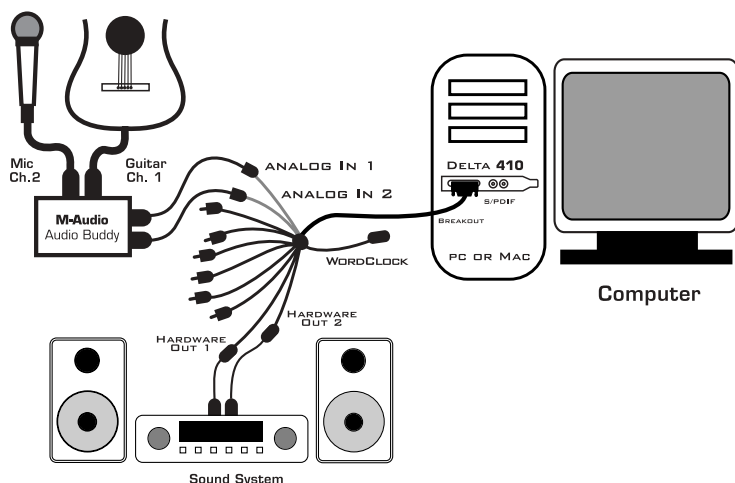
In this section we will explore a few sample setups for recording and playback using the Delta 410 PCI Audio Card. This is by no means an exhaustive tutorial but its intent is to help you understand most of the Delta 410's feature set. Before beginning, you should open your music software and profile the Delta 410, enable its drivers, or otherwise setup the software for operation with the Delta 410.

NOTE: All of these examples refer to the Windows MME driver names. If you're using ASIO drivers (or the Apple Sound Manager), you'll need to substitute the appropriate driver names when referring to software inputs or outputs.

Typical Setup #1

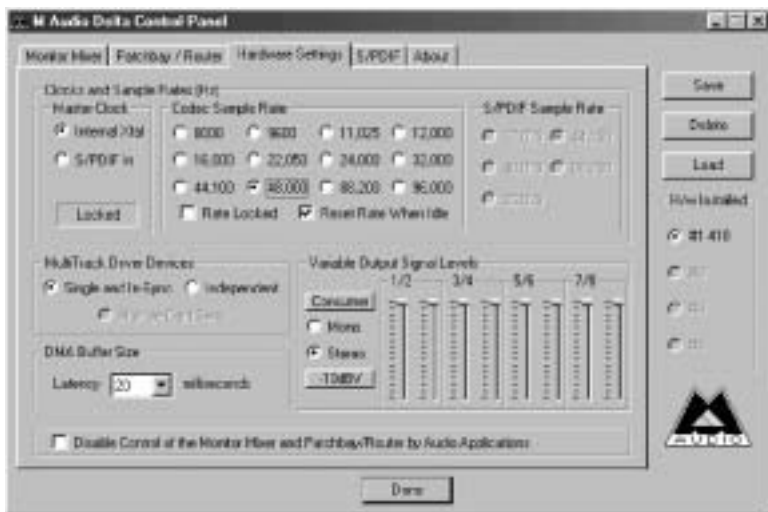
Let's assume for this setup that we're recording a guitar and vocal, then overdubbing another guitar and vocal track while listening to the first tracks. The following diagram shows a microphone pre-amp and direct box being used (in this case, the Audio Buddy™ by Midiman), and a stereo sound system. The pre-amp and direct box are required for the mic and guitar. Many instruments, such as MIDI modules or keyboards, may be connected directly to the Delta 410's inputs.

NOTE: Because improper connections may potentially make very loud noises, it's a good idea to have all monitor levels set low or muted while hooking up audio equipment -- you may even choose to turn your computer off before making the connections.



1. Plug the guitar into the channel-1 Line input of the pre-amp. Plug the microphone into the channel-2 Mic input.
2. Plug the outputs 1 & 2 of the pre-amp into the Delta 410's analog inputs 1 & 2. Use a high quality shielded cable with a 1/4" phone plug on one end and a male RCA plug on the other.
3. Plug the hardware outputs 1 & 2 of the Delta 410, that is the RCA output jacks 1 and 2, to a sound system or power amp with speakers.
4. Turn on your equipment in this suggested order: pre-amp, computer, then sound system.

We're now physically set up to monitor, record, and play back audio. The next steps involve configuring the Delta Control Panel software and the music software into which you will be recording. We'll start with the Delta Control Panel's "Hardware Settings" page, then the "Patchbay/Router" page, and finally the "Monitor Mixer" page. We're not using S/PDIF in this example so we'll ignore the S/PDIF page.

