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Introduction

Congratulations on your purchase of the Delta R-BUS PCI Audio Card designed and built by M Audio. R-BUS is a 24-bit, 8-channel format created by the Roland Corporation, and is compatible with R-BUS equipped products such as Roland's VM-7000 Series and VM-3100 Pro V-Mixers, VS-2480 24-track Digital Studio Workstation, VSR-880 Digital Studio Recorder and XV-5080 128-Voice Synthesizer/Sample Playback Module.

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 R-BUS.

The Delta R-BUS PCI Audio Card is part of the Delta family of audio devices, and therefore enjoys the benefits of proven Delta technology, plus advanced and extensive Delta driver development. Once you're up and running, you will quickly discover the power and brilliance in sound, quality and design, of your Delta R-BUS PCI Audio Card.

R-BUS is a trademark of the Roland Corporation.

What's in the Box?

Your Delta R-BUS box contains:

- This instruction manual.
- The Delta R-BUS breakout cable.
- The Delta R-BUS PCI host adapter card.
- Sync cable for internally connecting and syncing multiple Delta R-BUS cards.
- CD or floppy disk containing drivers & Delta Control Panel software for Windows 9x/NT/ME/2000 and Macintosh OS 8.5.1 or higher.
- M Audio Warranty Registration card.

About the Delta R-BUS PCI Audio Card

The Delta R-BUS functions as a multichannel digital recording interface. One standard R-BUS 8-channel connector provides 8 digital inputs and 8 digital outputs when connected to an R-BUS capable device, such as a Roland digital multitrack machine, or a digital mixing console with R-BUS I/O. The Delta R-BUS has two channels of analog I/O on RCA jacks, plus coaxial S/PDIF I/O. The user selects between the Analog and S/DIF inputs using the supplied Delta Control Panel software, while the

output signal is sent to both the Analog and S/PDIF outputs simultaneously.

The Delta R-BUS PCI Audio Card gives you the highest quality digital I/O available -- at up to 24-bit data width at any sampling rate from 8kHz to 96kHz. The Delta R-BUS allows seamless transfers between your computer and R-BUS capable devices, while receiving R-BUS sync. The Delta R-BUS PCI Audio Card's included breakout cable provides the Analog and S/PDIF input and output connections, plus a BNC wordclock output. The wordclock out is always active, so that you may send a digital clock signal for synchronizing the sampling clock on other digital audio devices.

You can record instruments or a stereo signal to the Delta R-BUS's Analog inputs, or record a digital audio signal from your DAT, MiniDisc, CD, or external A/D converter via the Delta R-BUS's S/PDIF input. You can monitor from the analog output while you record from the S/PDIF output to a digital mixdown deck such as a DAT. Last, but not least, control all routing and hardware settings using the Delta's comprehensive control panel software.

Within the Delta R-BUS's PCI chip is a hardware digital mixer. Controlled by the included Delta Control Panel software, it may handle all of your routing needs, give you extra control of all left, right and stereo levels, in addition to control of pans, solos, and mutes.

Product Features & Specifications

- 10x10 24-bit/96khz (32kHz to 96kHz R-BUS) full-duplex recording interface.
- PCI host card with external breakout cable.
- Macintosh and Windows compatible.
- 8-channel R-BUS digital input & output on standard DB25 R-BUS connector.
- Stereo coaxial S/PDIF digital input & output on gold-plated RCA connectors.
- Stereo analog input & output on gold-plated RCA connectors
- Analog I/O offers high dynamic range and low distortion, software configurable to Consumer and -10dBV operating line levels.
- S/PDIF output simultaneously sent to analog outputs for monitoring convenience.
- Input switching allows either S/PDIF or analog as active stereo input.
- R-BUS-to-S/PDIF or S/PDIF-to-R-BUS conversion in real time.
- Syncs with: Internally generated clock, clock from SPDIF inputs, or word clock from incoming R-BUS either from an external R-BUS device or internally from another Delta R-BUS card.
- Word clock output via break-out cable's BNC connector.

- 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 95/98/ME/2000 multi-card/ multi-client drivers with ASIO1 and ASIO2 multi-card, GSIF and EASI drivers included; Windows NT multi-card and Mac OS drivers with ASIO 1&2 also included.

Minimum System Requirements

For the PC

Windows 95, 98,NT, 2000 or ME
UDMA EIDE ATA 33/66 Harddrive

96kHz Operation

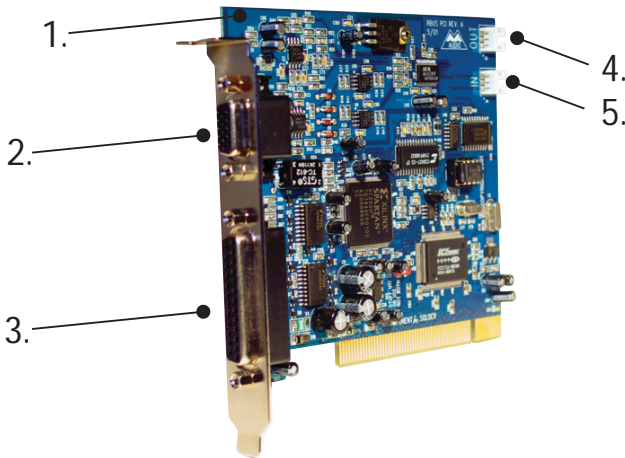
Pentium III 500Mhz
128 MB of PC100 RAM (256 recommended)

48kHz Operation

Pentium II 400
64 MB of SDRAM (128 recommended)

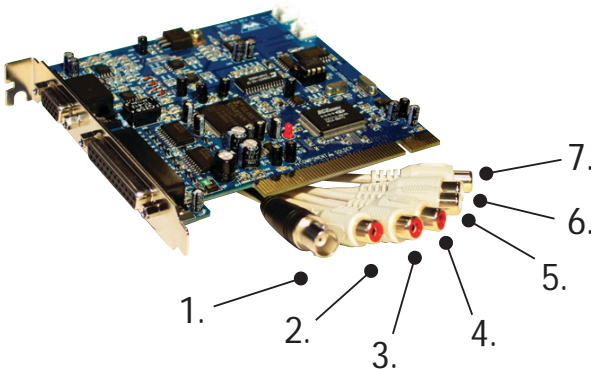
For the Mac

OS 8.6 or higher
G4, G3 or G3 accelerator
128 MB RAM - (96kHz operation)
64 MB RAM - (48kHz operation)



Delta R-BUS PCI Audio Card:

1. Delta R-BUS Audio Card: This is the PCI “host card” that installs into your computer’s PCI slot.
2. 15-pin D-sub connector: This 15-pin D-sub connector attaches to the supplied breakout cable, which provides additional I/O connectors.
3. R-BUS I/O on 25-pin D-sub connector: This 25-pin D-sub connector attaches via R-BUS cable to an R-BUS capable device.
4. R-BUS “Out” Sync Connector: Using the supplied internal sync cable, connect this Out jack to the In jack of a second, or “slave” R-BUS card and, with the proper Delta panel hardware settings, synchronize the master clocks of up to four Delta R-BUS PCI Audio Cards.
5. R-BUS “In” Sync Connector: Using the supplied internal sync cable, connect this In jack to the Out jack of the primary R-BUS card and, with the proper Delta panel hardware settings, synchronize the master clocks of up to four Delta R-BUS PCI Audio Cards.



Delta R-BUS PCI Breakout Cable:

1. Word Clock Out: This female BNC connector outputs a word clock signal that is in-sync with the present sample rate clock of the Delta R-BUS. The output circuitry is designed to drive a word clock signal across 75-ohm coaxial cables and into a device with 75-ohm termination.
2. Analog Out “Left” RCA jack: This jack outputs analog audio to a variety of external target devices. This jack is RCA female and is compatible with RCA male audio cables.
3. Analog Out “Right” RCA jack: This jack outputs analog audio to a

variety of external target devices. This jack is RCA female and is compatible with RCA male audio cables.

4. Analog In "Left" RCA jack: This jack inputs analog audio from a variety of external sources. This jack is RCA female and is compatible with RCA male audio cables.
5. Analog In "Right" RCA jack: This jack inputs analog audio from a variety of external sources. This jack is RCA female and is compatible with RCA male audio cables.
6. S/PDIF Out RCA jack: This jack outputs digital audio to a variety of external sources. This jack is RCA female and is compatible with coaxial digital cables.
7. S/PDIF In RCA jack: This jack inputs digital audio from a variety of external sources. This jack is RCA female and is compatible with coaxial digital cables.

Hardware Installation

To mechanically install the Delta R-BUS, 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 R-BUS 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. Newer Macintoshes will have only PCI slots.
4. Before removing the Delta R-BUS 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 R-BUS 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 R-BUS PCI host card's metal bracket down into the bracket hole on the back of your computer using the screw you removed in step 5 above.
8. Place the cover back on your computer.

Now it is time to connect the Delta R-BUS's breakout cable to the PCI host card that you have just installed. Never attach the break-out cable with the computer turned on. Doing so could damage the PCI card, and void your warranty. Similarly, you should power down your computer before attaching your R-BUS device to the 25-pin connector. With your computer turned off:

1. Unwrap the Delta R-BUS breakout cable. Locate the 15-pin D-sub connector on the Delta R-BUS PCI Host card.
2. Connect D-sub end of the breakout cable to the 15-pin D-sub connector on the Delta R-BUS PCI Host card that now resides in your computer.

