
Retro AS-1 Manual



Software Version 2.1.0

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The Retro AS-1 is a software analog synthesizer for use with your computer. It requires no additional hardware¹ to have those killer sounds from the 60's and 70's at your fingertips. You can play the Retro AS-1 live or from your sequencer - the integration with all of the audio tools on your computer or in your rig is fantastic. No more dealing with out of tune oscillators and heavy equipment - the Retro AS-1 works just fine on laptops!

Use the sounds and technology that the pros use. The Retro AS-1 works just great with ASIO cards, ReWire, MAS 2.0, DirectIO, and DirectConnect. That means integration with products such as Cubase VST, Logic, Digital Performer, ProTools, and CakeWalk just to name a few sequencers, is happenin'. If you've got a MIDI controller such as the Phat.Boy, you can control the synth parameters in real-time.

1. Use the built-in sound hardware on your Mac, just a sound card for your PC.

Features

Retro has been optimized for the Macintosh G4¹ and Pentium III to offer the best performance possible. We've got oscillators, filters, and modulation routings galore for those of you who fondly remember the 60's and all the old analog patch-cord gear. Some of the features include:

- up to 64 stereo voice polyphony²
- over 1300 factory sounds
- up to 96 khz sample rate
- 32 bit internal processing
- live performance response
- serial port, OMS, FreeMIDI, Windows drivers and MIDI input
- Sound Manager, DirectSound, ASIO, ReWire, DirectIO, MAS 2.0, DirectConnect audio output
- record to disk live or from a sequencer
- create your own sounds with included editor
- three oscillators each with fifteen waveforms, random tuning, sync, and pan
- ring modulator
- two filters each with fifteen types and overdrive that can be configured in series or parallel
- external audio input can be routed to ring modulator, filters, or insert effects
- two insert effects per MIDI channel including eqs, delays, chorus, and distortion
- two global effects including reverbs, delays, and reflection

The possibilities are endless. Remember, the oscillators go out of tune in the Retro AS-1 only if you want them to...

Differences From Version 1.x

If you are upgrading from version 1.x, you may be interested in the enhancements added with 2.x. They include:

1. Macintosh G4 and Pentium III optimization
2. Macintosh multiprocessor support
3. Increased maximum number of voices to 64
4. DirectConnect support for ProTools integration
5. Stereo signal path for oscillators and insert effects
6. More oscillator types and improved oscillator fidelity
7. External audio input
8. Ring modulator
9. More filter types
10. Invert parameter for most insert effects
11. Delay parameter for all modulators

-
1. AltiVec or Velocity engine, depending on whose marketing guys you want to believe.
 2. depending on how fast your CPU is.

12. More insert effect types including pitch shift, multi-tap chorus, and degrade
13. Automatic publishing of OMS and FreeMIDI names
14. More factory voices
15. Controller mappings
16. Velocity tables
17. Adjustable headroom for master output
18. ASIO and DirectIO audio output mappings
19. MIDI processor chord, pan, volume, fx1, and fx2 remembered per setup
20. Completely redone user interface¹

Thanks to all of our loyal customers for the feedback on version 1.x. We've been able to deliver a lot of features along the way until 2.x arrived. You've been a significant part of creating a better product². We've listened!

About BitHeadz

BitHeadz is a music software company located on the beautiful Monterey Bay in Capitola, California. Along with the Retro AS-1, BitHeadz has other software and sound content products that take advantage of the tremendous power in today's computers. See why pros the world over are BitHeadz fans.

Current products include:

- Unity DS-1 software sampler
- Unity Player software sample playback
- Black & Whites virtual piano module
- Osmosis Akai and Roland conversion utility
- Voodoo software drum machine
- Steve Reid's Global Percussion virtual percussion library
- Tubes, Tines, and Transistors synthesizer sample library
- Retro AS-1 VST plug-in

Join the BitHeadz revolution. Your roadie will love you for it...

1. it's blue!
2. that, and a lot of long hours.

The installation process consists of installing the software, registering the software, and authorizing your machine. Additionally, those of you who are upgrading from version 1.x of Retro AS-1 will want to bring over your custom sounds so that the 2.x can use them.

Let's walk through the installation process...

Software Installation

System requirements are:

- 200 Mhz 604 Macintosh, or 200 Mhz Pentium II PC
- OS 8.1 for Macintosh, or Windows 95/98 for PC
- Sound card for the PC
- 40 Mbytes free space on your hard disk
- at least 64 Mbytes RAM installed in your computer
- 800 x 600 monitor

Suggested additions include:

- MIDI controller
- MIDI input converter for the Macintosh¹
- high-quality ASIO or DirectIO card for sound output
- high-quality sound system for listening

All set?

Now, insert the 'Retro AS-1 CD-ROM' into your CD-ROM drive. Double click the installer named 'Retro AS-1 2.0 Installer' on the CD-ROM. Read the start up text and license agreement. When prompted by the installer, enter in the installer password from your registration number printed inside your jewel case. Select where you want to place the 'Retro AS-1 2.0 Folder' on your hard disk. That's it. Now relax while all the files are being copied to your hard disk.

At the end of the installation, two things are going to happen. First the 'Retro AS-1 QuickStart' text document is going to be opened. This document duplicates some of the information later on in this manual in the 'Getting Started' chapter. Check this out for quick hints on getting going with the Retro AS-1. The second thing that is going to happen is that the 'Retro AS-1 Authorizer' application is going to be launched. This application is used to both register the software, as well as authorize your machine to use the Retro AS-1.

The installer inserts trial authorization into your machine. This means that you can use the full functionality of the Retro AS-1 for a month before you register and authorize. Each time you use the product, you will be reminded that you need to register. The steps for registration and authorization are:

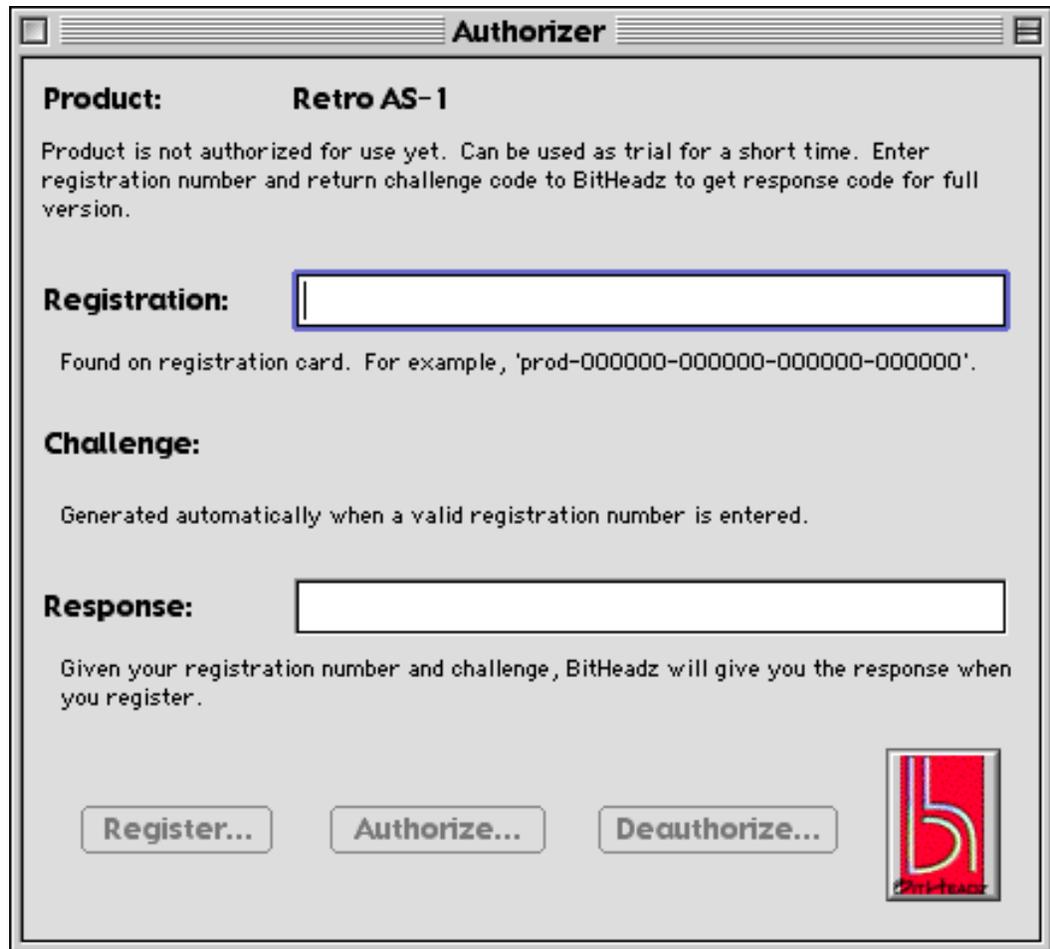
1. Register the software with 'Retro AS-1 Authorizer' via email or fax.
2. Receive an authorization response code from BitHeadz upon receipt of your registration information.
3. Enter the registration number and response code into the 'Retro AS-1 Authorizer' application, and authorize the software.

1. USB or serial port to MIDI converter.

Registration

Registration lets BitHeadz know who you are so we know who has purchased the software, and also allows BitHeadz to return to the customer an authorization response code.

When you open the 'Retro AS-1 Authorizer' application, you will see the main window. Notice that the first time you run the authorizer, the product description text says that you already have trial authorization, and the 'Register' button is disabled.



Enter in your registration number from inside your jewel case. It will begin with 'AS12'. For example, the registration entered here is AS12-290109-314549-190289-973099. Once you enter in a valid registration number, a unique challenge is generated, and the 'Register' button will be enabled.



The screenshot shows a window titled "Authorizer" for the product "Retro AS-1". The interface includes a text area with instructions, a registration number field containing "AS12-290109-314549-190289-973099", a challenge field containing "AS12-BTWR-SWKZ-FAZY-ACYD-FWDR", and a response field. At the bottom, there are three buttons: "Register...", "Authorize...", and "Deauthorize...", along with the BitHeadz logo.

Product: Retro AS-1

Product is not authorized for use yet. Can be used as trial for a short time. Enter registration number and return challenge code to BitHeadz to get response code for full version.

Registration: AS12-290109-314549-190289-973099

Found on registration card. For example, 'prod-000000-000000-000000-000000'.

Challenge: AS12-BTWR-SWKZ-FAZY-ACYD-FWDR

Generated automatically when a valid registration number is entered.

Response:

Given your registration number and challenge, BitHeadz will give you the response when you register.

Register... **Authorize...** **Deauthorize...**



Now we are ready to authorize the software. Press the 'Register' button. Now you will be asked to enter in you name and contact information. If you have email access from your machine and it is configured properly, the 'Electronic Mail' button will be enabled. Otherwise, you will have to mail or fax in your registration request. (You could also manually email in the registration text generated by 'Retro AS-1 Authorizer' as an attachment to registration@bitheadz.com as well.)



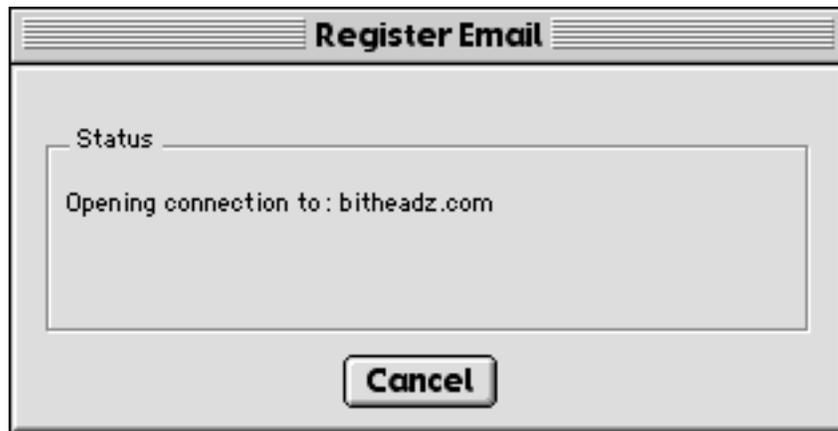
The image shows a 'Register' dialog box with a title bar. It contains several text input fields for personal information, two radio button options for mail preference, and two buttons at the bottom: 'OK' and 'Cancel'. The 'Email' field is highlighted with a blue border.

Name:	Joe BitHeadz
Address:	4400 Capitola Road
	Suite 202
City:	Capitola
State:	CA
Zip:	95010
Country:	USA
Phone:	831-465-9898
Fax:	831-465-9899
Email:	joe@bitheadz.com

Electronic Mail
Register via email if you have Internet access from your computer and your Internet preferences are configured correctly.

Standard Mail or Fax
Register via mail or fax to send a paper registration form to BitHeadz.

If you have electronic mail access, press the 'OK' button with 'Electronic Mail' selected. The authorizer will now automatically walk through the email process. You should not have to do anything.



To register via text, press the 'OK' button with 'Standard Mail or Fax' selected. A text file called 'Register Retro AS-1' will be generated.



Mail the document to BitHeadz at:

BitHeadz, Inc
Retro AS-1 Registration
4400 Capitola Road
Suite 202
Capitola, CA, 95010

You can alternatively fax the document to BitHeadz at 831-465-9899, or email it to registration@bitheadz.com.

Your registration request will be processed by BitHeadz within two days to send your authorization response code back to you.

You can now quit 'Retro AS-1 Authorizer' for a while. You can use the Retro AS-1 completely until you get your response code back. When you quit the 'Retro AS-1 Authorizer' while you have trial authorization, you should see a dialog like:



If you have no authorization on your machine, you will see a dialog like this:



Contact BitHeadz technical support if you see this dialog.

You can check your current registration number at any time by opening up the 'Retro AS-1' control panel. Your registration number is shown in the 'About' box.

Authorization

Once you get back an authorization response code from BitHeadz, enter it into the 'Retro AS-1 Authorizer' application. Open it back up, and enter your registration number and response code. Now the 'Authorize' button should be enabled.



Press the 'Authorize' button. You're done!

Now you can quit the 'Retro AS-1 Authorizer' again. If you are fully authorized, you will see a dialog like:



Updating from Previous Versions of Retro AS-1

The 2.x installation will overwrite files in your System folder so that you will no longer be able to use 1.x. The installer will, however, leave the old 'Retro AS-1 Folder' on your hard drive. If you have created custom sounds for version 1.x, you should copy them from the old 'Retro AS-1 Programs' folder to the new one. Then, you can discard your old 'Retro AS-1 Folder' and use the new 'Retro AS-1 2.0 Folder' you just installed.

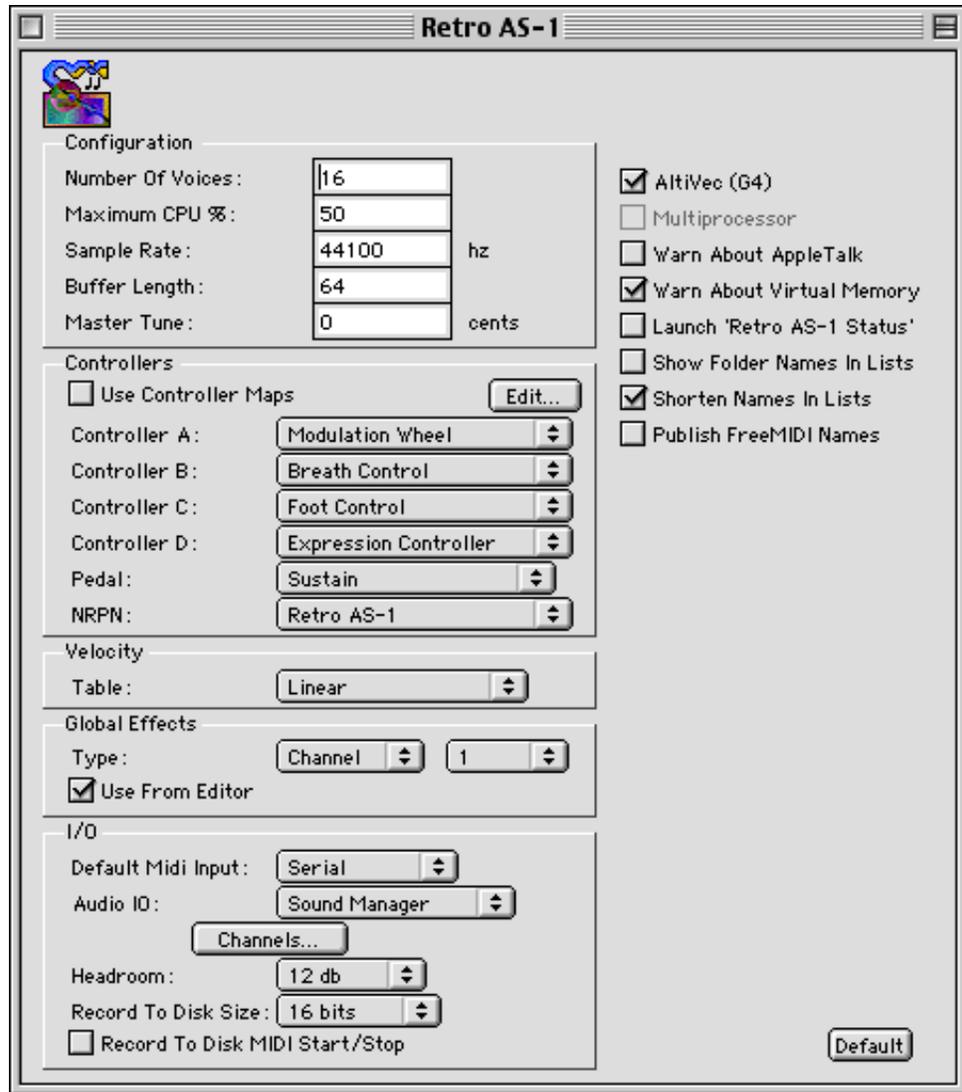
Note that Retro AS-1 version 2.0 can read 1.x version files, but versions 1.x cannot read 2.0 files.

Now that you've been able to successfully install the software you probably have a lot of questions. How can I play the Retro AS-1 live from a MIDI controller? How do I hook it up to my sequencer? Where are the factory sounds? Why can't the U.S. congress pass a simple campaign finance reform package? Will the Cubs ever win another pennant? Where do my missing socks *really* go?

Let's address some initial Retro AS-1 questions to get you going quickly and making music.

Configuring Retro AS-1

The first thing we want to do is make sure that the Retro AS-1 is properly configured for your system. This involves choosing the correct MIDI input and audio output for your system. Macintosh users have a choice of serial port, OMS, or FreeMIDI. If you have a pre-USB Macintosh and you want to use the Retro AS-1 standalone without a sequencer, the simplest solution is to use the serial port. Those of you on the bleeding edge with USB will need to use either OMS or FreeMIDI¹. To select the default MIDI input, open up the 'Retro AS-1' control panel. You will see something like:



The default MIDI input selection is in the lower left of the window. OMS and FreeMIDI users will have to make sure that OMS or FreeMIDI is set up correctly. Consult the documentation that came with your MIDI interface, or with the OMS and FreeMIDI installers. To use the OMS or FreeMIDI

1. you should also be using OS9 - the USB stability is much better.

drivers that come with the Retro AS-1, see the sections ahead about ‘Using OMS’ and ‘Using Free-MIDI’.

PC users won’t have to worry about selecting the MIDI input in the ‘Retro AS-1’ control panel. You’ve already had enough excitement installing your sound card - that’s usually where the MIDI input is coming from.

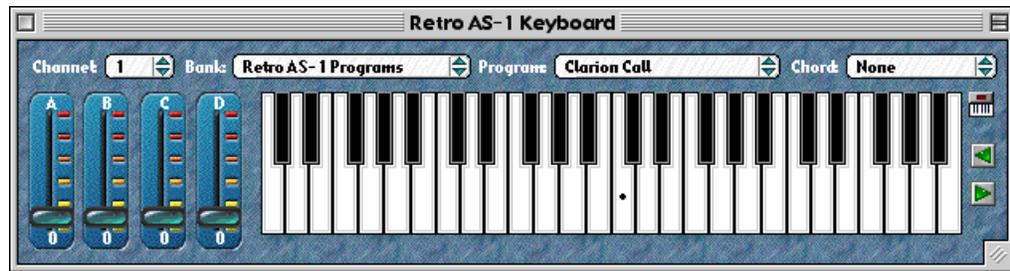
While you’ve got the control panel open, you can also select the audio output you want to use. This is the ‘Audio IO’ menu. The default for PC users is DirectSound, for Macintosh users, Sound Manager. These defaults should work for most everyone, but you can change them easily in the control panel. See the sections ahead about ‘Using ASIO’ as necessary.

Playing Sounds

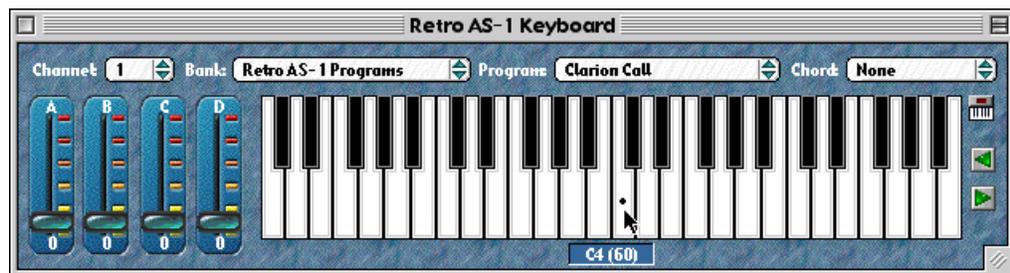
There are a lot of ways to play the sounds in Retro AS-1. Let’s check out three simple ways: the keyboard application, the MIDI processor, and the mixer.

Retro AS-1 Keyboard

The simplest way to get sound out of the Retro AS-1 is to use the on-screen keyboard in the ‘Retro AS-1 Keyboard’ application. This is also a simple way to make sure that everything has been installed correctly.



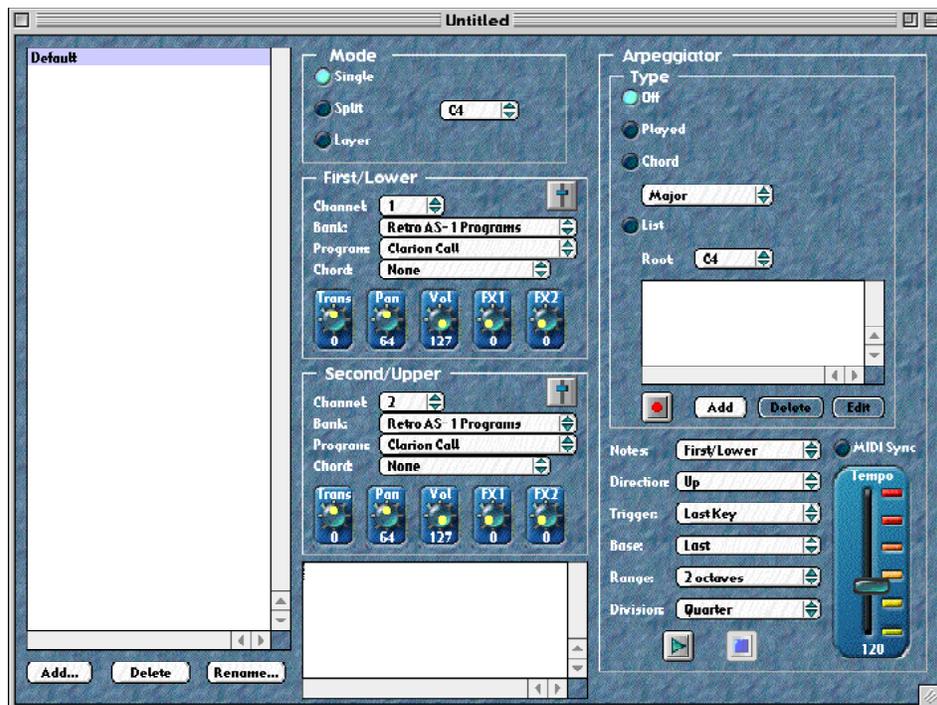
You can play with the ASCII keyboard, or click on the keyboard with the mouse. As you move over a note, the note name will be displayed below the keyboard.



Retro AS-1 MIDI Processor

Once you're sure that everything is working properly, you can open up the 'Retro AS-1 MIDI Processor' to play sounds from your external MIDI controller. When 'Retro AS-1 MIDI Processor' is launched, the default MIDI input you specified in the control panel is used to get MIDI into the Retro AS-1 engine. Now, when you play on your MIDI controller, you should hear sound from the Retro AS-1.

If you have problems getting MIDI input to the Retro AS-1, skip ahead to 'Using Serial Port MIDI', 'Using OMS', or 'Using FreeMIDI' ahead in this chapter.

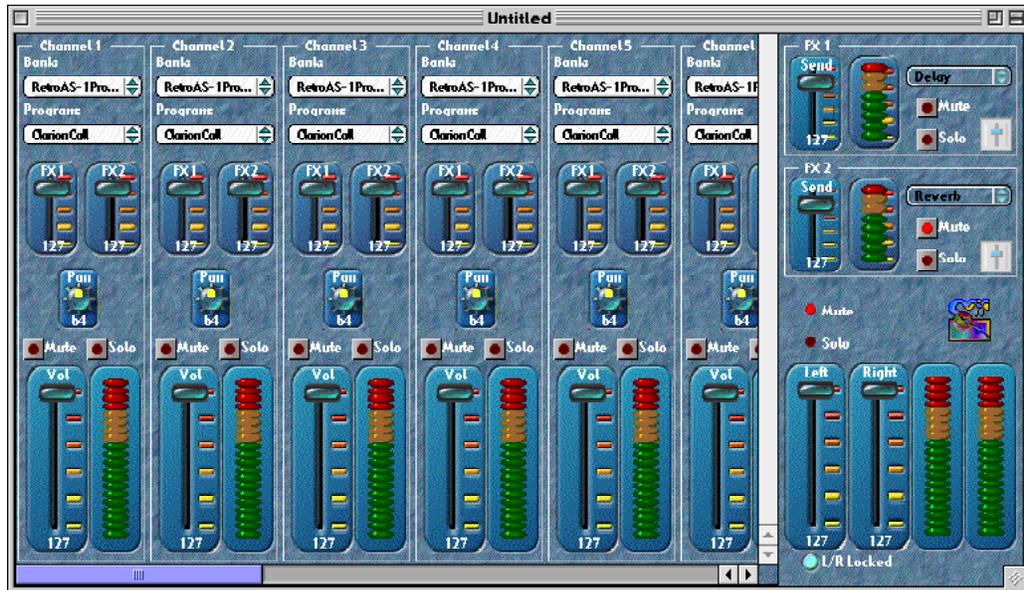


You can change sounds with the Program menu in the First/Lower section in the MIDI processor. The MIDI processor is a good way to access the installed sounds quickly with the bank and program menus. You also can set up splits or layers, as well as use the arpeggiator.

You could also open the MIDI processor example file installed and play through some of the setups.

Retro AS-1 Mixer

Another simple way to play the Retro AS-1 is to use the 'Retro AS-1 Mixer' application. Open up the application and you will see how to change the sounds for all sixteen MIDI channels that the Retro AS-1 is using. You can also monitor the audio activity on all the channels, as well as control the global effects processors.



You can use the scroll bar at the lower right to view more MIDI channels if you want.

The mixer also allows you to edit the global effects parameters, depending on who has control of the global effects. This is specified in the 'Retro AS-1' control panel. The default setting is 'Channel', which means that the sound loaded on the default MIDI channel 1 also specifies the global effects. The mixer can edit the global effects only when the control panel setting is 'Fixed'.

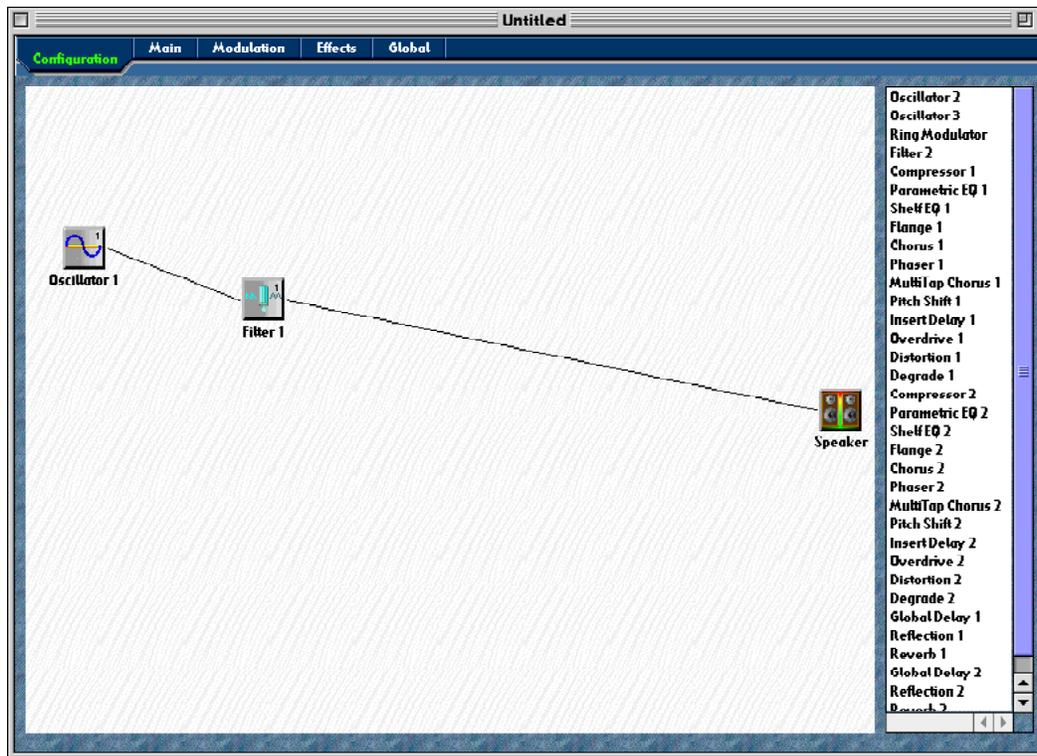
Editing Sounds

Now that you're getting the feel for the Retro AS-1, you might want to see what's going on under the hood and try to create or edit a sound of your own. Open up the 'Retro AS-1 Editor' application. This is the tool to use to modify the factory sounds, or create sounds from scratch. When you open up the editor, the default MIDI input is used, just like for the mixer.

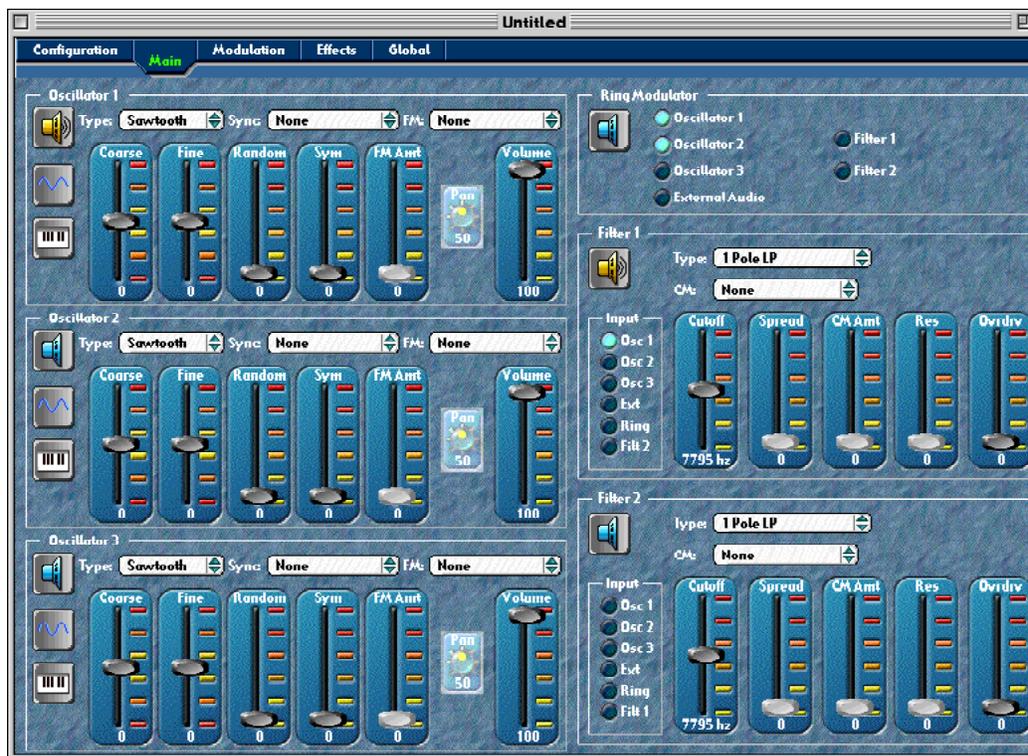
The tabs at the top of the main window are used to select the pages in the editor. There are five pages:

- Configuration
- Main
- Modulation
- Effects
- Global

The configuration window presents an overview of the algorithm the sound is using. Those of you who don't know what all the modules are don't need to worry. You'll figure that out with a little bit of time. You can turn modules on or off by double clicking the list at the right, or dragging them onto the configuration display.

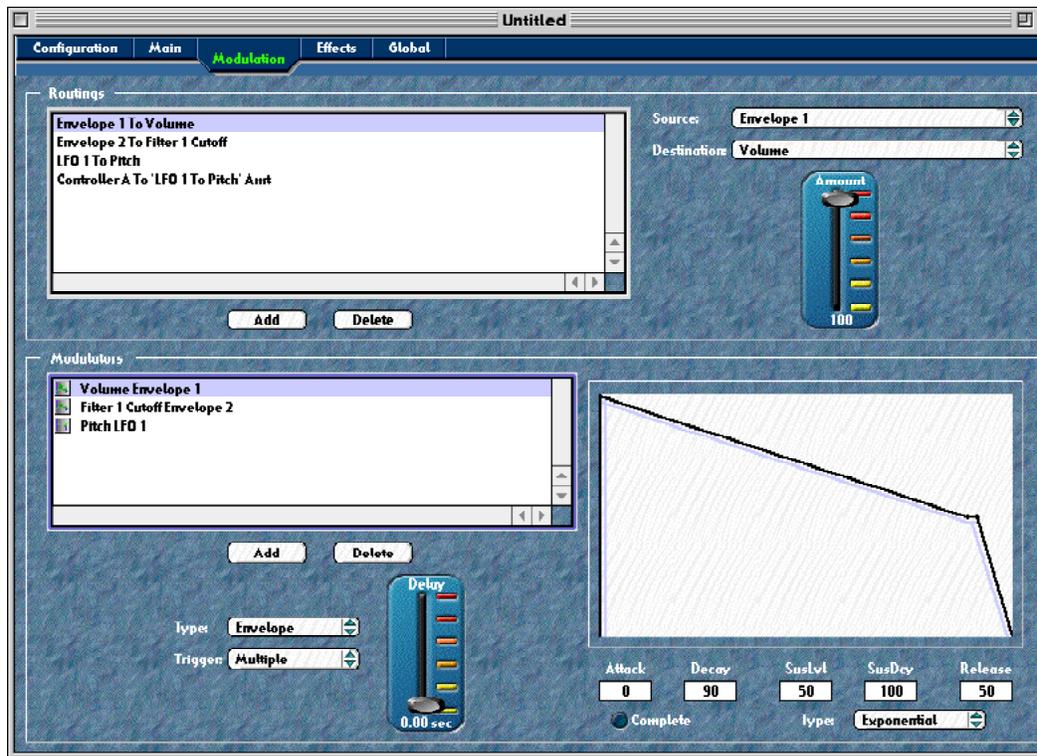


The next page is the main page. This is where you modulate the parameters for the oscillator, ring modulator, and filters. The default algorithm only has a single oscillator turned on. You can experiment by changing the oscillator type for oscillator 1.



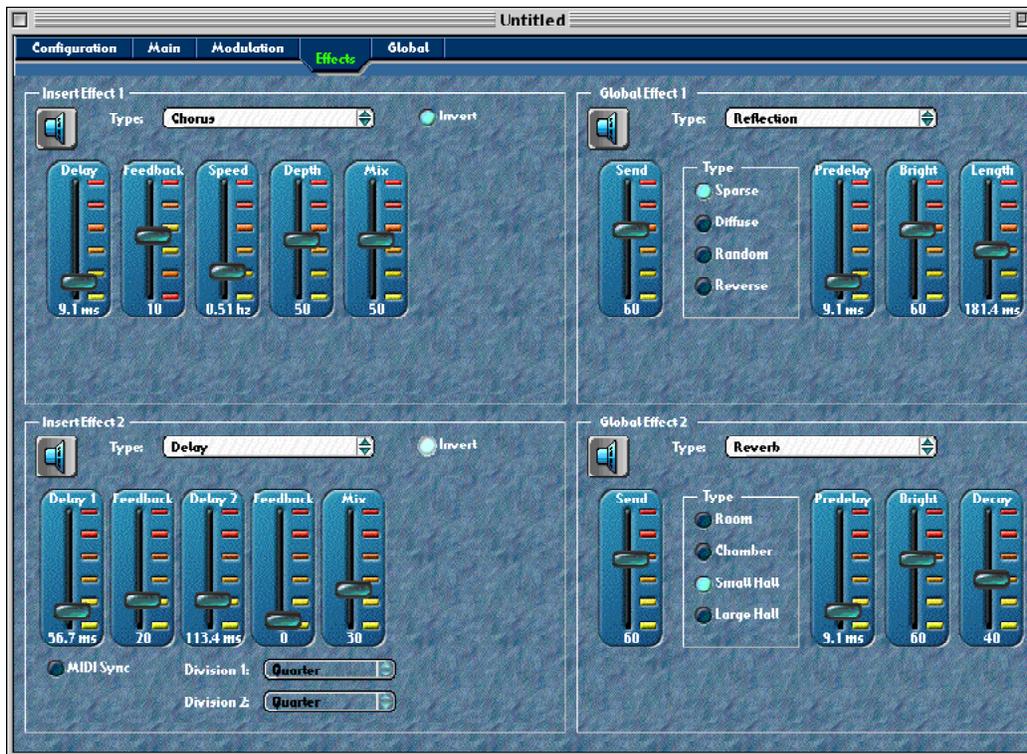
The next page is the modulation page. Whereas everything on the main page is for audio rate processing, the modulation page is processed at a slower MIDI rate. Here is where you assign envelopes, LFOs, and MIDI controllers to control the parameters in the Retro AS-1 algorithm. Unlike hardware synths, you have lots of modulators and modulation routings at your disposal.