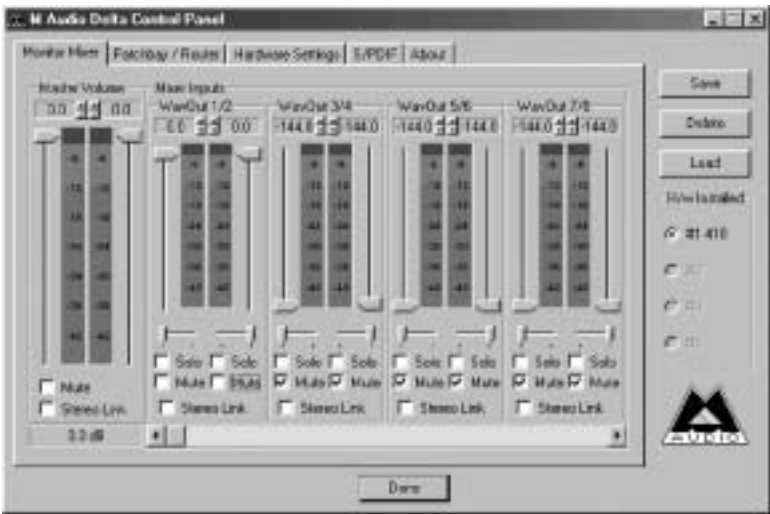


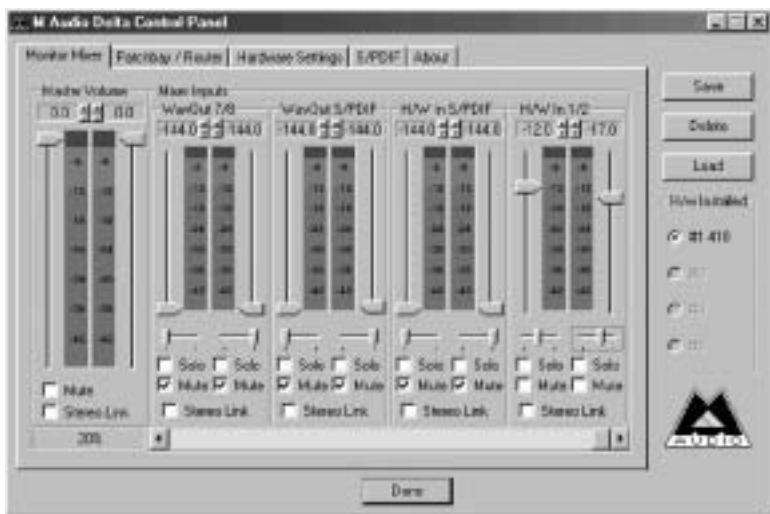
5. Open the Delta Control Panel by double clicking the icon in your Windows Control Panel, and then click on the 'Hardware Settings' tab.
6. Select 'Internal Xtal' as the master clock source. This allows the Delta 410 to derive its sample rates from its internal clock oscillator. 'Internal Xtal' is the default setting for the Delta Control Panel, so selecting it may not be necessary (it may already be selected).
7. Under "CODEC Sample Rate," verify that the "Rate Locked" checkbox is not activated. This will allow your application software to set the Delta 410 sample rate as it pleases.
8. Since this example will include the use of the monitor mixer, we will activate the "Reset Rate When Idle" feature. This will make sure the monitor mixer is running at a decent sample rate while the system is idle – this prevents the mixer sample rate from being set too low and therefore lowering its frequency response. Select a sample rate in the "CODEC Sample Rate" group to use as this idle sample rate. Choose a 44.1kHz or higher setting for best results, and select the same sample rate you will be using in your application if possible. We've chosen 48,000kHz for this example.

Now click on the Delta Control Panel's "Patchbay/Router" tab. In the first column of the Patchbay/Router page, click the radio button "Monitor Mixer" to connect the monitor mixer's stereo output directly to Delta analog outputs OUT1 and OUT2. Now, everything that we hear at outputs 1 & 2 will reflect our settings in the Monitor Mixer page.



Select the "Monitor Mixer" tab of the Delta Control Panel. The default Master Volume fader settings are 0dB and unmuted, and all other faders are set to full attenuation (-144dB) and muted. We will need to adjust these to our preference. The screen capture on the next page shows the settings that we wish to achieve.





9. In the Mixer Input column labeled "WavOut 1/2," click on each fader handle and drag it up to the 0dB setting. Also, deactivate (uncheck) each WavOut 1/2 mute box to unmute the channels. This will allow us, once we've recorded into a music software program, to hear those software outputs upon playback.
10. Using the scroll bar at the bottom of the control panel, scroll to the right until you see the column labeled "H/W In 1/2." Strum the guitar, and you should see an indication in the left meter, which represents signal levels from the Delta analog input 1. Test the mic, and you should see an indication in the right meter, which represents signal levels from Delta hardware input 2.
11. Adjust the gain on the pre-amp so that you're seeing a good level on the input meters, about -6dB to -3dB in the loudest parts (this is playing it a safe because you don't want to hit 0dB and "clip" the signal). Make similar adjustments for the microphone, using the right fader. These are the levels at which the signals will be recorded.
12. Now let's set the levels at which you will monitor the mic and guitar while recording. These are not to be confused with the levels that are recorded by the software – these levels are merely monitor levels that appear in the mixer outputs (in this case at Delta 410 analog outs 1 & 2). Click on the left fader handle of H/W In 1/2, and drag it about halfway up. Strum the guitar. If it's not loud enough, bring it up all of the way. If it is still not loud enough, you will have to raise the listening level of your sound system. Make similar adjustments for the microphone, using the right fader. You may want to set the pan position to suit your needs.

13. Now fine-tune your monitor levels. Sing and play guitar, adjusting your listening levels using the H/W In 1/2 faders so that you have a comfortable blend of guitar and mic levels.