Delta Driver Software Installation

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

Windows 2000 Installation

1. After installing the Delta R-BUS hardware, boot your system and start Windows. During the Windows boot procedure, new hardware will be automatically detected by the Found New Hardware Wizard. Click 'Next>'.
2. The 'Found 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 R-BUS. 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 R-BUS 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 R-BUS is ready for play.

Windows ME or 98 Installation

1. After installing the Delta R-BUS 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 Series\Delta9x. Click 'Next>'.
4. The 'Wizard' reports that its Windows driver file search has found the M Audio Delta R-BUS. 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 R-BUS 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 R-BUS is ready for play.

Windows 95 Installation

1. After installation of the Delta R-BUS 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 Series\Delta9x. Click 'Next>'.
4. Windows will start to copy files, with a progress indicator on the screen. Once this process completes itself, your Delta R-BUS 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 R-BUS is ready for play.

Windows NT Installation

1. Power up your computer after physically installing the Delta R-BUS 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 Series\Delta_nt. 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 R-BUS will be ready for use.

Macintosh Installation

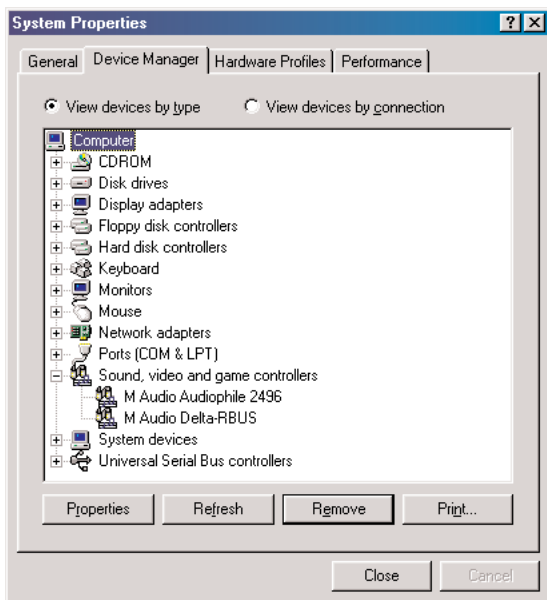
1. Open the System folder on your Macintosh hard drive. In the System folder, locate the Extensions folder.
2. On your Drivers CD disk, open the Delta R-BUS folder. Place the extension file "Delta R-BUS Driver" in your Extensions folder by clicking on it and dragging it to the Extensions folder.
3. If 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 R-BUS folder you will find three Delta R-BUS ASIO drivers. For Cubase versions 4.x, use the "ASIO2 DeltaR-BUS" driver. For Metro, or earlier versions of Cubase, use the "ASIO DeltaR-BUS v3" driver. For any music program that is not ASIO2 capable, use the "ASIO Delta R-BUS" driver instead (check your program's documentation). Place the file "ASIO Delta" in your music program's ASIO folder by clicking on it and dragging it to the ASIO folder. You will find the ASIO folder inside of your music application's 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, some music software applications that use ASIO will allow you to launch the Delta panel from within the program. If not, we suggest creating a shortcut to the control panel by highlighting it and pressing Command (Apple key)+M. Then, drag the shortcut to the desktop.
4. With the Delta R-BUS PCI card installed, restarting the computer will load the Delta R-BUS 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 R-BUS is properly installed. If your music program does use ASIO (recommended), 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 R-BUS, set Sound In and Sound Out to "Delta." See the section "Hardware Settings Page" in the Delta R-BUS "Control Panel Software" section for information on selecting Sound Manger inputs and outputs.

Your Delta R-BUS is now ready for audio input and output.

Verifying Windows Driver Installation

Windows displays the Delta R-BUS 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 R-BUS being a device of that nature. Below is an example view of the Device Manager.



This example shows the M Audio Delta R-BUS and M Audio Audiophile 2496 entries in the Windows Device Manager device list. The Delta R-BUS is properly installed with no conflicts, as is the Audiophile 2496. If you do not see your M Audio Delta R-BUS in your Device Manager in this fashion, please jump ahead to the "Troubleshooting" section of this manual.

Verifying Delta Control Panel Software Installation, PC and Mac

In Windows, open the Windows Control Panel (do so via Start | Settings | Control Panel). If your Delta R-BUS 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.

On the Macintosh: 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 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, 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 R-BUS's Inputs/Outputs

The Delta R-BUS PCI Audio Card's inputs and outputs are compatible with a wide variety of audio products. The 25-pin D-sub connector on the PCI host card interfaces to one R-BUS device via an R-BUS approved cable. One R-BUS cable carries 16 channels of audio data (8 "in" and 8 "out"), plus an R-BUS sync signal. R-BUS is a digital audio standard created by Roland, and is generally associated with Roland digital audio products or with devices that provide this R-BUS technology. Such devices might include digital multitracks, digital mixers, or a converter that turns 8 analog signals, 8-channel ADAT optical or TDIF into an R-BUS format signal.

On the external breakout cable that connects to the PCI card, you will find connectors for all other inputs and outputs. Coaxial S/PDIF I/O on female RCA jacks accepts a digital input from a variety of sources, and sends a digital output from your computer via the Delta software. The Delta Control Panel software gives you several options for digital output such as setting copy protection bits, plus advanced settings that will allow the output of a Dolby Digital 5.1, or "AC3" signal. The breakout cable BNC

connector is a wordclock output which may be used to synchronize other digital devices to the Delta R-BUS board. Wordclock is a sampling clock signal which automatically operates at the present Delta R-BUS sample rate, whether that sample rate is derived from the Delta R-BUS's internal clock, S/PDIF input, or R-BUS internal or external input.

Analog jacks on the Delta R-BUS breakout cable, two for input and two for output, are RCA phono type female jacks. Although the RCA jacks typically allow connection to unbalanced (typically consumer) line level connections, +4dBu level unbalanced equipment may be connected to the Delta R-BUS's RCA jacks. However, sometimes +4dB signals may be too hot for these analog inputs. Consult the user guide for your particular device. On the analog outputs, the Delta Control Panel software provides line level switches between -10dB and -4dB (labeled "Consumer"). These software switches allow you to adjust your stereo output signal to the line level of the receiving device.

NOTE: In order to preserve its high dynamic range and minimize distortion, the Delta R-BUS 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 "DMP3™") and then connect the pre-amp output to the input of the Delta R-BUS.

The Digital Monitor Mixer

The Delta R-BUS 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 to the pair of Delta R-BUS analog outputs and the S/PDIF digital output simultaneously (SP/ANA stereo pair). The output of the mixer may also be routed to the Delta R-BUS Audio Card's R-BUS OUT1 and OUT2. 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 R-BUS 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

Delta R-BUS'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 (R-BUS or S/PDIF), or the monitor mixer. This capability makes the Delta R-BUS quite flexible for WAV or AIFF output, monitoring, or directly connecting inputs to outputs for system test purposes or input monitoring.

Synchronization

For proper operation, the entire Delta R-BUS system is always synchronized to a single master clock. The master clock is chosen via the Delta Control Panel software, and this clock may be derived from the Delta R-BUS's internal crystal oscillators, S/PDIF In, or R-BUS In (either internal or external). Much of the time, the master clock is taken from the internal crystal oscillators. However, the S/PDIF and R-BUS options are used in situations where the Delta R-BUS must be synchronized to external digital audio or sample rates derived from an external device. The Delta R-BUS may be synchronized to other R-BUS capable devices using "R-BUS In" as your choice for master clock. Multiple Delta R-Bus cards may be synchronized by choosing "Delta R-BUS" as the master clock, and by making the proper connections and additional hardware settings.

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 WAV or AIFF file is played through the Delta drivers, the software application playing the WAV or AIFF file is responsible for setting the sample rate in the sound card hardware. The Delta R-BUS 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 R-BUS Audio Card must be configured to get its master clock from the S/PDIF In data stream. The reason for this is simple – a S/PDIF data stream coming from an external source is rarely going to be in sync with the Delta R-BUS card (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 R-BUS card to the S/PDIF input data and its digital audio will be transferred properly.

In situations where the Delta R-BUS is synchronizing to an external R-BUS device, such as a clock from a Roland digital multitrack or digital mixer that has R-BUS I/O, the Delta R-BUS Audio Card should similarly be configured to get its master clock from the external R-BUS wordclock data stream, labeled "R-BUS In." The reason for this is the same – an R-BUS data stream coming from an external source is rarely going to be in sync with the Delta R-BUS Audio Card (or other digital audio devices in the system), even if the sample rates are set the same. If the master clock were set to use the internal crystal (or any selection other than the proper R-BUS clock source), then the incoming R-BUS audio would have "pops," "crackles," and other undesirable audio artifacts present in it. Instead, setting the master clock to "R-BUS In" will synchronize the Delta R-BUS Audio Card to the R-BUS input data and its digital audio will be transferred properly. The special case to consider, again, is the external unit sending the R-BUS digital audio to the Delta R-BUS card may be "locked" to the word clock emitted from the Delta R-BUS card. In these cases, the Delta R-BUS and the external R-BUS device are in-sync, and the R-BUS data would therefore be in-sync with the Delta R-BUS system when the Delta R-BUS card is set to "Internal Xtal."

When using more than one Delta R-BUS card, the second and subsequent Delta R-BUS cards may be synchronized to the first Delta R-BUS card by selecting "R-BUS PCI" as the master clock. The Delta R-BUS has connections on the PCI card that allow you to connect and synchronize the R-BUS clock on multiple Delta R-BUS cards using the supplied internal sync cable. This is necessary to prevent the "pops," "crackles," and other undesirable audio artifacts that occur in unsynchronized digital audio. This is covered further in the "Hardware Settings" section of this manual.