Select a modulation routing in the top list, and a modulator from the bottom list.

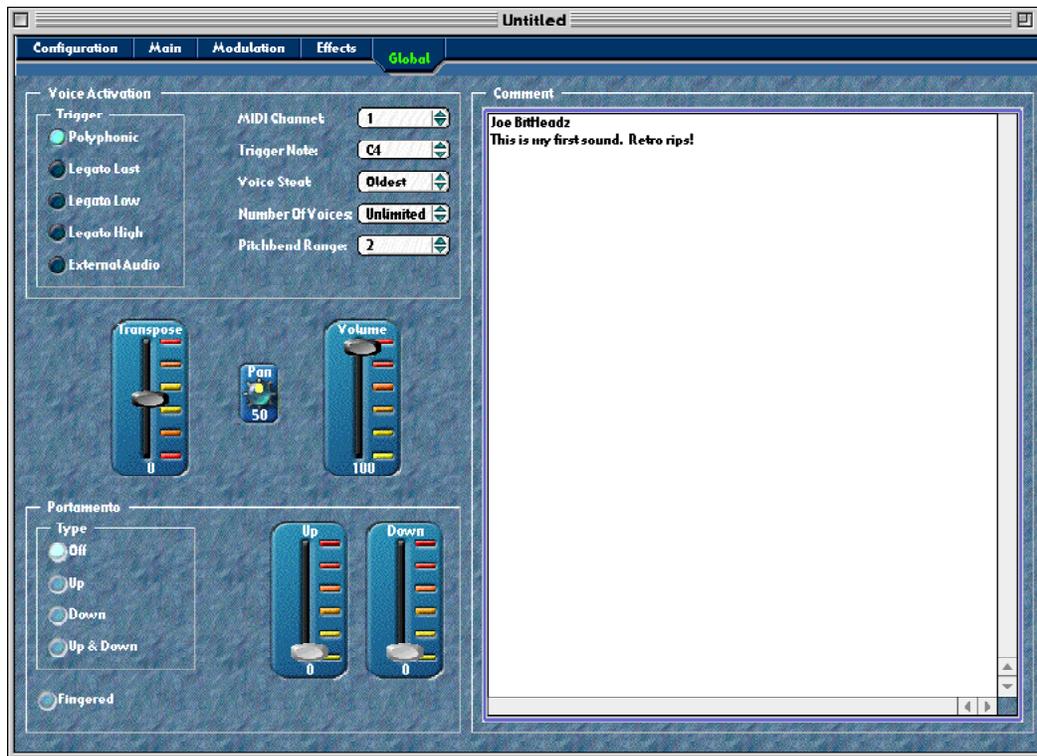


The next page is the effects page. This is where effects such as eq, chorus, or reverb are assigned to the sound. The Retro AS-1 has two insert effects per MIDI channel, and two global effects for the entire sixteen MIDI channel mix.

The insert effects follow the sound wherever it is used, but the global effects are assigned as specified in the control panel. The default is to use the global effects from the currently edited file.



The last page is the global page. Here you can assign voice trigger modes such as polyphonic and legato types, change the pitchbend range, and specify the overall volume. You can also specify your own custom comment that is saved with the file.



You may now want to open one of the factory files and experiment with the parameters. You can save your edited version of the file under a new name if you like.

It is important to remember that each file is a MIDI program accessible from MIDI program change. The programs listed in the keyboard, MIDI processor, and mixer applications are the files that are installed in the 'Retro AS-1 Programs' folder in the 'Retro AS-1 2.0 Folder'.

Using Serial Port MIDI

Non-USB Macintoshes can use the serial port directly to get MIDI into the Retro AS-1. Launch the 'Retro AS-1 Serial Input' application.



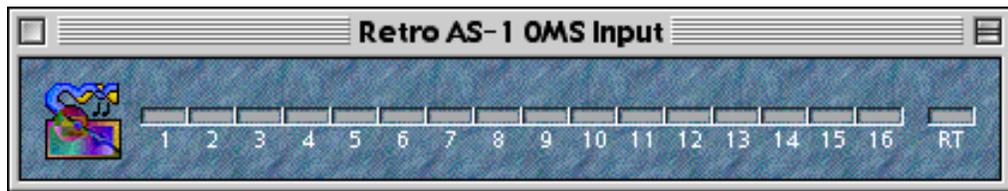
The activity lights show which MIDI channels have activity on them. The last light 'RT' is for real-time MIDI messages. You can select the port being used with the 'Port' menu. 'Fast' is only supported on MOTU's MIDI TimePiece MIDI interfaces.



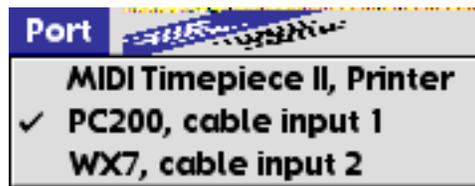
Using OMS

You can use OMS to get MIDI from an external MIDI controller into the Retro AS-1 with the 'Retro AS-1 OMS Input' application, or you can use OMS to specify the Retro AS-1 as a MIDI output device that third party applications such as sequencers use.

To use OMS to get MIDI into your computer so that you can use the MIDI processor, mixer, or editor application, specify OMS in the 'Retro AS-1' control panel as the default MIDI input. Now, any time one of those application is launched, the application 'Retro AS-1 OMS Input' is also launched to route MIDI to the engine.



The activity lights show MIDI coming in from you external MIDI controller. You can figure which port you are listening to with the 'Port' menu.



The OMS driver for the Macintosh version of the Retro AS-1 is automatically installed. You will have to open up your OMS studio setup document and update your studio to make sure that the Retro AS-1 icon is visible. Now, all OMS-aware applications can communicate with the Retro AS-1. In addition to sending MIDI to the synthesizer, the application can also get all of the bank and program names via the OMS Name Manager.

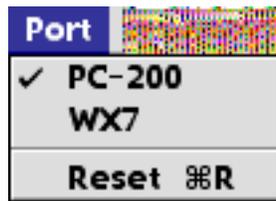
Using FreeMIDI

You can use FreeMIDI to get MIDI from an external MIDI controller into the Retro AS-1 with the 'Retro AS-1 FreeMIDI Input' application, or you can use FreeMIDI to specify the Retro AS-1 as a MIDI output device that third party applications such as Digital Performer use.

To use FreeMIDI to get MIDI into your computer so that you can use the MIDI processor, mixer, or editor application, specify FreeMIDI in the 'Retro AS-1' control panel as the default MIDI input. Now, any time one of those application is launched, the application 'Retro AS-1 FreeMIDI Input' is also launched to route MIDI to the engine.



The activity lights show MIDI coming in from you external MIDI controller. You can figure which port you are listening to with the 'Port' menu.



The FreeMIDI driver for the Macintosh version of the Retro AS-1 is automatically installed. You will have to open up your FreeMIDI setup application and change your preferences to make sure that the Retro AS-1 icon is visible. Now, FreeMIDI applications such as MOTU's Performer can communicate with the Retro AS-1. In addition to sending MIDI to the synthesizer, the application can also get all of the bank and program names automatically.

Using ASIO

Each ASIO hardware device has a software driver that comes with it. For Macintosh users the Retro AS-1 requires that the ASIO driver be in a folder called 'Retro AS-1 ASIO Drivers' in the System folder. Then when you open up the 'Retro AS-1' control panel and select ASIO Audio IO, you will see the ASIO driver in the popup menu in the ASIO dialog. Select 'ASIO' for the audio io menu, and press the 'Setup...' button.



You can now select which ASIO device you want to use from the ASIO driver menu.

There is a special case for the MOTU 2408 ASIO driver. This driver is happy only when it lives in a folder called 'ASIO Drivers'. Create a folder called 'ASIO Drivers' anywhere in your Extensions folder. Put the 2408 ASIO driver (called the 'ASIO PCI-324' driver) inside of this folder. Now create an alias to this folder you just created, name it 'Retro AS-1 ASIO Drivers', and place it in the Extensions folder. Now the Retro AS-1 can find the 2408 ASIO driver correctly.

PC users have it easy - all ASIO drivers can be found with the registry.

Using with a Sequencer

Retro AS-1 integrates very nicely with all of the major sequencers on the Macintosh and PC. For the PC, MIDI input is received from the 16-bit Windows Multimedia driver that is installed with the Retro AS-1. On the Macintosh, you can get MIDI from your sequencer into the Retro AS-1 with the installed OMS driver, FreeMIDI driver, or a native Logic interface.

Some sequencers offer varying degrees of support for getting bank and program names from the Retro AS-1 to appear in the sequencer. Any application that supports OMS names or FreeMIDI names will automatically get all of the installed bank and program names¹. This immediately takes care of applications like Cubase, Performer, Vision, and ProTools.

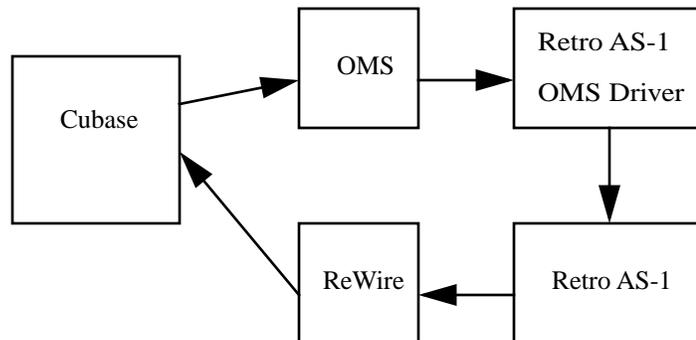
For audio, there are a number of ways to get audio out of the synthesizer when being used from a sequencer. The simplest way is to go out the DirectSound or Sound Manager output, but there are better ways available. BitHeadz supports standards such as ReWire, MAS 2.0, and DirectConnect to route the digital output from the synthesizer back into the digital audio sequencer. The advantage of this is that once the Retro AS-1 output is an audio track in the sequencer, it is treated like any other audio track. You can apply software DSP effects, automate the mixdown, and record your synthesizer tracks completely digitally then.

1. In version 1.x of the Retro AS-1, this required some user (divine?) intervention.

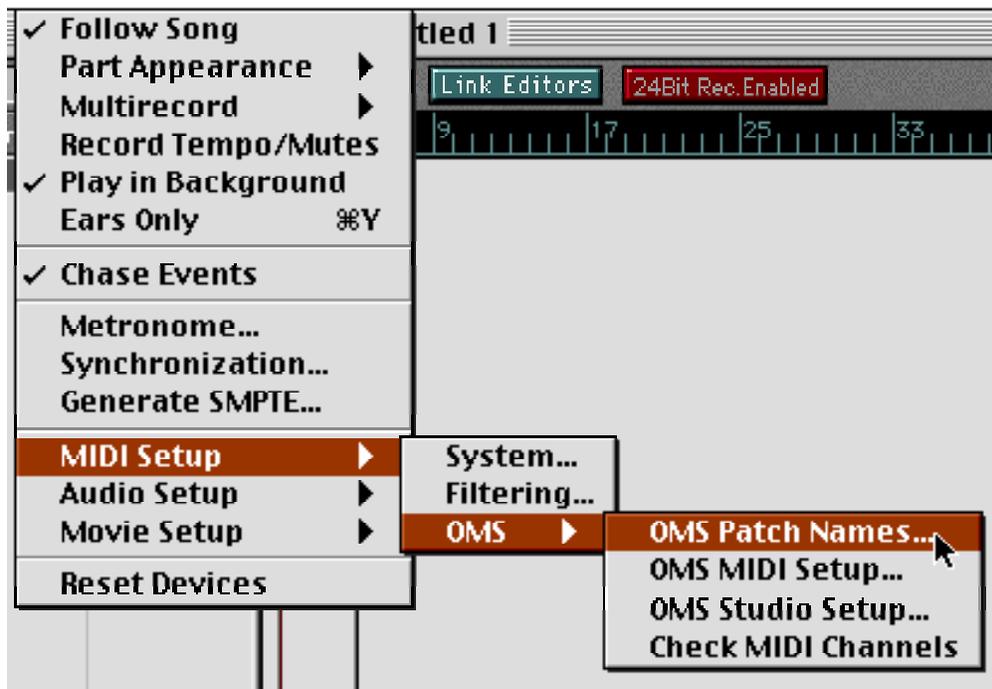
Using with Cubase

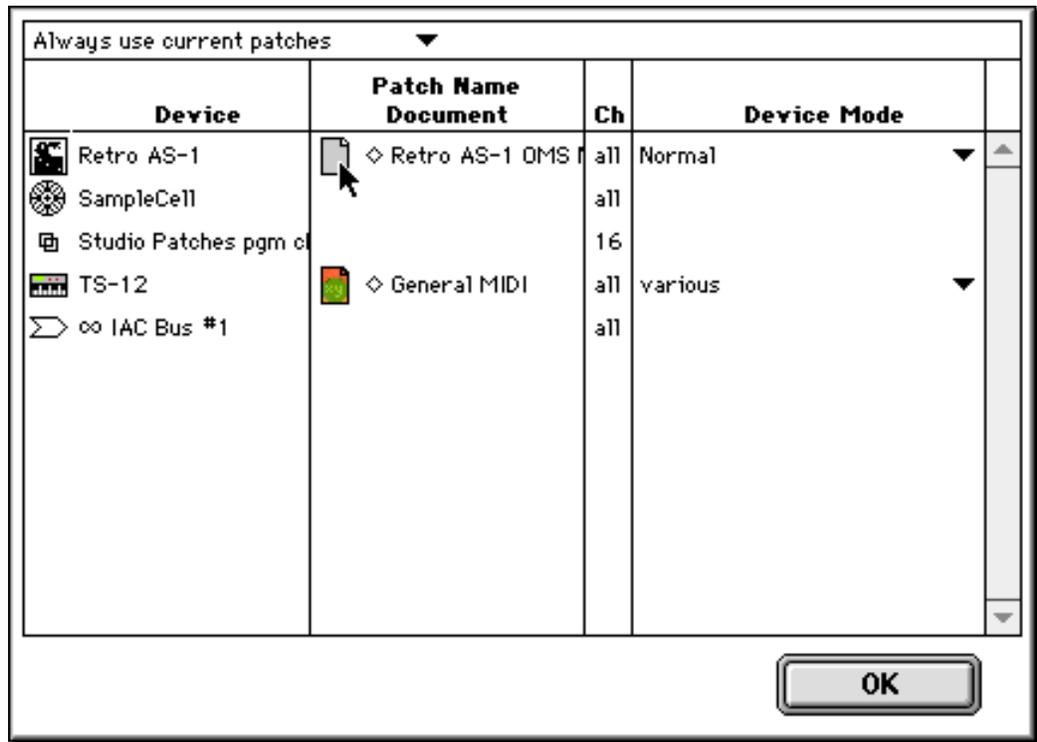
On the Macintosh side, the OMS driver is used for MIDI input. You need to make sure that the Retro AS-1 shows up in your OMS setup document.

ReWire is a mechanism for getting the digital audio output of the synthesizer back into Cubase VST. Place the 'Retro AS-1 ReWire' plug-in in the Extensions folder. With the 'Retro AS-1' control panel, select 'Plug-in' as the audio io type. When Cubase is restarted you will be able to see the Retro AS-1 from within the ReWire dialog. You can select the main or individual MIDI channel outputs from the Retro AS-1 as audio channels.

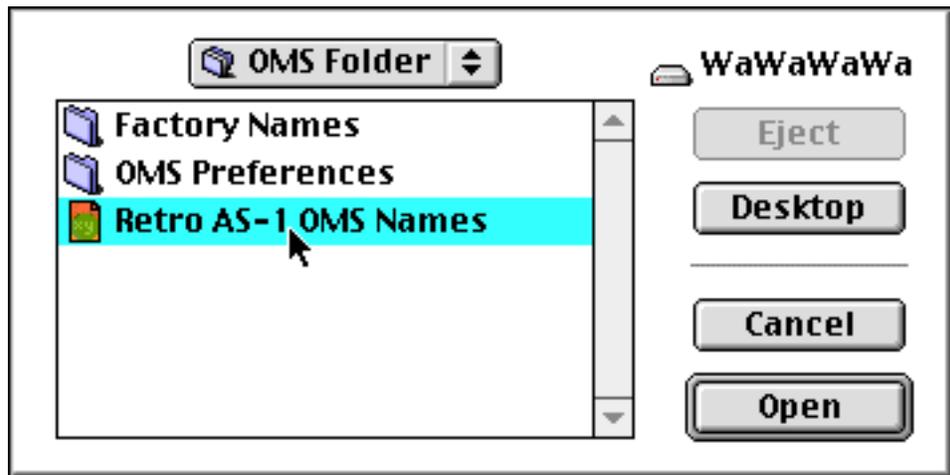


First, you need to set up the OMS names inside of Cubase. Bring up the OMS patch names dialog.

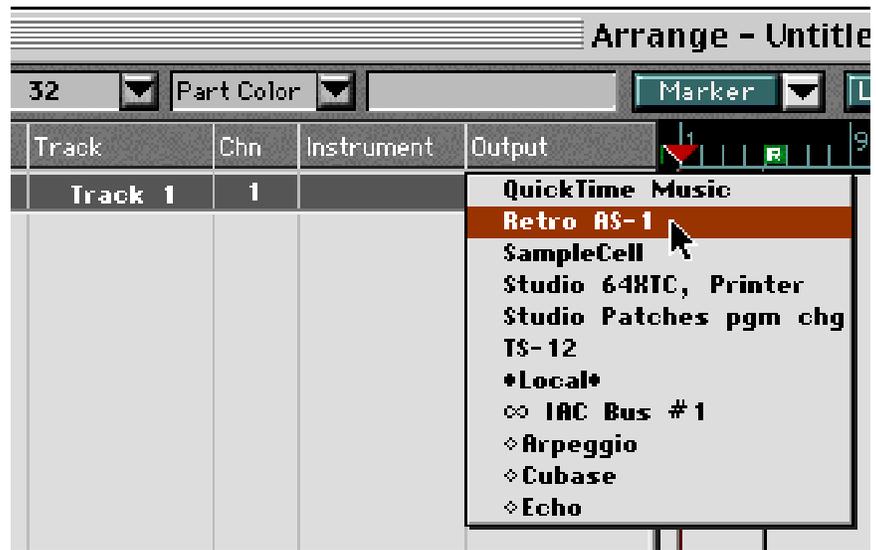




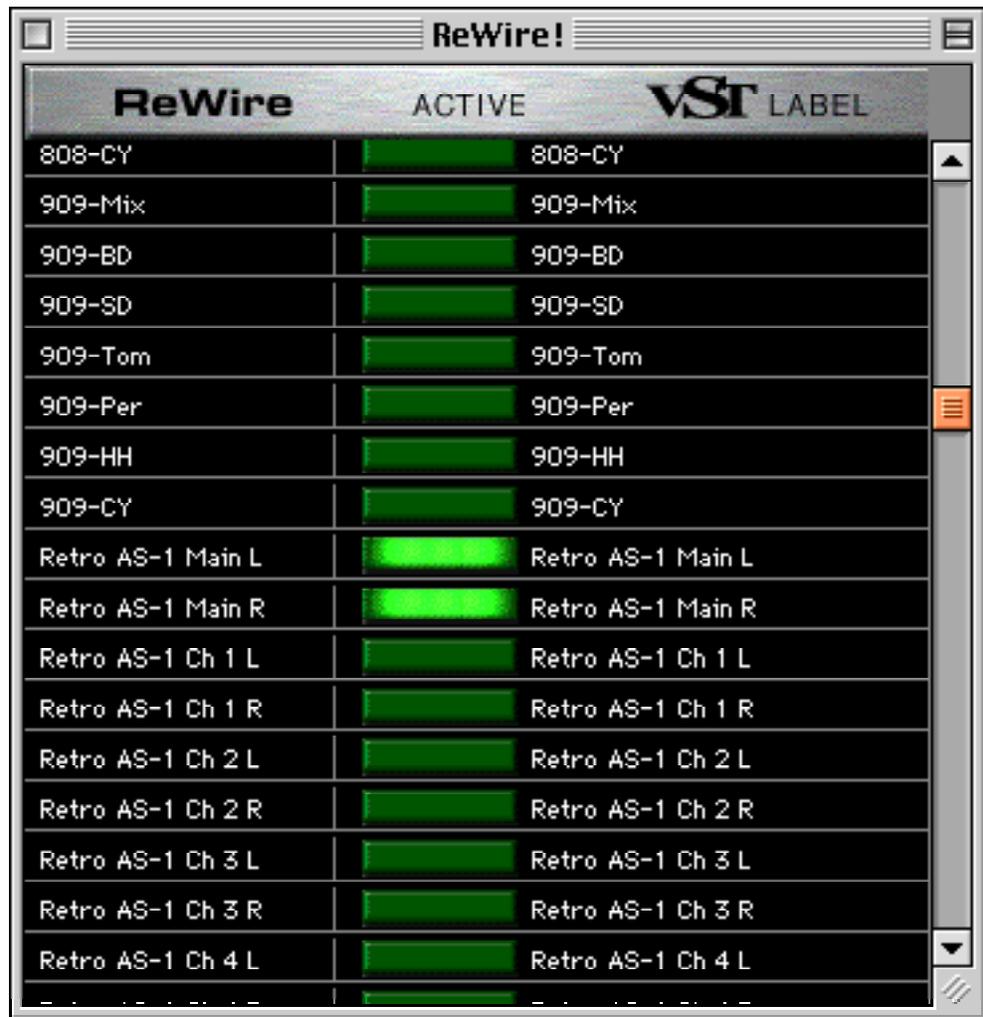
You need to subscribe to the 'Retro AS-1 OMS Names' file in the 'OMS Folder' in your System folder.



Now, when you create a MIDI track, you can select the Retro AS-1 as a MIDI output device.



Next, we need to set up ReWire. As mentioned earlier, make sure the 'Retro AS-1 ReWire' extension is placed in your Extensions folder. Also, you need to select 'Plug-in' for the audio io type in the 'Retro AS-1' control panel. Inside Cubase, you can now bring up the ReWire dialog.



Enable the Retro AS-1 channels that you want to listen to. Individual MIDI channels that you listen to will be taken out of the main mix. Now, you should be able to see the Retro AS-1 outputs in the VST audio mixer.



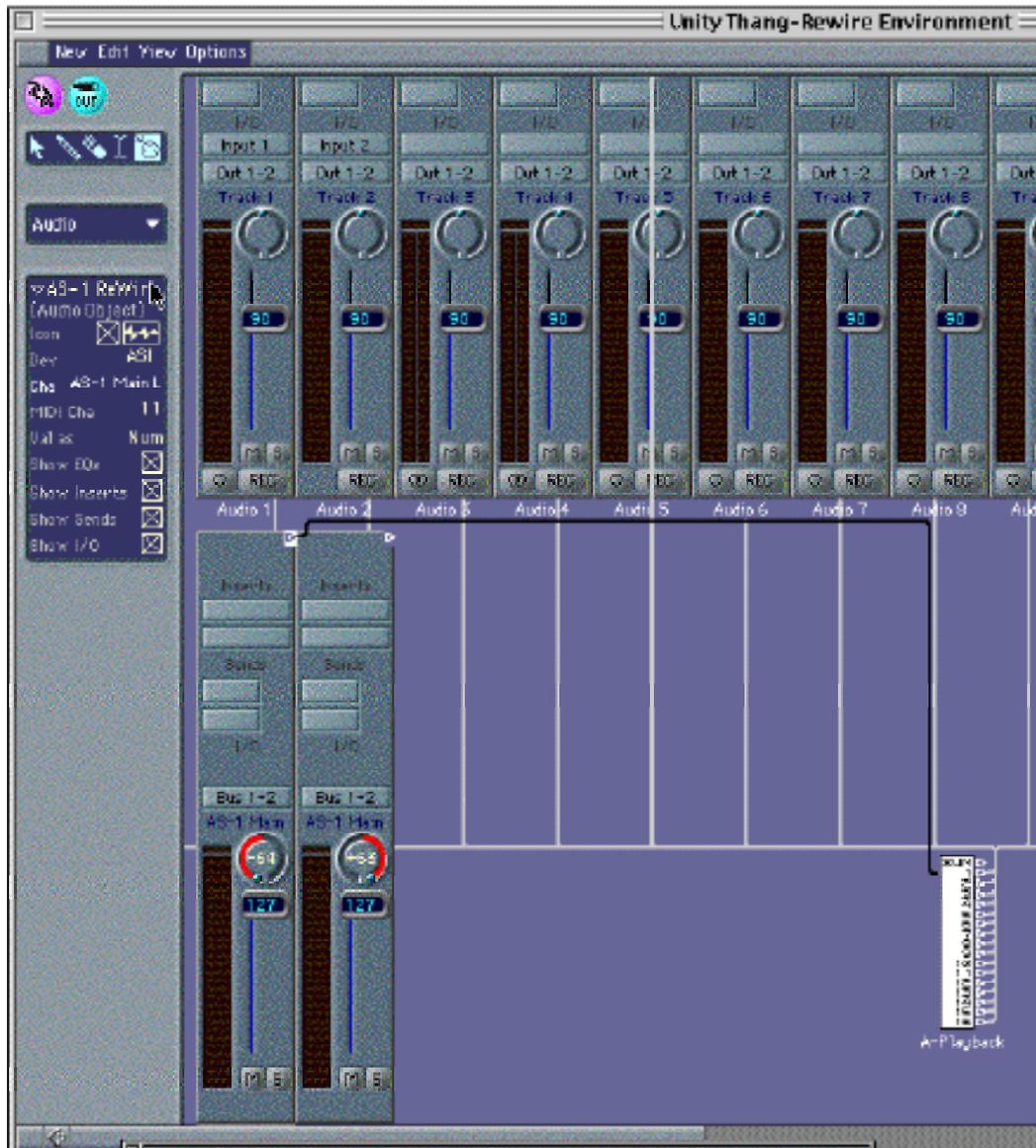
Using with Logic

There is native Logic support with the Retro AS-1 on the Macintosh side. You do not need to use OMS. Add the Logic environment to your document. You should see something like this in your environment window:



The most recent version of Logic also supports ReWire. Similar to Cubase, you can use the 'Retro AS-1 ReWire' plug-in to get the audio from the Retro AS-1 to be routed into Logic. Place the plug-in in the Extensions folder. Select 'Plug-in' from the audio io type in the 'Retro AS-1' control panel. Now, Logic will be able to get the audio from the Retro AS-1 via ReWire.

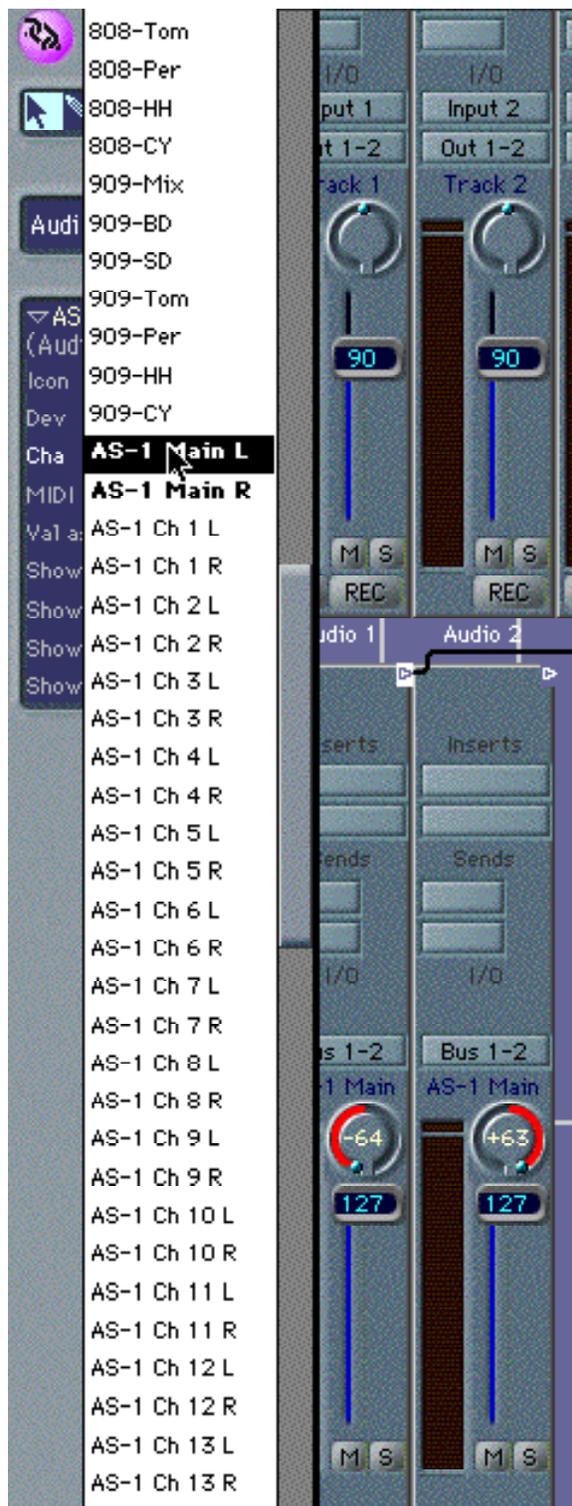
Now, assign the ReWire environment to the Retro AS-1 device.



You should be able to select the Retro AS-1 as an output for a MIDI track.



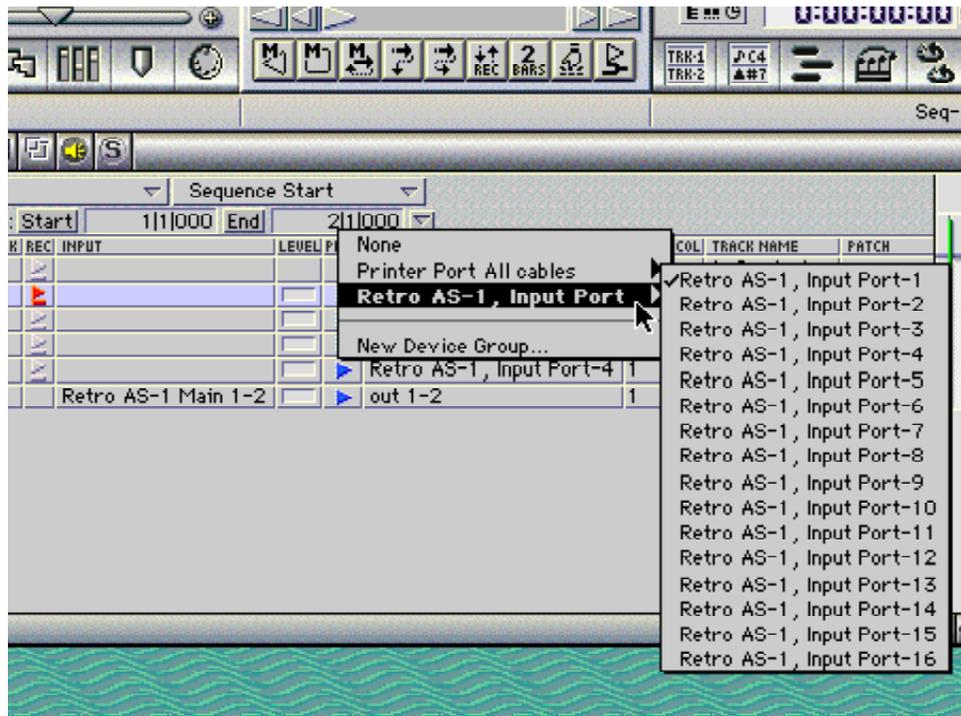
You can select which Retro AS-1 output to listen to on your audio track.



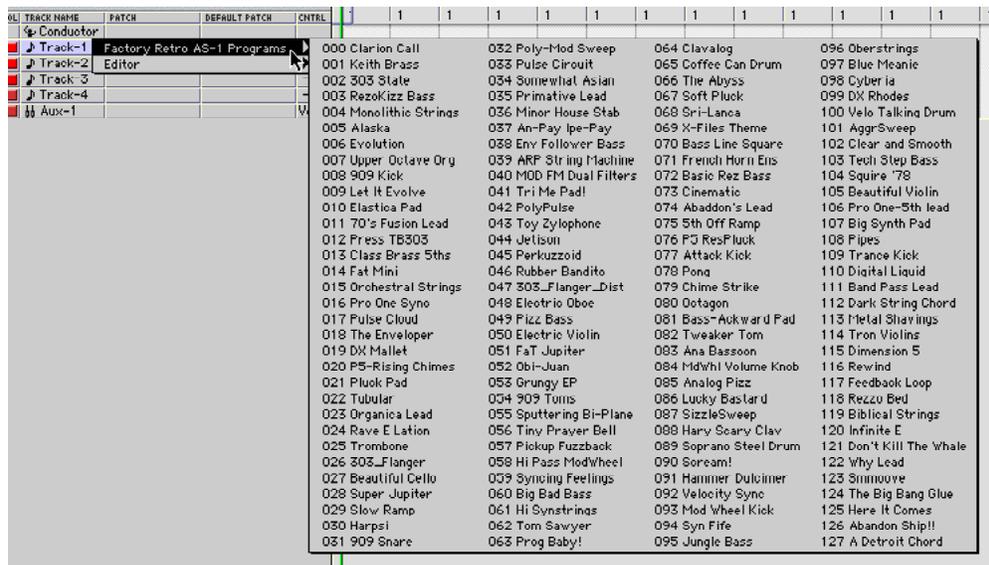
Using with Performer

With Performer or Digital Performer, the installed FreeMIDI driver allows Performer to send MIDI to the Retro AS-1. It also allows Performer to query the Retro AS-1 for bank and program names. Every time you launch Performer and the Retro AS-1 engine, the new bank and program name lists are published from the engine for Performer to read. You can see all of the names inside Performer very conveniently in the patch and default patch columns of the track window.

Select the Retro AS-1 channel you want to use from the input menu for a MIDI track. The Retro AS-1 shows up in this list because there is a FreeMIDI driver installed and recognized by FreeMIDI.

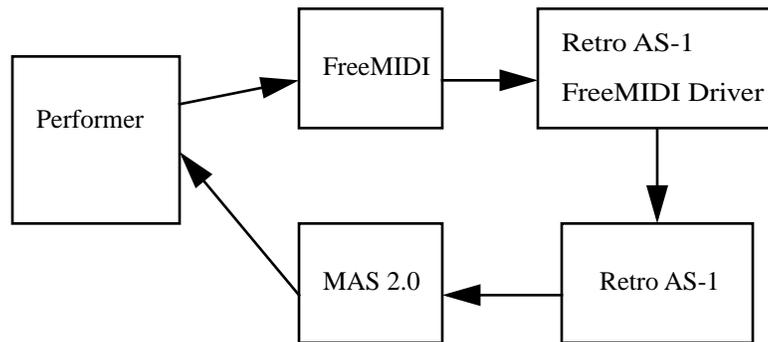


The names appear when you click on the patch or default patch column of a Retro AS-1 MIDI track. In your case, you will probably see more banks than you see here. As implemented in Performer, banks are the main level of the popup menu, and programs are the secondary level.

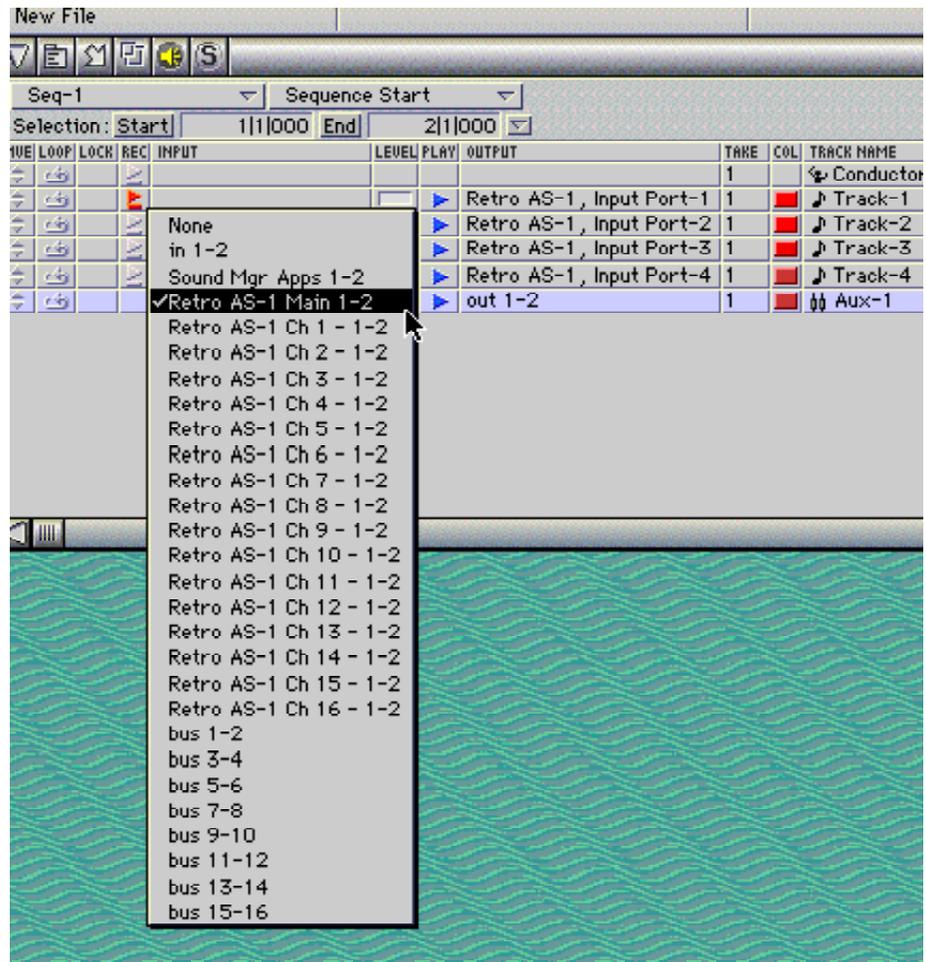


You're ready to go. Now you can select sounds and play the Retro AS-1 from Performer.