Now is the time to launch your music software and set it up to record and playback audio tracks. We're going to speak in general terms here, since setup within software programs will vary somewhat. Minimize your Delta Control Panel so that you can easily access it from your Windows taskbar. Then open your music software program.

14. First set up the sample rate in the software application. This operation will depend on the software. Choose a sample rate that is high enough to capture the frequency response of the guitar and vocals. A general rule of thumb is to multiply the highest frequency you would like to capture by two and add maybe a little on top of that – that gives you a suitable sample rate. Also keep in mind that if the final results of your work will end up on a CD-ROM burned from your WAV file, you probably want to use 44.1kHz, the native sample rate of "redbook" CD audio.
15. In your software application, set the 'source' or 'input port' to "Left PCM In 1/2 Delta-410" on track one, and "Right PCM In 1/2 Delta-410" on track two. Arm the tracks for recording. Track one is now set up to record the guitar, and track two the microphone. If your software requires this, set the software's clock source to 'Audio.'
16. Press record on your software's transport bar. Record a take of your guitar and vocals. Understand that while recording, you are monitoring the Delta inputs by way of the Monitor Mixer settings for H/W In 1/2, and according to the selection of 'Monitor Mixer' within the Patchbay/Router page. At the same time, your software is recording from H/W In 1/2 but at the levels that were set up with the pre-amp.
17. When you are done playing, stop the recording software and rewind the take. Before playing back what you've recorded, you will need to assign the recorded tracks to output devices on the Delta 410.

Note: For efficiency's sake, this step could have taken place while you were setting up the recording track assignments. However, since this step only affects playback and does not affect the recording setup in any way, we've placed it here to lessen confusion. This setting only needs to be made once, but may be changed if necessary.

Assign software track 1 to output device "WavOut 1/2 Delta-410" and pan the track (within your software) all the way to the left (hard left). Then assign track 2 to output device "WavOut 1/2 Delta-410" and pan the track all the way to the hard right. Now, when you start playback, track one (guitar) will be sent to the Delta software (WavOut) output 1, and track two (mic) to Delta software output 2

(you may also choose a different panning scheme). These two software outputs are connected to the inputs of the monitor mixer, therefore the recorded guitar and mic channels will be sent to the monitor mixer, levels will be modified by the mixer and the output of the mixer will be heard at analog outputs 1 & 2.

18. Start playback from your software's transport bar. Open the Delta Control Panel and go to the Monitor Mixer page. Observe the meters at "WavOut 1/2" – these are the playback levels of your guitar and mic. Adjust the faders and mute controls so that you may hear the guitar and mic at the appropriate levels and mix. These are the levels at which you may monitor the pre-recorded tracks while you overdub (record other tracks while listening to the first) additional parts.

Let's assume that you like this take, and wish to overdub an additional guitar and a harmony vocal. We can still use hardware inputs 1 & 2 of the Delta. We're set up to do so and there's no reason to change these inputs. Let's set ourselves up to overdub these next two tracks. We will record the next two tracks of material to tracks 3 & 4 of the software:

19. Back in your music program, set the 'source' or 'input port' to "Left PCM In 1/2 Delta-410" on track three, and "Right PCM In 1/2 Delta-410" on track four. Arm the tracks for recording. Track three is now set up to record the guitar, and track four the microphone. Usually at this point you would want to return to the Delta Control Panel monitor mixer to set up levels. However, because you will be recording the same instruments that you did on the first two tracks, you probably won't need to adjust input or monitoring levels.
20. Press record on your software's transport bar. Record a take of your new guitar and vocal tracks. Because you have set up the first two tracks to play back through the monitor mixer, you should hear those original tracks along with the ones that you are now recording.
21. When you are done playing, stop the recording software and rewind the take. Before playing back what you've recorded, you will need to assign the newly recorded tracks to output devices on the Delta 410. In your software, set the output ports of tracks three and four to "WavOut 3/4 Delta-410." Pan track three all of the way to the left (hard left), and pan track four hard right. Now track three (guitar) will be sent to the Delta software output 3, and track four (mic) to Delta software output 4.
22. Press play on your software's transport bar. Understand now that the four recorded tracks from the software are being sent to WavOut 1, WavOut 2, WavOut 3, and WavOut 4 simultaneously. Therefore they

are all being input to the monitor mixer and their playback levels can be controlled at the corresponding channels of the monitor mixer. Open the Monitor Mixer page of the Delta Control Panel and adjust the levels of the four channels according to your taste. You may also experiment with the Mute and Solo controls while listening to the playback. Note also that the mixer continues to monitor the guitar and mic at analog inputs 1 & 2!

At this point, you should be able to see how this multi-tracking session is developing. As we add more tracks within our music software, we set them to the next pair of Delta software outputs (3/4, then 5/6...), and bring up the faders of those software inputs in the monitor mixer (WavOut 3/4, WavOut 5/6...). We continually monitor from the Delta hardware outs 1 & 2, via the 'Mon. Mixer' setting as the monitor 'source' in the Patchbay/Router page, and adjusting our mix of the software outputs (and the way we monitor our guitar and vocal at the inputs) via the Monitor Mixer settings.