Finally, the S/PDIF In and R-BUS In (as well as R-BUS PCI) options may be used to operate the Delta R-BUS at non-standard sample rates. When one of these options is selected, the Delta R-BUS's sample rate will automatically match that of the incoming S/PDIF or R-BUS data stream.

NOTE: When either the S/PDIF or R-BUS In is selected as the master clock source, the Delta R-BUS mixer's frequency response will be affected by whatever sample rates you inject at the S/PDIF or R-BUS 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 R-BUS with your Music Software Application

Once the Delta R-BUS'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 R-BUS 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, as well as a MIDI driver setup page.

WINDOWS MME AUDIO INPUT DEVICES: All of the Delta R-BUS card's R-BUS inputs, plus either the Analog or S/PDIF In, may be used simultaneously for a total of 10 input channels. Within your software application(s), the names of the Delta R-BUS audio input devices are:

- PCM In 1/2 Delta-R-BUS
- PCM In 3/4 Delta-R-BUS
- PCM In 5/6 Delta-R-BUS
- PCM In 7/8 Delta-R-BUS
- SP/ANA In Delta-R-BUS
- Mon. Mixer Delta-R-BUS

The "PCM In" devices allow recording a stereo stream directly from the specified R-BUS input pairs. The "SP/ANA In" device allows you to record a stereo stream directly from either the Analog or S/PDIF input, as selected in the Delta Control Panel's Hardware Settings page (only one pair of these inputs, analog or digital, can be used at one time, and the "active" input must be selected in the control panel). The "Mon. Mixer" device allows stereo recording from the digital "monitor" mixer built-into the Delta R-BUS card. 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 (see Delta R-BUS 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-R-BUS, Right PCM In 1/2 Delta-R-BUS", "Left SP/ANA In Delta-R-BUS, Right SP/ANA In Delta-R-BUS", or "Left Mon. Mixer Delta-R-BUS, Right Mon. Mixer Delta-R-BUS," etc. from within your recording software.

WINDOWS MME AUDIO OUTPUT DEVICES: All of the Delta R-BUS Audio Card's 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 R-BUS audio output devices are:

WavOut 1/2 Delta-R-BUS
WavOut 3/4 Delta-R-BUS
WavOut 5/6 Delta-R-BUS
WavOut 7/8 Delta-R-BUS
WavOut SP/ANA Delta-R-BUS

All WavOut devices allow playing a stereo audio stream to the R-BUS hardware outputs (for WavOut 1/2, 3/4, 5/6, 7/8), the S/PDIF and Analog hardware outputs (for WavOut SP/ANA), and/or into the hardware 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-R-BUS, Right WavOut 1/2 Delta-R-BUS", or "Left WavOut S/PDIF Delta-R-BUS, Right WavOut S/PDIF Delta-R-BUS", 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 R-BUS'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.

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 | Sound. 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 (i.e., "Sound Manager").

The Delta R-BUS Audio Card is by nature a multichannel card. You can see how using only the Sound Manager drivers can be limiting. Therefore, we recommend the use of a music program that is ASIO compliant.

ASIO DRIVER INPUT DEVICES: When using the ASIO audio drivers with PC or Macintosh music programs that support ASIO-style audio, the input devices are displayed as mono devices. Within ASIO software applications, the names of the Delta R-BUS audio input devices are:

R-BUS In1 Delta-R-BUS
R-BUS In2 Delta-R-BUS
R-BUS In3 Delta-R-BUS
R-BUS In4 Delta-R-BUS
R-BUS In5 Delta-R-BUS
R-BUS In6 Delta-R-BUS
R-BUS In7 Delta-R-BUS
R-BUS In8 Delta-R-BUS
SP/ANA In L Delta-R-BUS
SP/ANA In R Delta-R-BUS
Mon. Mixer L Delta-R-BUS
Mon. Mixer R Delta-R-BUS

Notice the SP/ANA 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 DRIVER OUTPUT DEVICES: The Delta R-BUS's ASIO 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 , one would choose "R-BUS 1/2 Delta-R-BUS" for that track's output port, and then pan that output hard left. The ASIO outputs are named as follows:

R-BUS 1/2 Delta-R-BUS
R-BUS 3/4 Delta-R-BUS
R-BUS 5/6 Delta-R-BUS
R-BUS 7/8 Delta-R-BUS
SP/ANA L/R Delta-R-BUS

WINDOWS MULTIMEDIA SETTINGS: Windows may be set up to use the Delta R-BUS as its default audio device, allowing system sounds to be

sent out the Delta R-BUS. This also enables you to use the Delta R-BUS 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 R-BUS input and output devices of your choice. The most practical choice may be the SP/ANA output, using the Delta R-BUS's analog outs to monitor the system sounds.

Delta Control Panel Software

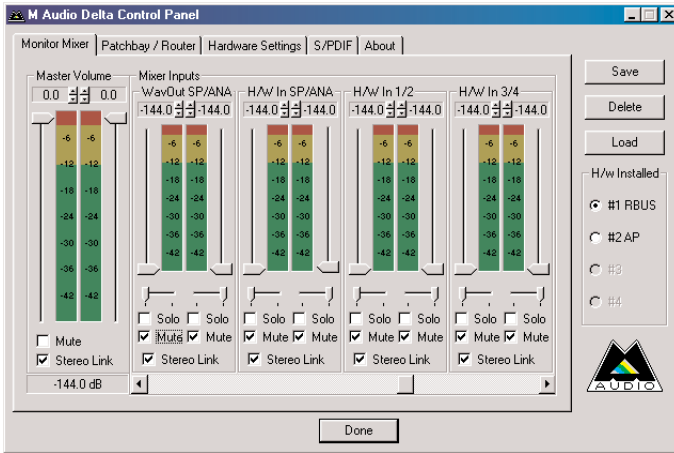
ON THE PC: Once the Delta R-BUS is properly installed, an "M Audio Delta H/W" icon will be displayed in your Windows Control Panel. By double-clicking on that icon, you will launch the Delta Control Panel software. You may also launch the Delta Control Panel software from the desktop if you have previously 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.

ON THE MAC: The Delta Control Panel must be placed on the hard drive by dragging the application from the Drivers disk. 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. Though most of the descriptions are Windows based, the functions are identical unless otherwise indicated. Within each section you will find the necessary name changes for using the Delta Control Panel "ON THE MAC."

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, 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 R-BUS's PCI controller chip. As described in previous sections, the output of this mixer may be assigned to the OUT1/OUT2 R-BUS outputs, and to the Analog and S/PDIF outputs simultaneously (this selection is made in the Patchbay Router page). At the same time, the mixer outputs may be recorded in stereo by software by selecting "Mon. Mixer" as the audio source for a given track.



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 "linked" 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 R-BUS 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 R-BUS input ports and analog or the S/PDIF digital input port) 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 SP/ANA." 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).

ON THE MAC, these inputs are labeled "SM/ASIO," as these software streams will be receiving their digital audio either from the Sound Manager or the ASIO driver, depending on your selection.

Further to the right are more channels, labeled "H/W In 1/2" through "H/W In 7/8," and "H/W In SP/ANA." These mixer inputs are audio streams from the physical Delta R-BUS card's hardware inputs, hence the "H/W" at the front of each label. These labels are consistent on both the Mac and PC.

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 Link 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 LINK

All input channel pairs have a "Stereo Link" capability. Clicking on and

activating the Stereo Link checkbox will link (or "link") 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 R-BUS's hardware outputs (4 pairs of R-BUS outputs and 1 pair of analog output channels that is identical to the S/PDIF digital output) to specific audio sources within the Delta R-BUS board. To display this page, click the "Patchbay/Router" tab of the Delta Control Panel.

ON THE MAC: Please substitute the name "SM/ASIO" where references are made to "WavOut." SM/ASIO are the software outputs on the Mac, while WavOut are the software outputs on the PC.

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

1. The default setting, "WavOut 1/2", connects R-BUS 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-R-BUS" it will be routed directly to the "hardware" R-BUS outputs 1 & 2 of your R-BUS 25-pin connector.
2. The second option, "Monitor Mixer", connects R-BUS ports OUT1 and OUT2 to the outputs of the Delta R-BUS monitor mixer. For more information of the capabilities of the monitor mixer, please see the section "Monitor Mixer Page".
3. The third option, "SP/ANA In", connects R-BUS ports OUT1 and OUT2 directly to the hardware Analog or S/PDIF inputs on the Delta R-BUS PCI host card (whichever input is selected in the Hardware Settings page will be the active input). 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, "SP/ANA 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 Analog or S/PDIF input (as selected in the Hardware Settings page) is routed to OUT2 and the right channel of the Analog or S/PDIF input is routed to OUT1.
5. Selections five through eight connect the hardware R-BUS inputs 1 & 2, 3 & 4, 5 & 6, or 7 & 8 (respectively) directly to the Delta card's hardware R-BUS outputs 1 & 2. For example, if "H/W In 1/2" were selected, any signal present at the IN1 port will be copied to OUT1, and any signal present at the IN2 port will be copied to OUT2. This same behavior applies to "H/W In 3/4", "H/W In 5/6", and "H/W In 7/8" when selected.