If you want to route the audio output from the Retro AS-1 back into Digital Performer, you can use the supplied 'Retro AS-1 MAS Plug-in'. Drop this file into the 'Plug-ins' folder of the 'MOTU' folder in your 'Extensions' folder. You will also need to change the audio io type to 'Plug-in' with the 'Retro AS-1' control panel. Now when you launch Digital Performer, you will see that the Retro AS-1 now has entries in the input menu of audio tracks in Performer.



The simplest way to do this is create an auxiliary audio track (either mono or stereo) in Performer and assign the Retro AS-1 output as the input to the track.

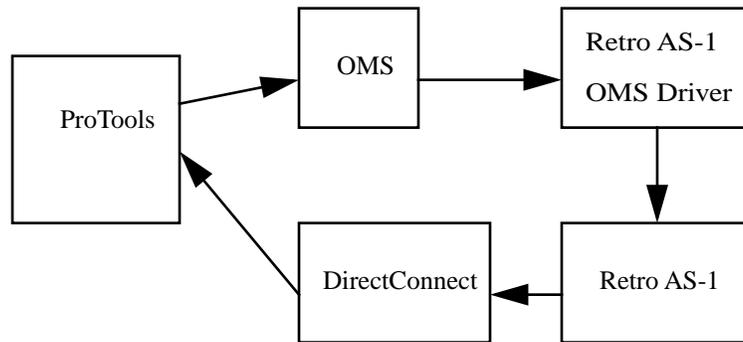


You can listen to the main outputs or individual MIDI channel outputs. The main outputs include all sixteen MIDI channels plus the global effects. The individual MIDI channels include the insert effects of the program, but not the global effects. With the individual MIDI channel support, you can pull a channel out of the main mix and process it's audio separately.

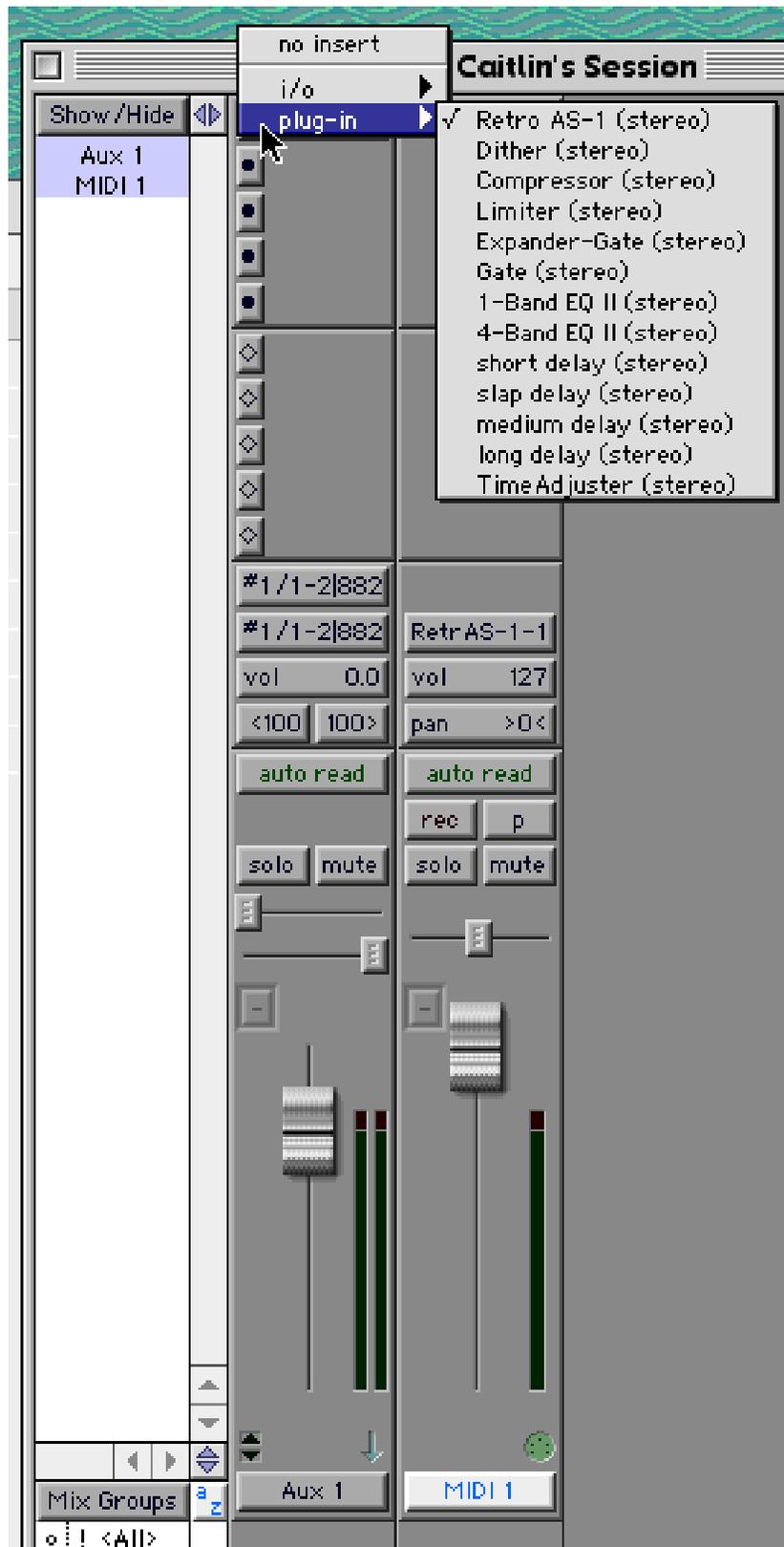
Using with ProTools

With ProTools 5, the MIDI support has been greatly enhanced. Since ProTools supports OMS, you will be able to select sounds and see all of the bank and program names from within ProTools.

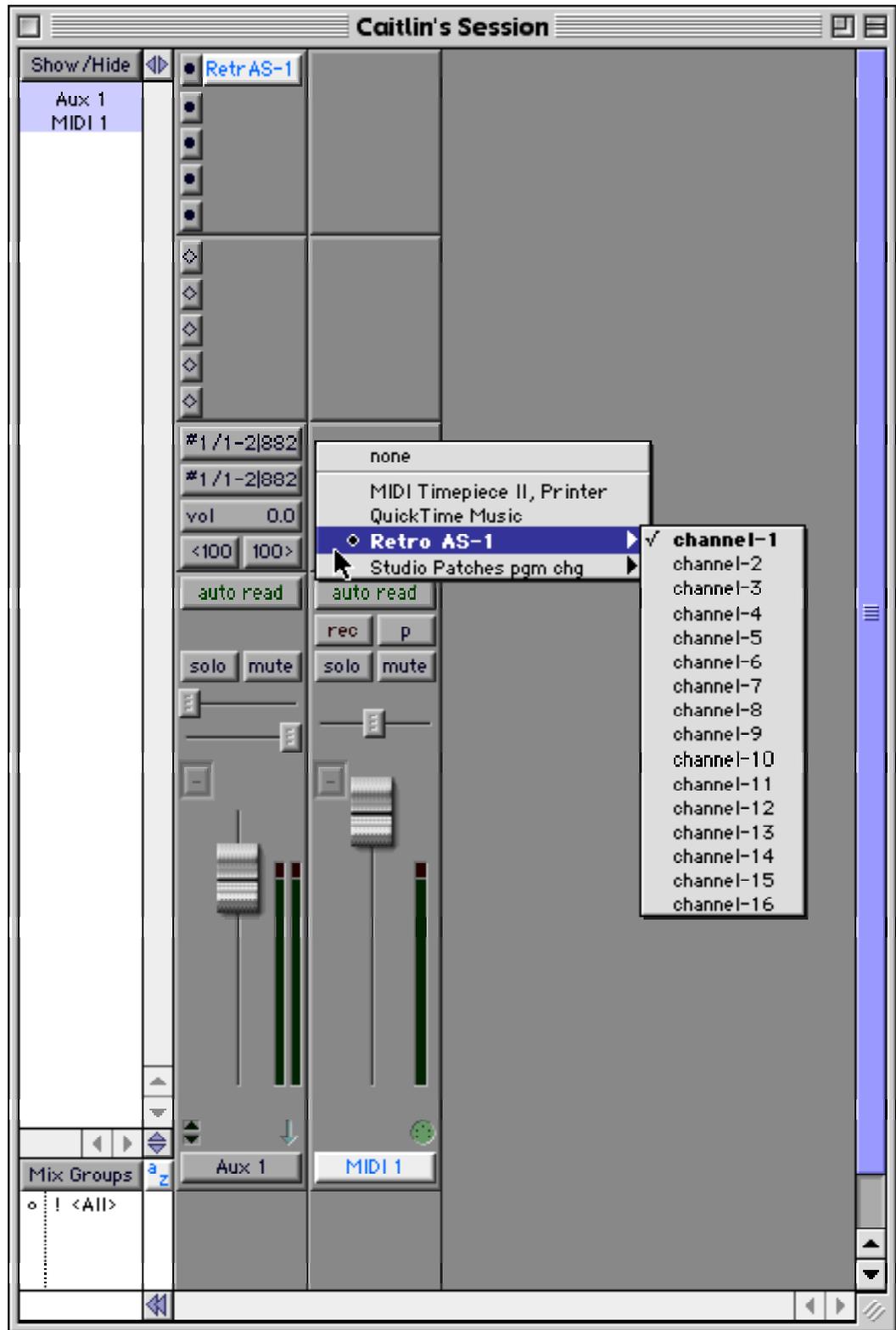
Also new with ProTools 5 is DirectConnect support. Similar to ReWire and MAS 2.0 support, DirectConnect supplies a digital back door from the Retro AS-1 into ProTools. The 'Retro AS-1 PI' is installed in the 'Plug-ins' folder of the 'DAE Folder' in your System folder. To enable this functionality, you need to select 'DirectConnect' from the audio io type in the 'Retro AS-1' control panel.



The DirectConnect Retro AS-1 plug-in is automatically installed. Inside ProTools, you must select the Retro AS-1 as the input for an audio track. You may need to create an aux audio track (mono or stereo) in the main window. Click on the insert selections at the top of the track.



The next task is to select the Retro AS-1 as the output for a MIDI track. You may need to add a MIDI track in the main window. ProTools uses OMS and the 'Retro AS-1 OMS Driver' to communicate with the synthesizer. Make sure that you have run OMS Setup so that OMS recognizes the Retro AS-1. Select which MIDI channel of the Retro AS-1 you want to communicate on.



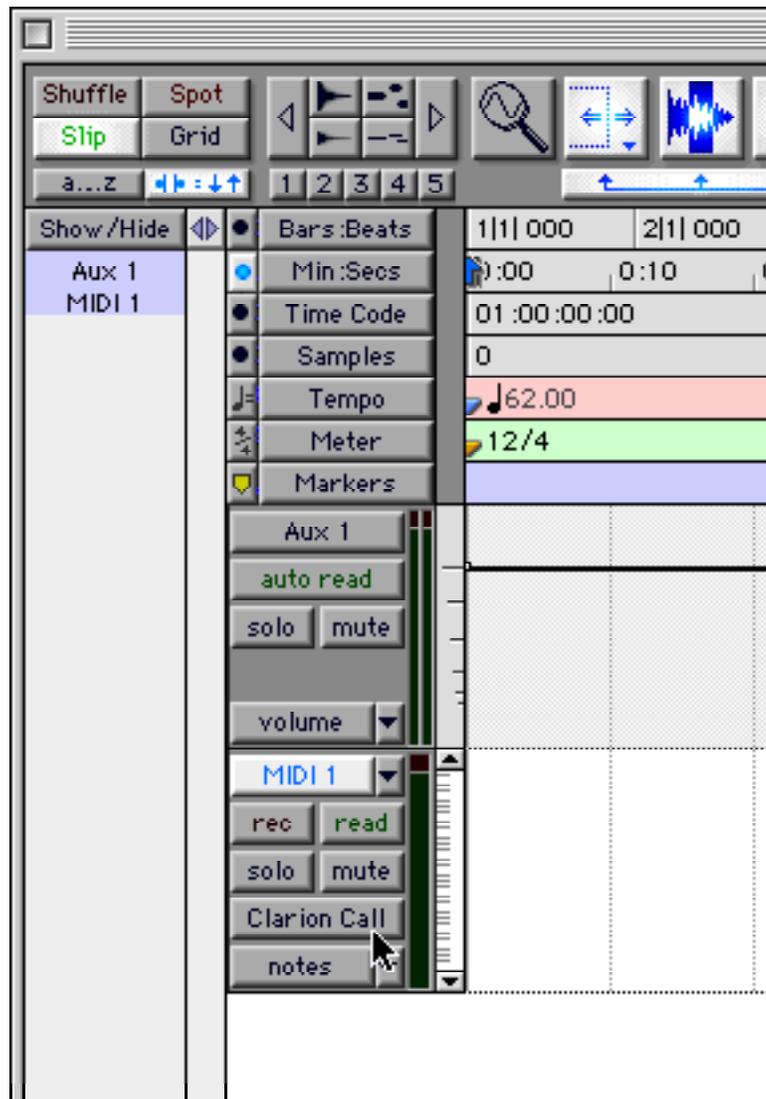
You should now see the DirectConnect window showing the Retro AS-1 logo.



Here, you can select which audio output from the Retro AS-1 you want to listen to on the specified ProTools audio track. You can listen to the main outputs, or individual MIDI channels. Once a MIDI channel is listened to individually, it is pulled out of the main output mix.

(no link selected)
Main S
Channel 1 S
Channel 2 S
Channel 3 S
Channel 4 S
Channel 5 S
Channel 6 S
Channel 7 S
Channel 8 S
Channel 9 S
Channel 10 S
Channel 11 S
Channel 12 S
Channel 13 S
Channel 14 S
Channel 15 S

Now, we can go to the main ProTools window and select which Retro AS-1 bank and program we want to use on the MIDI track.



You can select from all of the currently installed Retro AS-1 programs from a program select dialog.



Using with CakeWalk

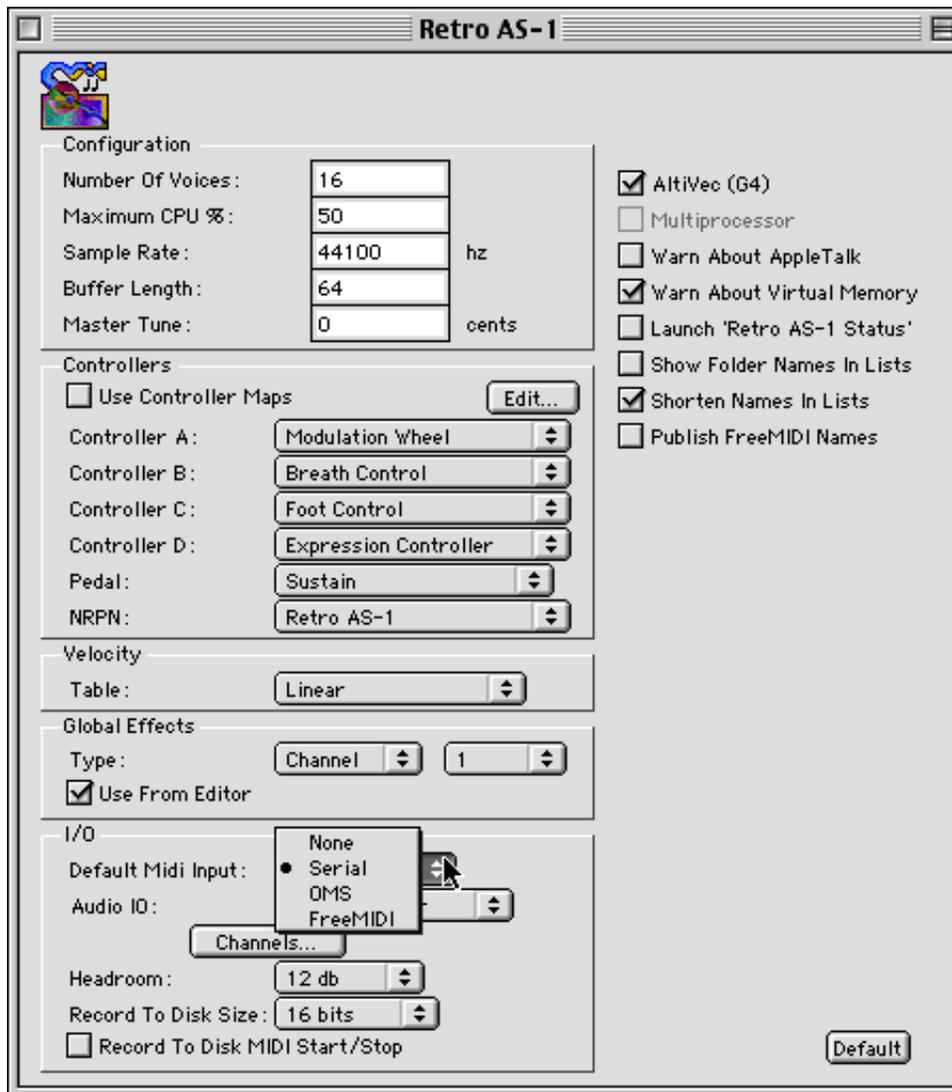
CakeWalk can use the installed Windows Multimedia MIDI driver to get access to the Retro AS-1. More information coming...

The Retro AS-1 need to be triggered by its MIDI input in order for it to output audio. There are several ways to get MIDI into the Retro AS-1, from the on-screen keyboards in the keyboard, editor, and MIDI processor applications, or from a 'live' MIDI connection from either the serial port, OMS, FreeMIDI, or Windows Multimedia. Here, we'll go through the 'live' MIDI connections.

Macintosh users will select the default MIDI input from the 'Retro AS-1' control panel. The default MIDI input is used if an application that does not require the OMS or FreeMIDI drivers (such as the Retro AS-1 editor, MIDI processor, and mixer) is launched. Windows users can use the 'Multimedia' control panel to select the Retro AS-1 as the default MIDI output device.

Selection

Changes to your default MIDI input are made with the 'Retro AS-1' control panel. Click on the default MIDI input menu in the I/O section of the control panel.



The default setting for the Macintosh is the serial port.

Serial Port

Macintosh owners with non-USB machines (that is, machines that have serial ports), have it a little bit easier to route real-time MIDI to the Retro AS-1. You don't need to configure OMS or FreeMIDI, you can talk to the serial port directly with the 'Retro AS-1 Serial Input' application.



This application is launched automatically in the background if MIDI input is needed when the engine is launched and you have specified 'Serial' as the default MIDI input in the 'Retro AS-1' control panel. This application hooks into the serial port directly to get MIDI and routes it to the Retro AS-1 synthesizer engine. The main window shows activity lights for each of the MIDI channels, as well as for MIDI Real-Time messages.

You have only two decisions to make. First, do you want to hook up to the modem or printer port, and second, do you want to use the fast mode of the MOTU MIDI TimePiece MIDI interface? Most people have a modem hooked up to the modem port, or a printer or AppleTalk network hooked up to the printer port. For the 'Retro AS-1 Serial Input', you should select whichever port you are not using.



Note that if you turn AppleTalk off, the port still will not be available until you reboot.

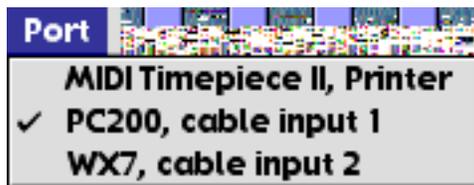
OMS

OMS can be used by the 'Retro AS-1 OMS Input' as a method of getting MIDI into the Retro AS-1. If you have a USB-based Macintosh, OMS is a good choice for you to get MIDI into your machine so you can use the Retro AS-1 editor, MIDI processor, or mixer.

To set the default MIDI input to OMS, use the 'Retro AS-1' control panel. Change the default MIDI input to OMS. Now, every time the editor, MIDI processor, or mixer is launched by itself (that is, without a sequencer running), the default MIDI input application 'Retro AS-1 OMS Input' is launched.



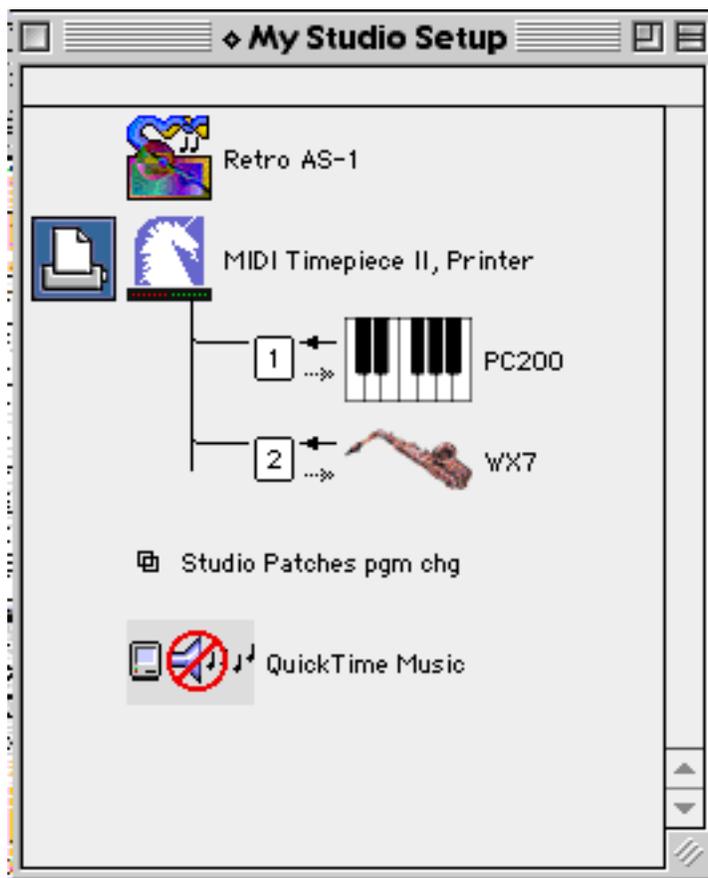
You can select which external MIDI controller to route to the Retro AS-1.



OMS Driver

The 'Retro AS-1 OMS Driver' is installed into the 'OMS Folder' in your System folder. Once your OMS setup has been updated with the 'OMS Setup' application, any OMS application will be able to route MIDI to the Retro AS-1, and query the OMS Name Manager for the currently installed Retro AS-1 bank and program names.

'Midi Cards & Interfaces' in the 'OMS Setup' application will rescan your studio and detect the installed 'Retro AS-1 OMS Driver'. When all is said and done, you should see the Retro AS-1 icon in your current studio document.



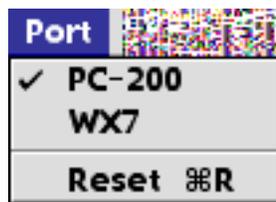
FreeMIDI

FreeMIDI can be used by the 'Retro AS-1 FreeMIDI Input' as a method of getting MIDI into the Retro AS-1. If you have a USB-based Macintosh, FreeMIDI is a good choice for you to get MIDI into your machine so you can use the Retro AS-1 editor, MIDI processor, or mixer.

To set the default MIDI input to FreeMIDI, use the 'Retro AS-1' control panel. Change the default MIDI input to FreeMIDI. Now, every time the editor, MIDI processor, or mixer is launched by itself (that is, without a sequencer running), the default MIDI input application 'Retro AS-1 FreeMIDI Input' is launched.



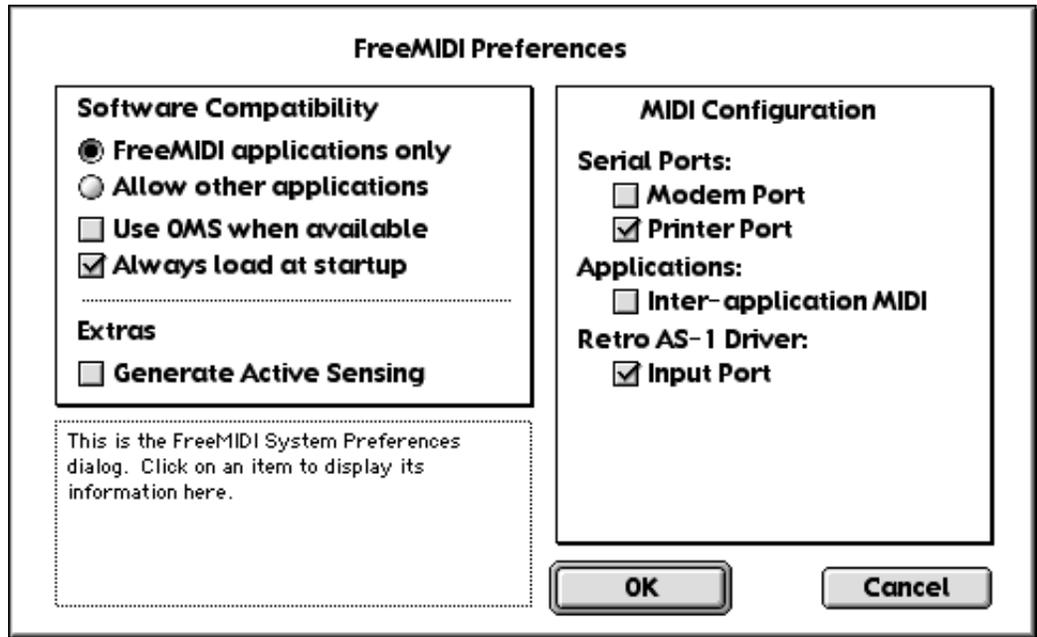
You can specify with MIDI device to listen to with the port menu.



FreeMIDI Driver

The 'Retro AS-1 FreeMIDI Driver' is installed into the 'FreeMIDI Folder' in your System folder. Once your FreeMIDI preferences have been updated with the 'FreeMIDI Setup' application, any FreeMIDI application such as Performer will be able to route MIDI to the Retro AS-1, and query for the currently installed Retro AS-1 bank and program names.

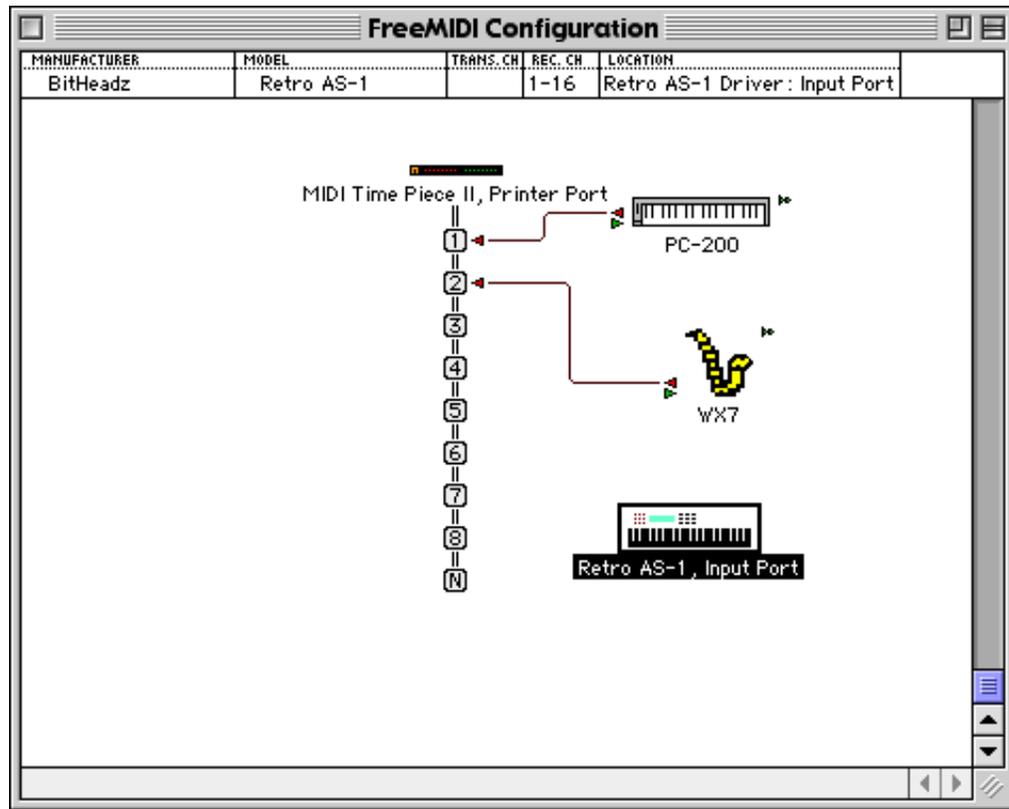
Run 'FreeMIDI Setup' and open up the preferences in the 'File' menu. Enable the Retro AS-1 Driver input port to make sure that FreeMIDI applications can send MIDI to the synthesizer.



Note that the 'Always load at startup' loads the Retro AS-1 engine at startup. You may not want this behaviour, since 'Retro AS-1' control panel changes will not take effect until you restart again.

You should now see the Retro AS-1 icon appear in the main configuration window¹.

1. it's supposed to be a Retro AS-1 icon, but there are some bugs in some versions of FreeMIDI.



Version 1.x owners of Retro AS-1 should make sure that the 'BitHeadz' folder in the 'Default Names' folder of the 'FreeMIDI Folder' should be removed. FreeMIDI no longer needs that default name document installed to get the name from the Retro AS-1.

Windows 95/98

In the Windows world, there is only one way to get MIDI in from an external MIDI controller to an application. You have no choice but to use the installed Retro AS-1 16-bit MIDI output device driver¹. That's the good news. The bad news is that you have to install a sound card and get all the audio and MIDI drivers to work. We all have the scars to prove it, also... Some of you smart eggs out there will skip all this silliness and buy a preconfigured PC with the sound card already installed and set up. Bravo!

1. who says Microsoft isn't a monopoly?

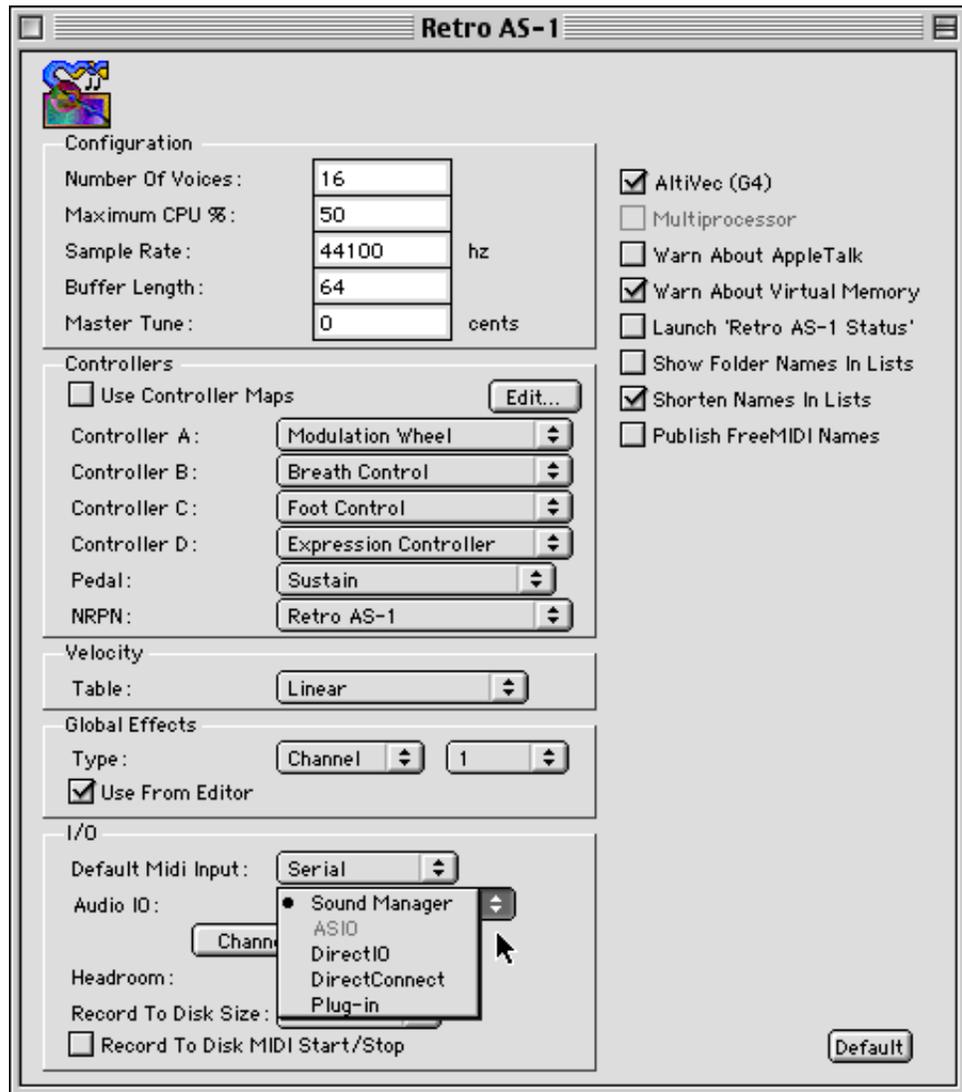
There are lots of ways to get audio out of the Retro AS-1. At the highest level, you can either listen to the Retro AS-1 live, or have it record it's output to a disk file¹. For the live audio output, you can talk to hardware directly via interfaces like DirectSound, Sound Manager, ASIO, or DirectIO, or you can talk to third party sequencers via interfaces such as ReWire, MAS 2.0, or DirectConnect. Got that clear? No worry, we'll straighten it out here.

Why the need for audio input? Isn't this Retro AS-1 thing a synthesizer? Don't synthesizers just have audio output? Normally, yes, but the Retro AS-1 also supports the ability to process live audio signals with its ring modulator, filters, and effects. You can even trigger MIDI notes from an external audio source² such as a microphone, a guitar, or another synthesizer.

-
1. wave file on a PC, AIFF on a Macintosh
 2. look ma', no MIDI!

Selection

The first thing to remember is that the 'Retro AS-1' control panel is your friend. Here, all the specifications for the audio input and output type are made. Click on the Audio IO menu in the bottom I/O section.



The types that are currently supported are enabled in the menu.

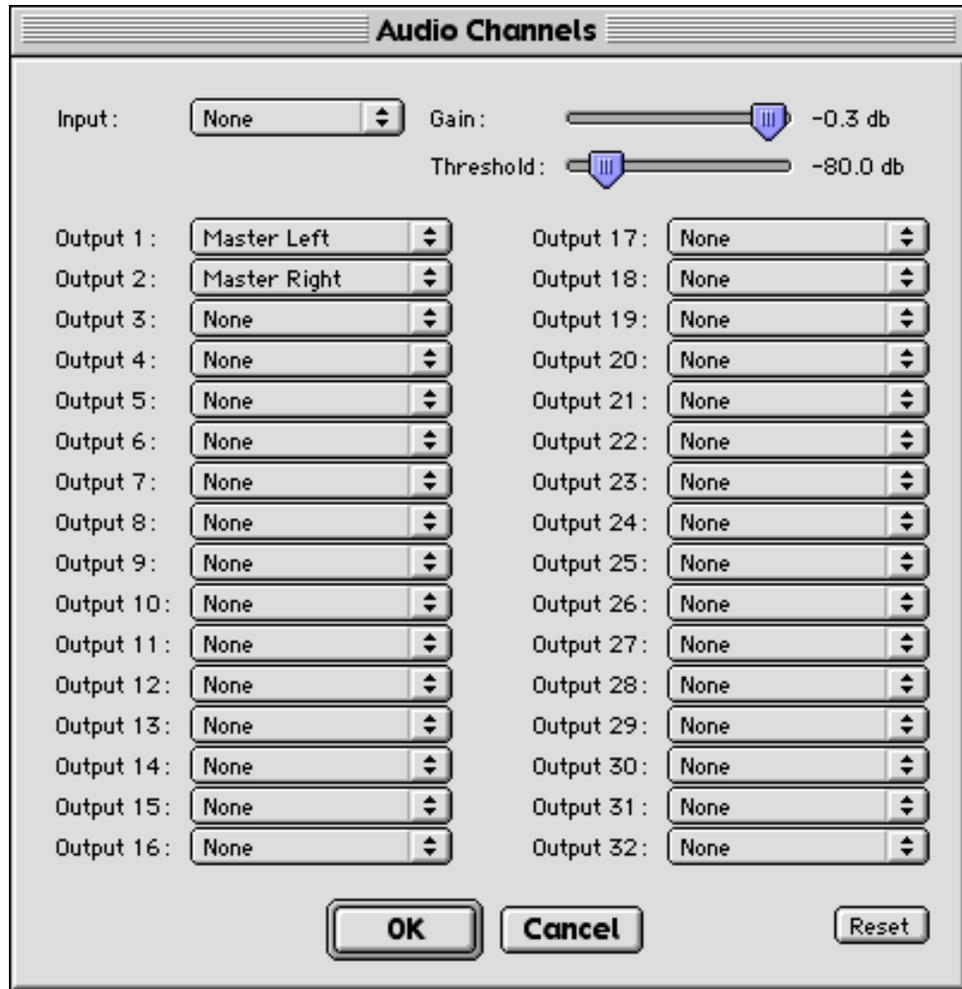
Channels

Some of the types also support a channel mapping dialog accessed via the 'Channels' button. This allows you to specify which audio input to listen to, and which outputs to output to. The Retro AS-1 can listen to a single audio input (the external audio that can be routed to the ring modulator, filters, and effects), but can output on up to thirty four outputs. Where does thirty four come from?

You're probably saying that thirty four is not a nice power of two, and we all know how those computer guys love powers of two. Thirty four is actually sixteen MIDI channels time two outputs a piece for left and right, and then two additional outputs for the main left and right. So for those who really want closure on this issue, yes, there are some powers of two in here:

$$34 = 2^{*4} * 2 + 2 \quad (\text{EQ 1})$$

You can select the audio input channel, the audio input threshold and gains, and the audio output mappings.



The input menu selects which audio input channel from hardware is to be used for the external audio input. If the input is none, some CPU savings happen.