Notice that if we continue to overdub past track 8, we run out of WavOut devices to assign to. In this case, you may want to do some of your level mixing within the software application if it supports it. Most applications will allow you to assign more than one track to an output device and then set the relative levels of the tracks within the software, letting the software do the mixing. In this example you could have assigned all of the playback tracks to "WavOut 1/2" and let the software handle the mix.

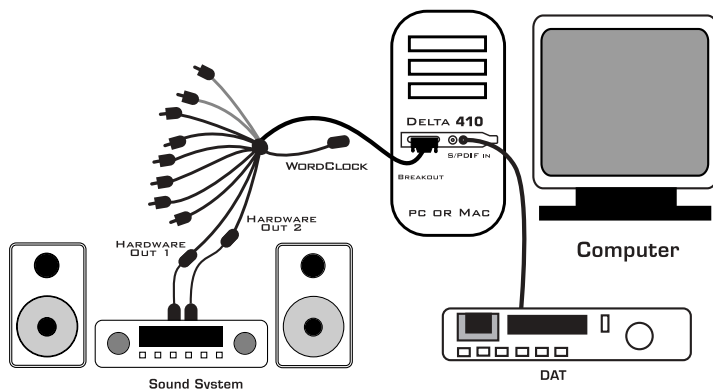
Typical Setup #2

Let's look at a setup that involves a typical transfer of information from DAT to computer and back to DAT. Here, we'll be using the Delta 410's S/PDIF I/O, plus one of the analog output stereo pairs.

NOTE: Because improper connections can potentially make very loud noises, it's a good idea to have monitor levels down while hooking up audio equipment -- you may even choose to turn your computer off before making the connections.

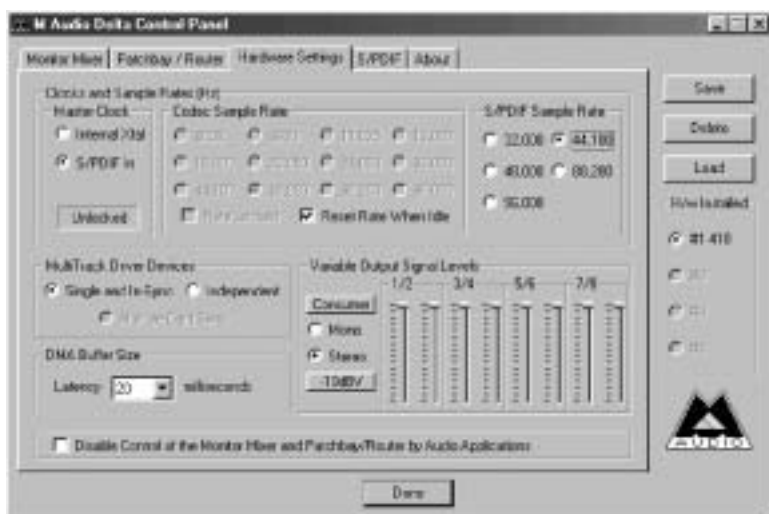
In this example, we will connect a DAT to the Delta 410 PCI Host card using coaxial S/PDIF cables (75-ohm impedance RCA-to-RCA). We'll also connect the 410's analog outputs to a sound system for monitoring purposes. A setup like this might be used to transfer a number of mixes from a DAT into an audio editing program, performing the appropriate edits, and then transferring the edited material back to DAT.

The example below may at first look long and laborious, but you will find that most of the settings are factory defaults and will rarely need to be modified.



Transferring from DAT to Delta 410

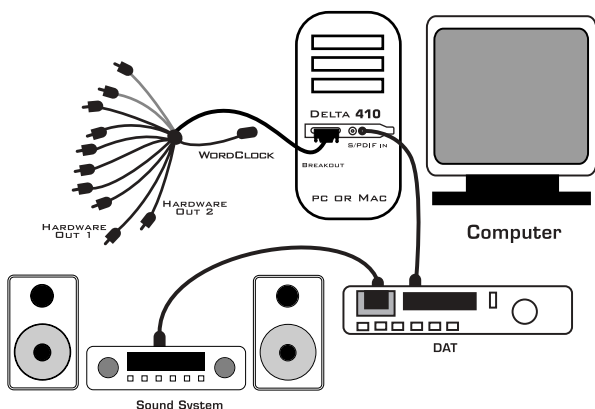
1. Connect the DAT's coaxial S/PDIF output to the S/PDIF In of the Delta 410 PCI host card, using a good quality cable.
2. Connect the 410 analog outputs 1 & 2 to some type of amplified sound system. The sound system should be equipped with speakers or head-phones.
3. Because you will be recording from the S/PDIF input, you will need to set up the Delta 410 to synchronize its master clock with the S/PDIF input. To do this, open the Hardware Settings page of the control panel software. Under Master Clock, select "S/PDIF In."
4. Next, you will need to tell your application software the expected sample rate. We'll use 44.1 kHz in this example. Therefore, on the Hardware Settings page, set the "S/PDIF Sample Rate" to 44,100.