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 R-BUS outputs to one of seven 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 R-BUS ports OUT3 and OUT4 to your music software or Windows/Macintosh multimedia applet. In other words, when music software plays audio to the device named "WavOut 3/4 Delta-R-BUS" it will be routed directly to the "hardware" R-BUS outputs 3 & 4 of your R-BUS 25-pin connector.
2. The second option, "SP/ANA In", connects R-BUS ports OUT3 and OUT4 directly to the hardware Analog or S/PDIF input on the Delta R-BUS PCI host card (whichever input is selected in the Hardware Settings page will be the active input). The left channel of the S/PDIF input is routed to OUT3 and the right channel of the S/PDIF input is routed to OUT4.
3. The third option, "SP/ANA 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 Analog or S/PDIF input is routed to OUT4 and the right channel of the Analog or S/PDIF input is routed to OUT3.
4. Options four through seven connect the hardware R-BUS inputs 1 & 2, 3 & 4, 5 & 6, or 7 & 8 (respectively) directly to the card's hardware R-BUS outputs 3 & 4. For example, if "H/W In 1/2" were selected, any signal present at the IN1 port will be copied to OUT3, and any signal present at the IN2 port will be copied to OUT4. This same behavior applies to "H/W In 3/4", "H/W In 5/6", and "H/W In 7/8" when selected.

The rightmost vertical column of Patchbay/Router page, "H/W Out SP/ANA," connects the Delta R-BUS's hardware Analog and S/PDIF outputs simultaneously to one of eight sources:

1. The default setting, "WavOut SP/ANA", connects the Analog Outs and the S/PDIF Out port to your music software or Windows/Macintosh multimedia applet. In other words, when music software plays audio to the device named "WavOut SP/ANA Delta-R-BUS" it will be routed directly to the hardware Analog and S/PDIF outputs on your Delta R-BUS PCI host card's breakout cable.
2. The second option, "Monitor Mixer", connects the Analog and S/PDIF Out ports to the outputs of the Delta R-BUS monitor mixer. For more information on the capabilities of the monitor mixer, please see the section "Monitor Mixer Page".
3. The third option, "SP/ANA In", connects the Analog and S/PDIF Out ports directly to either the hardware Analog input or the hardware

S/PDIF input on the Delta R-BUS's breakout cable. This selection, Analog or S/PDIF, is made in the control panel's Hardware Settings page (see section, "Hardware Settings Page"). The left channel of the selection (Analog In or S/PDIF In) is routed to the left channel of Analog Outs and S/PDIF Out and the right channel of the selection (Analog or S/PDIF In) is routed to the right channel of Analog Outs and S/PDIF Out.

4. The fourth option, "SP/ANA 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 selected input (Analog In or S/PDIF In) is routed to the right channel of Analog Outs and the S/PDIF Out, and the right channel of the selected input is routed to the left channel of Analog Outs and the S/PDIF Out.
5. Selections five through eight connect the hardware R-BUS inputs 1 & 2, 3 & 4, 5 & 6, or 7 & 8 (respectively) directly to the card's Analog and S/PDIF Out ports. For example, if "H/W In 1/2" were selected, any signal present at the IN1 port will be sent to the left channel of the Analog Outs and S/PDIF Out, and any signal present at the IN2 port will be sent to the right channel of the Analog Outs and S/PDIF Out. This same behavior applies to "H/W In 3/4", "H/W In 5/6", and "H/W In 7/8" when selected.

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. If somewhere in the process you become confused, you may always restore the default settings to use the card as a straight 10-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 R-BUS PCI Audio Card. 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), S/PDIF In, R-BUS In or R-BUS PCI. 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 "R-BUS In" if you wish to synchronize your digital audio with a source device that outputs

R-BUS wordclock, and R_BUS PCI if you wish to synchronize internally with another Delta R_BUS card using the internal hardware connectors and the supplied cable to connect the two cards.

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. The same is true for selecting "R-BUS In" or "R-BUS PCI" as the master clock setting – make sure there is a valid R-BUS signal present at the Delta card's external or internal R-BUS connector, respectively.

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 or R-BUS In is selected as the master clock source, the control panel will display "Locked" only when a valid S/PDIF or R-BUS signal is detected at the corresponding port. It will display "Unlocked" when there is no signal at the selected input, or when the signal is corrupt or invalid for any reason.

Also, when selecting and using S/PDIF In as your master clock setting, make sure that "S/PDIF" is selected as the input in the "Input Audio Source" section of the Hardware Settings page. Otherwise, no signal will be detected at the S/PDIF hardware input.

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 R-BUS 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.

R-BUS In SAMPLE RATE

When using "R-BUS In" as your master clock, this section tells the driver what the expected R-BUS In sample rate is. The section is only displayed when the board is set to use R-BUS In as the master clock source. From the list, select the sample rate closest to that of the incoming word clock. 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 R-BUS In is the master clock source, the digital monitor mixer will run at the sample rate received at the R-BUS in external connector. 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.

R-BUS PCI SAMPLE RATE

When using "R-BUS PCI" as your master clock, this section tells the driver what the expected R-BUS PCI sample rate is. The section is only displayed when the board is set to use R-BUS PCI as the master clock source. From the list, select the sample rate closest to that of the incoming word clock. In this case, it should match the sample rate of the master Delta R-BUS card. 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 R-BUS PCI is the master clock source, the digital monitor mixer will run at the sample rate received at the R-BUS internal sync connector. 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 R-BUS 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 R-BUS 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. This is done to ensure that playback starts simultaneously on multiple cards.

Then, all cards must be synchronized via wordclock in some fashion. If you have multiple Delta R-BUS cards, you can synchronize them using the internal sync connectors on the PCI card. Output of the first, or "master" card connects to the input of the second card, then the sync out of the second card connects to the third, etc. The master card may derive its clock from internal or external clocks, while all subsequent cards should be set to "R-BUS PCI" as their clock source.

You may also synchronize via S/PDIF. Select S/PDIF as your master clock on the second and subsequent cards, and connect the S/PDIF output of the first card to the S/PDIF input of the second card, etc. These settings ensure 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 R-BUS, set the buffer size in the control panel, then exit the control panel. After doing so, launch your music software.

VARIABLE OUTPUT LEVELS

The software switches in this section allow the user to match the Delta R-BUS' analog output levels to the operating signal levels of the external audio equipment. Two level selections are available: 'Consumer,' and -10dBV. The 'Consumer' setting is the least 'sensitive' of the two settings, and '-10dBV' the most sensitive. Therefore, the 'Consumer' setting has more headroom and can accept the hotter signals of the two settings. Consult the user guide of your external audio equipment regarding your equipment's input line level.

INPUT AUDIO SOURCE

The Delta R-BUS breakout cable includes inputs for both analog and S/PDIF connections. However, only one of these inputs, either Analog or S/PDIF, may be selected and used at one time. This section provides a software switch that allows you to select between "SP/ANA Ports." Selecting "S/PDIF" makes the S/PDIF hardware input the active input. Selecting "Analog" makes the the analog hardware inputs active. Remember that when S/PDIF is selected as the Input Audio Source, "S/PDIF In" must be selected as the master clock, otherwise no signal can be properly recorded at the S/PDIF input.

"DISABLE CONTROL" CHECKBOX

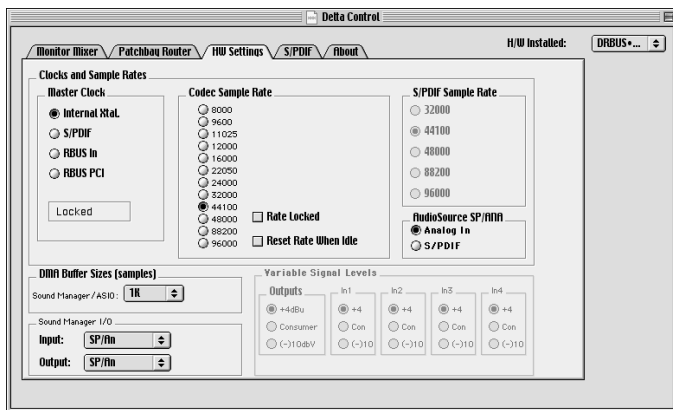
When running a music program that utilizes the Delta ASIO drivers, the music program will take control of some of the Delta Control Panel functions. Checking this checkbox will "Disable Control of the Monitor Mixer and Patchbay/Router in Audio Applications," namely, these ASIO capable applications. Some programs interpret Direct Monitoring differently, and may result in undesirable configurations for monitoring. Emagic's Logic program, in particular, will switch the Patchbay/Router into "Monitor Mixer" mode when Logic is switched into record. You may want to click on this switch when using Logic, thereby disengaging its control over the Patchbay/Router.

ON THE MAC: The Hardware Settings Page in the Macintosh version of 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 | Sounds 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), then leave the Sound control panel selection set 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.

The Sound Manager driver limits you to using only one of the Delta R-BUS 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 "SP/ANA" for Input and "SP/ANA" for Output. Once you have made a selection, go to the File menu and "Save as Preferences."



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

R-BUS'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 R-BUS.

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

On the PC, 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. To save your settings.

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.

ON THE MAC

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 righthand 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 R-BUS as the active device in the control panel.

Delta R-BUS Recording Tutorials

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

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

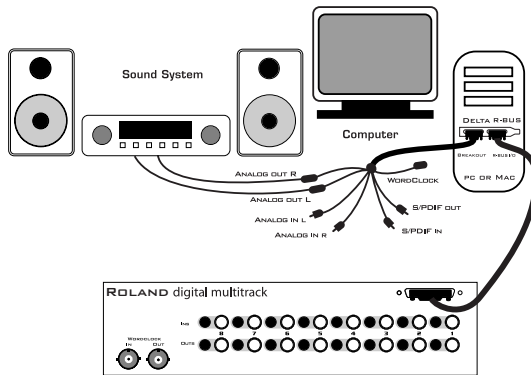
Typical Setup #1

Let's look at a setup that involves a typical transfer of information from

R-BUS to computer, and back to R-BUS. Here, we'll be using the Delta R-BUS Audio Card's 25-pin R-BUS I/O, plus the analog output stereo pair for monitoring.