The input gain is a scaling that is applied as the input is read from the hardware. The threshold is used only if the program has the voice activation type 'External Audio'¹.

1. see the chapter on 'Editing & Creating Sounds' for details.

- None
- Channel 1
- Channel 2
- Channel 3
- Channel 4
- Channel 5
- Channel 6
- Channel 7
- Channel 8
- Channel 9
- Channel 10
- Channel 11
- Channel 12
- Channel 13
- Channel 14
- Channel 15
- Channel 16
- Channel 17
- Channel 18
- Channel 19
- Channel 20
- Channel 21
- Channel 22
- Channel 23
- Channel 24
- Channel 25
- Channel 26
- Channel 27
- Channel 28
- Channel 29
- Channel 30
- Channel 31
- Channel 32

The output menus select which of the Retro AS-1 output is to be routed to which physical hardware output.

- None
- Master Left
- Master Right
- Channel 1 Left
- Channel 1 Right
- Channel 2 Left
- Channel 2 Right
- Channel 3 Left
- Channel 3 Right
- Channel 4 Left
- Channel 4 Right
- Channel 5 Left
- Channel 5 Right
- Channel 6 Left
- Channel 6 Right
- Channel 7 Left
- Channel 7 Right
- Channel 8 Left
- Channel 8 Right
- Channel 9 Left
- Channel 9 Right
- Channel 10 Left
- Channel 10 Right
- Channel 11 Left
- Channel 11 Right
- Channel 12 Left
- Channel 12 Right
- Channel 13 Left
- Channel 13 Right
- Channel 14 Left
- Channel 14 Right
- Channel 15 Left
- Channel 15 Right
- Channel 16 Left
- Channel 16 Right

Sound Manager

The Sound Manager support is pretty simple. You can listen to either the left or right channel for audio input, and the audio output is always the main stereo output from the synthesizer. Make sure that you set the output sample rate to 44.1 khz or higher for the best performance with the 'Sound', or 'Monitors & Sound' control panel.

You can also specify which Sound Manager driver you want to use with the 'Sound' or 'Monitors & Sound' control panel. The default is 'Built-in', using the included hardware with your Macintosh, but you can use custom Sound Manager drivers to route all of your Sound Manager output to third party cards.

DirectSound

You can select which DirectSound output to use in the 'Retro AS-1' control panel. Beyond this, there is nothing else to select.

ASIO

Most professional sound cards support ASIO as an interface standard to communicate between applications and the hardware. When ASIO is selected in the 'Retro AS-1' control panel, the Retro AS-1 engine uses the specified ASIO driver for all audio input and output.

Note that ASIO 1.x drivers could only support a single client, that is, only one application can talk to the hardware at a time. Therefore, if you tried to use ASIO output from the Retro AS-1 the same time that Cubase was using the same piece of audio hardware, there would be a conflict. The solution to this problem is to use ReWire as a better method of getting audio out of the Retro AS-1 and into Cubase. If you are using the Retro AS-1 without any other application requiring the sound card, then ASIO is a good choice.



Remember, the control panel looks for a folder called 'Retro AS-1 ASIO Drivers' in the Extensions folder to find its ASIO drivers. Make sure you have the latest ASIO driver for your hardware!

There is a special case for the MOTU 2408 ASIO driver. This driver is happy only when it lives in a folder called 'ASIO Drivers'. Create a folder called 'ASIO Drivers' in your Extensions folder. Put the 2408 ASIO driver (called the 'ASIO PCI-324' driver) inside of this folder. Now create an alias to this folder you just created, name it 'Retro AS-1 ASIO Drivers', and place it in the Extensions folder. Now the Retro AS-1 can find the 2408 ASIO driver correctly.

Notice that not all devices will respond to the ASIO control panel button. Not all drivers support this message¹.

1. in fact, some drivers have this nice 'feature' where they crash when they receive the control panel message.

DirectIO

When DirectIO is specified in the audio io type menu, Digidesign cards such as ProTools hardware or AudioMedia IIIs can be output to directly from the Retro AS-1.

Note that DirectIO can only support a single client, that is, only one application can talk to the hardware at the same time. Therefore, if you tried to use DirectIO output from the Retro AS-1 the same time that ProTools was using the ProTools hardware, there would be a problem. The work-around is to use DirectConnect if possible. In this way, the audio output from the Retro AS-1 is routed to the input of an audio track in ProTools.

The setup button is used to specify which DirectIO compatible device to talk to.

ReWire

ReWire allows the 32-bit floating point digital output from the Retro AS-1 to go directly into a third party sequencer that supports ReWire. Currently, Cubase VST, Logic, and Studio Vision 4.5 support ReWire. Once the audio output from the synthesizer is brought into the sequencer, it can be processed like any other audio track. You can apply VST effects, record the audio, and automate the mixdown.

MAS 2.0

Similar to ReWire, MAS 2.0 supported with Digital Performer 2.6 and later allows the 32-bit floating point digital output from the Retro AS-1 to go directly into Digital Performer. Once the audio output from the synthesizer is brought into Digital Performer, you can apply MAS 2.0 effects, or even record the audio of the track to disk.

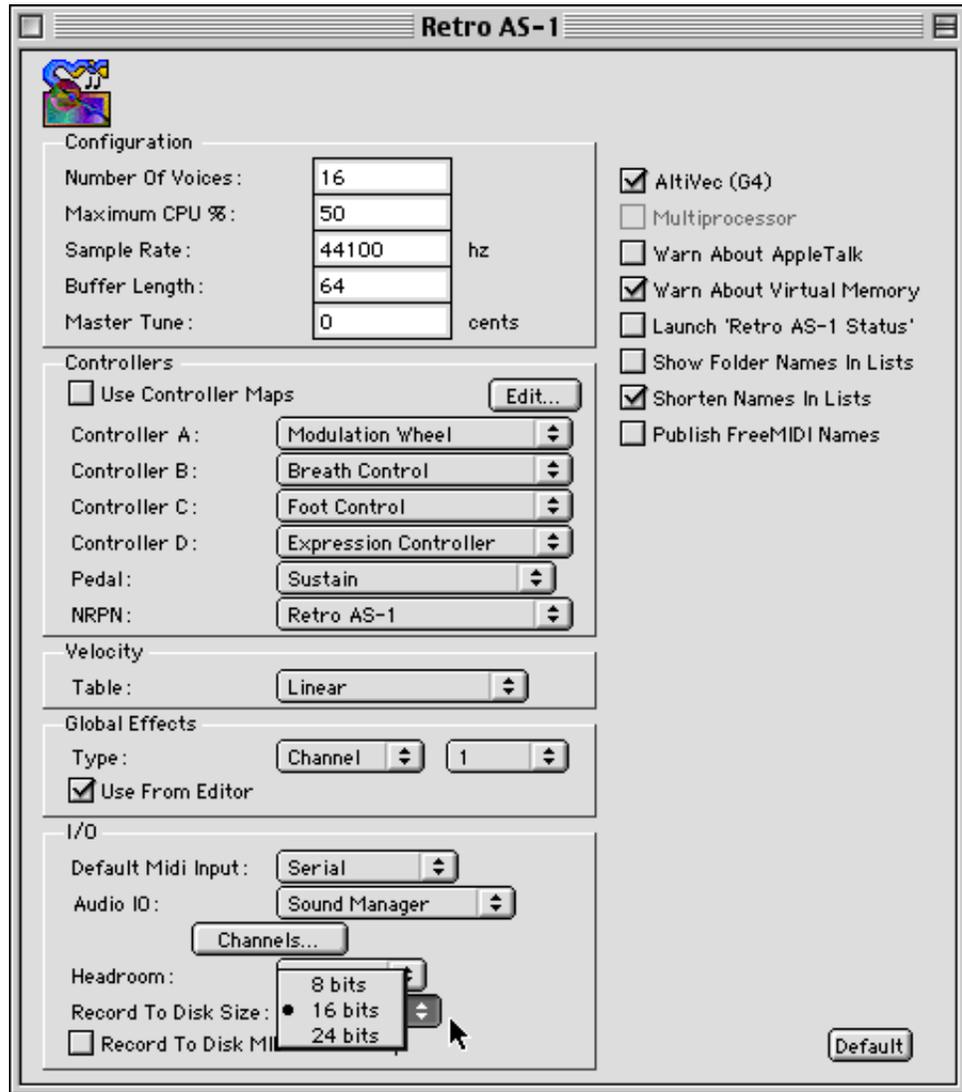
DirectConnect

DirectConnect released with ProTools 5 allows the 32-bit floating point digital output from the Retro AS-1 to go directly into ProTools¹. Once the audio output from the synthesizer is brought into ProTools, you can use your TDM effects to process the signal.

Record To Disk

The audio output of the Retro AS-1 can also always be written to a disk file. This means can play live or from your sequencer and have the entire output from the Retro AS-1 be recorded. From the control panel, the recording process can be started either immediately after the file name is specified, or upon a MIDI start message. You can also specify whether the audio is saved as 8, 16, or 24 bit data.

1. currently not support with the Digi 001 systems.



To specify the record to disk file name, the keyboard, mixer, MIDI processor, and editor all have menu items to start and stop the record to disk process. When the 'Start Record To Disk' is selected, you can specify the file to be created.

On the Macintosh, you can also start the record to disk process with the control strip modules. The module with the "R" in it is used to start and stop the record disk process if the Retro AS-1 engine is already running.



Integration with a sequencer consists of two mechanisms. First, MIDI must be output from the sequencer and input to the Retro AS-1. This is normally done via drivers such as the OMS or FreeMIDI driver on the Macintosh, or the Windows Multimedia driver on the PC. Second, the audio output can optionally be routed back from the Retro AS-1 as a 32 bit audio input channel to the sequencer with technologies such as ReWire, MAS 2.0, and DirectConnect. In doing this, the Retro AS-1 does not communicate with the sound output hardware directly, but instead passes the audio to the sequencer. This allows you to process the synthesizer output in your sequencer with effects plug-ins supported in VST, MAS 2.0, or TDM.

Cubase

Cubase Macintosh users will use OMS to get MIDI from Cubase into the Retro AS-1. On both the PC and Macintosh, when the Retro AS-1 is configured for 'Plug-in' audio io, the 'Retro AS-1 ReWire' plug-in can be used to route the audio out of the synthesizer and into VST.

A simple example to set up the Retro AS-1 in Cubase is:

1. Place the 'Retro AS-1 ReWire' extension in your Extensions folder.
2. Open the 'Retro AS-1' control panel and specify 'Plug-in' for the audio io type.
3. Close the 'Retro AS-1' control panel.
4. Launch Cubase, creating a new document.
5. Open up the 'ReWire' dialog in Cubase.
6. Enable the Retro AS-1 outputs that you want to listen to. For example, enable Main L and Main R for now. You will see one new stereo audio channel created in the Cubase mixer.
7. Select the Retro AS-1 in a MIDI track as the track output.
8. Select a Retro AS-1 sound from the bank and program popup menus in Cubase.
9. Record enable a track for play through in Cubase.
10. Now, when you play on your external MIDI controller, you should hear the Retro AS-1 via ReWire out your ASIO sound card.

Logic

Logic can send MIDI directly to the Retro AS-1. OMS is not required. You need to use the included Logic environment.

1. Place the 'Retro AS-1 ReWire' extension in your Extensions folder.
2. Open the 'Retro AS-1' control panel and specify 'Plug-in' for the audio io type.
3. Close the 'Retro AS-1' control panel.
4. Launch Logic, creating a new document.
5. Add the Retro AS-1 Logic environment to your document.
6. Open up the 'ReWire' dialog in Logic.
7. Enable the Retro AS-1 outputs that you want to listen to.
8. Select the Retro AS-1 in a MIDI track as the track output.
9. Record enable a track for play through in Logic.
10. Now, when you play on your external MIDI controller, you will hear the Retro AS-1 via ReWire.

Performer

Performer uses the FreeMIDI driver installed with the Retro AS-1. This routes MIDI from Performer to the synthesizer. Optionally, you can also use the 'Retro AS-1 MAS Plug-in' to route the audio output from the Retro AS-1 back into Digital Performer as an audio track¹.

1. Place the 'Retro AS-1 MAS Plug-in' in the 'Plug-ins' folder in the 'MOTU' folder in the 'Extensions' folder.
2. Open the 'Retro AS-1' control panel and specify 'Plug-in' for the audio io type.
3. Close the 'Retro AS-1' control panel.
4. Launch Digital Performer, creating a new document.
5. Select the Retro AS-1 as the output device for a MIDI track.
6. Select a program to play from the patch column of the Retro AS-1 MIDI track.
7. Record enable the Retro AS-1 MIDI track.
8. Select MIDI Through from Options menu and make sure that patch through is enabled.
9. Create a stereo aux track to listen to the output of the Retro AS-1.
10. Select the Retro AS-1 as the input for the stereo aux track. Select the Main L/R from the Retro AS-1 to get the complete mix.
11. Now, when you play on your external MIDI controller, you will hear the Retro AS-1 via MAS.

ProTools

ProTools 5 supports both OMS for MIDI input to the Retro AS-1 and DirectConnect for audio output.

1. Open the 'Retro AS-1' control panel and specify 'DirectConnect' for the audio io type.
2. Close the 'Retro AS-1' control panel.
3. Launch ProTools, creating a new document.
4. Select the Retro AS-1 as the output device for a MIDI track.
5. Select a program to play from the program dialog for the Retro AS-1 MIDI track.
6. Record enable the Retro AS-1 MIDI track.
7. Enable patch through from the MIDI menu.
8. Create an aux stereo audio track.
9. Select the Retro AS-1 as the input for the audio track from the plug-ins pop-up menu.
10. In the DirectConnect window with the Retro AS-1 graphic, select the Main L/R from the Retro AS-1 as the output to listen to on the current audio track.
11. Now, when you play on your external MIDI controller, you will hear the Retro AS-1 via DirectConnect.

CakeWalk

CakeWalk uses the Windows multimedia driver to get MIDI into the Retro AS-1

1. Launch CakeWalk, creating a new document.
2. Select the Retro AS-1 as the MIDI device for a MIDI track.
3. Select the program of the Retro AS-1 to play by clicking on the program column and getting the program change dialog.

-
1. Note that Digital Performer is required to use MAS, not Performer.

4. Record enable the track.
5. Specify MIDI play through.
6. Now, when you play on your external MIDI controller, you will hear the Retro AS-1 out the output specified in the Retro AS-1 control panel, either DirectSound, or ASIO.

There are a couple of different ways for using Retro live. With the ‘Retro AS-1 MIDI Processor’, you can save multiple setups consisting of programs, splits, layers, and arpeggiator settings for easy recall. You can then easily step through setups live and have everything recalled instantly.

The other application you can use is the ‘Retro AS-1 Mixer’. Documents here represent the complete sixteen MIDI channel bank, program, fx, pan, and volume assignments, as well as the global effects and master volumes. Documents can be saved and recalled quickly, and you can select different MIDI channels to transmit on from your controller for live performance.

MIDI Processor

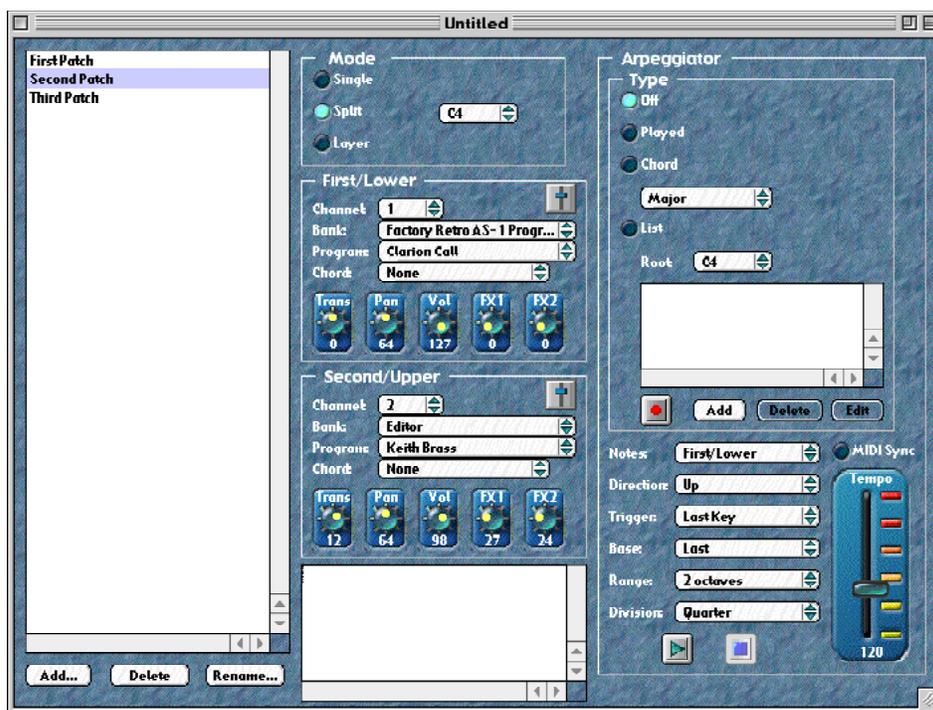
When the MIDI processor is launched, it automatically launches the default MIDI input as specified in the control panel.

A setup in the MIDI processor consists of:

- mode: single, split, or layer
- split mode note
- first/lower region: channel, bank, program, chord, transpose, pan, volume, fx1, fx2
- second/upper region: channel, bank, program, chord, transpose, pan, volume, fx1, fx2
- arpeggiator: type: off, played, chord, list, chord type, list root note, list notes, notes to arpeggiate, direction, trigger, base, range, and division

Multiple setups can be saved in a single MIDI processor document. They can be selected by either clicking on the list with the mouse, or via MIDI program change. To enable the MIDI program change selection, use the Preferences dialog to select 'MIDI Program Change Selects Setup'.

In this example below, there are three setups in this document, the second one 'Second Patch' is currently selected. This setup is a split with 'Clarion Call' in the bottom half of the keyboard below C4, and 'Keith Brass' in the top half.



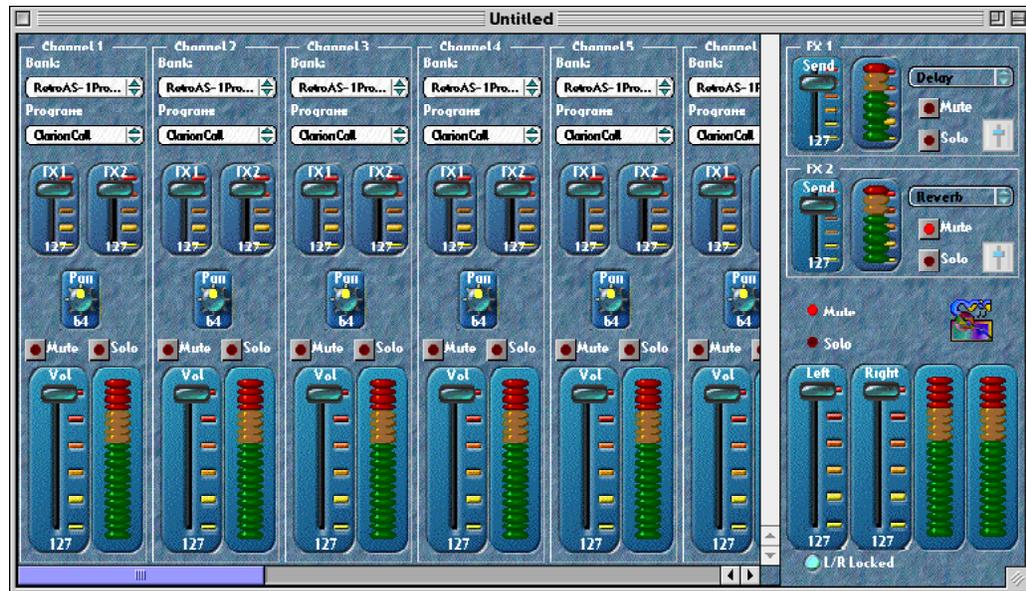
You can use the arpeggiator to arpeggiate the notes that are currently being played, the notes in a specified chord, or the notes specified in the list. The arpeggiator is triggered as specified in the trigger menu, or can be triggered manually with the play icon at the bottom of the arpeggiator section.

The arpeggiator tempo can be synchronized to MIDI clock.

Mixer

Mixer documents can be saved that represent a snap-shot of everything being played in the synthesizer at that moment. The parameters saved are:

1. channels: bank, program fx1, fx2, pan, volume, mute, solo
2. global effect 1: type and parameters, send, mute, solo
3. global effect 2: type and parameters, send, mute, solo
4. master volume left and right



When you open up the mixer without a document, the preferences you have set specify whether the mixer window parameters are read from the synthesizer, or reset to default values. When you open the mixer with a document, all the parameters from the document are sent down to the synthesizer.

If your external MIDI controller can easily switch between different MIDI channels, you can load up the different patches you want to play, and then just cycle between the different MIDI channels on your controller to play the different sounds.

Editing and Creating Sounds

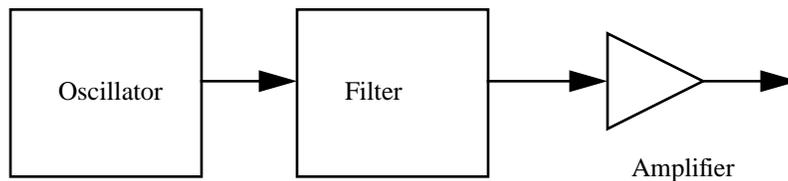
The Retro AS-1 comes with over 1000 factory sounds, but it also comes with the ‘Retro AS-1 Editor’ to tweak those sounds, or create new ones. You don’t have to be too familiar with analog synthesizers to edit the existing sounds, but those of you synth-heads from way back will immediately understand and appreciate the depth and power of the Retro AS-1 synthesis engine.

In the beginning, there were oscillators, and they were good...

Synthesis 101

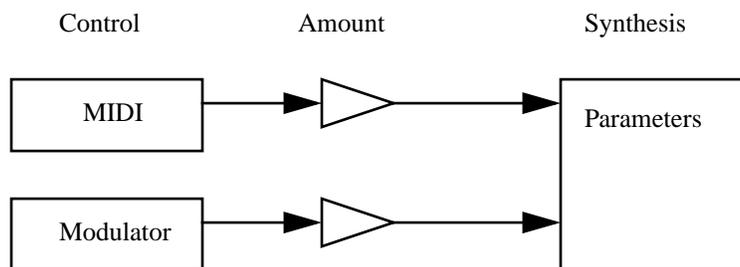
...and on the second day, He created filters, which sounded pretty cool. By this time, the concept of patch cords had evolved as a way to interconnect all these little oscillators. Now, all hell broke loose with globs of envelopes, LFOs, and ring modulators - everyone was confused. Enter the Retro AS-1 - you get the power of oscillators, filters, ring modulators, and modulators, but you also have an easy way to interconnect them.

Subtractive synthesis is another term for analog synthesis, meaning start with waveforms of high-frequency content, and subtract out some harmonics with a filter. Those in the know will understand this as:



The Retro AS-1 supports analog or subtractive synthesis, as well as other types like FM synthesis, with a lot of wrinkles thrown in. There are three oscillators and two filters in the Retro AS-1 which can be arranged in various configurations. The filters can be in parallel or series, or you can route the output of a filter to the frequency input of an oscillator.

Another feature of the Retro AS-1 borrows from the patch-cord behemoths of old in that variable numbers of routings and modulators are supported. What this means is that you can have as many envelopes or LFOs as you want¹. You can also have variable numbers of modulation routings per voice - you could have the modulation wheel control eight different parameters in a voice.



Routing or control sources in the Retro AS-1 include:

- Note
- Velocity
- Release Velocity
- Aftertouch (mono and poly)

1. within reason. There is a limit of 24 modulators per voice.

- Controller A, B, C, D (as assigned in the 'Retro AS-1' control panel)
- External audio amplitude
- Modulators

Routing destinations or synthesis parameters that can be controlled include:

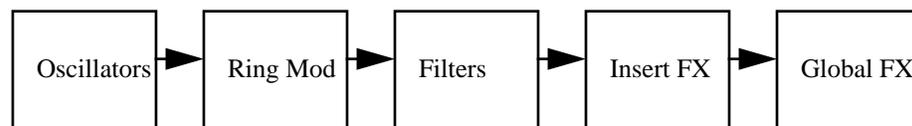
- Oscillator Pitch
- Oscillator Random
- Oscillator Symmetry
- Oscillator FM Amount
- Oscillator Pan
- Oscillator Volume
- Filter Cutoff
- Filter Spread
- Filter Cutoff Modulation Amount
- Filter Resonance
- Filter Overdrive
- Routing amounts
- Modulator parameters
- Global effect sends

Therein lies the power of the Retro AS-1. You have lots of power at your fingertips, but without the hassle of dealing with patch cords.

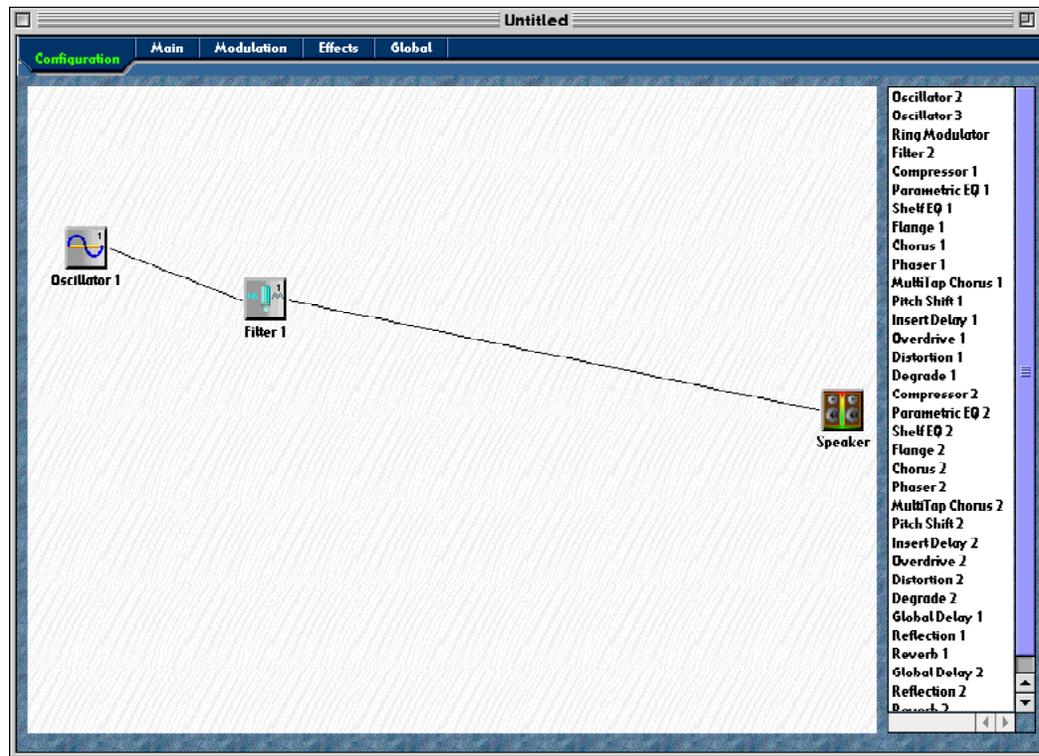
Configuration Page

The configuration page gives you an overview of the algorithm that the program is using. You can turn processing modules on by double-clicking in the right list of available modules, or via drag and drop onto the configuration display. Modules can be deleted by selecting them and pressing the delete key.

Audio paths are added by clicking on a module in the configuration display and dragging to a different module. Audio paths can be deleted by selecting the line and pressing the delete key. Not all audio paths are possible. The general signal flow is from oscillators to the ring modulator, to the filters, to the insert effects, and to the global effects. The major exceptions are features like sync and FM which can occur freely between oscillators and filters.



Remember, you can have only two insert effects and two global effects active at any time.



Double-clicking on a module in the configuration display will jump to the page for editing that module.

Main Page

The main page is where you edit the oscillators, ring modulator, and filters. Each of these modules can be turned on and off independently.

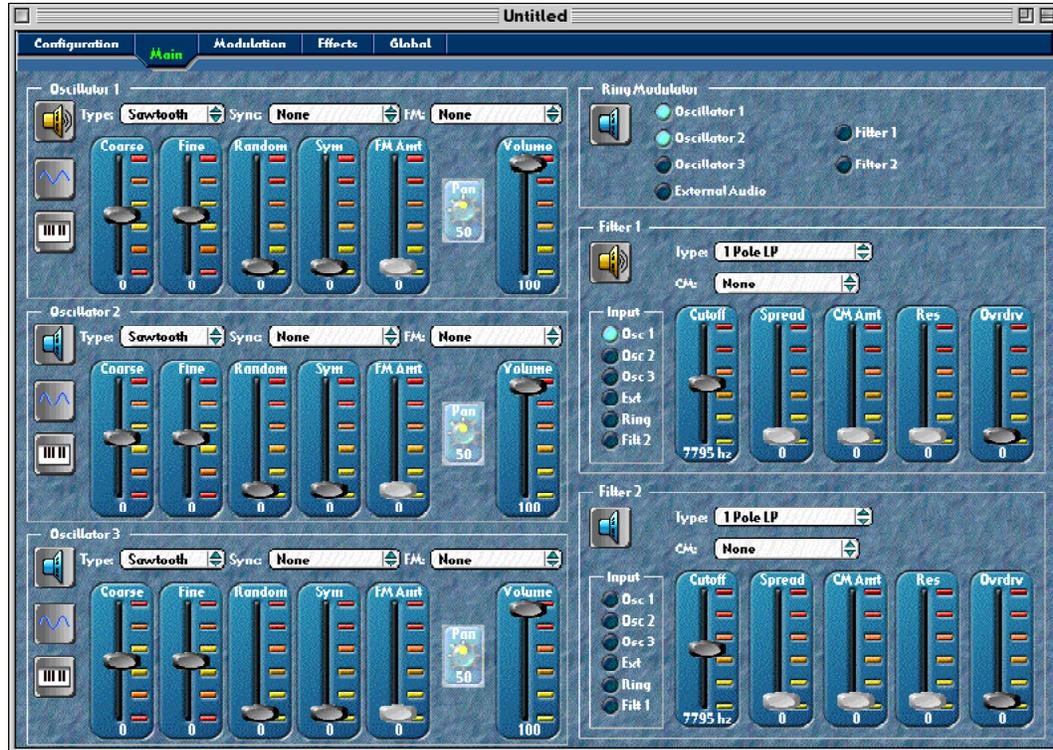
The oscillators have fifteen different waveforms to choose from. The oscillators can be mono or stereo, or have keyboard tracking on or off. Note that the pan knob is disabled if the oscillator is mono. Oscillators can be randomly tuned just like the synthesizers of old¹. Oscillators can be routed to the ring modulator, filters, or other oscillators as sync or FM sources.

Oscillator types:

- Sawtooth
- Triangle
- Pulse
- Sine variations (normal, square root, squared, warp 1, warp 2, asymmetrical)
- Glottal
- Noise (red, pink, and white)

1. way back then, this was considered a bug. Now, we're considering it a feature!

The ring modulator is used for clangorous, metallic effects by multiplying in the input signals together. Unlike the analog synthesizers of old, you can ring modulate multiple sources together at once. You can also ring modulate with the external audio as a source. The output of the ring modulator can be routed to the filters, or back to the oscillators as a sync or FM source.



The filters are used to attenuate harmonics present in the filter input. Thirteen filter types are supported: lowpass, highpass, bandpass, bandstop, and allpass types, as well as some non-linear versions. The spread control specifies the spread of the filter poles¹ for some interesting effects. Filter CM refers to cutoff modulation, where the Retro AS-1 can modulate the cutoff frequency of the filter with an audio source. This creates effects similar to FM with two oscillators. Finally, the filter input can be overdriven with the overdrive parameter for those growly, distorted filter sounds we all love.

Filter types:

- 1 pole lowpass
- 2 pole lowpass
- 4 pole lowpass with resonance
- 1 pole highpass
- 2 pole highpass
- 4 pole highpass with resonance
- 1 pole allpass with resonance
- 2 pole allpass with resonance

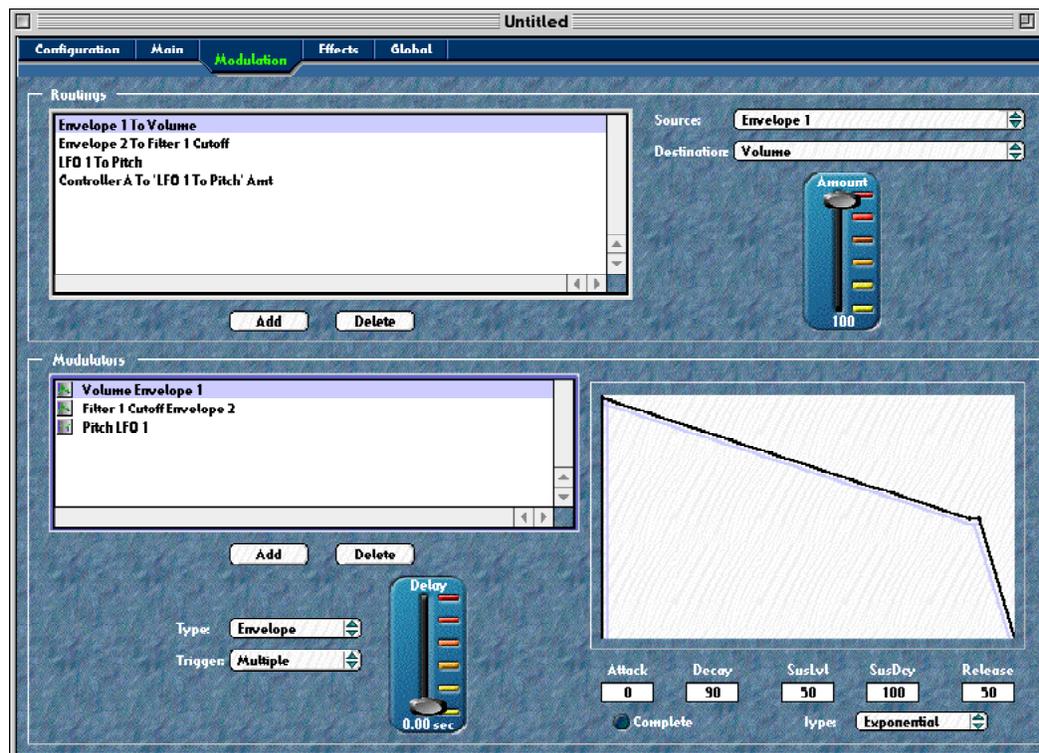
1. don't panic, this is a mumbo-jumbo DSP term meaning the rolloff of the filter.

- 4 pole allpass with resonance
- state variable lowpass (2 pole)
- state variable bandpass (2 pole)
- state variable bandstop (2 pole)
- state variable highpass (2 pole)
- slope
- threshold
- comb

Modulation Page

Whereas the main page deals with all of the audio stuff, the modulation page deals with all the control of the synthesis parameters in real-time. There are two lists. The top list is for the routings, which specify a routing source, a routing destination, and a routing amount. As discussed earlier, routing sources mostly come either from MIDI, or from user-defined modulators. Routing destinations are the parameters that we want to control in real-time. The routing amount specifies how much change on the source will affect the destination. An amount of zero is no change. Notice that routing amounts can be either positive or negative.

The bottom list is for the modulators. There are four types of modulators: envelopes, LFOs, random generators, and ramps. Each modulator has a trigger type and a delay, but beyond that, all of the modulators have different parameters. When you click on a modulator in the modulator list, it's editor is brought up in the lower right of the modulation page.



Note that you can change the display of the envelope editor from graphical (as displayed above) to sliders with the preferences. Open the editor preferences, go to the program page, and uncheck graphical in the envelopes section.

Notice that the names of the routings and modulators change in the lists as they are used. Modulation routings can get complicated pretty quickly if you have a modulator control the parameter of another modulator and so on.

Effects Page

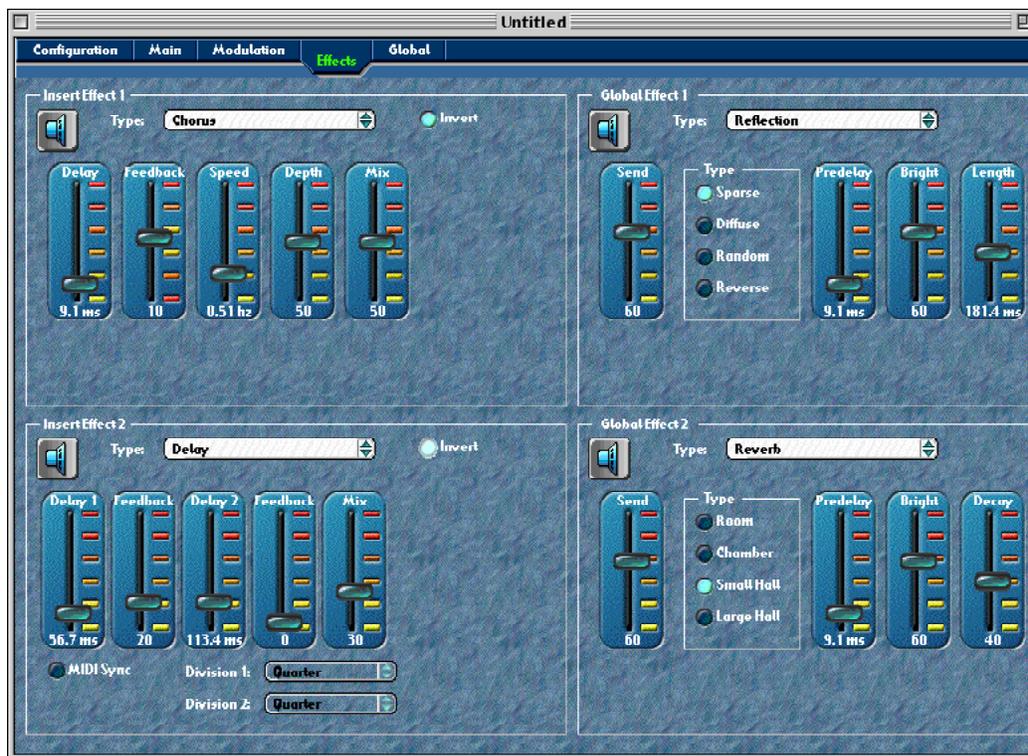
The Retro AS-1 has two insert effects per MIDI channel, and two global effects for the entire sixteen channel mix. There are twelve insert effect types and three global effect types.