5. In order to monitor the digital signal coming into the 410, switch to the Patchbay /Router page of the control panel software. In the "H/W Out 1/2" column, select the radio button named "S/PDIF In." This will copy all S/PDIF input audio directly over to the analog outputs – therefore in this example, the monitor mixer will be completely bypassed. Once this assignment is made, you may play the DAT material at any time and verify that it is making it into the Delta 410 successfully. This can be done regardless of whether or not your recording software is open.



6. Within your recording software, select "S/PDIF In Delta-410," as the audio input device. The Delta input appears as a stereo pair.
7. Start your software recording and then start your DAT material playing. You should be able to hear the DAT material through your sound system.



Transferring from 410 to DAT, monitoring with DAT

1. Connect the Delta 410's S/PDIF Out to the DAT's coaxial S/PDIF Input using a good quality cable.
2. Connect the DAT analog outputs to some type of amplified sound system. The sound system should be equipped with speakers or headphones.
3. Because you will be playing back at the recorded sample rate, you will want to set the Delta 410's master clock to use the 410 internal crystal. Do this by opening the Hardware Settings page of the Delta Control Panel software and under Master Clock, selecting "Internal Xtal." Also, under the Codec Sample Rate section you may uncheck "Rate Locked" if it is previously checked. This allows for more flexible sample rate playback.
4. In order to verify proper S/PDIF Output routing, open the Patchbay/Router page of the control panel software. In the "H/W Out S/PDIF" column, select the radio button named "WavOut S/PDIF." Now everything that is sent by your software to the "WavOut S/PDIF" device will be routed to the hardware S/PDIF output, and consequently to the DAT.
5. Next let's make sure the S/PDIF output format is correct. Open the S/PDIF page of the control panel software. Under Digital Output Format, choose "Consumer." Uncheck "Advanced" if it is checked previously. Now click on the "Restore Defaults" button to set the default S/PDIF outgoing status bits. This will disable copy protection and also set the emphasis to "none," allowing the DAT to accept and record the audio properly.
6. Within your recording software, select "WavOut S/PDIF Delta-410" as the audio output device.
7. Start your DAT recording and then start your software playing. You should be able to hear the DAT material through your sound system. This verifies that the digital audio is making it into the DAT correctly.

Troubleshooting

This section addresses potential problems that can occur in all operating system environments, with emphasis on hardware troubleshooting. Within the PC environment there are a limited number of hardware resources (I/O addresses, IRQs, and DMA channels) available for use. Since audio cards require many resources, most audio card installation problems arise from unavailable or improperly set resources. This is important enough to repeat:

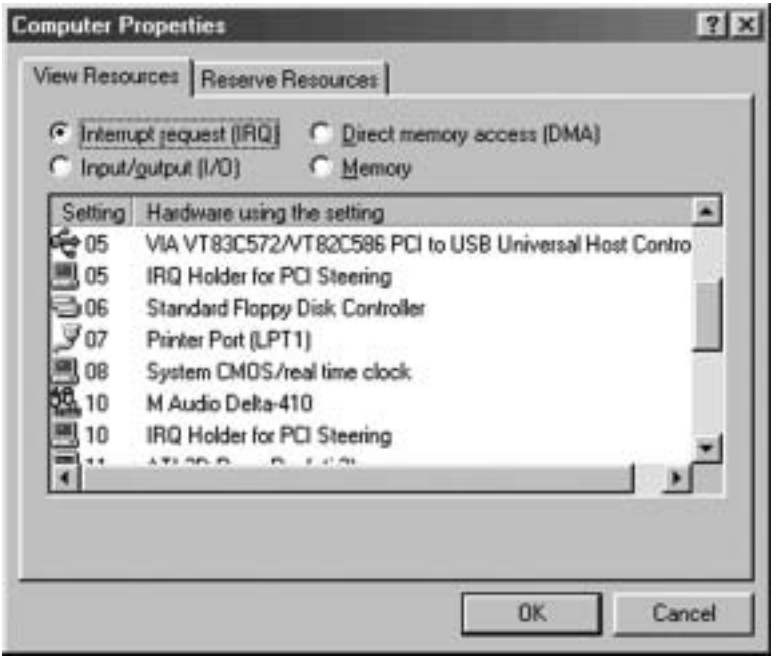
IMPORTANT: Most sound card installation problems result from attempting to use system resources (IRQs, address locations) already in use by other hardware (or software acting as "virtual" hardware) in the system.

The Delta 410 has been carefully designed to minimize the number of resources consumed (it requires just one IRQ and does not require any DMA channel resources). It is also capable of sharing an IRQ in some cases. However, the possibility of resource conflicts still exists due to the nature of the Windows environment. Many resource conflicts are automatically recognized by Windows' Plug-and-Play (PnP) system. When a resource conflict is detected, it is displayed in the Windows Device Manager. The Device Manager places a yellow exclamation point on top of the icon associated with the problem device. For an example of how the Device Manager should look when a Delta 410 is successfully installed, see the "Verifying Windows Driver Installation" section of this manual. If a yellow exclamation point does appear over your Delta 410 icon, you may have a resource conflict. There are several ways to approach this problem.