NOTE: Because improper connections can potentially make very loud noises, it's a good idea to have monitor levels turned 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 Roland 8-channel multitrack (such as the VSR 880) to the Delta R-BUS PCI Host card using an R-BUS cable. We'll also connect the Delta R-BUS's analog outputs to a sound system for monitoring purposes. A setup like this might be used to transfer a multitrack recording from a Roland multitrack machine into an audio editing program, performing the appropriate edits, and then transferring the edited material back to the Roland multitrack. The example below shows the setup you will need to perform these tasks.

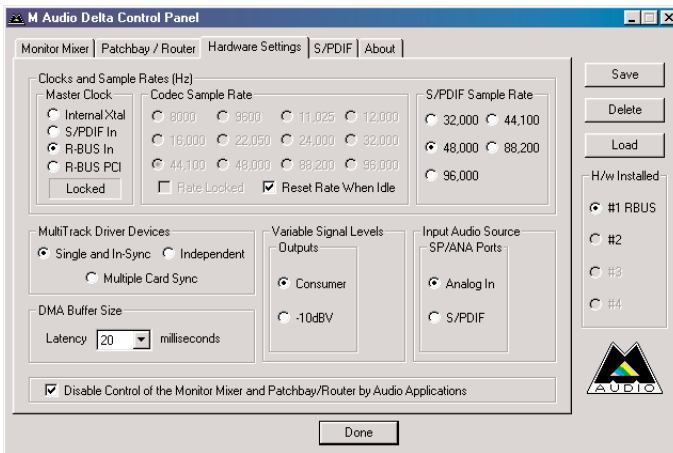


Transferring from Roland R-BUS to Computer

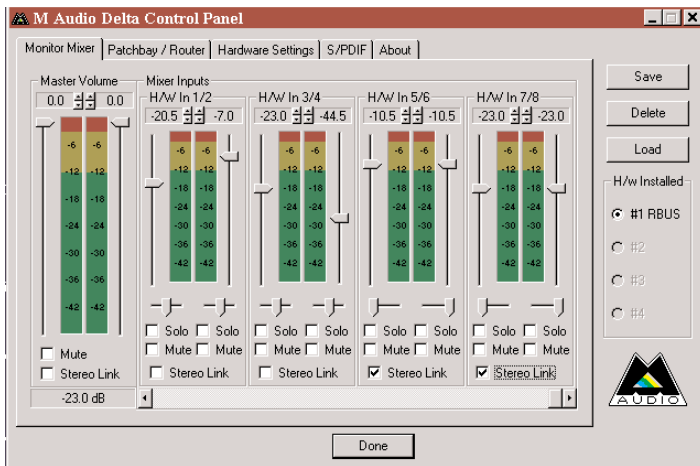
1. Connect the Roland multitrack's 25-pin R-BUS output to the R-BUS connector of the Delta R-BUS PCI host card's 25-pin R-BUS connector, using an R-BUS cable.
2. Connect the Delta's analog outputs to some type of amplified sound system. The sound system should be equipped with speakers or

headphones. Set the line level switch in the Hardware Settings page for the analog outputs to be compatible with that sound system's inputs (see section, "Hardware Settings Page").

3. Because you will be recording from the R-BUS input, you will need to set up the Delta R-BUS to synchronize its master clock with the R-BUS input. To do this, open the Hardware Settings page of the control panel software. Under Master Clock, select "R-BUS In."
4. Next, you will need to tell your application software the expected sample rate. We'll use 48 kHz in this example. Therefore, on the Hardware Settings page, set the "S/PDIF Sample Rate" to 48,000.



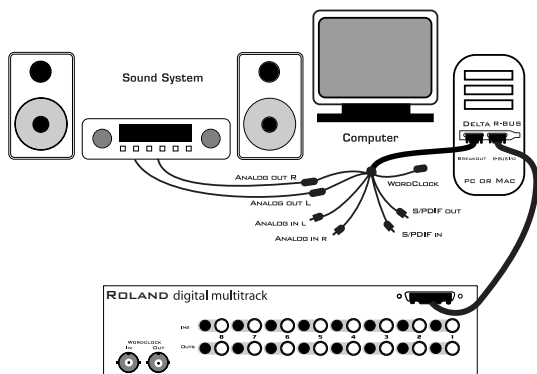
5. In order to monitor the digital signal coming into the R-BUS, switch to the Patchbay / Router page of the control panel software. In the "H/W SP/ANA" column (the rightmost column), select the radio button named "Monitor Mixer." This will allow us to bring up levels in the monitor mixer for the R-BUS inputs, solo and mute individual tracks for quality assurance, possibly create a ruff mix for monitoring purposes, and send that ruff mix to the analog outputs. Once this assignment is made, click the "Monitor Mixer" tab. You may play the Roland multitrack material at any time and verify that its signal is making it into the Delta R-BUS successfully. This can be done regardless of whether or not your recording software is open.



6. In the Monitor Mixer page, scroll to the right until you see the H/W inputs for R-BUS channels 1/2, 3/4, 5/6, and 7/8. Unmute tracks in succession, and raise the fader level until you begin to hear sound from the analog outputs through your sound system. You may choose to engage the “Stereo Link” switch, and raise or lower faders in stereo pairs. You may pan tracks, and basically set up a mix for monitoring purposes. These levels are “pre-fader,” and will not affect your recording levels. Since this is a digital transfer, if your Roland tracks were recorded properly, the levels you see in the Delta’s monitor mixer and consequently within your music software should be fine.
7. Within your recording software, you’ll need to set up eight tracks for recording, assuming that your Roland multitrack recording contains eight tracks. This could be done with eight mono tracks or four stereo tracks, but for this example we will use eight mono tracks. Select “PCM In Left 1/2 Delta-R-BUS,” as the audio input device, then “PCM In Right 1/2 Delta-R-BUS,” then “PCM In Left 3/4,” “PCM In Right 3/4,” etc. If you are using ASIO, these input devices will appear with different names. Consult the section, “Using the Delta R-BUS With Your Music Software.”
8. Start your software recording and then start your Roland multitrack material playing. You should be able to hear the multitrack material through your sound system while the music software records the transfer from the Roland multitrack.

This setup would also allow us to perform a R-BUS to S/PDIF transfer in real time. Remember that the signal at the analog output is duplicated at the S/PDIF output. Our mix that is set up in the Delta Control Panel’s Monitor Mixer can be output to a S/PDIF capable device (such as a DAT) while staying in the digital domain.

If recording from the S/PDIF output, 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.



Transferring from Computer to Roland R-BUS, monitoring with Analog Outs

1. Connect the Delta R-BUS's 25-pin R-BUS connector to the Roland multitrack's R-BUS connector using an R-BUS cable.
2. Connect the Delta R-BUS's analog outputs to some type of amplified sound system. The sound system should be equipped with speakers or headphones. Set the line level switch in the Hardware Settings page for the analog outputs to be compatible with that sound system's inputs (see section "Hardware Settings Page").
3. Because you will be playing back at the recorded sample rate, you will want to set the Delta R-BUS's master clock to use the internal crystal. Do this by opening the Hardware Settings page of the Delta Control Panel software and under Master Clock, select "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. Consequently, you will need to set up your Roland multitrack to receive external sync, since the Delta R-BUS is now the master clock.

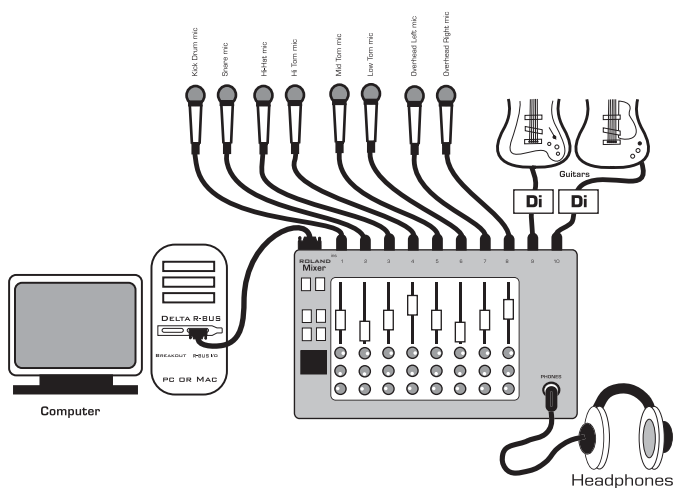
4. In order to verify proper output routing, open the Patchbay/Router page of the control panel software. In the "H/W Out 1/2, 3/4, 5/6, and 7/8" columns, select the radio buttons named "WavOut 1/2, 3/4, 5/6, and 7/8." Now everything that is sent by your software to the "WavOut 1/2 through 7/8" devices will be routed to the hardware R-BUS output, and consequently to the Roland Multitrack.
5. Setting the Roland tracks to "record ready" will allow us to monitor the Delta R-BUS signal at the Roland inputs. The signal at the Roland inputs will show up at the Roland outputs, and consequently at the Delta R-BUS inputs. Because of this, we can monitor in a similar fashion to our "Roland to Delta R-BUS" setup, which is described in the first part of this tutorial. (p.34)
6. Switch to the Patchbay/Router page of the Delta Control Panel software. In the "H/W SP/ANA" column (the rightmost column), select the radio button named "Monitor Mixer." In the Monitor Mixer page, scroll to the right until you see the H/W inputs for R-BUS channels 1/2, 3/4, 5/6, and 7/8. Set up a mix in a fashion similar to that of the first part of this tutorial, unmuting channels, panning, and bringing up faders until a desirable monitor mix is achieved.
7. Within your recording software, select "WavOut 1/2 Delta-R-BUS" through "WavOut 7/8 Delta-R-BUS" as the audio output devices. If you want a track to record onto the Roland's track #1 (for example), you'll need to set the output device to "WavOut 1/2 Delta-R-BUS," and then pan that track hard left. To record onto Roland track #2, set the output device to "WavOut 1/2 Delta-R-BUS," and then pan that track hard right. Continue setting up tracks in that fashion.
8. Start your Roland multitrack recording and then start your software playing. You should be able to hear the material being recorded to the Roland device through the Delta R-BUS analog outs, into your sound system.