Insert effects:

- Compressor
- Parametric EQ
- Shelf EQ
- Flange
- Chorus
- Phaser
- MultiTap Chorus
- Pitch Shift
- Delay
- Overdrive
- Distortion
- Degrade

Global effects:

- Global delay
- Reflection
- Reverb



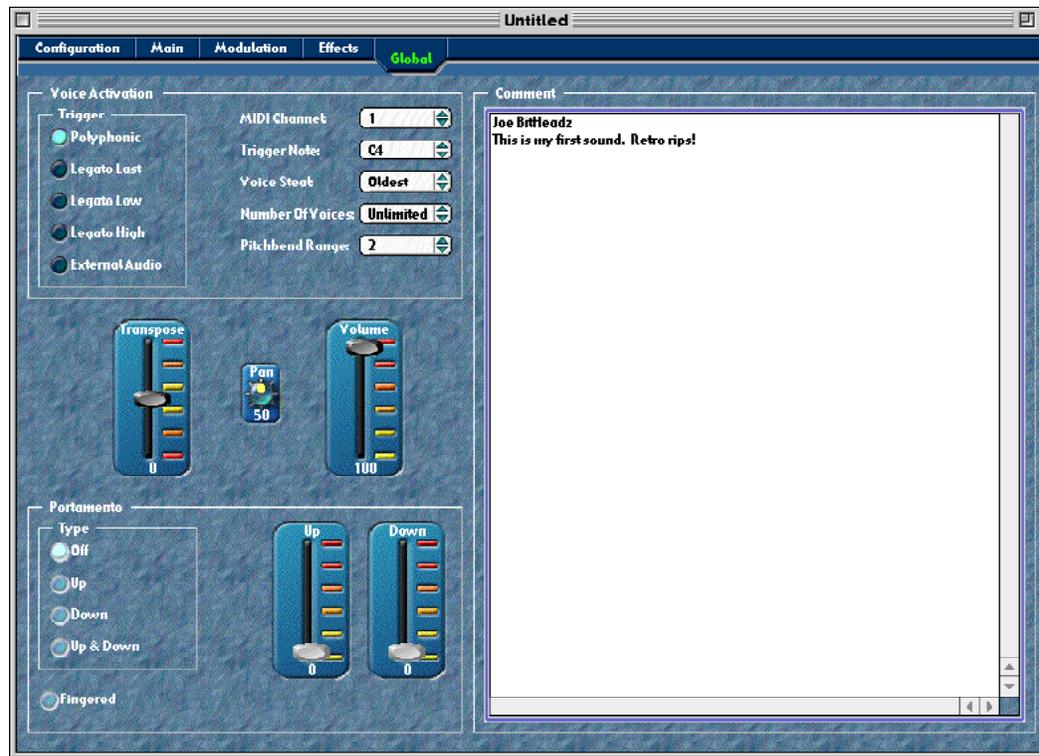
Each of the insert effects and global effects can be turned on and off independently

Globals Page

The globals page are where voice trigger modes, pitch bend ranges, and overall volumes and pans for the program are set. There are a couple of different types of portamento you can choose from. You can also remember a comment for every single file.

Voice trigger types:

- polyphonic
- legato last note
- legato low note
- legato high note
- external audio trigger



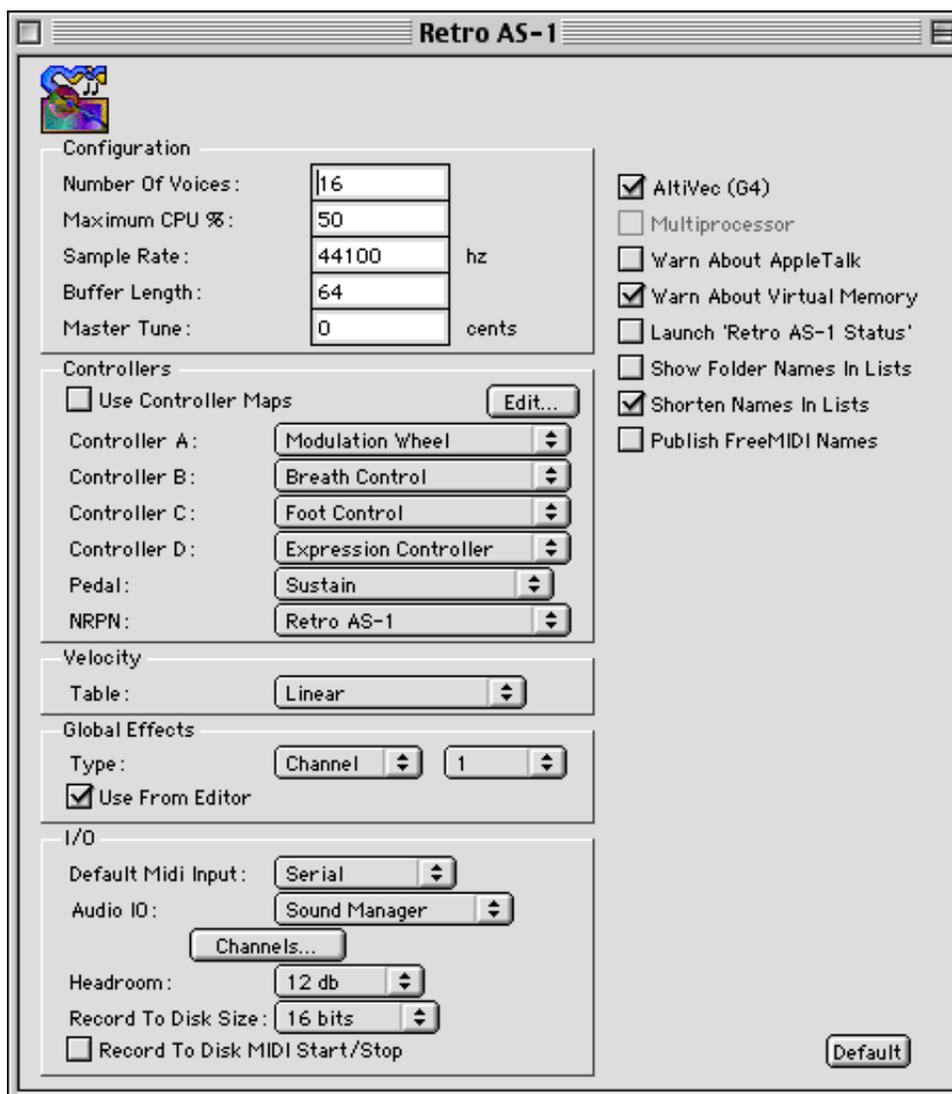
Note that the portamento parameters are available only if you are in legato or external audio mode for the voice triggering.

The details of the software components of the Retro AS-1 are listed here.

Control Panel

The control panel is where the settings for the Retro AS-1 synthesizer engine are made. Here you select the basic configuration, controllers to use, global effects usage, as well as the audio and MIDI inputs and outputs. Note that for changes in the control panel to take effect, the Retro AS-1 engine must be restarted. You will have to quit all currently running applications that are using the engine, like the Retro AS-1 keyboard, mixer, editor, or MIDI processor, as well as any sequencer that is using OMS or FreeMIDI.

Main



Number of voices

Control Panel

Specifies the maximum number of voices the engine will support. The number of voices may need to be limited on some systems if the voices require too much processing power, or if there is not much CPU power left for the Retro AS-1.

Maximum CPU %

Sets the maximum CPU percentage that the Retro AS-1 can use. Use this to allow processing for other applications in your system, such as sequencers.

Sample Rate

Specify the sample rate that the Retro AS-1 engine will run at. This should match that for your sound output hardware. On slower, older machines, you may want to experiment with this parameter to get better performance.

Buffer Length

Controls the length of the internal buffer size that is used for processing. Smaller values will yield better sound quality at the expense of more processing required. Larger values will give better CPU performance, but in some cases, fidelity may be compromised. On slower, older machines, you may want to experiment with this parameter to get better performance.

Master Tune

Tune the entire synthesizer in cents.

Use Controller Maps

Map incoming MIDI controller messages. This changes the incoming controller number to a different controller number. When enabled, you can specify the maps being used with the Edit button next to this checkbox.

Edit Controller Maps

Edit the controller maps. This brings up a dialog to specify up to eight controller maps. See below.

Controller A, B, C, D

Set which controller numbers are interpreted in the Retro AS-1 engine as controllers A, B, C, and D. The default is A is modulation wheel, B is breath control, C is foot control, and D is the expression controller. Controllers A, B, C, and D are the easiest way to change the sounds in real time under MIDI control.

Pedal

Set which MIDI pedal controller number is to be used for modulator triggering. The default is the sustain pedal.

NRPN

The Retro AS-1 can support NRPNs (non-registered parameter numbers) in two different ways, either the native way that provides access to all of the internal Retro AS-1 parameters, or the way that the Phat.Boy MIDI controller in mode 1 or 2 supports.

Although NRPNs are a very powerful way of changing the sound parameters in real-time via MIDI, they are very complicated. Often, there is an easier way of changing parameters - you might want to try using controllers 70 - 79 for fixed modulation routings. See the MIDI Implementation chapter.

Velocity Table

Specify the velocity table to be used for MIDI input into the engine. Experiment with what works best for your controller.

Global Effects Type

There are three different ways to use the global effects:

- Off
- Fixed
- Channel

Off means that the global effects are disabled. Fixed means that the global effects are remembered in the Retro AS-1 preference file and can be edited from the 'Retro AS-1 Mixer' application. Channel means that whatever sound is loaded on the specified global effects channel is used for the global effects.

Global Effects Channel

When the global effects type is selected, you can select which MIDI channel to use the program from for the global effects.

Use From Editor

When enabled, this means that whatever sound is currently being edited with the 'Retro AS-1 Editor' is to be used for the global effects.

Default MIDI Input

Four choices:

- Off
- Serial
- OMS
- FreeMIDI

This specifies which MIDI input utility to launch when an application such as the Retro AS-1 keyboard, mixer, editor, or MIDI processor is launched. You can specify either 'Retro AS-1 Serial Input', 'Retro AS-1 OMS Input', 'Retro AS-1 FreeMIDI Input', or none at all. Note that when the OMS or FreeMIDI driver causes the engine to launch, the default MIDI input specified is not used.

Audio IO

Specify where the audio input comes from and where the audio output from the Retro AS-1 goes to. Possibilities include:

- Sound Manager

Control Panel

- ASIO
- DirectIO
- DirectConnect
- Plug-in

Sound Manager is the default setting. The output from the Retro AS-1 will come out of the built-in hardware on your Macintosh. ASIO is to select an ASIO driver from the 'Retro AS-1 ASIO Drivers' folder in your Extensions folder. DirectIO is for direct communication with Digidesign hardware. DirectConnect is for ProTools 5 support. Plug-in is for either ReWire or MAS 2.0 support.

I/O Channels

Edit the input and output channel mappings. See below.

Setup

For some of the audio IO types, the setup button appears. For ASIO, the ASIO driver selection dialog is brought up. For DirectIO, the Digidesign hardware setup dialog is opened.

Headroom

Specify the amount of headroom in the main output from the Retro AS-1 to prevent clipping. A value of 0 db is no headroom - only one or two voices can cause clipping. Higher values of headroom allow more voices to be played before saturation.

Record to Disk Size

Specify the data size saved to the AIFF file on the Macintosh, or wave file on the PC. The options are:

- 8 bits
- 16 bits
- 24 bits

Be careful, not all digital audio applications support 24 bit data.

Record to Disk MIDI Start/Stop

The record to disk process can be started with MIDI start when this is enabled. This allows you to queue up the record to disk process, and then press the space bar on your sequencer to both start sequence playback with the Retro AS-1, as well as start the recording to disk.

AltiVec

This is enabled when your machine has a G4 AltiVec processor. When checked, you will have better performance because of the G4 optimizations in the Retro AS-1 engine.

Multiprocessor

This is enabled if your machine has multiple processors. When checked, you can offload the Retro AS-1 voice synthesis to the second CPU, freeing up the main CPU. This will reduce the Retro AS-1 processing on the first CPU to very little, allowing you to run more plug-ins on the first CPU.

Warn About AppleTalk

Bring up an obnoxious dialog warning you that AppleTalk is on when the engine is launched. There is a purpose to this - the performance of your system is degraded when AppleTalk is on, especially for audio applications such as the Retro AS-1.

Warn About Virtual Memory

Virtual memory: friend or foe? The jury is still out, but most all audio applications do not perform as well with virtual memory turned on. The Retro AS-1 is no exception. When 'Warn About Virtual Memory' is checked, bring up a warning message if the engine is launched and virtual memory is on.

Launch Retro AS-1 Status

When checked, launch the 'Retro AS-1 Status' application when the engine is launched. The status application provides monitoring information about the current number of voices and CPU percentage being used.

Show Folder Names in Lists

You can optionally show the bank's parent folder names in popup menus used by the Retro AS-1 keyboard, mixer, and MIDI processor.

Shorten Names in Lists

Remove the little numbers before the programs to try to shorten the list in the program popup menus. For example, '000 Clarion Call' will be shortened to 'Clarion Call'.

Default

Reset the preferences to their default settings.

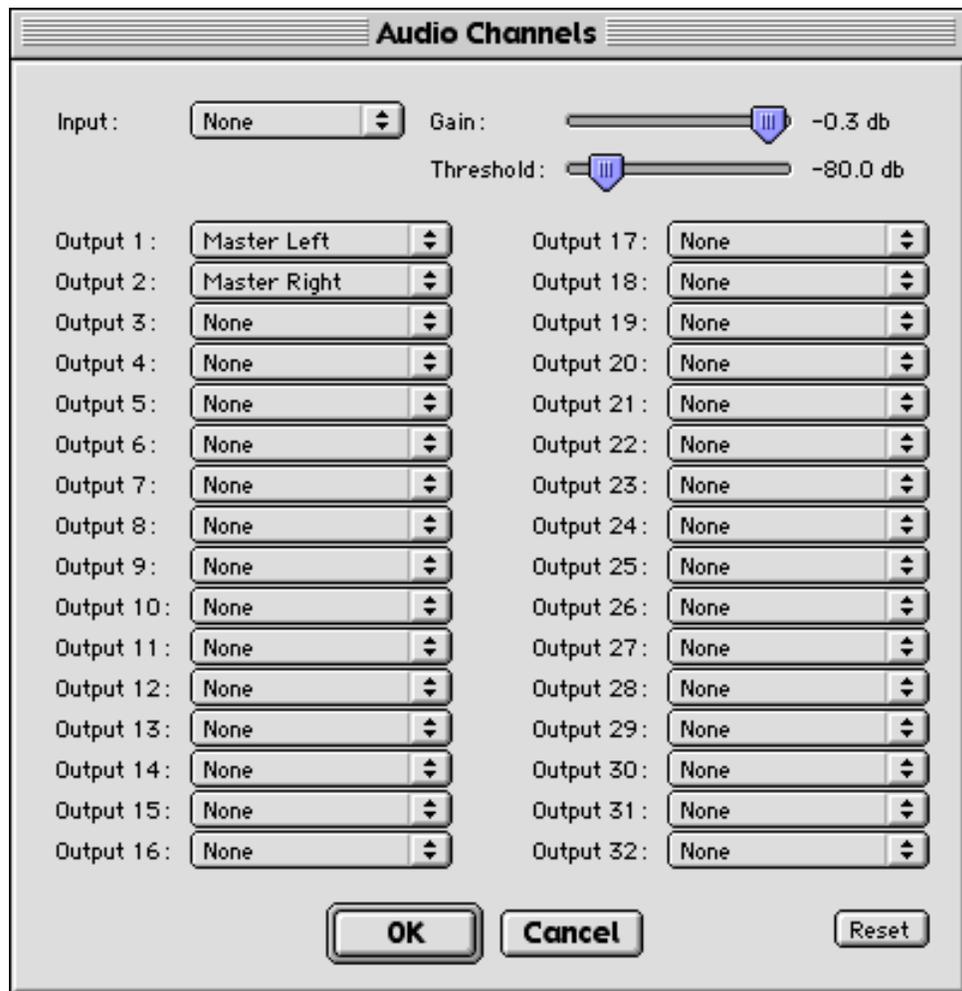
Controller Maps

When the controller maps are edited, you can select up to eight MIDI controllers to be mapped. You can choose the controller to map from, and the controller to map to.



Audio Channels

The Retro AS-1 can choose which hardware input channel to use, as well as which Retro AS-1 outputs are routed to which hardware outputs. This dialog can only be brought up for Sound Manager, ASIO, or DirectIO io types.



Input

Select which hardware input channel the external audio input should be listening to. In the 'Retro AS-1 Editor', this input can be routed to the ring modulator, filters, or insert effects.

Gain

The gain of the audio input signal. This is really an attenuation of the incoming audio.

Threshold

Specify the trigger threshold for the incoming audio. This is used for external audio voice triggering mode to trigger a program via audio, not MIDI.

Output 1-32

For each hardware output, select which Retro AS-1 audio output to listen to. Note that most audio hardware has fewer than 32 outputs, therefore, not all of the output assignments you make here will mean something.

ASIO Setup

If you have ASIO specified as the audio IO type, the setup button will bring up the ASIO setup dialog. Here you can choose which ASIO device the Retro AS-1 should be communicating with.



Not all ASIO devices support the ASIO control panel button.

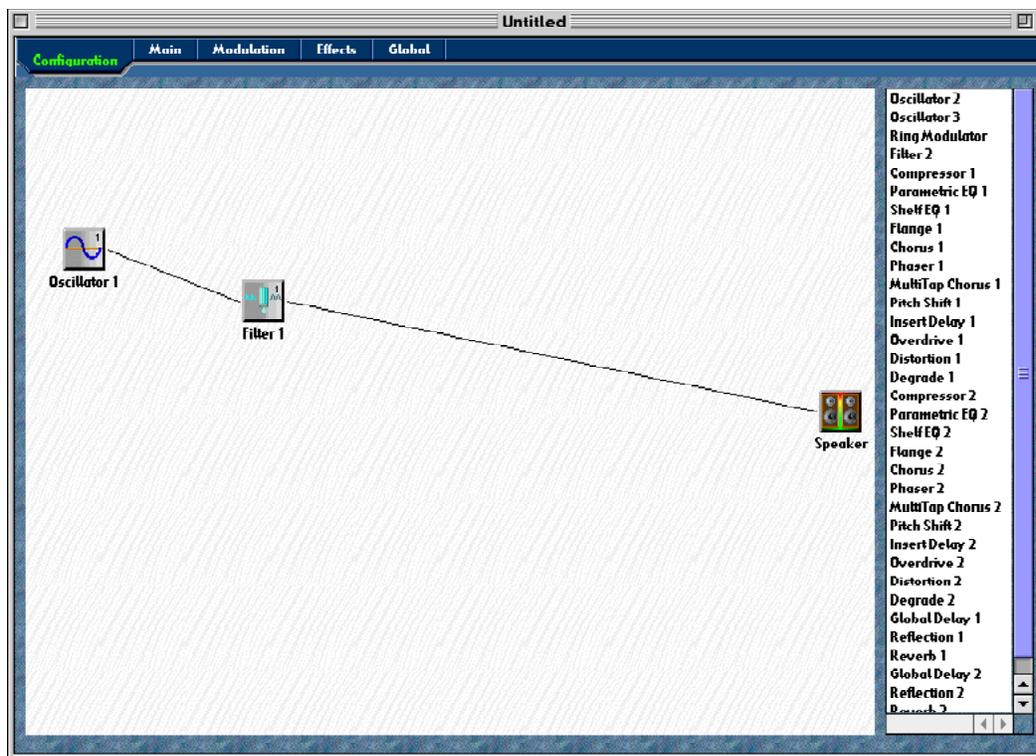
Editor

You can navigate between the different editor pages with the buttons at the top of the window, or use the page menu.



Configuration Page

Displays a graphical overview of the Retro AS-1 algorithm being used. You can turn processing modules on and off.



Configuration Display

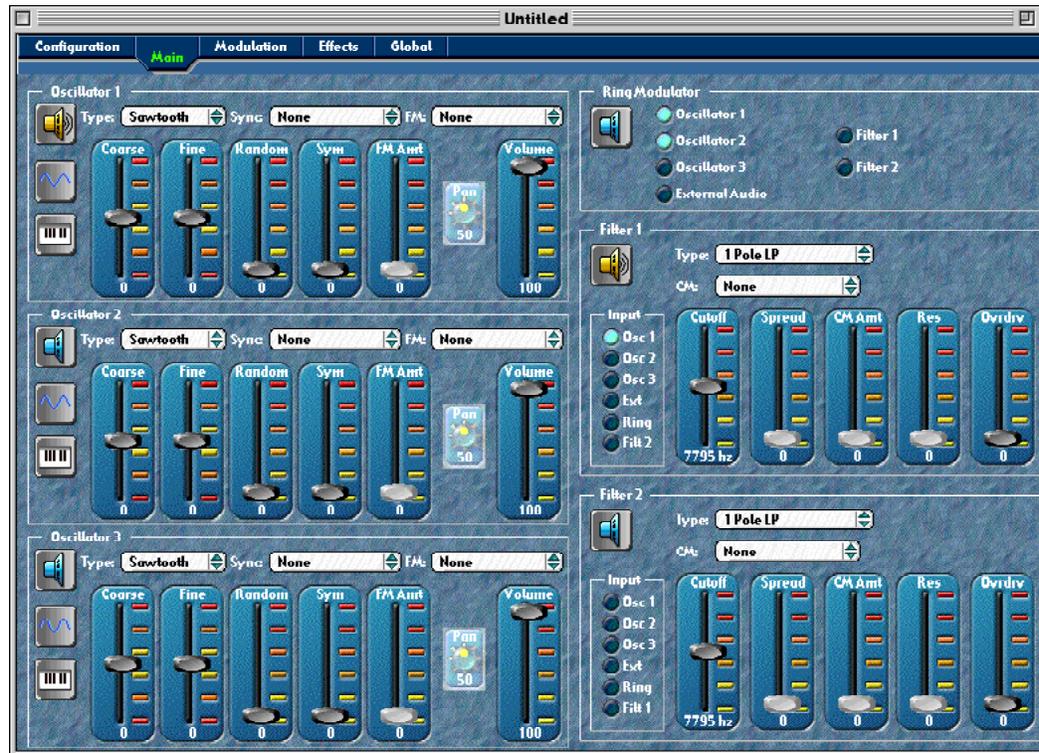
Graphical display of modules. You can double-click modules to jump to the corresponding editor page, you can draw lines between modules for connections, or you can select modules and connections for copying or deleting.

Module List

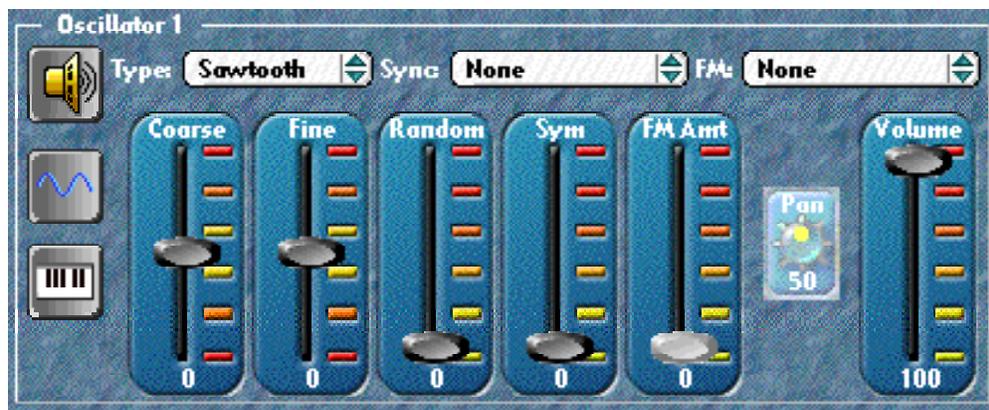
On right hand side, the list of available modules. Once a module has been placed on the configuration display by double-clicking or drag & dropping, the module is removed from the available list.

Main Page

This is where the three oscillators, one ring modulator, and filters are edited.



Oscillator



Enable

Turn the oscillator on and off. Turning the oscillator off will save CPU power.

Stereo

Enable the oscillator stereo output. When enabled, the pan knob will become active.

Keyboard Tracking

Enable keyboard tracking for the oscillator. When off, only middle C (60) will be used.

Type

Oscillator type:

- Sawtooth - can be changed from sawtooth to triangle with symmetry parameter
- Triangle
- Pulse - symmetry parameter changes from square wave to narrow pulse
- Sine
- Sine Square Root - $\sqrt{\text{sine}}$
- Sine Squared - $\text{sine} * \text{sine}$
- Sine Warp 1 - slow sine at beginning of period, fast sine at end
- Sine Warp 2 - very slow sine at beginning of period, very fast sine at end
- Asymmetrical sine - symmetry parameter controls speed of sine within period
- Glottal - raised cosine speed controlled by symmetry parameter
- White Noise - 'bright' noise
- Pink Noise
- Red Noise - 'dull' noise

Different parameters such as Random and Symmetry are enabled depending on which oscillator type is selected.

Sync Source

Sync sources:

- None
- Oscillator 1 output
- Oscillator 2 output
- Oscillator 3 output
- External audio input
- Ring Modulator
- Filter 1 input
- Filter 1 output
- Filter 2 input
- Filter 2 output

The sync source determines when the oscillator phase is reset, that is, when the oscillator waveform starts over again. For those who remember, this is the "hard sync" of old.

FM Source

FM sources:

- None

- Oscillator 1 output
- Oscillator 2 output
- Oscillator 3 output
- External audio input
- Ring Modulator
- Filter 1 input
- Filter 1 output
- Filter 2 input
- Filter 2 output

The FM source is used with the FM amount slider to modulate the frequency of the oscillator at audio rates. Note that you can use the external audio, ring modulator, and filters as FM sources.

Coarse

Coarse tuning for the oscillator. Up and down four octaves.

Fine

Fine tuning for the oscillator. Up and down 100 cents.

Random

Amount of random tuning of the oscillator every time it is activated. Simulate that wonderful, out of tune, fat sound of hardware analog synthesizers.

Symmetry

For some oscillator types, notably the sawtooth, pulse, and asymmetrical sine, change the waveform shape in real time. For the sawtooth, this will change the sawtooth into a triangle wave, for the pulse, this will change from a square wave to a narrow pulse.

FM Amount

Amount of FM source that is to be used for this oscillator's frequency modulation.

Pan

When enabled as a stereo oscillator, the pan specifies the placement in the stereo field.

Volume

Volume of the oscillator.

Ring Modulator

Multiply all of the ring modulator sources together for metallic, clangorous effects.



Enable

Enable the ring modulator.

Oscillator 1

Oscillator 1 is an input.

Oscillator 2

Oscillator 2 is an input.

Oscillator 3

Oscillator 3 is an input.

External Audio

The external audio is an input. Make sure that an audio input channel is selected in the 'Retro AS-1' control panel. This is done with the 'Channels' button in the control panel.

Filter 1

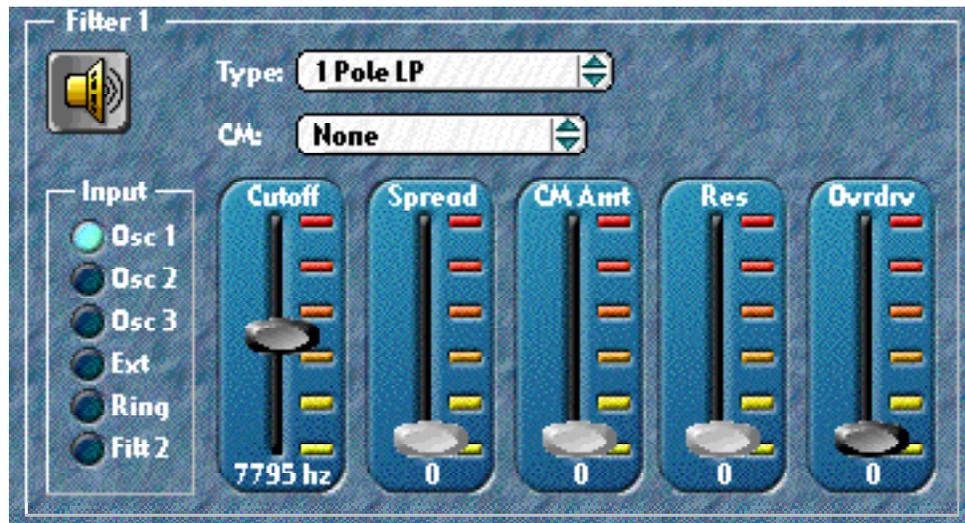
Filter 1 is an input.

Filter 2

Filter 2 is an input.

Filter

Filters remove frequencies present in their input. With the Retro AS-1, you can configure the filters to be either in series or parallel.



Enable

Turn the filter on and off. Turning the filter off will save CPU processing power.

Oscillator 1

Oscillator 1 is an input to the filter.

Oscillator 2

Oscillator 2 is an input to the filter.

Oscillator 3

Oscillator 3 is an input to the filter.

External Audio

The external audio is an input to the filter. Make sure that an audio input channel is selected in the 'Retro AS-1' control panel. This is done with the 'Channels' button in the control panel.

Ring Modulator

The ring modulator is an input to the filter.

Filter 1/2

The other filter is an input to this filter.

Type

Filter types:

- 1 pole lowpass - 6 db/octave

Reference

- 2 pole lowpass - 12 db/octave
- 4 pole lowpass with resonance - 24 db/octave
- 1 pole highpass - 6 db/octave
- 2 pole highpass - 12 db/octave
- 4 pole highpass with resonance - 24 db/octave
- 1 pole allpass with resonance - phaser type of filter
- 2 pole allpass with resonance - phaser type with more phase shift
- 4 pole allpass with resonance - phaser type with more phase shift
- state variable lowpass (2 pole) - 12 db/octave resonant lowpass
- state variable bandpass (2 pole) - 12 db/octave resonant bandpass
- state variable bandstop (2 pole) - 12 db/octave resonant bandstop
- state variable highpass (2 pole) - 12 db/octave resonant highpass
- slope - non-linear lowpass filter with maximum slew rate
- threshold - non-linear highpass filter with minimum slew rate
- comb - single delay line with feedback

Not all of the filter types will have the resonance parameter enabled.

Cutoff Modulation Source

CM sources:

- None
- Oscillator 1 output
- Oscillator 2 output
- Oscillator 3 output
- External audio input
- Ring Modulator
- Filter 1 input
- Filter 1 output
- Filter 2 input
- Filter 2 output

Cutoff modulation allows you to modulate the cutoff of the filter in real-time at audio rates. The amount of modulation is specified by the CM amount slider.

Cutoff

Cutoff or resonant frequency of the filter.

Spread

Steepness of the filter. Lower values mean a steeper cutoff slope.

Cutoff Modulation Amount

Amount of cutoff modulation.

Resonance

Resonance or feedback of the filter. This reinforces the harmonics at the cutoff frequency.

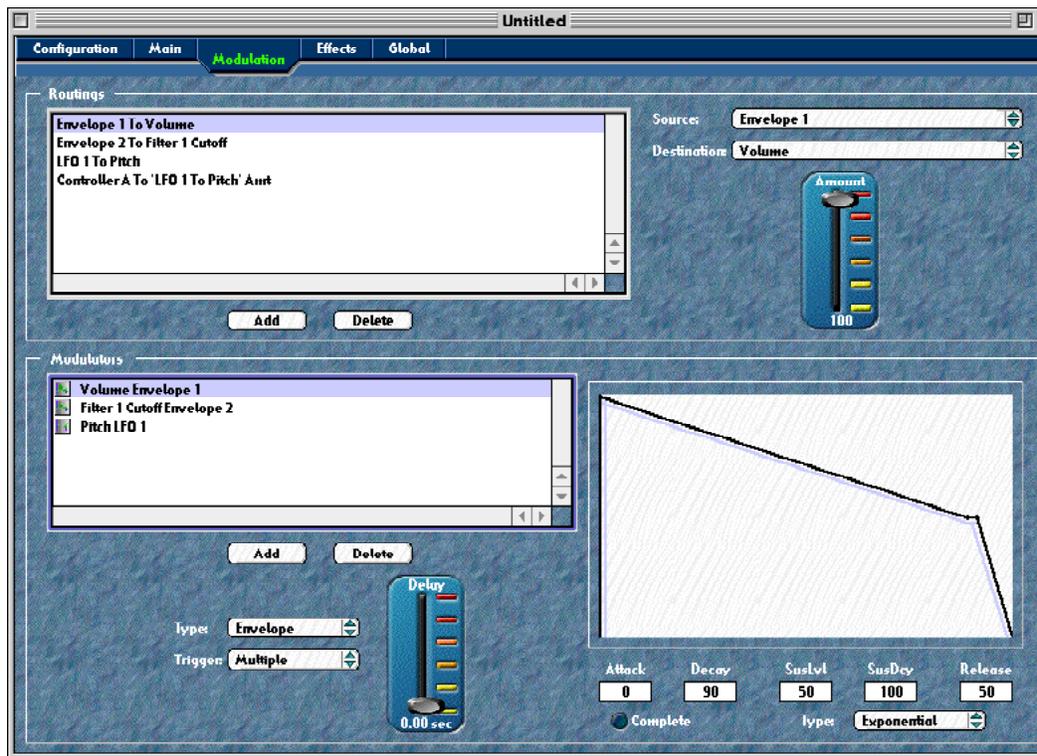
Overdrive

Overdrive the input of the filter for distorted, overloaded filter effects.

Modulation Page

Allows the user to specify both modulation routings as well as modulation sources. The Retro AS-1 can have variable numbers of routings and modulators, up to a limit of twenty four each.

As you select a routing from the routing list, the source, destination, and amount parameters are updated. When you select a modulator from the modulator list, the type, trigger, delay, and modulator editor are updated.



Routing List

List of modulation routings specifying how synthesis parameters are to be controlled in real-time.

Routing List Add

Add a new routing to the list.

Routing List Delete

Remove the selected routing from the list.

Source

The routing source of the selected routing.

- Note
- Velocity
- Release Velocity
- Aftertouch (mono and poly)
- Controller A, B, C, D (as assigned in the 'Retro AS-1' control panel)
- External audio amplitude
- Modulators

Destination

The routing destination of the selected routing.

- Oscillator Pitch
- Oscillator Random
- Oscillator Symmetry
- Oscillator FM Amount
- Oscillator Pan
- Oscillator Volume
- Filter Cutoff
- Filter Spread
- Filter Cutoff Modulation Amount
- Filter Resonance
- Filter Overdrive
- Routing amounts
- Modulator parameters
- Global effect sends

Amount

Amount the routing source should affect the destination.

Modulator List

List of modulators. You can think of modulators are user-defined routing sources.

Modulator List Add

Add a modulator to the list.

Modulator List Delete

Delete a modulator to the list.

Type

Modulator types:

- Envelope
- LFO
- Random
- Ramp

Trigger

Trigger types:

- Multiple - normal triggerring per note
- Single - only one trigger on first note of voice
- Pedal Down - trigger by pedal down (pedal assigned in control panel)
- Pedal Up - trigger by pedal up (pedal assigned in control panel)
- Key Up - trigger by key up

Multiple means that every voice using this program has its own copy of this modulator running. Single means that there is only one modulator active for all voices of this type. Modulators are normally triggered by key down, but they can also be triggered by pedal down and up, as well as key up. The pedal number is defined in the 'Retro AS-1' control panel.

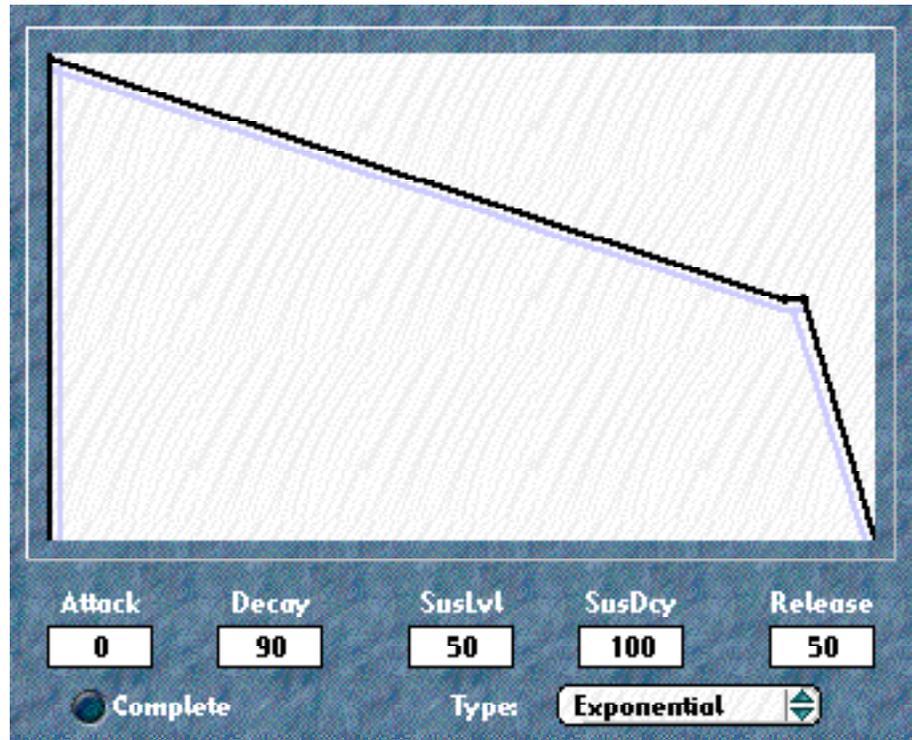
Delay

Delay for the modulator from when it is triggered to when it starts.