NOTE: When resolving conflicts between PnP and non-PnP devices, it is recommended to re-adjust the resource settings of the non-PnP device first. Typically, Windows is only aware of the resource settings of the installed PnP devices and has no information available to it for adjusting the PnP devices' resources around those of the non-PnP devices. The exceptions to this are when: (1) a non-PnP device has a true Windows 98/95 driver written for it, (2) the BIOS setup allows reserving an IRQ for a legacy device as opposed to a PnP device, or (3) resource requirements for the non-PnP device have been manually entered into the Windows Device Manager. In these cases Windows is aware of the non-PnP device's resource requirements.

One of the quickest ways to change the resources assigned to a PCI card like the Delta 410 is to merely relocate the card to another PCI slot. Before doing so, it is a good idea to locate the device in the Device Manager, highlight it, and click "Remove" (in 95/98) or select "Uninstall" from the Actions menu (in Win 2000). With the computer's power off, remove the Delta 410 from its current PCI slot, move it to another available PCI slot, and turn your computer back on. More often than not, this will change the IRQ assignment of the Delta 410 when you re-enter Windows. After returning to Windows, follow the steps outlined in the "Verifying Windows Driver Installation" section of this manual. It might take more than one PCI slot relocation to find an open IRQ.

If relocating your card to another PCI slot does not cure the Delta 410's conflict(s), then you must do some further investigation to determine the exact nature of the conflict(s). Again, go to the Windows Device Manager, highlight the Delta 410 or other devices with conflicts and click the "Properties" button at the bottom of the Device Manager window. This will open the properties page for that device. Select the "Resources tab" in order to view the resource assignments, plus possible conflicts. You may learn more about a conflict by highlighting each item one-by-one (done by clicking on them, or scrolling through the list using your keyboard cursor keys) and examining the "Conflicting resource list:" at the bottom of the box.



Sometimes it is possible that a resource problem is not showing up in the conflicting resource list or as a yellow exclamation point in the Device Manager. If you have any doubt about the configuration of your device (or just want to double-check), you can view all of the devices and their assigned resources by highlighting "Computer" at the top of the Device Manager list and clicking the Properties button. This will allow you to view a list of assigned IRQ numbers on the left, and the associated devices on the right. If a number does not show up in this list, it means that it is available for use. Look also for IRQs that are shared by more than one device. While the Delta 410 may share an IRQ with some devices, not all devices are capable of sharing IRQs. An entry that reads "IRQ Holder for PCI Steering" along with an installed PCI device (such as the Delta 410) is normal. If you see another device showing up on the same IRQ as the Delta 410 (such as a video card, SCSI adapter, USB Host Controller or hard disk controller), then it is possible that this is the source of the conflict. Typically, if you move one of the conflicting cards to another PCI slot, an IRQ conflict will disappear.

Address conflicts are rare amongst PCI devices, but if there is no obvious IRQ conflict, why not check for I/O Address conflicts while in the Device Manager? You may view the list of assigned I/O addresses by selecting the "Input/output (I/O)" radio button below the "Interrupt Request (IRQ)" radio button at the top of the Device Manager page. I/O addresses are displayed as 16-bit hexadecimal numbers, therefore one might note that an address of 300h (the default address of the Midiman Midisport 8x8/s, for instance), will read "0300" in this list.

If scanning all the resource lists in the Device Manager does not provide an answer or clue to the resource conflict, you might want to exit Windows and do a final inspection of your computer's BIOS setup. Some newer BIOS' (see your computer manual) allow the reservation of an IRQ for each PCI slot on the motherboard. This may be very handy in resolving IRQ assignments for PCI devices.

Also, sometimes a BIOS is configured to direct a particular IRQ to an ISA legacy device (non-PnP ISA card), and needs to be told to look for a PCI/ISA PnP device (some systems default to this, especially with IRQs 3 and 4). Consult your computer or motherboard manual for advice on how to do this.

With some systems you will reach the dead-end realization that you have no available IRQs – every one of them is assigned to some device in the system. This most typically occurs with pre-packaged computers made by the big-name O.E.M. computer companies. These computers have so many features packed into them that every IRQ is consumed. In this type of situation, some kind of reconfiguring or reprioritizing your system is in order. Optionally, Windows may allow you to create a second "hardware configuration" which disables some of the installed devices and makes their resources available for general use. See your Windows documentation for information on this subject.

Windows 2000: ACPI mode is the default configuration for Windows 2000, which loads all devices configurable by the OS onto one IRQ. This will not work for most of us. Changing settings in the BIOS or moving devices to different PCI slots will not cause them to change IRQs.

You can change your Windows 2000 system to “Standard PC” mode easily. This will cause your system to reconfigure ALL of the devices, including printer ports and COM ports. While this may sound like a scary proposition, doing so will then allow your devices to accept different IRQs, also allowing your BIOS to take control if your BIOS is capable of this.

The best way to approach this is to change to Standard PC mode before you install your Delta card or any additional PnP expansion cards. If you’ve already installed these devices, you may need to completely start over to get each one to configure properly to its own IRQ. This means removing the device from the Device Manager, powering down, removing, and then installing each device one by one. It sounds sinister, but it is the best way to insure that each device configures properly.

To remove a device from the Device Manager, right-click My Computer and select Properties. Click the Hardware tab, then select Device Manager. Locate the device in the list (clicking on the + sign opens the list for that device category), highlight it, then select “Uninstall” from the Actions menu. This is a good practice when reconfiguring a device, as it removes entries in the Registry for that particular device. Power down, and physically remove the expansion card from its PCI slot.