Typical Setup #2

This section contains a multitracking example illustrating another way to use the Delta R-BUS and its control panel software. Rather than use a Roland R-BUS digital multitrack machine, we will use a digital mixing board with R-BUS I/O to record 8 tracks of digital audio through the Delta R-BUS, and to monitor 8 tracks of digital audio from the Delta R-BUS. Let's assume that the mixer is an 8-buss (eight sends to the recording device, which in this case is the Delta R-BUS and your computer), and 12 (or even 16) mic/line inputs. The mixer is connected to a sound system, or you can use the mixer's headphone output(s).

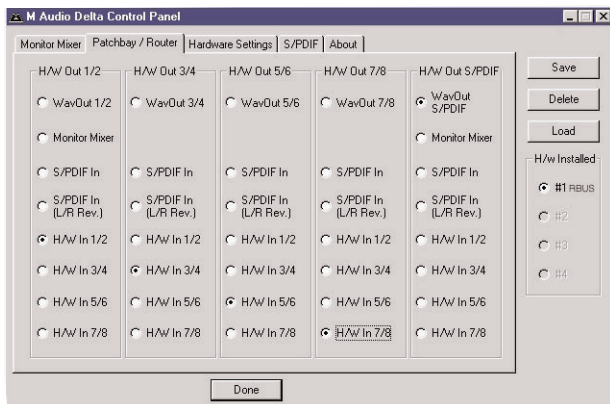
Let's say that we're recording a band. We've got eight mics on the drum set, with the guitar and bass going 'direct' into the digital mixer. We're going to combine some of the drums while recording, just to make it a little more interesting. We have 8-busses in our digital mixer, and the R-BUS connection on the Delta R-BUS PCI Audio Card is capable of eight audio input and output streams. The guitar and bass will take up two of these streams, so we have six left for the drums (we could have used just six mics, but we're not limited to that if we combine some of the drum channels).

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. – Turn your computer off before making the connections to the mixer, then mute all channels before connecting the mics.



1. Connect the Delta R-BUS's 25-pin R-BUS connector to the digital mixer's R-BUS buss out/ tape return connector, using a R-BUS cable.
2. Plug the microphones into the mic inputs 1-8 of your digital mixer, and place the mics around the drums in some strategic fashion (you may want to consult a book on recording techniques). A logical suggestion would be: kick, snare, hi-hat, hi-, mid-, and lo-toms, plus two overheads. Plug the guitar and bass into direct boxes, and then into line inputs 9 & 10 of the digital mixer.
3. Set up the digital mixer's input channels 1 through 10 (those channels with the mics and guitars plugged in) to send their signals to the mixer's eight busses. Do not select "stereo buss" for these channels, as they will be monitored from the tape returns, which are the Delta R-BUS's outputs "returning" to the digital mixer (see Appendix B for suggestions on a bussing configuration).

- Open the Delta Control Panel to the Patchbay/Router page. For the H/W Out 1/2 (the leftmost column), select H/W In 1/2 as the source. Doing so will allow you to monitor the digital mixer's buss out 1 and 2 through the Delta R-BUS hardware inputs, and back to the digital mixer's tape returns. On H/W Out 3/4 select H/W In 3/4 as the source, set H/W Out 5/6 to H/W In 5/6, and set H/W Out 7/8 to H/W In 7/8 as their monitoring sources. Using these settings for the Patchbay/Router page connects each hardware input directly to hardware outputs.



- You can now begin to set up levels on your drum mics, guitar, and bass. How to do so is beyond the scope of this tutorial. However, as a general rule of thumb, achieving a level of close to “digital zero” is the optimum level for most tracks. The levels that you see in the Delta Control Panel’s Monitor Mixer are your record levels, though you can also view those levels from your music software’s level meters. On your digital mixer, you will set the record levels on the input channels 1 through 10. To hear them, bring up the monitor faders 1 through 8 on your digital mixer, which will allow you to hear the “tape returns.”

This is a standard way to use a recording mixer, and also allows for zero latency when recording. See Appendix B for a further discussion of this, plus other options, and a discussion of using ASIO drivers in a similar scenario. We’re now physically set up to monitor, record, and playback audio with the Delta R-BUS and related components. The next steps involve the settings in the Delta Control Panel. We’ll use the same settings as Typical Setup #1 for the Delta Control Panel’s ‘Hardware Settings’ page, i.e. "Internal Xtal", "Reset Rate When Idle" and 48kHz idle sampling rate. This makes the Delta R-BUS the master clock, and therefore, you should

set your digital mixer to receive external sync. See Appendix C for more information on this, and other choices you may have for synchronizing the Delta R-BUS with your digital mixer. We suggest that you use the Delta R-BUS's Wordclock output on the breakout cable to send clock to the digital mixer (if it has wordclock input), and set the external sync in the digital mixer to receive its clock from the wordclock input. Use a good quality, 75-ohm BNC to BNC cable.

6. Minimize the Delta Control Panel to the Windows taskbar or on your Macintosh screen.
7. Open your music software program. Set up eight tracks for recording:

Track one	--	Left PCM In 1/2 Delta-R-BUS
Track two	--	Right PCM In 1/2 Delta-R-BUS
Track three	--	Left PCM In 3/4 Delta-R-BUS
Track four	--	Right PCM In 3/4 Delta-R-BUS
Track five	--	Left PCM In 5/6 Delta-R-BUS
Track six	--	Right PCM In 5/6 Delta-R-BUS
Track seven	--	Left PCM In 7/8 Delta-R-BUS
Track eight	--	Right PCM In 7/8 Delta-R-BUS

8. Now we want to set up the output ports for the eight tracks.

Track one	--	WavOut 1/2 Delta-R-BUS, panned hard left.
Track two	--	WavOut 1/2 Delta-R-BUS, panned hard right.
Track three	--	WavOut 3/4 Delta-R-BUS, panned hard left.
Track four	--	WavOut 3/4 Delta-R-BUS, panned hard right.
Track five	--	WavOut 5/6 Delta-R-BUS, panned hard left.
Track six	--	WavOut 5/6 Delta-R-BUS, panned hard right.
Track seven	--	WavOut 7/8 Delta-R-BUS, panned hard left.
Track eight	--	WavOut 7/8 Delta-R-BUS, panned hard right.

9. Bring up the meter view in your music software, and check your input levels here. Let's say that your hardware input 1 is the kick drum mic. Have the drummer play the kick drum and raise the gain on your mixer's input channel 1 until you see a level of -6dB or so. This is your recording level. At the same time you can begin to raise the faders on your mixer until you hear the kick drum at a comfortable volume. This is your monitor level. Do the same for each instrument.

NOTE: You could view the record levels from the Monitor Mixer page also. The levels appearing in H/W In 1/2 through H/W In 7/8 will represent the signal appearing at the hardware inputs. We are not monitoring via the Monitor Mixer, however, so no fader levels in this page will apply or are needed in this example.

Once this is done, we are set up and ready to record. Close or minimize your software's meter view at this point.

10. Arm tracks one through eight for recording and press the record button on your music software's transport bar.
11. Once you have a take that you think is worth listening to, stop recording and rewind. Maximize the Delta Control Panel from your Windows taskbar.
12. Click the Patchbay/Router tab. In the first column, H/W Out 1/2, click the radio button "WavOut 1/2" so that our monitoring source is now the software output from the music program. Set the H/W Out 3/4 column to "WavOut 3/4," the H/W Out 5/6 column to "WavOut 5/6," and finally, set the H/W Out 7/8 column to "WavOut 7/8." Now all of the software outputs of the music program are connected to the corresponding hardware outputs. Minimize the control panel.
13. Click play on the transport bar of your music software. If the take is satisfactory, disarm tracks one through eight and revel in your success. If you wish to redo the tracks, "undo" the recording in your software, repeat steps 10 through 13 in this section.

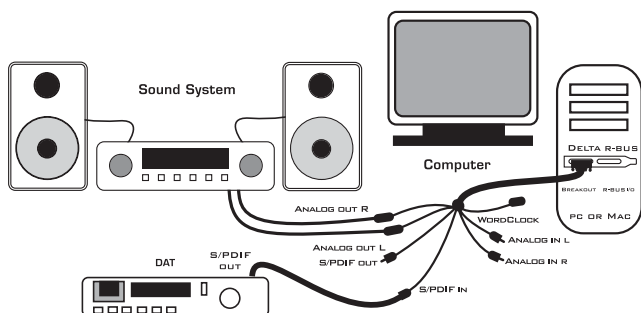
Using the Delta R-BUS and the Delta Control Panel software in this manner may be your choice when using a mixing console to control the monitor and playback levels. By always monitoring from the digital mixer's tape return (monitor) channels, setting up levels and adding effects, we will monitor the exact same sound while recording as we do when we playback. See Appendix B for more on this subject.