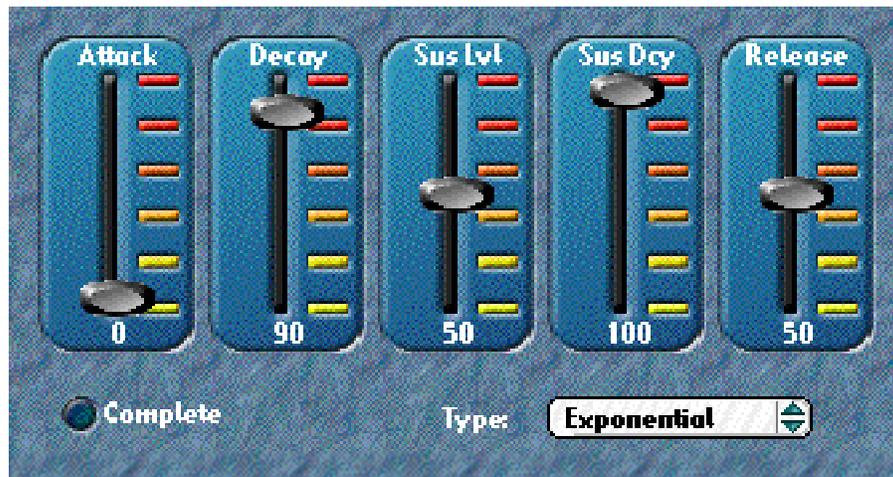
Envelope

The Retro AS-1 has five stage envelopes: delay, attack, decay, sustain decay, and release. The envelopes can be either exponential type or linear type. For audio purposes, usually exponential sounds the more natural, but for control and modulation purposes, often linear works better.

Shown graphically:



Alternatively, you can change how envelopes are edited with a preference.



A preference on the preferences program page allows you to edit in rate or time. For a slow envelope, a low rate is a large time, whereas a for a fast envelope, a high rate is a short time.

Attack

Attack of the envelope.

Decay

Decay of the envelope.

Sustain Level

Sustain level of the envelope.

Sustain Decay

Sustain decay of the envelope. Once you reach the sustain level of the envelope, the envelope jumps to the sustain decay. To turn the sustain decay off to get a simple ADSR type of envelope, set the sustain decay to 100 if editing in time, or 0 if editing in rate.

Release

Release of the envelope.

Complete

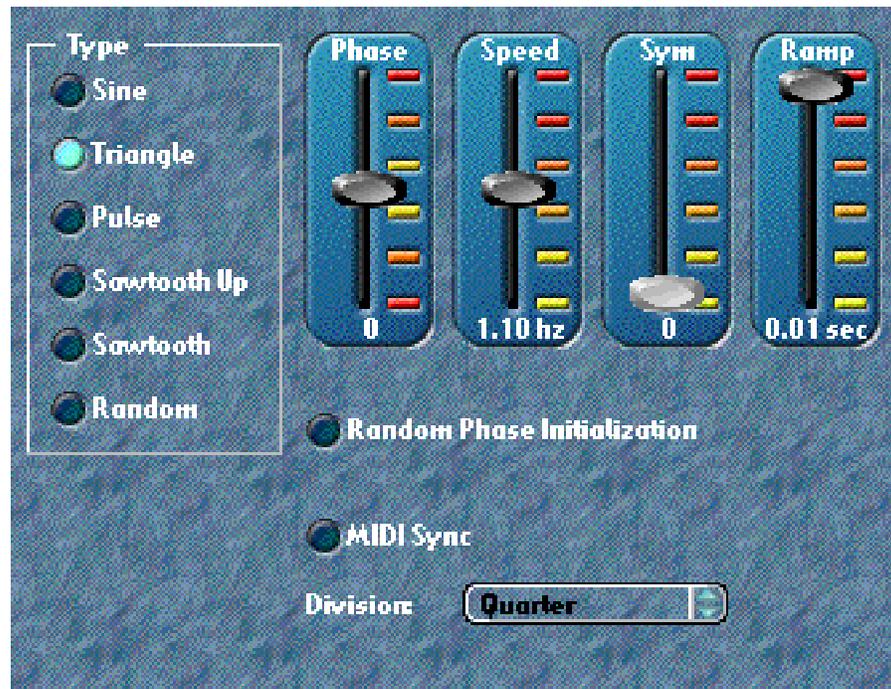
When checked, go through the complete cycle of the envelope, no matter when the key is released.

Type

Either exponential or linear. This specifies the shape of the segments. Normally, you will want to use exponential, but linear is sometimes useful as a modulation source.

LFO

LFOs are oscillators that are running at much slower rates than the audio oscillators on the main page. You do not listen to LFOs, they are for modulation purposes only.



Sine

Sine wave LFO.

Triangle

Triangle wave LFO.

Pulse

Pulse wave LFO. Can be changed from square to narrow pulse with the symmetry slider.

Sawtooth Up

Sawtooth up LFO.

Sawtooth Down

Sawtooth down LFO.

Random

Random LFO. There is a difference between the random LFO and the random modulator. The random LFO is a random sequence that can be slowed down or sped up, whereas the random modulator cannot change its speed, but the amount of randomness can be controlled with its filter parameter.

Phase

Initial phase of the LFO.

Speed

Speed of the LFO.

Symmetry

For pulse types, the symmetry of the LFO.

Ramp

The ramp in rate of the LFO. The LFO may gradually ramp in fast or slow.

Random Phase Initialization

Randomly set the phase of the oscillator upon activation.

MIDI Sync

The speed of the LFO may be overridden and synced to MIDI clock when this is checked.

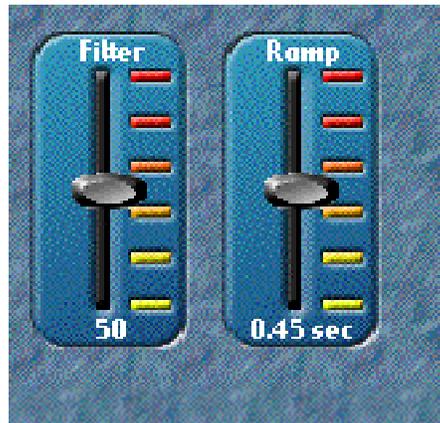
Division

When using MIDI sync, specify the division to sync to:

- whole
- half
- quarter
- eighth
- eighth triplet
- sixteenth
- sixteenth triplet
- thirty second

Random

The random modulator is different from the random LFO in that the amount of randomness for the random modulator can be controlled with its filter parameter, where the random LFO is a random sequence that can be slowed down or sped up.



Filter

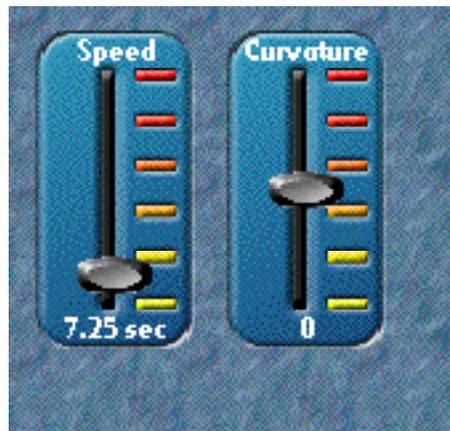
Filter the random sequence to make it more or less random.

Ramp

Ramp in the random sequence either slow or fast.

Ramp

A ramp modulator can be thought of as a single stage of an envelope, with the benefit that you can continuously change the shape of the envelope stage with the curvature parameter. A ramp starts at zero, and goes to full amplitude. Once it reaches full amplitude, it stays there.



Speed

Speed of the ramp.

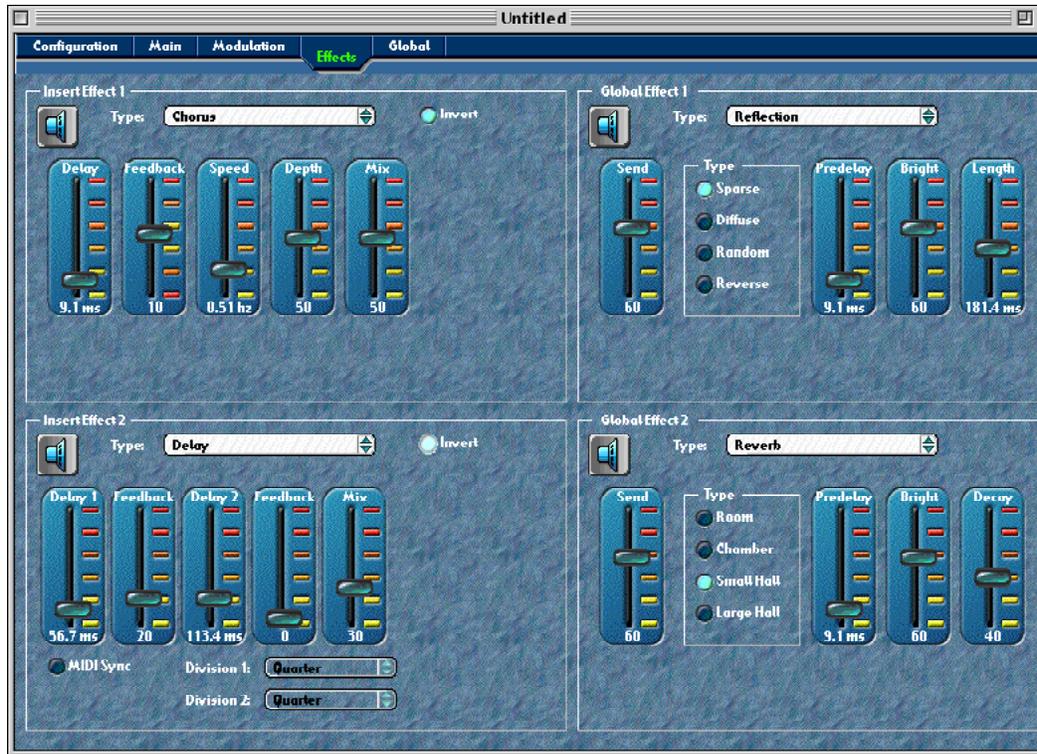
Curvature

Change the shape of the ramp. Zero is a linear shape. Positive curvatures are concave up, and negative curvatures are concave down.

Effects Page

The Retro AS-1 has two insert effects and two global effects per voice. To hear the sound of the global effects, make sure that the 'Retro AS-1' control panel has 'Use From Editor' checked.

The insert effects are processed in series, one after the other on the stereo output from the voice. The global effects are processed via the send amounts from the output of the insert effects.



Insert Effect Enable

Insert effects may be turned off and on. Turning them off saves CPU power.

Insert Effect Type

Insert effect types:

- Compressor
- Parametric EQ
- Shelf EQ
- Flange
- Chorus
- Phaser
- MultiTap Chorus

Reference

- Pitch Shift
- Delay
- Overdrive
- Distortion
- Degrade

Invert

Supported by some insert effects. When checked, this will make sure the processed signal is inverted between the left and right stereo outputs of the insert effect, giving the sound a wider stereo spread. You may need to turn this sound off if the insert effect is routed to another insert effect that sums the incoming left and right signals for processing.

Sums incoming left and right:

- Flange
- Chorus
- Phaser
- MultiTap Chorus
- Delay

Global Effect Enable

Turn the global effect on and off.

Global Effect Type

Global effect types:

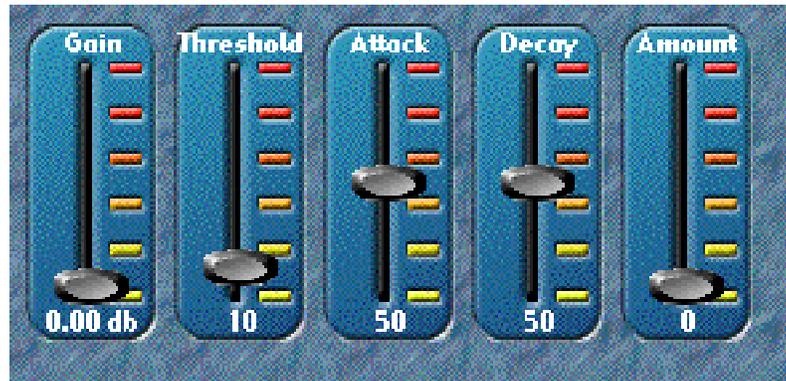
- Global delay
- Reflection
- Reverb

Global Effect Send

Amount of output from the insert effects to send to the global effect.

Compressor

Compressors reduce the dynamic range of the signal.



Gain

Gain of the input signal before compression is done. Can be used for overdriven compression effects.

Threshold

Amplitude threshold where the compression should kick in.

Attack

Attack rate of the compression.

Decay

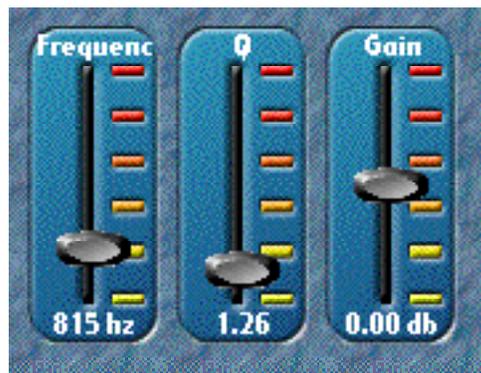
Decay rate of the compression.

Amount

Amount of compression.

Parametric EQ

Parametric EQs are used to boost or cut harmonic content around a specified single frequency.



Frequency

Center frequency the EQ is to modify.

Q

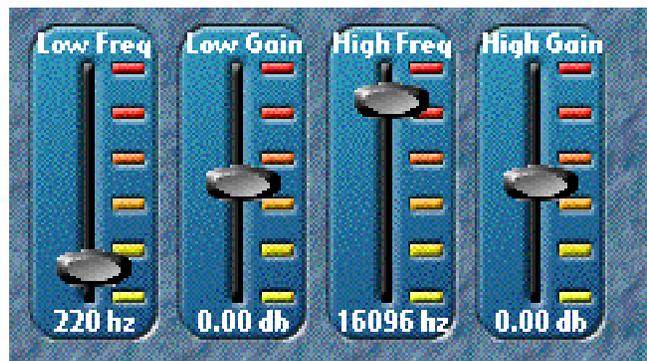
Width of the EQ. Larger values result in narrower Qs, meaning that only a narrow range of frequencies will be modified.

Gain

Positive values for boost, negative values for cut. A value of zero is no gain.

Shelf EQ

Shelf EQs are used to tailor both the low and frequency content of the input at the same time.



Low Frequency

Low frequency below which the signals will be controlled by the low gain slider.

Low Gain

Positive values for boost, negative values for cut. Zero is no gain.

High Frequency

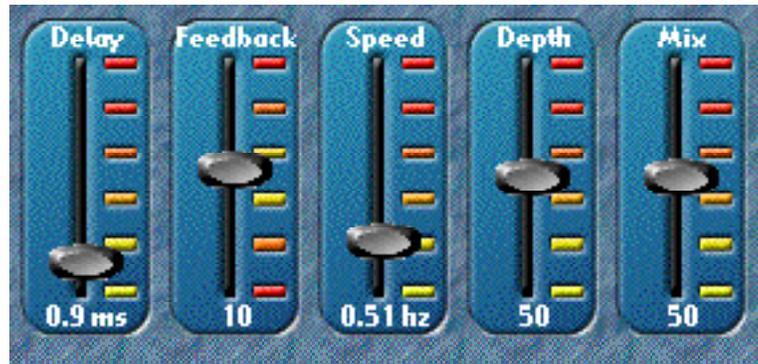
High frequency above which the signals will be controlled by the high gain slider.

High Gain

Positive values for boost, negative values for cut. Zero is no gain.

Flange

Watery, slow moving effect.



Delay

Maximum length of the delay used for the flange.

Feedback

Amount of feedback around the delay. Feedback can be either positive or negative to reinforce different frequencies.

Speed

Speed of the LFO controlling the flange delay.

Depth

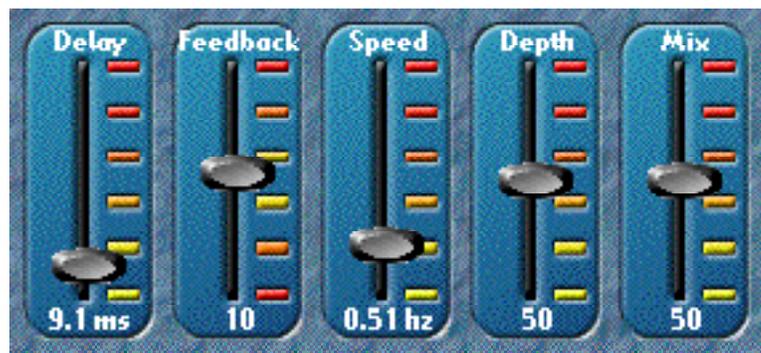
Depth of the LFO controlling the flange delay.

Mix

Amount of processed signal as compared to the input.

Chorus

An effect to ‘fatten’ up the sound with a little detuning.



Delay

Maximum length of the delay used for the chorus.

Feedback

Amount of feedback around the delay. Feedback can be either positive or negative to reinforce different frequencies.

Speed

Speed of the LFO controlling the chorus delay.

Depth

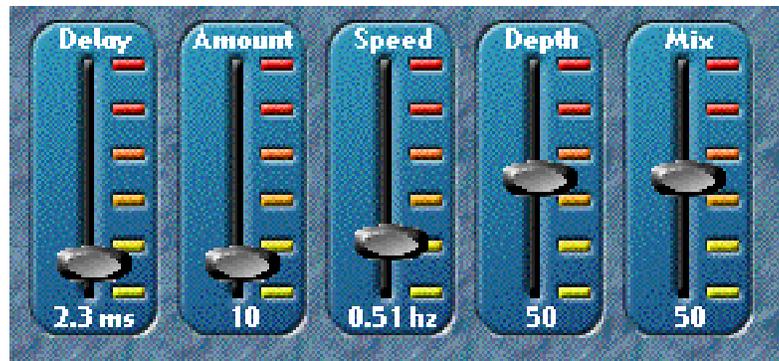
Depth of the LFO controlling the chorus delay.

Mix

Amount of processed signal as compared to the input.

Phaser

Phasers do not change the frequency content of the input, but they delay different frequencies by different amounts.



Delay

Maximum length of the delay used for the phaser.

Amount

Amount of feedback around the delay.

Speed

Speed of the LFO controlling the phaser delay.

Depth

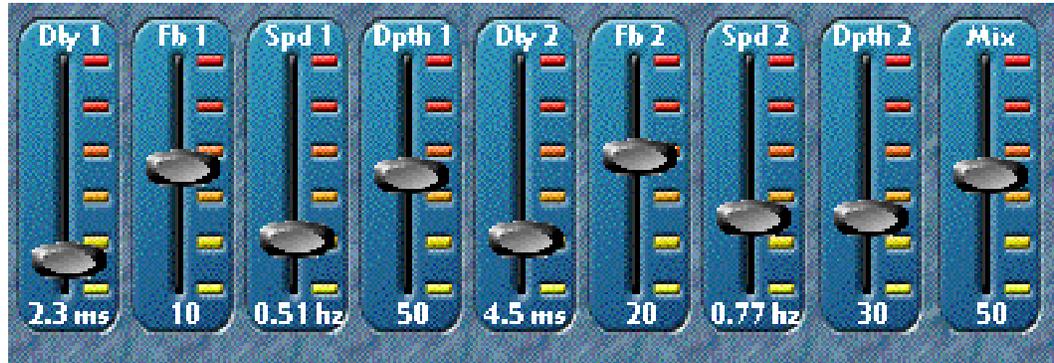
Depth of the LFO controlling the phaser delay.

Mix

Amount of processed signal as compared to the input.

MultiTap Chorus

Two choruses embedded inside of each other. Makes for an even 'fatter' sound.



Delay1/2

Maximum length of the delay used for this tap of the chorus.

Feedback 1/2

Amount of feedback around the delay for this tap. Feedback can be either positive or negative to reinforce different frequencies.

Speed 1/2

Speed of the LFO controlling the chorus delay for this tap.

Depth 1/2

Depth of the LFO controlling the chorus delay for this tap.

Mix

Amount of processed signal as compared to the input.

Pitch Shifter

Pitch shifters are used to change the pitch of the sound in real-time and mix it in with the original pitch.



Coarse

Coarse tuning in half steps of the pitch shift.

Fine

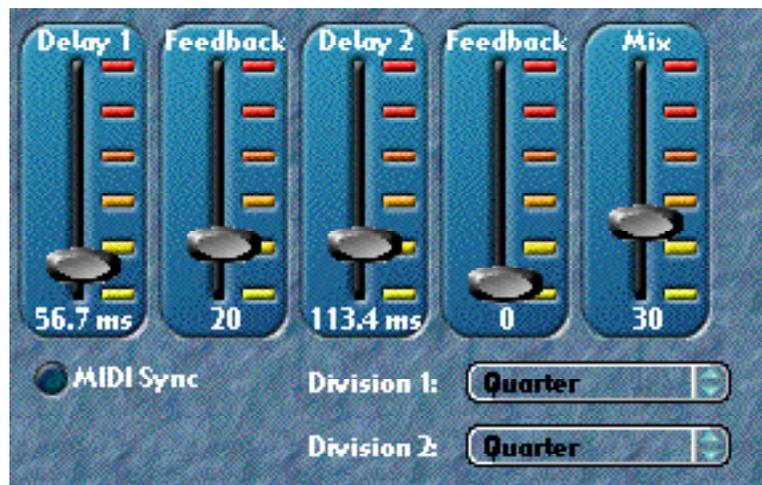
Fine tuning in cents of the pitch shift.

Mix

Amount of processed signal as compared to the input.

Insert Delay

Single delay line with two taps for feedback.



Delay 1

Length of the first tap. The first delay is mixed into the left output.

Feedback 1

Amount of feedback for the first tap.

Delay 2

Length of the second tap. The second delay is mixed into the right output.

Feedback 2

Amount of feedback for the second tap.

Mix

Amount of processed signal as compared to the input.

MIDI Sync

Override the delay length parameters and sync them up to MIDI clock.

Division 1

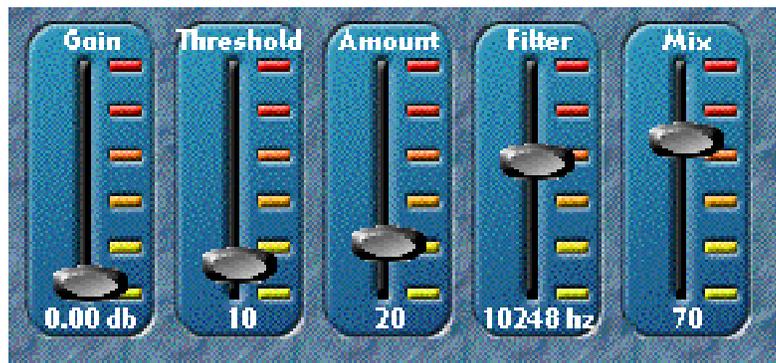
Division of MIDI clock for delay 1 to sync up to.

Division 2

Division of MIDI clock for delay 2 to sync up to.

Overdrive

Overdrive a signal by simulating a tube amplifier gain stage.



Gain

Amount of input gain.

Threshold

Threshold at which the overdrive starts.

Amount

Reference

Amount of overdrive.

Filter

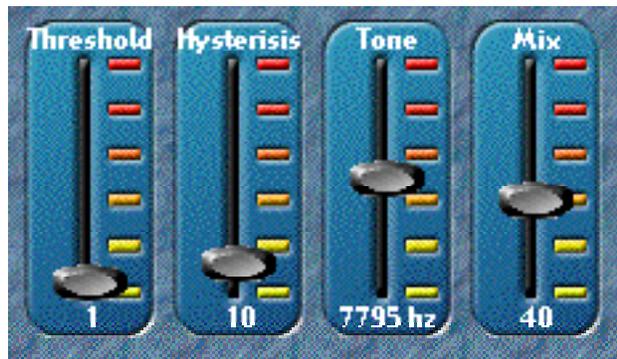
Filter the overdriven signal.

Mix

Amount of processed signal as compared to the input.

Distortion

Distort a signal by simulating the cross-over distortion of an analog amplifier.



Threshold

Threshold below which the cross-over distortion occurs.

Hysteresis

‘Memory’ around the threshold for non-linear distortion.

Tone

Tone of the processed signal.

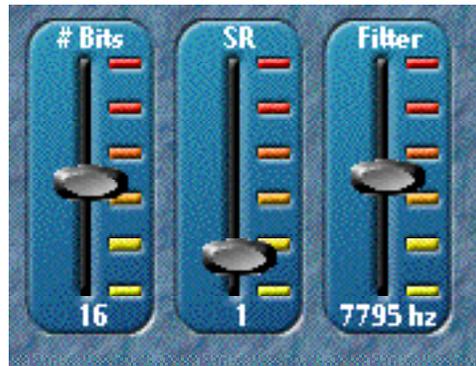
Mix

Amount of processed signal as compared to the input.

Degrade

Here we are in the second millenium¹, and we have all this fancy DSP processing power, and yet we’re trying to re-create the low sample rate and low bit rate sounds we all hated two decades ago? Well, yes! In fact, some of those old ‘effects’ are pretty darn interesting. Check ‘em out.

1. Okay, okay, no spam about the fact that the new millenium ‘really’ starts in 2001. All I know is that I get excited when my car odometer turns over from 49999 to 50000, where turning over from 50000 to 50001 doesn’t really do anything for me.



Number Of Bits

Number of bits to output the signal at. Internally, the Retro AS-1 using 32 bit floating point, but you can change this down to one bit if you like.

Sample Rate Reduce

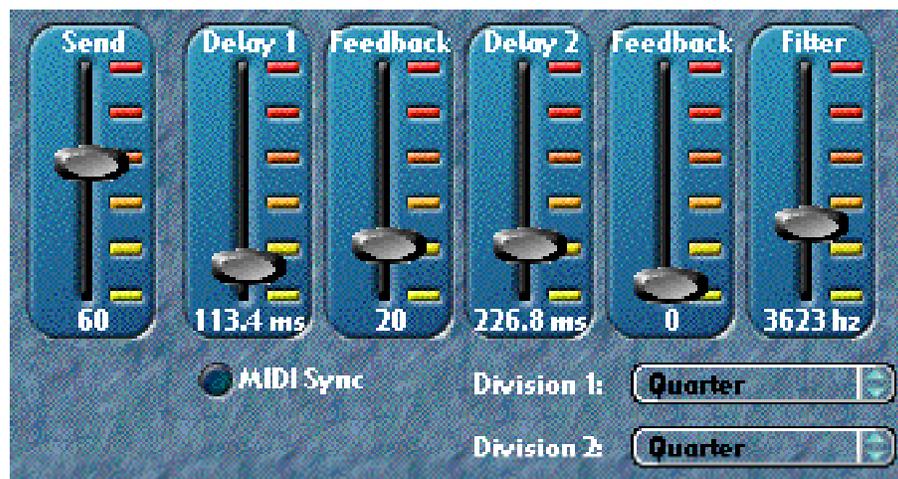
Scale the sample rate down by a factor of two. A value of 1 means a factor of 2, a value of two means a factor of 4, and so on¹.

Filter

Filter down the processed output a bit. Changing the number of bits and reducing the sample rate introduces a lot of aliasing.

Global Delay

A delay line with two taps being fed back upon itself, but with a filter on the output.



1. there those DSP guys go again, with their powers of two.

Delay 1

Length of the first delay.

Feedback 1

Feedback of the first delay.

Delay 2

Length of the second delay.

Feedback 2

Feedback of the second delay.

Filter

Lowpass filter the processed output.

MIDI Sync

Sync up the delay lengths to MIDI clock.

Division 1

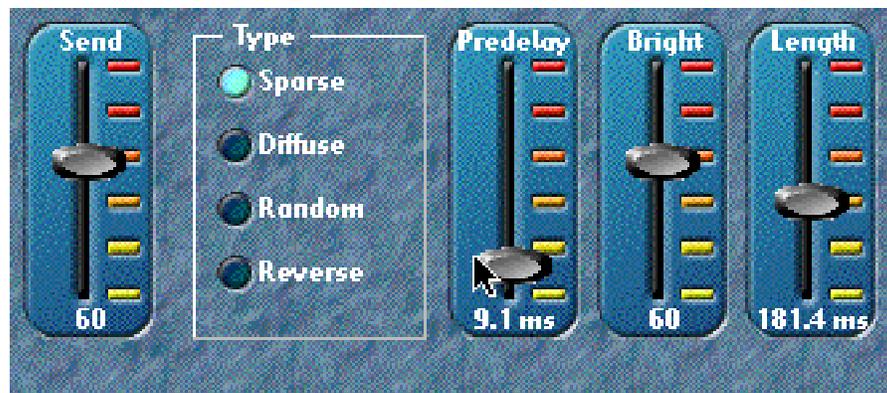
Division of the MIDI clock for the first delay.

Division 2

Division of the MIDI clock for the second delay.

Reflection

Simulate the early reflection pattern of different acoustic spaces. These early reflections can be added to reverberant sound with the reverb effect as desired.



Sparse

Few early reflections decaying away.

Diffuse

Lots of reflections decaying away.

Random

Random reflection times and amplitudes.

Reverse

Reflections increasing in amplitude.

Predelay

Amount of time before the processed output is heard.

Bright

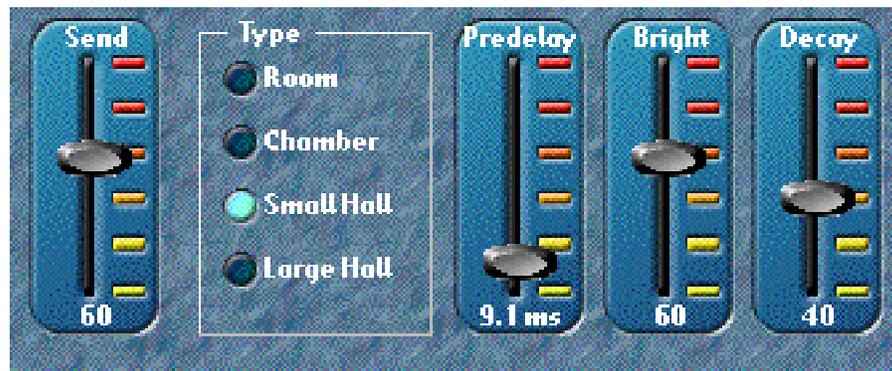
Amount of lowpass filtering in the processed output.

Length

Length of the early reflections.

Reverb

Simulate acoustic space echos.



Room

Smallest.

Chamber

Middle.

Small Hall

Larger.

Large Hall

Largest.

Predelay

Length of time until the processed reverb is heard.

Bright

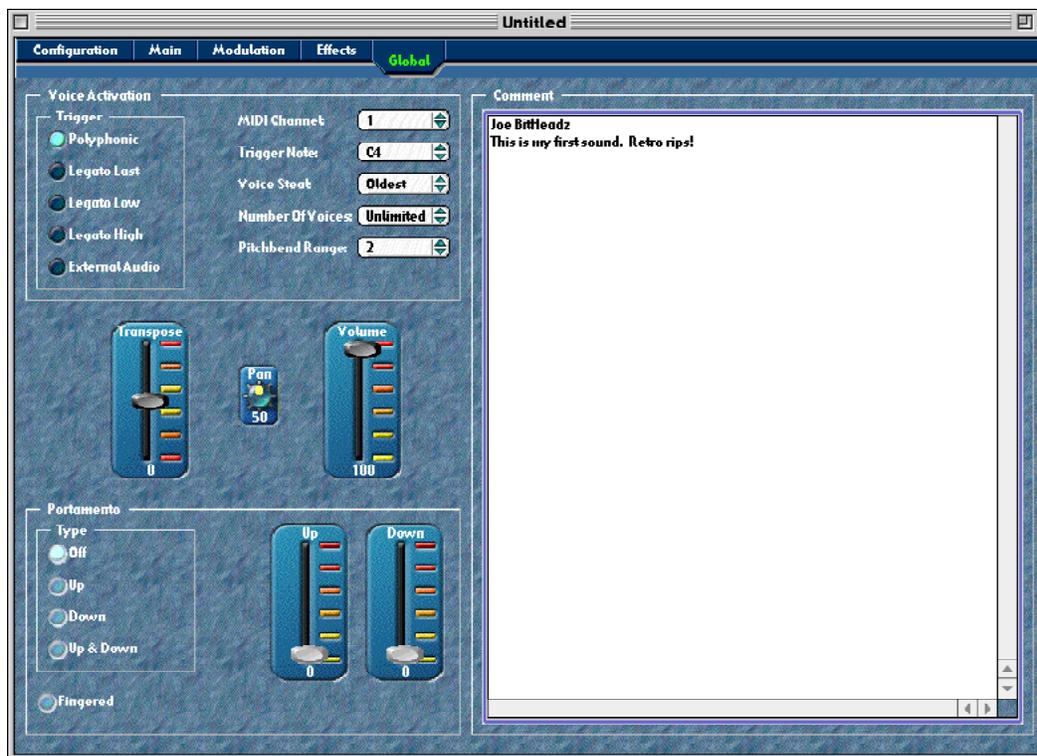
Brightness in the output signal.

Decay

Decay time of the reverberant output.

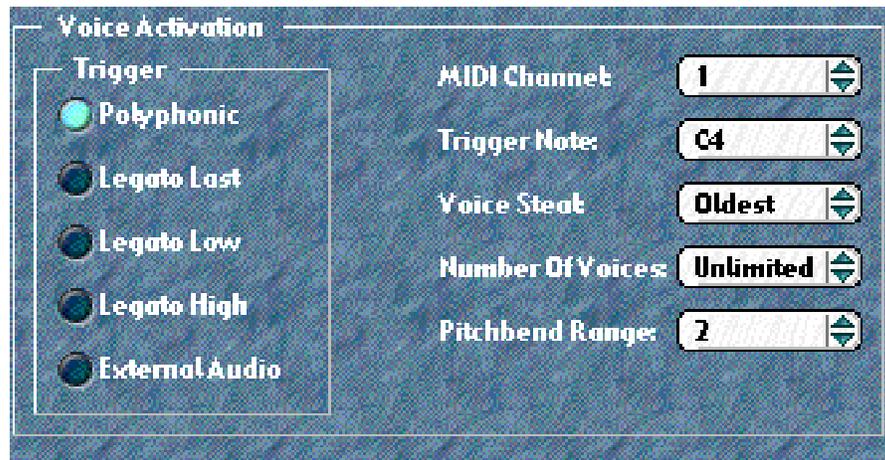
Global Page

Specifies the overall MIDI control of the program.



Voice Activation

Initialize the voice in different ways.



Polyphonic

Trigger the voice polyphonically up the number of voices specified with the number of voices menu.

Legato Last

Trigger only one voice. Use the pitch on the last MIDI note on.

Legato Low

Trigger only one voice. Use the pitch of the lowest MIDI note on.

Legato High

Trigger only one voice. Use the pitch of the highest MIDI note on.

External Audio

Trigger only one voice from the external audio trigger. You will need to make sure that the external audio input is enabled in the 'Retro AS-1' control panel, and that you have configured the input gain and threshold correctly.

MIDI Channel

While in the editor, use this MIDI channel to play on. This parameter is *not* saved with the file.

Trigger Note

For external audio trigger mode, the note to trigger.

Voice Steal

Voice steal types:

- Oldest

Reference

- Low
- Middle
- High

Voice stealing is used when the maximum number of voices for the synthesizer or voice has been exceeded, or the synthesizer is using too much CPU processing power as specified in the 'Retro AS-1' control panel.

Number of Voices

Maximum number of voices for this program.

Pitchbend Range

Pitchbend range up to one octave.

Transpose, Pan, and Volume



Transpose

MIDI note transpose.

Pan

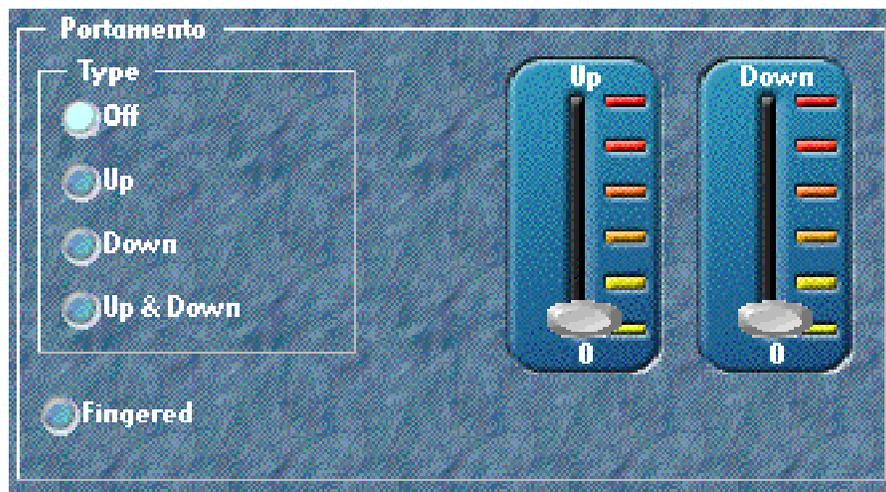
MIDI pan.

Volume

MIDI volume.

Portamento

Portamento is active only in legato voice trigger modes.



Off

No portamento.

Up

Portamento from low notes to high notes only.

Down

Portamento from high notes to low notes only.

Up & Down

Portamento from any note to any note.

Fingered

Portamento only if note ons are overlapping.

Up Time

Amount of portamento up time.

Down Time

Amount of portamento down time.

File Menu



New

Create a new document from the template saved in the preference file. If no template has been saved, a default template will be used.

Open

Open a file on the desktop.

Close

Close a file on the desktop.

Save

Save the top-most window to file.

Save As

Save the top-most window to a new file.

Save As 'New' Template

Save the top-most window as a template to use when 'New' is chosen from the File menu.

Revert

Discard changes and re-open the file from disk.

Quit

Quit the Retro AS-1 Editor.

Edit Menu

Edit	Page	Synthesis
Can't Undo		⌘Z
Cut		⌘X
Copy		⌘C
Paste		⌘V
Clear		
Select All		⌘A
Randomize		⌘R
Preferences...		

Undo/Redo

When enabled, can undo or redo the last task performed.

Cut

When enabled, can cut selected configuration modules, routings, or modulators.