To change your system to Standard PC mode:

1. Boot into Windows and open the Device Manager. Right-click the + sign next to “Computer.”
2. Double-click the entry that appears under Computer, which should indicate that the computer is in ACPI mode. Click the Driver tab, then click the “Update Driver” button.
3. The Upgrade Device Driver Wizard will appear. Click Next>. Select “Display a list of known drivers for this device...” and click Next>.
4. Select the radio button “Show all hardware of this device class.” In the list on the right, select “Standard PC,” then click Next>. Follow the prompts, and restart your computer when instructed.

Troubleshooting Tips for Frequently Asked Questions

Problem: No Sound.

Possible Cause 1: The Delta 410 hardware or software device drivers are not properly installed. See the installation sections of this manual for further information.

Possible Cause 2: There is a resource conflict between the Delta 410 and another device in your computer. Check the Delta 410 configuration (Address, IRQ) against those of the other installed devices. If necessary, change the settings for the one or more of the devices.

Possible Cause 3: Your application software has not been properly configured to use the Delta 410 as its audio output device.

Possible Cause 4: Misrouted outputs in the Delta Control Panel. Check the Delta Control Panel's Patchbay/Router page to verify output routing assignments. Also, make sure that if the output is routed from the digital mixer, that the mixer's faders, solo and mute controls are set up properly.

Possible Cause 5: Improper connections of the audio accessories. Verify that the Delta 410 analog audio outputs are properly connected to a digital mix deck or external mixer/amplifier, or the S/PDIF Out is connected to an external digital audio device capable of receiving S/PDIF.

Problem: No visual activity on Audio Input volume (VU) meters of user software.

Possible Cause 1: The Delta 410 input devices are not properly selected in the user's application software.

Possible Cause 2: If the software is recording from the Delta 410's monitor mixer device, be sure that the mixer's faders, solo and mute controls are set up properly.

Possible Cause 3: Improper connections to audio accessories.

Problem: Repetitious Sound.

Possible Cause: An IRQ resource conflict. Often this will result in a small segment of sound (0.5 to 1 second) repeating itself over and over, sometimes completely locking up the computer. See the general troubleshooting suggestions at the beginning of this section.

Problem: I'm getting some pops and clicks in my audio recording.

Possible Cause 1: Input levels are too "hot," causing clipping or input distortion. Make sure you have the proper signal levels set on the Hardware Settings page of the Delta Control Panel. "Consumer" can handle hotter signals than "-10." If you find that you are still clipping at the Consumer setting, you will need to turn down the audio at the source.

Possible Cause 2: If you are recording from the S/PDIF input, but you have the Delta 410's master clock set to something other than the S/PDIF input, you are recording an out-of-sync S/PDIF stream. This can result in lost or bogus samples being recorded.

Possible Cause 3: Your application software may not have the proper audio buffer sizes set. Each software application handles this differently, but typically there is somewhere in the software's setup to set the size of the playback and recording buffers used by the application. Some applications also require you to run a card calibration (sometimes called "profiling") the first time you use the software with a new audio card.

Possible Cause 4: Some accelerated graphics cards use excessive amounts of system bandwidth, preventing the recording buffer of an audio card from keeping up with demand. This can cause clicks in the recording. Reducing or turning off the graphics card's graphics acceleration feature often resolves this problem. In Windows, the level of graphics acceleration is accessed from Start | Settings | Control Panel | System | Performance | Graphics.

Problem: The sound from the monitor mixer is muffled. It sounds as if it were running through a mixer with the treble control turned all the way down!

Possible Cause: The current Delta 410 sample rate is too low. The monitor mixer is a digital device that runs at the current sample rate of the Delta 410 board. The frequency response of the mixer is roughly one-half of the sample rate. There is no way to prevent this lost frequency response while playing back or recording at a low sample rate. However, it may be prevented when the system is idle. See the "CODEC SAMPLE RATE" paragraph of the section 'Hardware Settings Page' for more information.

Appendix A - Technical Specs

Analog Audio

Peak Analog Input Signal:	+2.1dBV (-10dBV setting)
Peak Analog Output Signal:	+10.0dBu (max setting), +2.0dBV (-10dBV setting)
Dynamic Range:	
Outputs:	101.5 dB (a-weighted),
Inputs:	99.6 dB (a-weighted)
THD (at 0dBFS):	
Outputs:	less than 0.002%,
Inputs:	less than 0.002%
Frequency Response:	22Hz - 22kHz, -0.2, -0.4dB @ 48kHz; 22Hz - 40kHz, -0.2, -0.7dB @ 96kHz
Input Impedance:	10k ohms minimum
Input Connectors:	RCA, gold plated
Output Connectors:	RCA, gold plated

Digital Audio

Digital Input Format:	S/PDIF coaxial
Digital Input Sample Rate:	32kHz to 100kHz.
Digital Output Format:	S/PDIF coaxial, or AES/EBU data stream over S/PDIF coaxial.
Digital Output Sample Rate:	8kHz to 100kHz.