Typical Setup #3

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 R-BUS's S/PDIF I/O, plus the analog output stereo pair.

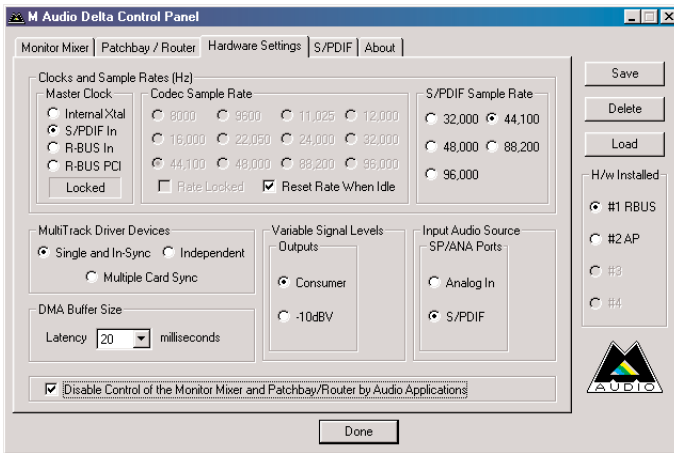
NOTE: Because improper connections can potentially make very loud noises, it's a good idea to have monitor levels down while hooking up audio equipment -- you may even choose to turn your computer off before making the connections.

In this example, we will connect a DAT to the Delta R-BUS's breakout cable using coaxial S/PDIF cables (75-ohm impedance RCA-to-RCA). We'll also connect the Delta R-BUS'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.

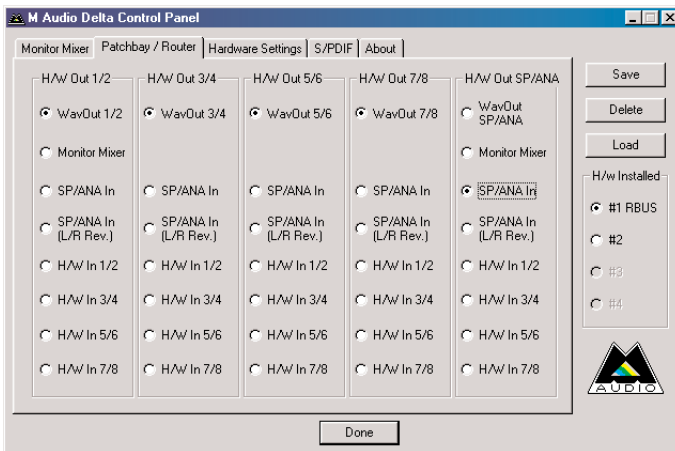


Transferring from DAT to Computer

1. Connect the DAT's coaxial S/PDIF output to the S/PDIF In of the Delta R-BUS breakout cable, using a good quality digital cable.
2. Connect the Delta R-BUS's analog outputs to some type of amplified sound system. The sound system should be equipped with speakers or headphones. The line level output settings in the Delta Control Panel's "Hardware Settings" page may be set to be compatible with that sound system's inputs.
3. Because you will be recording from the S/PDIF input, you will need to set up the Delta R-BUS 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." You'll also need to select the S/PDIF as the chosen input source for SP/ANA (thereby deselecting the Analog input).
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.



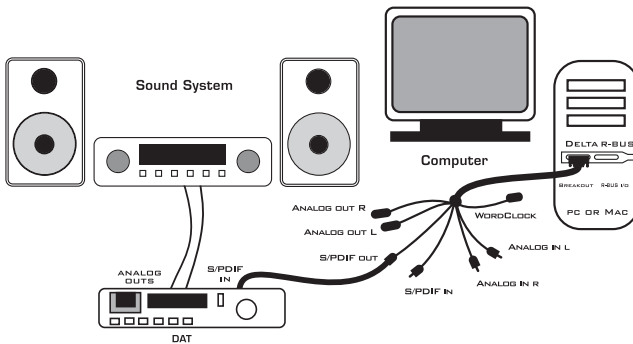
- In order to monitor the digital signal coming into the R-BUS, switch to the Patchbay/Router page of the control panel software. In the "H/W Out SP/ANA" column, select the radio button named "SP/ANA In." This will copy all S/PDIF input audio directly over to the analog outputs – therefore in this example,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



- Within your recording software, select "SP/ANA In Delta-R-BUS," as the audio input device. The Delta input appears as a stereo pair, or as

left and right inputs (see the section, “Using the Delta R-BUS with your Music Software Application”).

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.
8. Once you have recorded your tracks, set the music software’s output port to WavOut SP/ANA. Go into the Delta Control Panel “Patchbay/Router” page, and set the H/W Out SP/ANA column to play “WavOut SP/ANA. This will connect your software outputs to the Delta R-BUS’s Analog and S/PDIF hardware outputs, allowing you to monitor playback from the analog outs. Rewind, and playback your recorded material.



Transferring from Computer to DAT, monitoring with DAT

1. Connect the Delta R-BUS’s S/PDIF Out to the DAT’s coaxial S/PDIF Input using a good quality digital cable.
2. Connect the DAT analog outputs to some type of amplified sound system. The sound system should be equipped with speakers or headphones. You could, conceivably, continue to monitor via the Delta R-BUS’s analog outputs, since the signal sent to the S/PDIF out is duplicated at the analog outs. However, it is often better to monitor the DAT, since any problems occurring at the DAT will be heard when monitoring the DAT.
3. Because you will be playing back at the recorded sample rate, you will want to set the Delta R-BUS’s master clock to use the internal crystal. Do this by opening the Hardware Settings page of the Delta Control

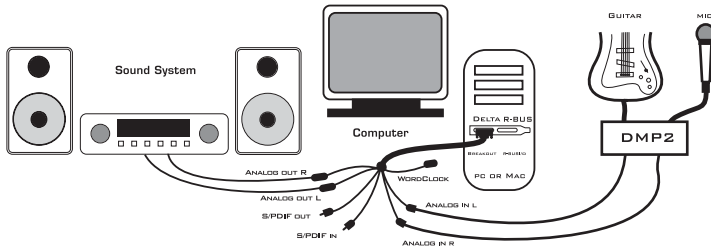
Panel software and under Master Clock, selecting "Internal Xtal." Also, under the Codec Sample Rate section you may uncheck "Rate Locked" if it is previously checked. This allows for more flexible sample rate playback.

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 SP/ANA" column, select the radio button named "WavOut SP/ANA." Now everything that is sent by your software to the "WavOut SP/ANA" 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 SP/ANA Delta-R-BUS" 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.

Typical Setup #3

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/direct box being used (in this case, the DMP2™ by M Audio), 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 R-BUS's analog inputs.

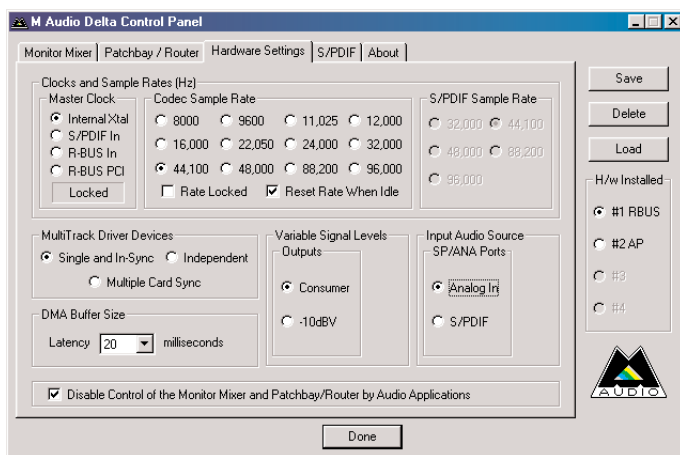
NOTE: Because improper connections may potentially make very loud noises, it's a good idea to have all monitor levels set low or muted while hooking up audio equipment -- you may even choose to turn your computer off before making the connections.



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 R-BUS's analog inputs. Use a high quality shielded cable with a 1/4" phone plug on one end, and a male RCA plug on the other. You'll need to open the Delta Control Panel (when your computer is powered up) to the Hardware Settings page. Select "Analog" as the input (deselecting "S/PDIF") to activate the Delta R-BUS's analog inputs.
3. Plug the analog outputs of the Delta R-BUS into a sound system or power amp with speakers. Again, use a high quality cable with a male RCA plug on the end that connects to the Delta R-BUS's analog outputs, and the type of plug on the other end (generally, either male RCA or 1/4" male phone plug) that is appropriate for your sound system or power amp.
4. Turn on your equipment in this suggested order: pre-amp, computer, then sound system.