Copy

When enabled, can copy selected configuration modules, routings, or modulators.

Paste

When enabled, can paste configuration modules, routings, or modulators.

Clear

When enabled, can clear selected configuration modules, routings, or modulators.

Select All

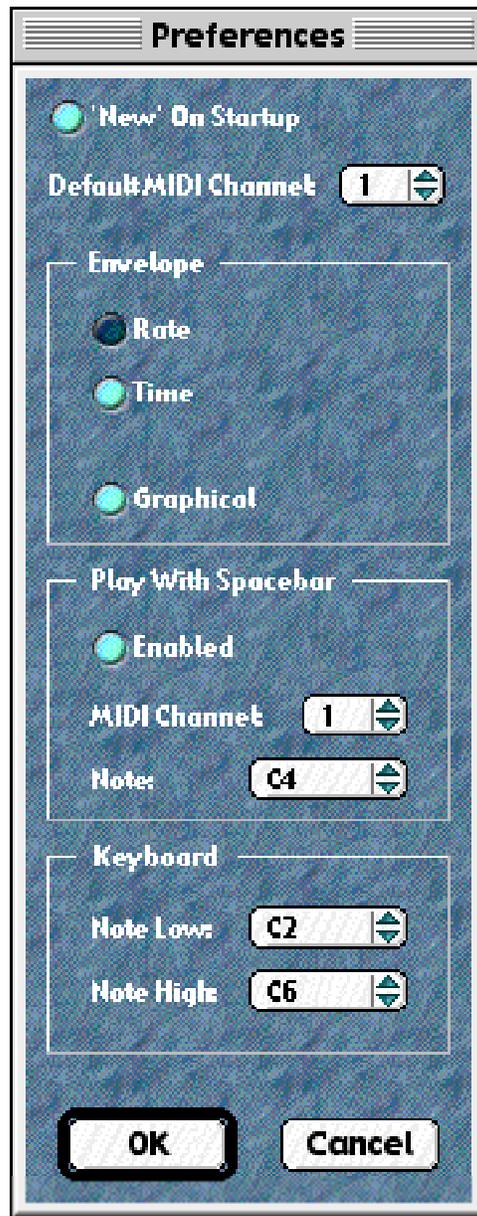
When enabled, can select all.

Randomize

When enabled, can randomize the parameters on a particular page of the editor.

Preferences

Bring up the preferences dialog.



'New' On Startup

When checked, open a new document when the editor is launched.

Default MIDI Channel

Default MIDI channel to assign to new or opened files.

Envelope Rate

Edit the envelopes on the modulation page with attack, decay, sustain decay, and release as rates. Slow envelopes are small rates, fast envelopes are large rates.

Envelope Time

Edit the envelopes on the modulation page with attack, decay, sustain decay, and release as times. Slow envelopes are large times, fast envelopes are small times.

Envelope Graphical

Edit the envelopes graphically, as opposed to with sliders.

Play With Spacebar Enabled

When checked, the space bar can be used to trigger a MIDI note.

Play With Spacebar MIDI Channel

The MIDI channel to use when triggering with the space bar.

Play With Spacebar Note

The MIDI note to use when triggering with the space bar.

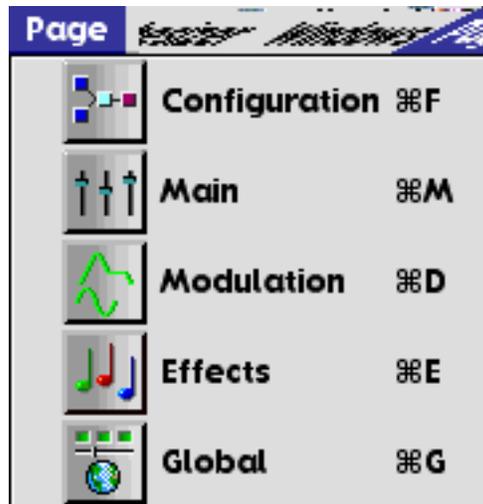
Keyboard Note Low

The low note of the keyboard window.

Keyboard Note High

The high note of the keyboard window.

Page Menu



Configuration

Jump to the configuration page for the top-most window.

Main

Jump to the main page for the top-most window.

Modulation

Jump to the modulation page for the top-most window.

Effects

Jump to the effects page for the top-most window.

Global

Jump to the global page for the top-most window.

Synthesizer Menu

Send messages to the Retro AS-1 engine directly.



All Notes Off

Send an all notes off message to the synthesizer.

All Sound Off

Send an all sound off message to the synthesizer.

Reset

Reset the synthesizer.

Reset Controllers

Reset the synthesizer controllers.

Start Record To Disk

Start the synthesizer recording to disk. You will be prompted for a file name.

Stop Record To Disk

Stop the synthesizer recording to disk.

Control Panel

Open the 'Retro AS-1' control panel.

Status

Open the 'Retro AS-1 Status' application.

Keyboard

Open the 'Retro AS-1 Keyboard' application.

MIDI Processor

Open the 'Retro AS-1 MIDI Processor' application.

Mixer

Open the 'Retro AS-1 Mixer' application.

BitHeadz Web Site

Connect to the BitHeadz web site using the default browser. You will need to have your internet configuration set up correctly, for example with the 'Internet Setup Assistant'.

Windows Menu



Tools

Open up the tools window. If checked, the tools window is already open.

Keyboard

Open up the keyboard window. If checked, the keyboard window is already open.

Documents

List of the currently open windows.

Tools Window

Shortcuts for menu operations.



Undo

Undo the last task.

Cut

Cut the selected configuration module, routing, or modulator.

Copy

Copy the selected configuration module, routing, or modulator.

Paste

Paste a configuration module, routing, or modulator.

Clear

Clear the selected configuration module, routing, or modulator.

All Notes Off

Send an all notes off message to the synthesizer.

All Sound Off

Send an all sound off message to the synthesizer.

Reset

Send a reset message to the synthesizer.

Start Record to Disk

Start record to disk. You will be prompted for a file name.

Stop Record to Disk

Stop record to disk.

Control Panel

Open the 'Retro AS-1' control panel.

Status

Open the 'Retro AS-1 Status' application.

Keyboard

Open the 'Retro AS-1 Keyboard' application.

MIDI Processor

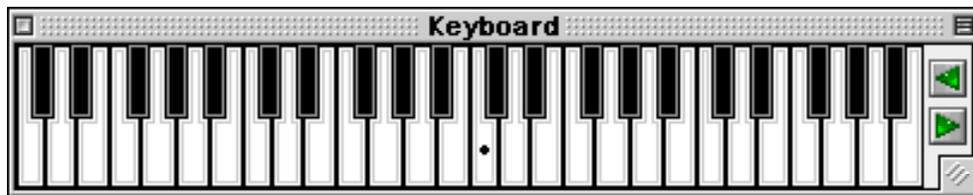
Open the 'Retro AS-1 MIDI Processor' application.

Mixer

Open the 'Retro AS-1 Mixer' application.

Keyboard Window

You can trigger MIDI notes without a MIDI controller inside of the editor with the keyboard window.



Keyboard

Click on the notes of the keyboard to send a MIDI note on to the synthesizer. Release for a MIDI note off.

Shift Down

Shift the keyboard down one octave. Option click to shift down by one note.

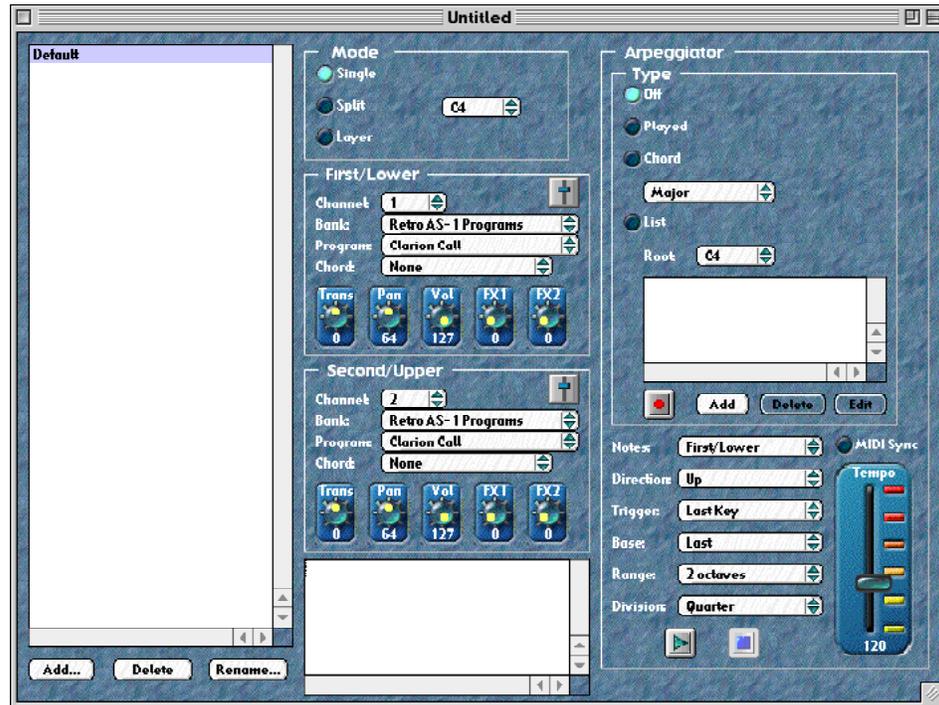
Shift Up

Shift the keyboard up one octave. Option click to shift up by one note.

Midi Processor

The MIDI processor is used for real time performance. You can set up splits and layers, as well as use the built-in arpeggiator.

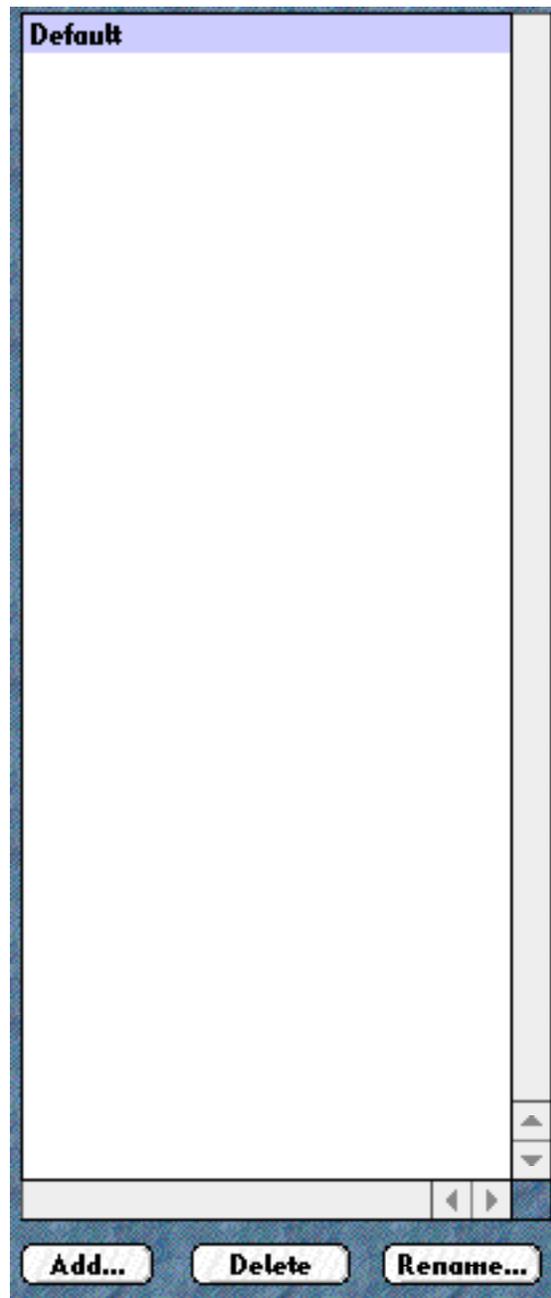
Main Window



The main window consists of the setup list, the mode selection, the regions, the arpeggiator, and the comment.

Setup List

List of setups saved to the current document. Setups can be selected with the mouse or via MIDI program change when the preference is enabled. A setup specifies the mode, regions, and arpeggiator settings.



Add

Add a new setup.

Delete

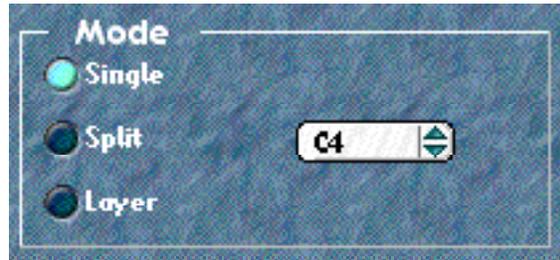
Delete the currently selected setup.

Rename

Rename the currently selected setup.

Mode

Each setup operates in one mode.



Single

Use only the first/lower region for the entire range of the keyboard.

Split

Split the keyboard. Use the lower region for notes below the split note, and upper region for notes above the split note.

Layer

Layer the keyboard. Activate both regions with one note.

Split Note

Specify the split note for the split mode.

Regions

There are two regions, first/lower and second/upper. Single mode only uses the first/lower region, while split and layer modes use both regions.



Channel

MIDI channel of the synthesizer that the region uses.

Bank

Bank for the region.

Program

Program for the region.

Chord

Chord for the region.

Transpose

Transpose amount for the region.

Pan

Pan for the region.

Volume

Reference

Volume for the region.

FX1

Global effect 1 send for the region.

FX2

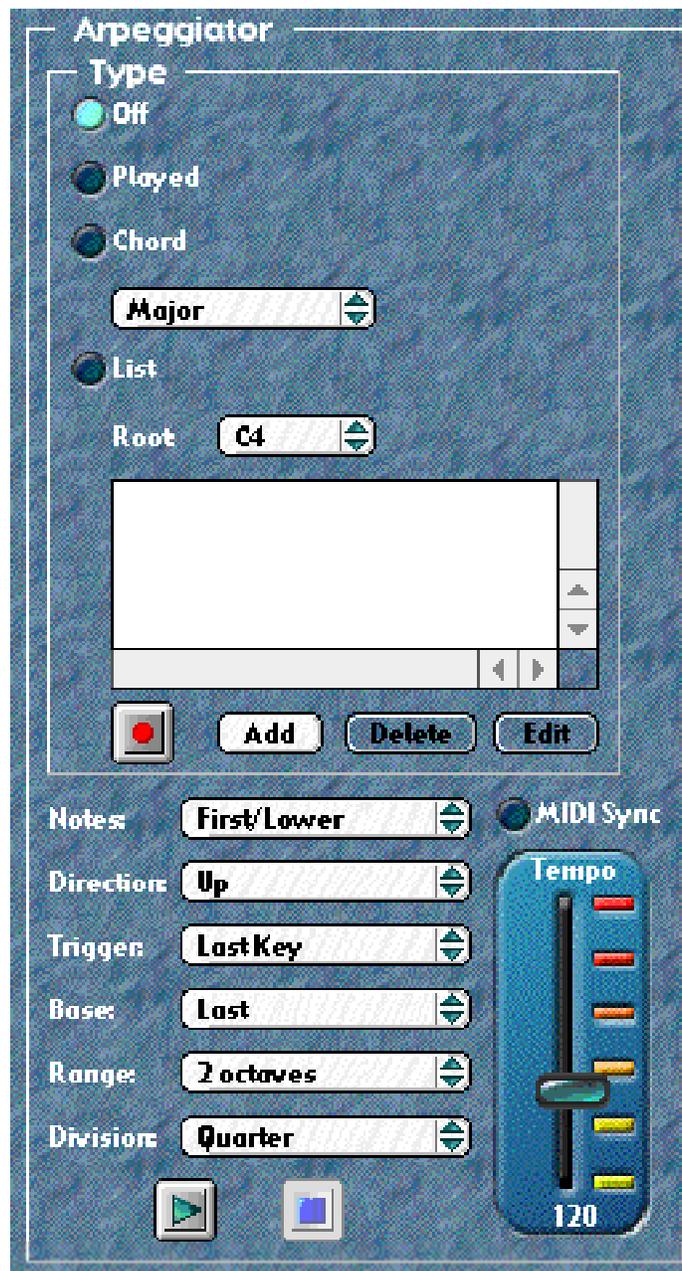
Global effect 2 send for the region.

Edit

Open the current program in the 'Retro AS-1 Editor'.

Arpeggiator

The arpeggiator is a mini-sequencer that will send notes to the synthesizer automatically without you having to play them yourself. Unlike human keyboard virtuosos, it shows up on time for the gig, and knows the part it's supposed to play!



Off

Arpeggiator is off.

Played

Arpeggiate through the currently played notes.

Chord

Arpeggiate on a specific chord.

List

Arpeggiate through notes in the user-defined list.

Chord Type

Chord to arpeggiate through when chord arpeggiate type is selected.

List Root Note

Root note of the notes to use in the list when list arpeggiate type. With this parameters you can transpose the arpeggiated pattern without having to edit the notes individually.

List Notes

List of notes to use when using list arpeggiate type. You can double-click on a note to edit it.

List Add Notes

Add the currently played notes to the list.

List Add Note

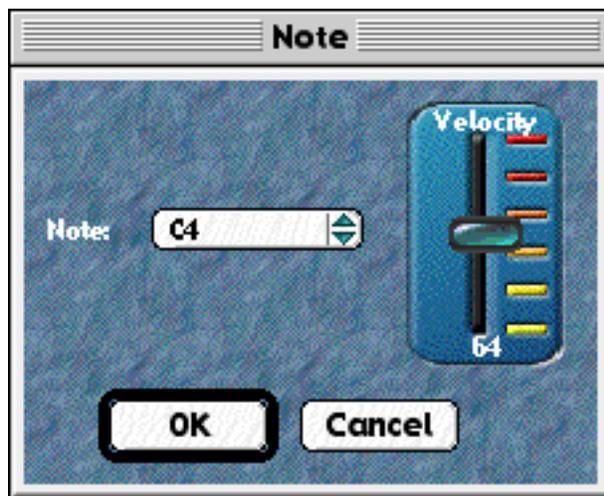
Add a single note to the note list. Bring up a dialog to edit the note.

List Delete Note

Delete the currently selected note in the note list.

List Edit Note

Edit the currently selected note from the note list.



Notes

Which notes to arpeggiate on:

- First/Lower
- Second/Upper
- Split
- Layer

Direction

Direction of the arpeggiator:

- Up
- Down
- Up & Down
- Random

Trigger

How to trigger the arpeggiator:

- Manual
- Last Key
- Low Key
- High Key
- Pedal

Note that manual trigger is always available, even when manual trigger type is not selected.

Base

Arpeggiate from which currently played note:

- Last
- Lowest
- Highest

Range

Range of the arpeggiation:

- 1 octave
- 2 octaves
- 3 octaves
- 4 octaves

Division

Division to arpeggiate on:

- whole note
- half note

Reference

- quarter note
- eighth note
- eighth triplet note
- sixteenth note
- sixteenth triplet note
- thirty secondth note

MIDI Sync

When checked, synchronize to MIDI clock. The tempo slider is disabled.

Tempo

Tempo that the arpeggiator is running at.

Play

Manually play the arpeggiation.

Stop

Manually stop the arpeggiation.

File Menu



New

Open a new file from the saved template in the preference file. If no template has been saved, use a default template.

Open

Open a file on the desktop.

Close

Close the top-most window.

Save

Save the top-most window.

Save As

Save the top-most window to a new file.

Save As 'New' Template

Save the top-most window as a new template in your preference file.

Revert

Discard any changes to the top-most window, and open up again from the desktop.

Quit

Quit the 'Retro AS-1 MIDI Processor'.

Edit Menu



Undo/Redo

Undo or redo the last task.

Cut

Cut the currently selected setup.

Copy

Copy the currently selected setup.

Paste

Paste a setup into the list.

Clear

Clear the currently selected.

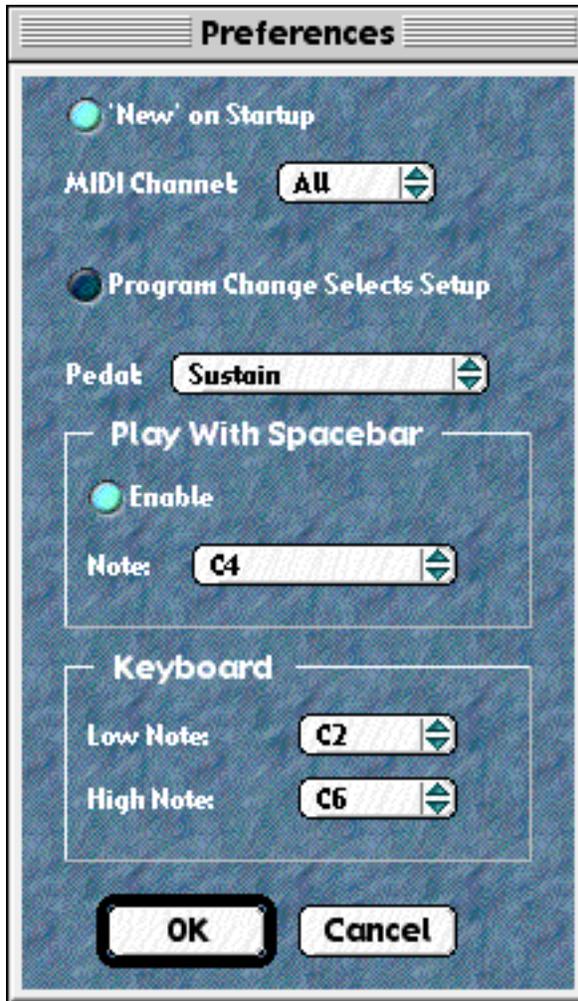
Bypass

Bypass the MIDI processor and pass MIDI through.

Latch

Latch the arpeggiator.

Preferences



'New' on Startup

Open up a new document when the 'Retro AS-1 MIDI Processor' is launched.

MIDI Channel

Incoming MIDI channel to process.

Program Change Selects Setup

When checked, MIDI program change will select setups from the setup list.

Pedal

MIDI pedal controller assignment used for the arpeggiator trigger.

Play With Spacebar Enable

Enable playing a note with the space bar.

Play With Spacebar Note

Note to play when the space bar is pressed.

Keyboard Low Note

Low note of the on-screen keyboard.

Keyboard High Note

High note of the on-screen keyboard.

Synthesizer Menu



All Notes Off

Send an all notes off message to the synthesizer.

All Sound Off

Send an all sound off message to the synthesizer.

Reset

Reset the synthesizer.

Reset Controllers

Reset the synthesizer controllers.

Start Record To Disk

Start the synthesizer recording to disk. You will be prompted for a file name.

Stop Record To Disk

Stop the synthesizer recording to disk.

Control Panel

Open the 'Retro AS-1' control panel.

Status

Open the 'Retro AS-1 Status' application.

Keyboard

Open the 'Retro AS-1 Keyboard' application.

Editor

Open the 'Retro AS-1 Editor' application.

Mixer

Open the 'Retro AS-1 Mixer' application.

BitHeadz Web Site

Connect to the BitHeadz web site using the default browser. You will need to have your internet configuration set up correctly, for example with the 'Internet Setup Assistant'.

Tools Window



Undo

Undo the last task.

Cut

Cut the selected setup.

Copy

Copy the selected setup.

Paste

Paste a setup.

Clear

Clear the selected setup.

All Notes Off

Send an all notes off message to the synthesizer.

All Sound Off

Send an all sound off message to the synthesizer.

Reset

Send a reset message to the synthesizer.

Start Record to Disk

Start record to disk. You will be prompted for a file name.

Stop Record to Disk

Stop record to disk.

Control Panel

Open the 'Retro AS-1' control panel.

Status

Reference

Open the 'Retro AS-1 Status' application.

Keyboard

Open the 'Retro AS-1 Keyboard' application.

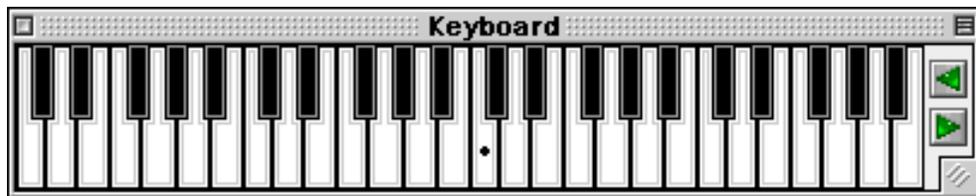
Editor

Open the 'Retro AS-1 Editor' application.

Mixer

Open the 'Retro AS-1 Mixer' application.

Keyboard Window



Keyboard

Click on the notes of the keyboard to send a MIDI note on to the synthesizer. Release for a MIDI note off.

Shift Down

Shift the keyboard down one octave. Option click to shift down by one note.

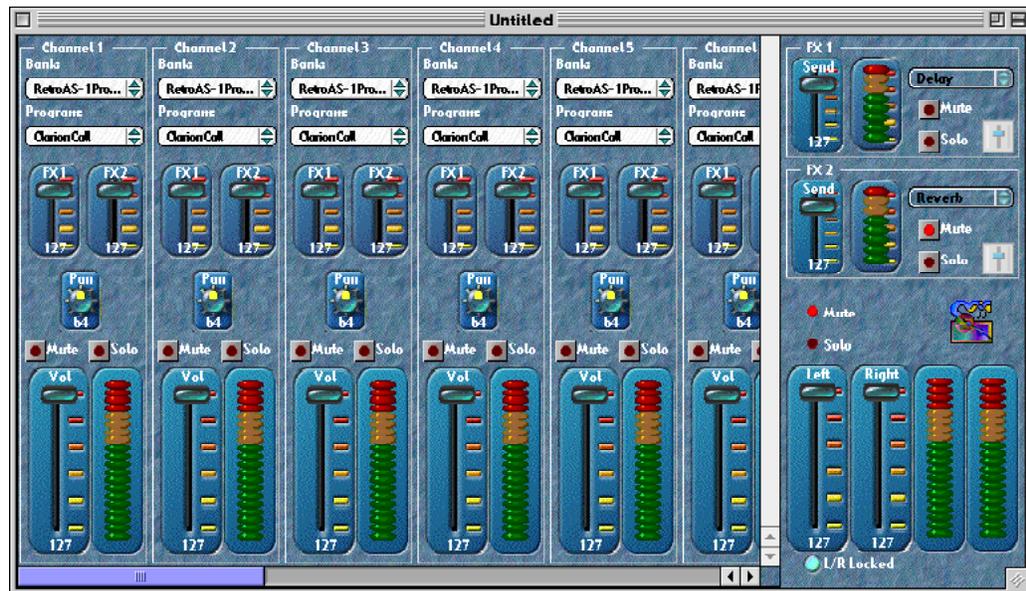
Shift Up

Shift the keyboard up one octave. Option click to shift up by one note.

Mixer

Show what's going on inside the engine on all sixteen MIDI channels.

Main Window



Channel

Sixteen MIDI channels.



Bank

Bank selected from the available Retro AS-1 banks. Banks are found by looking for a folder, or an alias to a folder in the System Folder called 'Retro AS-1 Programs'.

Program

Program selected from the current bank.

FX1

Effects depth 1 for this MIDI channel. Same as MIDI controller 91.

FX2

Effects depth 2 for this MIDI channel. Same as MIDI controller 92.

Pan

Pan for this MIDI channel. Same as MIDI controller 10.

Mute

Mute for this MIDI channel. Same as MIDI controller 20 (BitHeadz use of an undefined controller number).

Solo

Solo for this MIDI channel. Same as MIDI controller 21 (BitHeadz use of an undefined controller number).

Volume

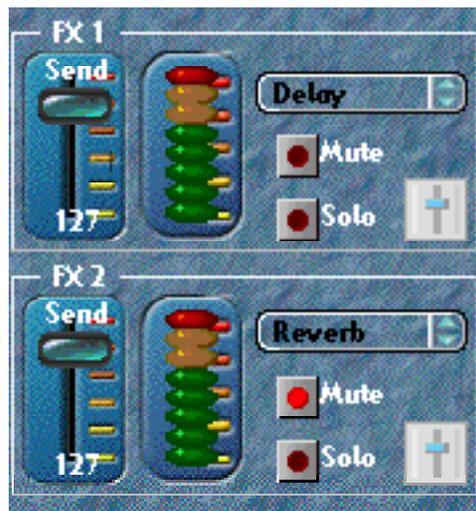
Volume for this MIDI channel. Outputs MIDI controller 7.

Meter

Display the current audio volume.

Global Effects

Two global effects are available for all sixteen MIDI channels. You can edit the global effects with the mixer only if 'Fixed' global effects type is chosen in the 'Retro AS-1' control panel.



Send

Overall send amount to the global effect.

Meter

Display the input amplitude to the global effect.

Type

Three types:

- Global delay
- Reflection
- Reverb

The type can only be selected if in 'Fixed' global effects type as chosen in the control panel.

Mute

Mute the global effect.

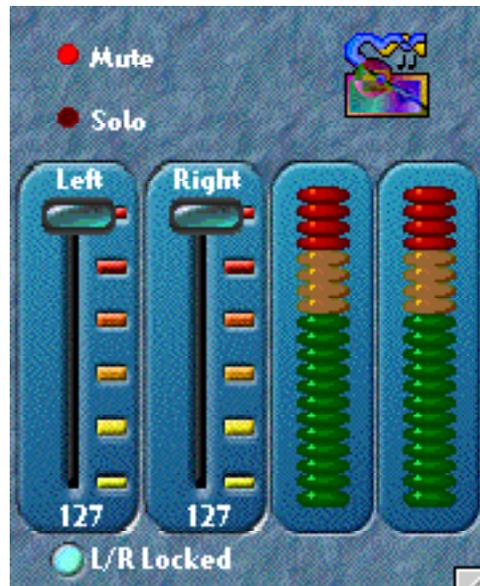
Solo

Solo the global effect.

Edit

Open the editor for the global effect if 'Fixed' global effects type is chosen in the control panel.

Output



Mute

Show if any channel or global effect is muted.

Solo

Mixer

Show if any channel or global effect is soloed.

Left

Master volume left.

Right

Master volume right.

Meters

Display the master output amplitude.

Locked

Lock the two master levels together so they can be moved together easily.

File Menu



New

Open a new window. Only one window can be open at a time with the mixer.

Open

Open a file on the desktop.

Close

Close the window.

Save

Save the window.

Save As

Save the window to a new file.

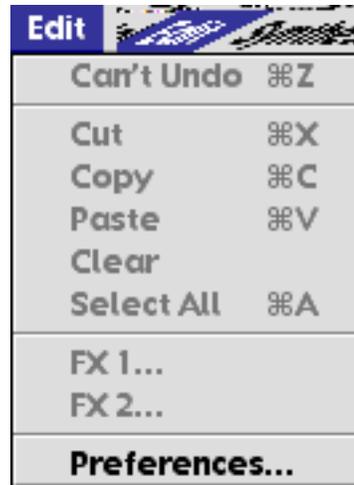
Revert

Discard any changes to the window, and open the file up again.

Quit

Quit the 'Retro AS-1 Mixer'.

Edit Menu



Undo

Undo the last task.

Cut

Cut the selected text.

Copy

Copy the selected text.

Paste

Paste text.

Clear

Clear the selected text.

FX1

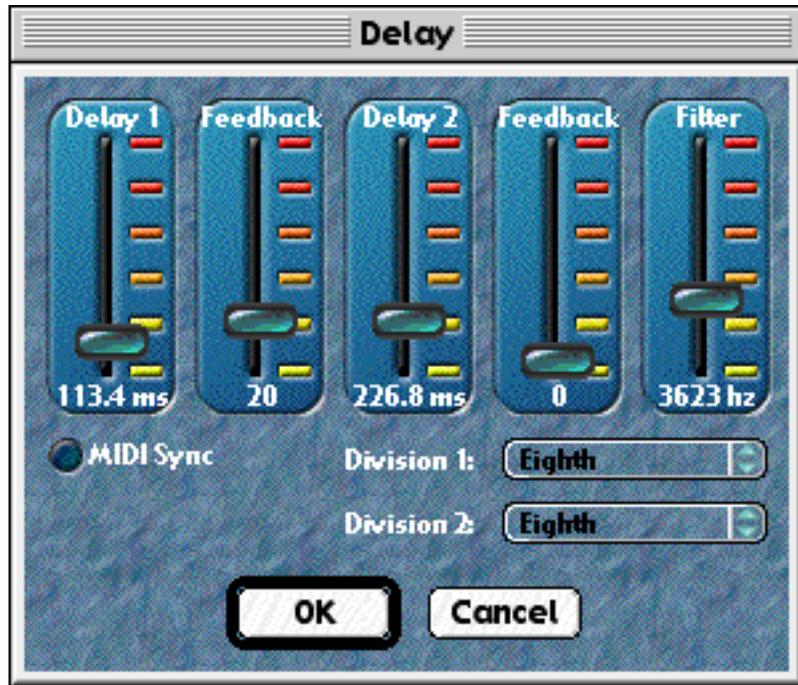
Open the editor for global effect 1. Enabled only if Retro AS-1 control panel effects are in fixed mode.

FX2

Open the editor for global effect 2. Enabled only if Retro AS-1 control panel effects are in fixed mode.

Delay

Global delay.



Delay 1

Length of the first tap.

Feedback 1

Feedback of the first tap.

Delay 2

Length of the second tap.

Feedback 2

Feedback of the second tap.

Filter

Lowpass filter on the output.

MIDI Sync

Enable MIDI sync to control the tap lengths.

Division 1

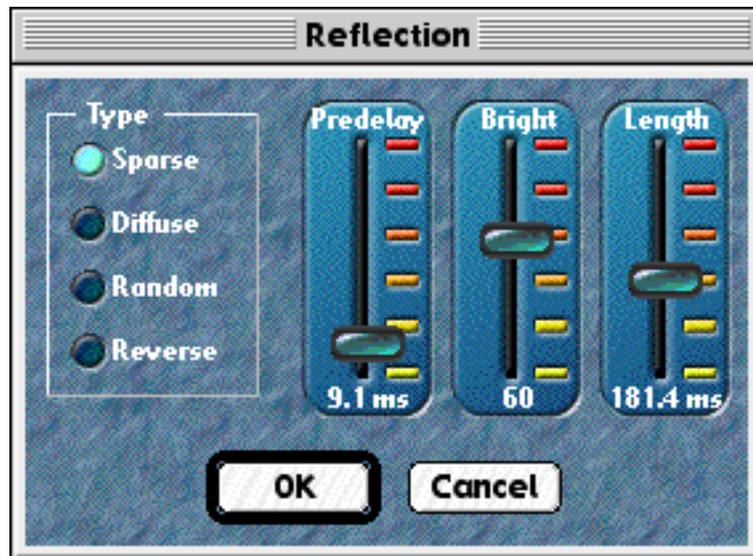
When MIDI sync is on, specify the length of the first tap.

Division 2

When MIDI sync is on, specify the length of the second tap.

Reflection

Global reflection.



Sparse

Sparse reflection pattern with normal decay.

Diffuse

Diffuse reflection pattern with many reflections and normal decay.

Random

Random reflection pattern in amplitude and time.

Reverse

Reverse reflection pattern in amplitude and time.

Predelay

Mixer

Time before the reflection is heard.

Brightness

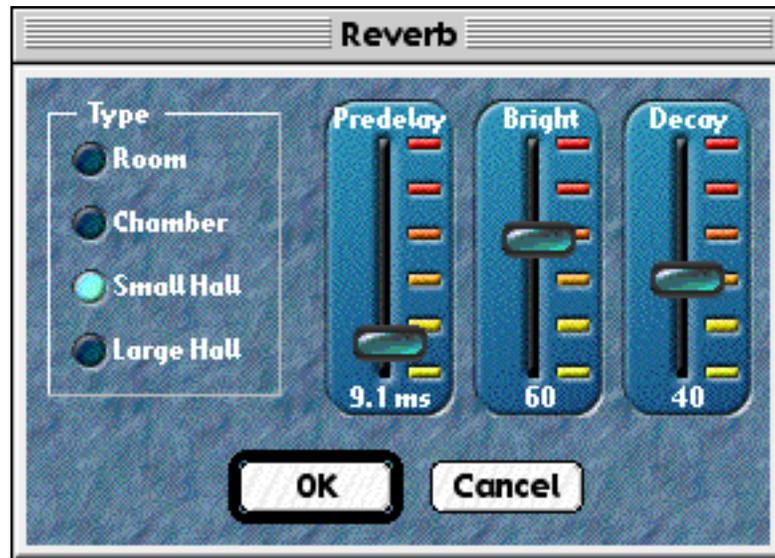
Brightness of the reflection output.

Length

Overall length of the reflections.

Reverb

Global reverb.



Room

Room reverb density.

Chamber

Chamber reverb density.

Small Hall

Larger space, a small hall.

Large Hall

Largest space, a large hall.

Predelay

Time before the reverb is heard.

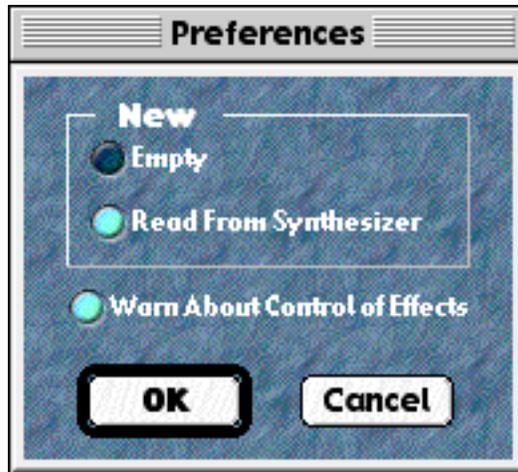
Brightness

Brightness of the reverb output.

Length

Overall length of the reflections.

Preferences



Empty

For a new mixer document, create an empty document and sent it down to the Retro AS-1 engine.

Read From Synthesizer

For a new mixer document, read the current engine status up from the Retro AS-1 engine.

Warn About Control of Effects

When the mixer is first launched, warn about the control of the effects if the mixer cannot edit the global effects. To edit the global effects, you should have the Retro AS-1 control panel global effects setting to 'Fixed'.

Synthesizer Menu



All Notes Off

Send an all notes off message to the synthesizer.

All Sound Off

Send an all sound off message to the synthesizer.