Adapter Resource Requirements

IRQ:	One required
I/O Addresses:	Four blocks: 32, 16, 16, and 64 bytes
DMA Channels:	None required

Appendix B-If You Use An External Mixer...

Our main objective is to get the signal we want to record to the Delta 410, and to monitor the outputs from the Delta 410. The 410 has a mixer contained on its chip that allows you to mix hardware inputs and software outputs and send it to an analog stereo output pair and/or the S/PDIF out. The 410 also allows you to record that mix into your music software as a hardware input. Still, some of you may choose to use a mixing console to achieve your multi-tracking goals.

A mixing console (sometimes referred to as mixing 'board' or 'desk') that is designed for multi-track recording has the ability to fulfill these two basic functions -- getting the signal to the recording device, and receiving the outputs of that recording device for mixing or monitoring. In this sense, a recording console is two mixers in one. A mixer designed for recording will also have the ability to send to one or more mixdown decks, to monitor these mixdown decks, to control separate control room and studio listening levels, as well as other recording-specific functions.

There are two basic layouts for the recording console, "split section" and "in-line." The split section design is arranged with a recording or 'channel' section (to send the signal to the recording device) side-by-side with a monitoring section (to receive the outputs of the recording device). The in-line design has the recording and monitoring sections "in line" within each channel module, so that each channel has two line inputs.

The recording section is distinguished by its bussing system, which takes the recording channel signal through a summing matrix to multiple outputs- usually in multiples of eight. It could be said that an '8-buss system' is designed for 8 track recording, and a 24-buss system for 24 track recording, etc., but this is not written in stone.

What we are describing here is the extreme- a professional, costly piece of gear that has been purchased for this one specialized purpose. There are features inherent in other types of consoles, however, that will allow us to perform these two separate functions of recording and monitoring. A sound reinforcement or a broadcast console, and in some cases a recording console, might offer a bussing system in the form of "sub-mix outs." These are usually arranged in stereo pairs with a set of level control faders for each pair. This configuration can be effectively used for recording, as long as the record channels are taken out of the stereo buss. The difference here is that there is no real distinction between the recording and monitoring sections.

Some line mixers have a number of effect or auxiliary sends for each channel. These sends will have their own individual level control and will receive the signal either pre fader or post fader, i.e. either independent or dependent on that channel's fader level. It is possible to use these "aux sends" to send a signal to

the recording device. A pre fader send is certainly preferable, since this will allow for a recording level that is separate from the monitoring level.

The bottom line here is that you can not use the 'main output' of your mixer to send a signal to the recording device, and then take the outputs of that recording device back into the mixer (whose signal also goes to the main out). This creates a feedback loop, bad for your eardrums and bad for your equipment.

One modern console design gets around that by offering an "alt out," which is an alternate stereo buss or output. When selecting 'alt out' on a channel, it mutes that channel to the stereo buss and redirects it to the alt out buss. This could be viewed as a 2-buss system, and can be used effectively for recording purposes.

In our Typical Setup 1 and 2 in the previous section, we used pre-amps to handle the recording. A line mixer that simply received the line outputs from the 410 and mixed them to stereo could handle the monitoring needs. Hopefully, the information here will give you some insight into how to use the gear that you own, or what to look for if you are seeking additional equipment to facilitate your hard disk recording.

Limited Lifetime Warranty

MIDIMAN warrants that this product is free of defects in materials and workmanship under normal use so long as the product is: owned by the original purchaser; the original purchaser has proof of purchase from an authorized MIDIMAN dealer; and the purchaser has registered his/her ownership of the product by sending in the completed warranty card.

This warranty explicitly excludes power supplies and included cables which may become defective as a result of normal wear and tear.

In the event that MIDIMAN receives written notice of defects in materials or workmanship from such an original purchaser, MIDIMAN will either replace the product, repair the product, or refund the purchase price at its option. In the event any repair is required, shipment to and from MIDIMAN and a nominal handling charge shall be born by the purchaser. In the event that repair is required, a Return Authorization number must be obtained from MIDIMAN. After this number is obtained, the unit should be shipped back to MIDIMAN in a protective package with a description of the problem and the Return Authorization clearly written on the package.

In the event that MIDIMAN determines that the product requires repair because of user misuse or regular wear, it will assess a fair repair or replacement fee. The customer will have the option to pay this fee and have the unit repaired and returned, or not pay this fee and have the unit returned unrepaired.

The remedy for breach of this limited warranty shall not include any other damages. MIDIMAN will not be liable for consequential, special, indirect, or similar damages or claims including loss of profit or any other commercial damage, even if its agents have been advised of the possibility of such damages, and in no event will MIDIMAN's liability for any damages to the purchaser or any other person exceed the price paid for the product, regardless of any form of the claim. MIDIMAN specifically disclaims all other warranties, expressed or implied. Specifically, MIDIMAN makes no warranty that the product is fit for any particular purpose.

This warranty shall be construed, interpreted, and governed by the laws of the state of California. If any provision of this warranty is found void, invalid or unenforceable, it will not affect the validity of the balance of the warranty, which shall remain valid and enforceable according to its terms. In the event any remedy hereunder is determined to have failed of its essential purpose, all limitations of liability and exclusion of damages set forth herein shall remain in full force and effect.