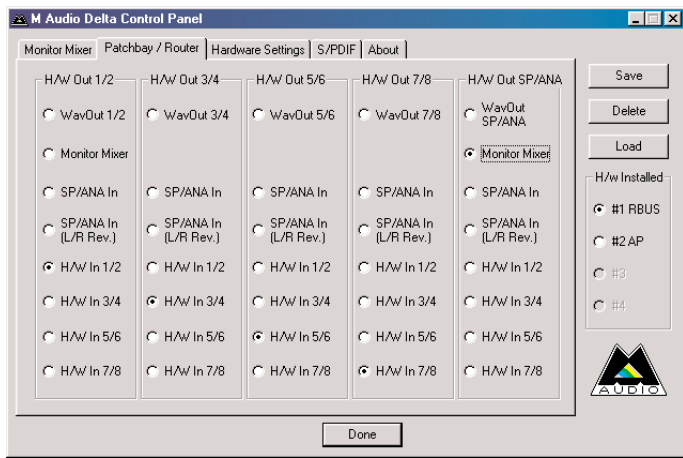
We're now physically set up to monitor, record, and play back audio. In this scenario, you could substitute a tape deck, CD player, or other playback deck for the instruments and preamp. Just hook it up to the left and right analog inputs, corresponding to the left and right outputs of your playback deck.

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.

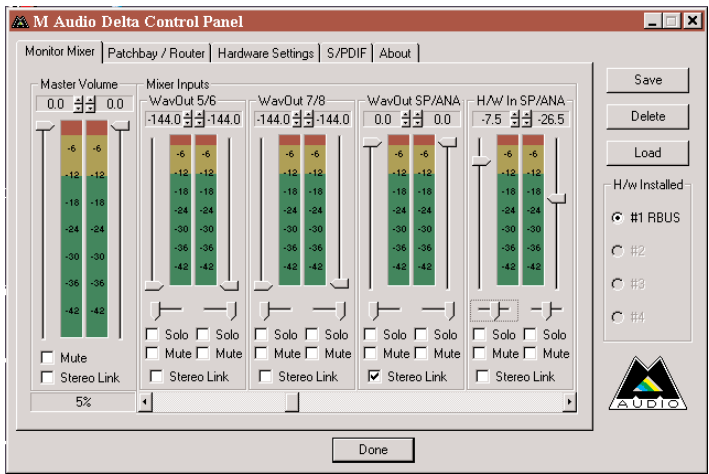


5. Open the Delta Control Panel by double clicking the icon in your Windows Control Panel (or, on the Mac, wherever you've placed your control panel), and then click on the 'Hardware Settings' tab.
6. Select 'Internal Xtal' as the master clock source. This allows the Delta R-BUS to derive its sample 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 R-BUS 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 44,100kHz for this example, which is a standard operating sample rate for digital multitracks should you decide to transfer this audio to a Roland device. 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 or AIFF, you probably want to use 44.1kHz, the native sample rate of "redbook" CD audio.

Now click on the Delta Control Panel's "Patchbay/Router" tab. In the very last 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. Now, everything that we hear at the analog outputs 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 SP/ANA," click on each fader handle and drag it up to the 0dB setting. Also, deactivate (uncheck) each WavOut SP/ANA 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 SP/ANA." Strum the guitar, and you should see an indication in the left meter, which represents signal levels from the Delta analog input. Test the mic, and you should see an indication in the right meter, which represents signal levels from Delta hardware input "H/W In SP/ANA" in the left meter.
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). Make similar adjustments for the microphone, using the gain control on channel 2. 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 the Delta R-BUS analog outs). Click on the left fader handle of H/W In SP/ANA, 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.
13. Now fine-tune your monitor levels. Sing and play guitar, adjusting your listening levels using the H/W In SP/ANA 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 (on the Mac, minimize and move to a convenient place). Then open your music software program.

14. First set up the sample rate in the software application. This operation will depend on the software. You will want to choose the same sample rate that you have selected in your Delta Control Panel's Hardware Settings page.
15. In your software application, set the 'source' or 'input port' to "Left PCM In SP/ANA Delta-R-BUS" on track one, and "Right PCM In SP/ANA Delta-R-BUS" 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 SP/ANA, 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 SP/ANA (with Analog" selected as the active input) 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 R-BUS.

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.

Assign software track 1 to output device "WavOut SP/ANA Delta-R-BUS" and pan the track (within your software) all the way to the left (hard left), or wherever you find it appropriate between left and center. Then assign track 2 to output device "WavOut SP/ANA Delta-R-BUS" and pan the track all the way to the hard right, or wherever you find it appropriate between right and center. Now, when you start playback, track one (guitar) will be sent to the Delta software (WavOut SP/ANA Left), and track two (mic) to Delta software output 10 (WavOut SP/ANA Right). These two software outputs are inputs to 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 the analog outputs.

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 SP/ANA" – 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 analog inputs 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 music software:

19. Back in your music program, set the 'source' or 'input port' to "Left PCM In SP/ANA Delta-R-BUS" on track three, and "Right PCM In SP/ANA Delta-R-BUS" 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. Again, these instruments are being monitored from the Monitor Mixer "H/W Ins 1/2."
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 (WavOut SP/ANA), 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 R-BUS. You could have all four recorded tracks playing to the same software outputs, namely the SP/ANA output, but you can also choose other outputs like H/W Out 1/2. We're sending them to the Monitor Mixer, so doing this will give us a little more control over our playback levels.

In your software, set the output ports of tracks three and four to "WavOut 1/2 Delta-R-BUS." 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 1, and track four (mic) to Delta software output 2.

22. Press play on your software's transport bar. Understand now that the four recorded tracks from the software are being sent to WavOut SP/ANA (left and right), WavOut 1, and WavOut 2 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 (H/W In 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 (1/2, then 3/4...), and bring up the faders of those software inputs in the monitor mixer (WavOut 1/2, WavOut 3/4...). We continually monitor from the Delta analog outs, 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 SP/ANA" and let the software handle the mix, which, after you are through recording, may be your choice for mixing tracks.

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.

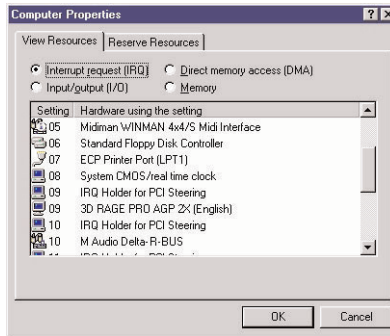
The Delta R-BUS has been carefully designed to minimize the number of resources consumed (it requires just one IRQ and does not require any DMA channel resources). It is also capable of sharing an IRQ in some cases. However, the possibility of resource conflicts still exists due to the nature of the 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 R-BUS is successfully

installed, see the "Verifying Windows Driver Installation" section of this manual. If a yellow exclamation point does appear over your Delta R-BUS 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 R-BUS is to merely relocate the card to another PCI slot. With the computer's power off, remove the Delta R-BUS 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 R-BUS 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 R-BUS'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 R-BUS 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 R-BUS 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 R-BUS) is normal. If you see another device showing up on the same IRQ as the Delta R-BUS (such as a video card, SCSI adapter, or USB Host 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 Winman 4X4/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's (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.

Finally, with some systems you will reach the dead-end realization that you have no available IRQ's – 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.

Troubleshooting Tips for Frequently Asked Questions

Problem: No Sound.

Possible Cause 1: The Delta R-BUS 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 R-BUS and another device in your computer. Check the Delta R-BUS 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 R-BUS 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 R-BUS analog audio outputs are properly connected to a mix deck or external mixer/amplifier, that the S/PDIF Out is connected to an external digital audio device capable of receiving S/PDIF, or that the R-BUS connector is connected to an external digital audio device capable of receiving R-BUS. If using the S/PDIF input, make sure that you have selected S/PDIF instead of Analog as your input source.

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

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

Possible Cause 2: If the software is recording from the Delta R-BUS'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 inputs to the Delta R-BUS. If you find that you are still clipping, 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 R-BUS'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: If you are recording from the R-BUS input, but you have the Delta R-BUS's master clock set to something other than the R-BUS Clk, you are recording an out-of-sync R-BUS stream. This can result in lost or bogus samples being recorded.

Possible Cause 4: 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 5: 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: I'm getting some pops and clicks in my monitoring signal, even when my system is idle.

Possible Cause: If the S/PDIF input is not muted in the monitor mixer, and you have the Delta R-BUS's master clock set to something other than the S/PDIF input, you are monitoring an out-of-sync S/PDIF stream. This can result in lost or bogus samples being recorded. This can also occur when using the R-BUS input without "R-BUS Clk" selected as you master clock.

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 R-BUS sample rate is too low. The monitor mixer is a digital device that runs at the current sample rate of the Delta R-BUS 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 Signal: +2dBV(consumer setting), -2dBV(-10 setting).

THD: less than 0.002% @ 0dBFS

Freq. Response: 22Hz-44kHz, -0.4,-0.4dB (96kHz sample rate)

Dynamic Range (a-weighted): D/A 104.0dB, A/D 100.4dB

Input Impedance: 10k ohms minimum.

Connectors: Gold-plated RCA female, on break-out cable.

Digital Audio

R-BUS Sample Rate: 8kHz to 48kHz

R-BUS I/O Format: 8x8 simultaneous (parallel) input and output.

R-BUS Connector: DB25 female on PCI board.

S/PDIF Sample Rate: 8kHz to 96kHz.

S/PDIF Input Format: Coaxial, 0.5V to 5V peak-to-peak.

S/PDIF Output Format: Coaxial, 0.5V peak-to-peak; also configurable to output AES/EBU format data stream at 0.5V peak-to-peak.

S/PDIF Connectors: Gold-plated RCA female, on break-out cable.

Word Clock Output Rate: 8kHz to 96kHz.

PCI 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...

Please check our website, www.m-audio.com, for Appendix B. Go to the Tips and Tricks section and look for Delta R-BUS.

Appendix C

Please check our website, www.m-audio.com, for Appendix B. Go to the Tips and Tricks section and look for Delta R-BUS.

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.