Reset

Reset the synthesizer.

Reset Controllers

Reset the synthesizer controllers.

Start Record To Disk

Start the synthesizer recording to disk. You will be prompted for a file name.

Stop Record To Disk

Stop the synthesizer recording to disk.

Control Panel

Open the 'Retro AS-1' control panel.

Status

Reference

Open the 'Retro AS-1 Status' application.

Keyboard

Open the 'Retro AS-1 Keyboard' application.

Editor

Open the 'Retro AS-1 Editor' application.

MIDI Processor

Open the 'Retro AS-1 MIDI Processor' application.

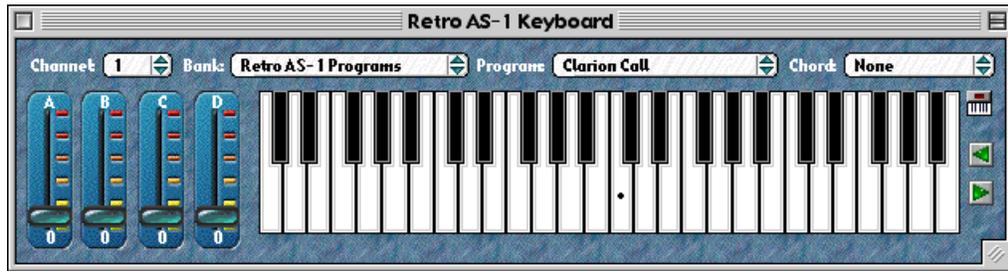
BitHeadz Web Site

Connect to the BitHeadz web site using the default browser. You will need to have your internet configuration set up correctly, for example with the 'Internet Setup Assistant'.

Keyboard

Send MIDI events to the engine with either the mouse or the ASCII keyboard.

Main Window



Channel

MIDI channel to send events on to the synthesizer.



Bank

Bank to choose sounds from. Banks are found by looking for a folder, or an alias to a folder in the System Folder called 'Retro AS-1 Programs'.



Program

Program to play from the currently selected bank.

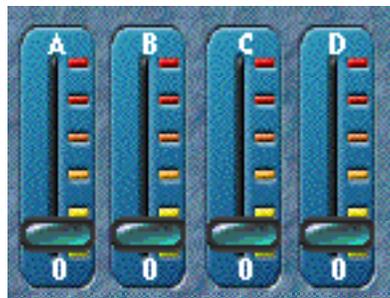


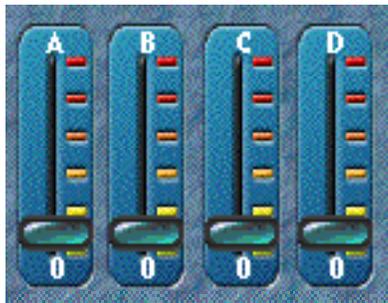
Chord

Reference

Chord to play:

- None
- Fourth
- Tritone
- Fifth
- Sixth
- Octave
- Diminished
- Minor
- Minor 6th
- Major
- Major 6th
- Augmented
- Diminished 7th
- Minor 7th
- Dominant 7th
- Major 7th
- Augmented 7th
- Diminished 9th
- Minor 9th
- Dominant 9th
- Major 9th
- Augmented 9th





Controllers

Controllers send as MIDI controllers 16-19. These are used as controller A, B, C, and D in the engine for real-time MIDI control.



Latch

Latch all notes played by the keyboard.

Shift Left

Shift the keyboard down one octave. Option shift to shift down by one note.

Shift Right

Shift the keyboard up one octave. Option shift to shift up by one note.

File Menu



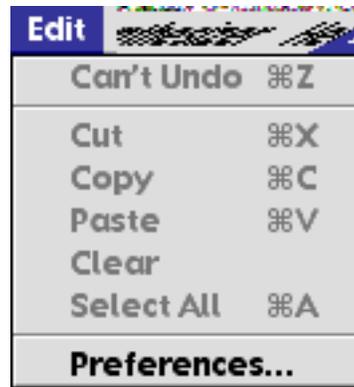
Close

Close the window and quit.

Quit

Close the window and quit.

Edit Menu



Undo/Redo

Undo/redo the last text task.

Cut

Cut the selected text.

Copy

Copy the selected text.

Paste

Paste the selected text.

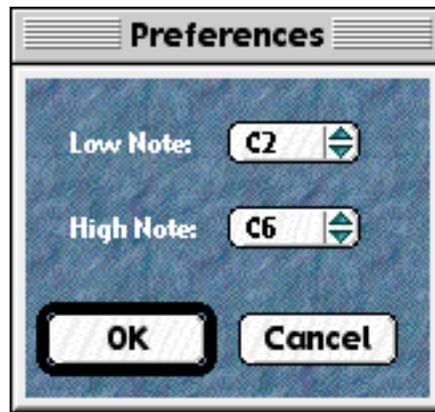
Clear

Clear the selected text.

Select All

Select all of the edited text.

Preferences



Low Note

Low note of the keyboard.

High Note

High note of the keyboard.

Synthesizer Menu



All Notes Off

Send an all notes off message to the synthesizer.

All Sound Off

Send an all sound off message to the synthesizer.

Reset

Reset the synthesizer.

Reset Controllers

Reset the synthesizer controllers.

Start Record To Disk

Start the synthesizer recording to disk. You will be prompted for a file name.

Stop Record To Disk

Stop the synthesizer recording to disk.

Control Panel

Open the 'Retro AS-1' control panel.

Status

Open the 'Retro AS-1 Status' application.

Editor

Open the 'Retro AS-1 Editor' application.

MIDI Processor

Open the 'Retro AS-1 MIDI Processor' application.

Mixer

Open the 'Retro AS-1 Mixer' application.

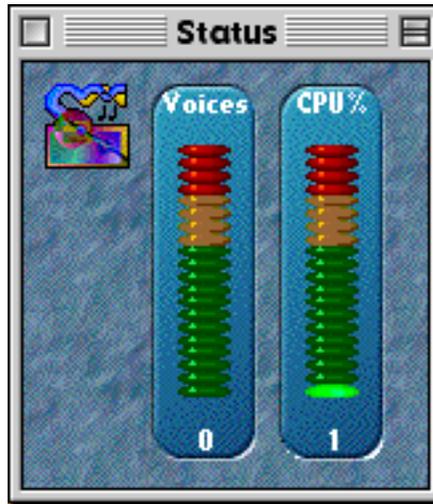
BitHeadz Web Site

Connect to the BitHeadz web site using the default browser. You will need to have your internet configuration set up correctly, for example with the 'Internet Setup Assistant'.

Status

The status application shows the current number of voices and CPU percentage being used by the engine. It can optionally be opened up any time the engine is used with a checkbox in the 'Retro AS-1' control panel.

Main Window



Voices

Current number of voices being played.

CPU %

Current CPU percentage being used.

File Menu



Close

Close and quit the 'Retro AS-1 Status' application.

Quit

Close and quit the 'Retro AS-1 Status' application.

Synthesizer Menu



All Notes Off

Send an all notes off message to the synthesizer.

All Sound Off

Send an all sound off message to the synthesizer.

Reset

Reset the synthesizer.

Reset Controllers

Reset the synthesizer controllers.

Start Record To Disk

Start the synthesizer recording to disk. You will be prompted for a file name.

Stop Record To Disk

Stop the synthesizer recording to disk.

Control Panel

Open the 'Retro AS-1' control panel.

Keyboard

Status

Open the 'Retro AS-1 Keyboard' application.

Editor

Open the 'Retro AS-1 Editor' application.

MIDI Processor

Open the 'Retro AS-1 MIDI Processor' application.

Mixer

Open the 'Retro AS-1 Mixer' application.

BitHeadz Web Site

Connect to the BitHeadz web site using the default browser. You will need to have your internet configuration set up correctly, for example with the 'Internet Setup Assistant'.

Serial Input

Get MIDI in directly by communicating with a MIDI interface connected to a serial port. If you have a USB Macintosh with no serial port, you cannot use this application. Use 'Retro AS-1 OMS Input' or 'Retro AS-1 FreeMIDI Input' instead.

Main Window

Display MIDI activity on each of the sixteen MIDI channels, and for real-time MIDI.



File Menu



Close

Close and quit the 'Retro AS-1 Serial Input'.

Quit

Close and quit the 'Retro AS-1 Serial Input'.

Port Menu



Modem

Connect to the modem port.

Printer

Serial Input

Connect to the printer port.

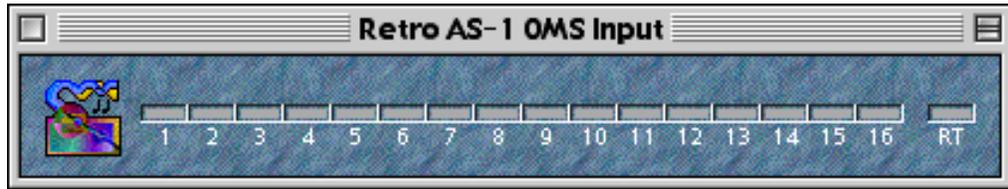
Fast

For the MOTU MIDI TimePiece MIDI interface, use the fast mode to communicate between the interface and the Macintosh.

OMS Input

Main Window

Display MIDI activity on each of the sixteen MIDI channels, and for real-time MIDI.



File Menu



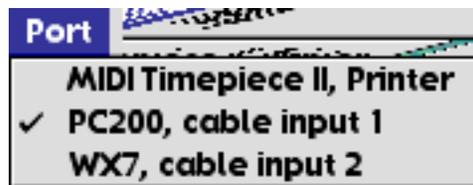
Close

Close and quit the 'Retro AS-1 OMS Input'.

Quit

Close and quit the 'Retro AS-1 OMS Input'.

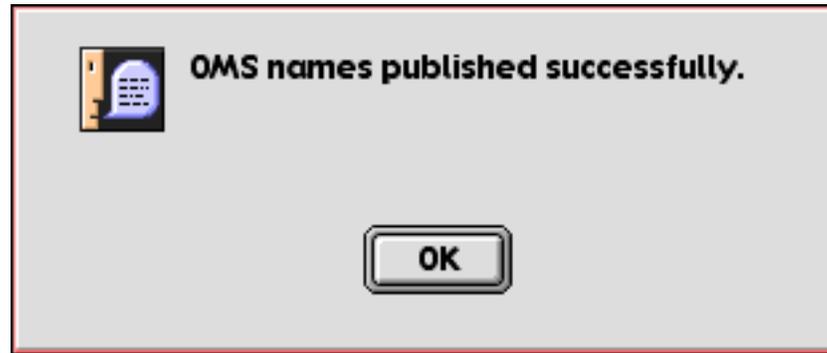
Port Menu



List all of the ports that OMS knows about. You will have to select one.

OMS Publish

The 'Retro AS-1 OMS Publish' utility tells OMS to look for the 'Retro AS-1 Names' file in the 'OMS Folder' in your System folder. You only need to run this utility once after you have changed your OMS setup with the Opcode application 'OMS Setup'. Once this application has been run successfully, you will see the Retro AS-1 bank and program names show up correctly with OMS-aware applications.



Once you see this dialog, you can quit the 'Retro AS-1 Publish' application.

FreeMIDI Input

Main Window

Display MIDI activity on each of the sixteen MIDI channels, and for real-time MIDI.



File Menu



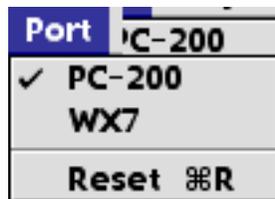
Close

Close and quit the 'Retro AS-1 FreeMIDI Input'.

Quit

Close and quit the 'Retro AS-1 FreeMIDI Input'.

Port Menu



List all of the ports that FreeMIDI knows about. Select one.

Reset

Reset the port.

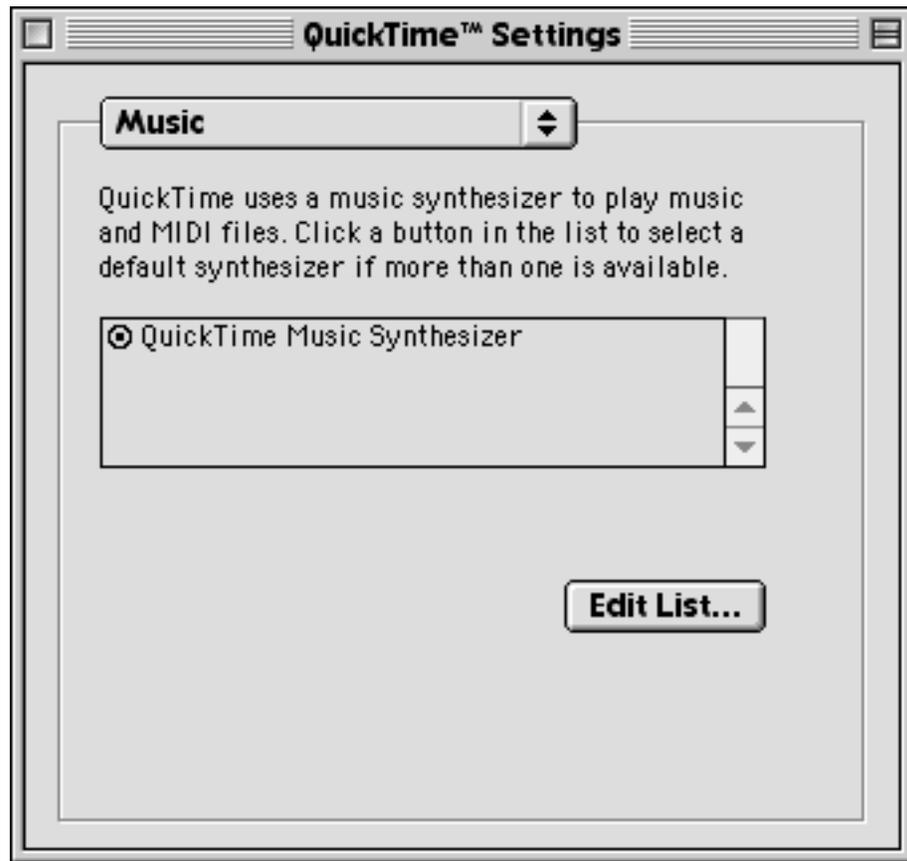
QuickTime Driver

The 'Retro AS-1 QuickTime Driver' is a Macintosh extension that allows QuickTime to use the Retro AS-1 as an output synthesizer for MIDI track playback.

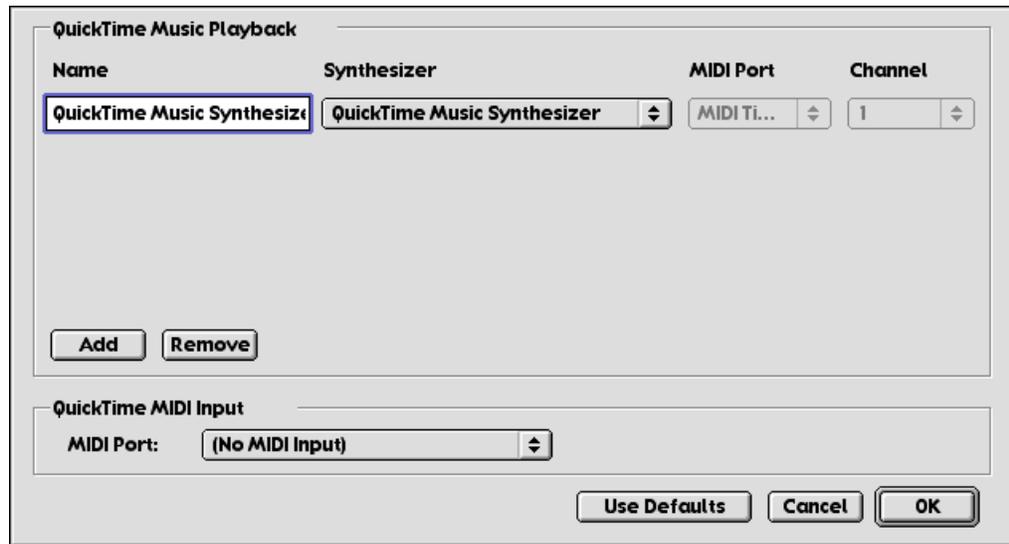
Installation

Put the 'Retro AS-1 QuickTime Driver' in your Extensions folder. You will have to reboot for the operating system to recognize it.

Now, open up the QuickTime control panel, and go to the music page. Here you see which synthesizers QuickTime knows about. Notice that the Retro AS-1 is not in this list yet.



Click on the edit list button at the bottom.



Now, click on the add button and select the synthesizer Retro AS-1 from the synthesizer menu. Click OK. Now you should see the Retro AS-1 in the available synthesizers list.

Usage

You will need a version of QuickTime Pro to edit the MIDI track assignments of a QuickTime movie. Use MoviePlayer to open an existing movie or create a movie from scratch and import a Standard MIDI file. Choose Get Info about the movie, and find the music page. Have at it...

File Typer

The 'Retro AS-1 File Typer' is a little drag & drop utility for converting files that were created on the PC version of Retro AS-1 to the Macintosh. All this utility does is search through the files and folders that were dropped on top of it and checks inside the files to see which are Retro AS-1 files. Those that are have the Macintosh file type and creator set correctly.

PC

The 'Retro AS-1 PC' is a little drag & drop application for converting files created on the Macintosh to the PC. All it does is append '.ras' to the end of Retro AS-1 files so that they can be interpreted correctly on the PC.

ReWire Plug-in

The ReWire plug-in is used by VST applications such as Steinberg's Cubase, Emagic's Logic, or Studio Vision 4.5 to get the digital output from the Retro AS-1 into the sequencer. The plug-in needs to be placed in your Extensions folder for the sequencers to find it correctly.

Cubase 4.0.0r3 or later is required.

MAS 2.0 Plug-in

The MAS 2.0 plug-in is used by Digital Performer to read the digital output from the Retro AS-1 into Digital Performer as an audio track. The plug-in needs to be placed in the 'Plug-ins' folder in the 'MOTU' folder of your 'Extension' folder. It is suggested that you use auxiliary audio tracks for starters, as opposed to voice audio tracks inside Digital Performer.

Digital Performer 2.6 or later is required.

Names

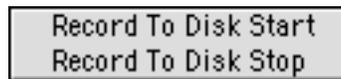
Drag and drop utility to create a text list of all of the Retro AS-1 banks currently installed into the 'Retro AS-1 Programs' folder. 128 names for each bank are listed. If a bank does not have 128 programs, then blanks are listed. You can use this document for pasting into patch lists in OMS applications or Logic.

Record Control Strip Module

The 'Retro AS-1 Record' control strip module is installed automatically. If you are using the control strip, you will see the little icon in you control strip:



With this little module, you can start and stop the record to disk process of the engine. Note that the engine must already be running as launched from another application.



Click on the icon and select either start or stop. A file named 'Retro AS-1 Record To Disk' is created on your desktop. The file is not overwritten. Subsequent record to disks will have 1, 2, and so on appended to the file name

Volume Control Strip Module

The 'Retro AS-1 Volume' control strip module is installed automatically. If you are using the control strip, you will see the little icon in you control strip:



Here you will be able to change the volume of the Retro AS-1 engine. The engine must be running having been launched from another application.



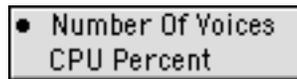
When you click on the icon, you will get a little slider to change the volume with.

Meter Control Strip Module

The 'Retro AS-1 Meter' control strip module is installed automatically. If you are using the control strip, you will see the little meter in your control strip:



You will be able to monitor the current number of voices or CPU percentage being used by the Retro AS-1 engine.



Clicking on the icon will bring up a little menu to choose what you are viewing.

Frequently Asked Questions

Some frequently asked questions from our technical support department.

Please check our website at www.bitheadz.com for the most up-to-date FAQ lists.

Cannot connect to engine

1. Check to make sure that you have enough memory in your machine. The Retro AS-1 engine uses between 8 and 14 Mbytes of memory.
2. Make sure that the Retro AS-1 engine and objects library are installed in your Extension folder.
3. Make sure you have enough free memory to run the Retro AS-1 application and engine at the same time. If not, quit an unused application.
4. Over time, even though the Finder says that you have enough free memory, the memory may get fragmented. You may need to restart if the Finder says you have plenty of memory, but still cannot connect to the engine.

No sound output

1. Check to make sure that your amplifier is turned on and that the output from your computer is plugged into the amplifier or speakers.
2. Check your sound output selection in the control panel. When in doubt, use Sound Manager to make sure sound is working.
3. If you have chosen Sound Manager, check in your Sound or Monitors & Sound control panel that the sound output volume is turned up¹.

Sound is distorted

1. Make sure that the audio output from your computer is not overloading your sound or speaker system. Try turning down the volume on your power amp or speakers and see if the distortion persists.
2. You can try turning down the volume of the voices via MIDI volume for individual MIDI channels, or use the mixer to lower the volume of the master output.
3. You can try to edit the voices that you are using to attenuate them a bit.
4. Try limiting the number of voices to lighten the CPU load. Sometimes, when the CPU load is too high, the output distorts and stutters.
5. Limit the CPU usage in the 'Retro AS-1' control panel to lighten the CPU load.

No MIDI input

1. Check your MIDI cables².
2. Check to make sure your MIDI interface is turned on³.
3. If you have a serial port Macintosh, try the 'Retro AS-1 Serial Input' utility to make sure your MIDI interface is connected to the right port and functioning properly. You should see the MIDI activity lights changing in the 'Retro AS-1 Serial Input' application.

-
1. by the way, since you're in the control panel, you may want to turn your alert volume down.
 2. don't laugh, all of us have missed this at one point in time.
 3. ditto.

Sluggish CPU performance

4. If you are using OMS or FreeMIDI, try running the setup application to make sure your interfaces are being recognized properly.

Sluggish CPU performance

1. Make sure there is not too much other activity in your system. No, Martha, you can't run 73 plug-in reverbs and automate your mixdown and expect that the Retro AS-1 can perform optimally.
2. Limit the number of voices in the 'Retro AS-1' control panel.
3. Limit the maximum CPU usage in the 'Retro AS-1' control panel.

Using the MOTU 2408

Check out the support area in BitHeadz web site at www.bitheadz.com for the latest information on integrating with your MOTU 2408.

Macintosh startup sound too loud

You've set the Sound Manager output volumes the way you like them, but the Macintosh startup sound is now way too loud. Our suggestion is to use the BitHeadz freeware utility 'Startup Sound Mute'. This little control panel will allow you to mute the startup sound of your Macintosh. Check it out at www.bitheadz.com.

*Differences between
Version 1.x and Version 2.x*

Lots of improvements with version 2.x.

Stereo Signal Path

The oscillators, filters, and insert effects are all true stereo. Most all analog synthesizers are monophonic throughout.

Oscillator Types

More oscillator types added:

- Sine Square Root
- Sine Squared
- Sine Warp 1
- Sine Warp 2
- Asymmetrical Sine

Notice a pattern here? Variations on sine waves are cool, especially with non-linear processing like FM, sync, and ring modulators.

Ring Modulator

You can ring modulate between the oscillators, external audio input, and the filters. Tre' chic.

External Audio Input

An external audio input can be routed to the ring modulator or filters. You can use this as a modulation source for sync or FM, or you can process the external audio with the Retro AS-1 filters and insert effects. You can even trigger MIDI notes from the external audio input.

Filter Types

More filter types:

- Slope
- Threshold
- Comb

The first two are non-linear types that will introduce some subtle distortion to the signal. The comb filter is essentially a little delay line being fed back upon itself.

Modulators

Delay parameter for all modulators.

Insert Effect Types

New insert effect types:

- Compressor
- MultiTap Chorus
- Pitch Shifter
- Degrade

G4 and Pentium III Optimization

Optimized for the latest PC and Macintosh hardware. Also increased the number of voices to 128.

Multiprocessor Support

You can take advantage of the latest dual processor Macintoshes with the multiprocessor support. This lets you offload the main cpu by calculating most of the Retro AS-1 voices on the second CPU.

Automatic Publishing of OMS and FreeMIDI Names

No more having to deal with OMS and FreeMIDI names. The names are automatically published when the Retro AS-1 is launched.

A big yeah!

Controller Mappings

With the 'Retro AS-1' control panel, you can specify up to eight controller mappings. Now, if you have a controller that only sends modulation wheel, you can map it to any controller number to control parameters inside the Retro AS-1.

Velocity Tables

Velocity table for scaling MIDI velocity before it is used internally by the engine.

Audio Mappings

For ASIO and DirectIO, you can map any Retro AS-1 output to any hardware output.

MIDI Processor Improvements

Chords, pan, volue, fx1, fx2 are now saved per setup.

DirectConnect Support

ProTools 5 guys can get access to the digital audio output from the Retro AS-1 by using DirectConnect. The Retro AS-1 appears as an input plug-in to audio tracks inside of ProTools.

The gory details. If you have trouble sleeping, this is the place to start...

MIDI Implementation Chart

Controllers:

0	Bank High
1	Modulation Wheel
2	Breath Control
4	Foot Control
5	Portamento Time
6	Data Entry High
7	Volume
10	Pan
11	Expression
14	Transpose
15	Fine
16	Controller A
17	Controller B
18	Controller C
19	Controller D
20	Mute
21	Solo
32	Bank Low
38	Data Entry Low
64	Sustain Pedal
65	Portamento Pedal
66	Sostenuto
67	Soft Pedal
68	Legato Pedal
69	Hold Pedal
70	Oscillator 1 Volume
71	Oscillator 2 Volume
72	Oscillator 3 Volume
74	Filter 1 Cutoff
75	Filter 1 Resonance
76	Filter 2 Cutoff
77	Filter 2 Resonance
78	Envelope 1 Attack
79	Envelope 2 Decay
85	Edit Sound
91	Effects Depth 1
92	Effects Depth 2
98	NRPN Low
99	NRPN High
120	All Sound Off
121	Reset Controllers
123	All Notes Off

NRPN Implementation

The Retro AS-1 NRPN implementation allows you to control all of the parameters via MIDI. The NRPN value is sent in hexadecimal numbers as four controller change messages. We are using Non-registered parameter number low (\$62 = 98) and high (\$63 = 99), as well as data entry low (\$26 = 38) and high (\$06 = 6). Those of you who do not know hexadecimal numbers should try to find a computer-type friend you knows bits and bytes.

```
b0 62 pl
b0 63 ph
b0 26 dl
b0 06 dh
```

```
pl = parameter with index low 7 bits
ph = parameter with index high 7 bits
dl = data low 7 bits
dh = data high 7 bits
```

```
parameter with index = parameter + (index<<10)
```

Like normal controller messages, you offset the b0 status byte by 0 to 15 for the MIDI channel you want to control. The data values are biased around \$40 for the high data for bipolar parameters such as oscillator coarse and fine tune, routing amount, eq gains, flange, chorus, and multitap chorus feedback, and phaser amounts.

To send an NRPN to a routing or modulator, you also need to send an index to specify which modulator in the file you want to control.

The parameter numbers for all of the parameters supported by the Retro AS-1 are:

```
// oscillators
1: kAnalogParameterOscillator1Enable,
2: kAnalogParameterOscillator1Stereo,
3: kAnalogParameterOscillator1KeyboardTracking,
4: kAnalogParameterOscillator1Type,
5: kAnalogParameterOscillator1SyncSource,
6: kAnalogParameterOscillator1FMSource,
7: kAnalogParameterOscillator1CoarseTune,
8: kAnalogParameterOscillator1FineTune,
9: kAnalogParameterOscillator1Random,
10: kAnalogParameterOscillator1Symmetry,
11: kAnalogParameterOscillator1FMAmount,
12: kAnalogParameterOscillator1Pan,
13: kAnalogParameterOscillator1Volume,

14: kAnalogParameterOscillator2Enable,
15: kAnalogParameterOscillator2Stereo,
16: kAnalogParameterOscillator2KeyboardTracking,
17: kAnalogParameterOscillator2Type,
18: kAnalogParameterOscillator2SyncSource,
19: kAnalogParameterOscillator2FMSource,
20: kAnalogParameterOscillator2CoarseTune,
21: kAnalogParameterOscillator2FineTune,
22: kAnalogParameterOscillator2Random,
```

```
23: kAnalogParameterOscillator2Symmetry,
24: kAnalogParameterOscillator2FMAmount,
25: kAnalogParameterOscillator2Pan,
26: kAnalogParameterOscillator2Volume,

27: kAnalogParameterOscillator3Enable,
28: kAnalogParameterOscillator3Stereo,
29: kAnalogParameterOscillator3KeyboardTracking,
30: kAnalogParameterOscillator3Type,
31: kAnalogParameterOscillator3SyncSource,
32: kAnalogParameterOscillator3FMSource,
33: kAnalogParameterOscillator3CoarseTune,
34: kAnalogParameterOscillator3FineTune,
35: kAnalogParameterOscillator3Random,
36: kAnalogParameterOscillator3Symmetry,
37: kAnalogParameterOscillator3FMAmount,
38: kAnalogParameterOscillator3Pan,
39: kAnalogParameterOscillator3Volume,

// ring modulator
40: kAnalogParameterRingModulatorEnable,
41: kAnalogParameterRingModulatorOscillator1,
42: kAnalogParameterRingModulatorOscillator2,
43: kAnalogParameterRingModulatorOscillator3,
44: kAnalogParameterRingModulatorExternalAudio,
45: kAnalogParameterRingModulatorFilter1,
46: kAnalogParameterRingModulatorFilter2,

// filters
47: kAnalogParameterFilter1Enable,
48: kAnalogParameterFilter1Type,
49: kAnalogParameterFilter1CMSource,
50: kAnalogParameterFilter1Oscillator1,
51: kAnalogParameterFilter1Oscillator2,
52: kAnalogParameterFilter1Oscillator3,
53: kAnalogParameterFilter1RingModulator,
54: kAnalogParameterFilter1ExternalAudio,
55: kAnalogParameterFilter1Filter2,
56: kAnalogParameterFilter1Cutoff,
57: kAnalogParameterFilter1Spread,
58: kAnalogParameterFilter1CMAmount,
59: kAnalogParameterFilter1Resonance,
60: kAnalogParameterFilter1Overdrive,

61: kAnalogParameterFilter2Enable,
62: kAnalogParameterFilter2Type,
63: kAnalogParameterFilter2CMSource,
64: kAnalogParameterFilter2Oscillator1,
65: kAnalogParameterFilter2Oscillator2,
66: kAnalogParameterFilter2Oscillator3,
67: kAnalogParameterFilter2RingModulator,
68: kAnalogParameterFilter2ExternalAudio,
69: kAnalogParameterFilter2Filter1,
70: kAnalogParameterFilter2Cutoff,
```

```
71: kAnalogParameterFilter2Spread,  
72: kAnalogParameterFilter2CMAmount,  
73: kAnalogParameterFilter2Resonance,  
74: kAnalogParameterFilter2Overdrive,  
  
// routings  
75: kAnalogParameterRoutingSource,  
76: kAnalogParameterRoutingDestination,  
77: kAnalogParameterRoutingAmount,  
  
// modulators  
78: kAnalogParameterModulatorTrigger,  
79: kAnalogParameterModulatorDelay,  
  
80: kAnalogParameterEnvelopeComplete,  
81: kAnalogParameterEnvelopeType,  
82: kAnalogParameterEnvelopeAttack,  
83: kAnalogParameterEnvelopeDecay,  
84: kAnalogParameterEnvelopeSustainLevel,  
85: kAnalogParameterEnvelopeSustainDecay,  
86: kAnalogParameterEnvelopeRelease,  
  
87: kAnalogParameterLFOType,  
88: kAnalogParameterLFORandomPhaseInitialization,  
89: kAnalogParameterLFOPhase,  
90: kAnalogParameterLFOSpeed,  
91: kAnalogParameterLFOSymmetry,  
92: kAnalogParameterLFORamp,  
93: kAnalogParameterLFOSync,  
94: kAnalogParameterLFODivision,  
  
95: kAnalogParameterRandomFilter,  
96: kAnalogParameterRandomRamp,  
  
97: kAnalogParameterRampSpeed,  
98: kAnalogParameterRampCurvature,  
  
// insert effects  
99: kAnalogParameterInsertEffect1Enable,  
100: kAnalogParameterInsertEffect1Invert,  
  
101: kAnalogParameterCompressor1Gain,  
102: kAnalogParameterCompressor1Threshold,  
103: kAnalogParameterCompressor1Attack,  
104: kAnalogParameterCompressor1Decay,  
105: kAnalogParameterCompressor1Amount,  
  
106: kAnalogParameterParametricEQ1Frequency,  
107: kAnalogParameterParametricEQ1Q,  
108: kAnalogParameterParametricEQ1Gain,  
  
109: kAnalogParameterShelfEQ1LowFrequency,  
110: kAnalogParameterShelfEQ1LowGain,  
111: kAnalogParameterShelfEQ1HighFrequency,
```

112: kAnalogParameterShelfEQ1HighGain,
113: kAnalogParameterFlange1Delay,
114: kAnalogParameterFlange1Feedback,
115: kAnalogParameterFlange1Speed,
116: kAnalogParameterFlange1Depth,
117: kAnalogParameterFlange1Mix,

118: kAnalogParameterChorus1Delay,
119: kAnalogParameterChorus1Feedback,
120: kAnalogParameterChorus1Speed,
121: kAnalogParameterChorus1Depth,
122: kAnalogParameterChorus1Mix,

123: kAnalogParameterPhaser1Delay,
124: kAnalogParameterPhaser1Amount,
125: kAnalogParameterPhaser1Speed,
126: kAnalogParameterPhaser1Depth,
127: kAnalogParameterPhaser1Mix,

128: kAnalogParameterMultiTapChorus1Delay1,
129: kAnalogParameterMultiTapChorus1Feedback1,
130: kAnalogParameterMultiTapChorus1Speed1,
131: kAnalogParameterMultiTapChorus1Depth1,
132: kAnalogParameterMultiTapChorus1Delay2,
133: kAnalogParameterMultiTapChorus1Feedback2,
134: kAnalogParameterMultiTapChorus1Speed2,
135: kAnalogParameterMultiTapChorus1Depth2,
136: kAnalogParameterMultiTapChorus1Mix,

137: kAnalogParameterPitchShift1Coarse,
138: kAnalogParameterPitchShift1Fine,
139: kAnalogParameterPitchShift1Mix,

140: kAnalogParameterInsertDelay1Delay1,
141: kAnalogParameterInsertDelay1Division1,
142: kAnalogParameterInsertDelay1Feedback1,
143: kAnalogParameterInsertDelay1Delay2,
144: kAnalogParameterInsertDelay1Division2,
145: kAnalogParameterInsertDelay1Feedback2,
146: kAnalogParameterInsertDelay1Mix,
147: kAnalogParameterInsertDelay1Sync,

148: kAnalogParameterOverdrive1Gain,
149: kAnalogParameterOverdrive1Threshold,
150: kAnalogParameterOverdrive1Amount,
151: kAnalogParameterOverdrive1Filter,
152: kAnalogParameterOverdrive1Mix,

153: kAnalogParameterDistortion1Threshold,
154: kAnalogParameterDistortion1Hysteresis,
155: kAnalogParameterDistortion1Tone,
156: kAnalogParameterDistortion1Mix,

157: kAnalogParameterDegrade1NumberOfBits,
158: kAnalogParameterDegrade1SampleRateReduction,
159: kAnalogParameterDegrade1Filter,

160: kAnalogParameterInsertEffect2Enable,
161: kAnalogParameterInsertEffect2Invert,

162: kAnalogParameterCompressor2Gain,
163: kAnalogParameterCompressor2Threshold,
164: kAnalogParameterCompressor2Attack,
165: kAnalogParameterCompressor2Decay,
166: kAnalogParameterCompressor2Amount,

167: kAnalogParameterParametricEQ2Frequency,
168: kAnalogParameterParametricEQ2Q,
169: kAnalogParameterParametricEQ2Gain,

170: kAnalogParameterShelfEQ2LowFrequency,
171: kAnalogParameterShelfEQ2LowGain,
172: kAnalogParameterShelfEQ2HighFrequency,
173: kAnalogParameterShelfEQ2HighGain,

174: kAnalogParameterFlange2Delay,
175: kAnalogParameterFlange2Feedback,
176: kAnalogParameterFlange2Speed,
177: kAnalogParameterFlange2Depth,
178: kAnalogParameterFlange2Mix,

179: kAnalogParameterChorus2Delay,
180: kAnalogParameterChorus2Feedback,
181: kAnalogParameterChorus2Speed,
182: kAnalogParameterChorus2Depth,
183: kAnalogParameterChorus2Mix,

184: kAnalogParameterPhaser2Delay,
185: kAnalogParameterPhaser2Amount,
186: kAnalogParameterPhaser2Speed,
187: kAnalogParameterPhaser2Depth,
188: kAnalogParameterPhaser2Mix,

189: kAnalogParameterMultiTapChorus2Delay1,
190: kAnalogParameterMultiTapChorus2Feedback1,
191: kAnalogParameterMultiTapChorus2Speed1,
192: kAnalogParameterMultiTapChorus2Depth1,
193: kAnalogParameterMultiTapChorus2Delay2,
194: kAnalogParameterMultiTapChorus2Feedback2,
195: kAnalogParameterMultiTapChorus2Speed2,
196: kAnalogParameterMultiTapChorus2Depth2,
197: kAnalogParameterMultiTapChorus2Mix,

198: kAnalogParameterPitchShift2Coarse,
199: kAnalogParameterPitchShift2Fine,
200: kAnalogParameterPitchShift2Mix,

```
201: kAnalogParameterInsertDelay2Delay1,
202: kAnalogParameterInsertDelay2Division1,
203: kAnalogParameterInsertDelay2Feedback1,
204: kAnalogParameterInsertDelay2Delay2,
205: kAnalogParameterInsertDelay2Division2,
206: kAnalogParameterInsertDelay2Feedback2,
207: kAnalogParameterInsertDelay2Mix,
208: kAnalogParameterInsertDelay2Sync,

209: kAnalogParameterOverdrive2Gain,
210: kAnalogParameterOverdrive2Threshold,
211: kAnalogParameterOverdrive2Amount,
212: kAnalogParameterOverdrive2Filter,
213: kAnalogParameterOverdrive2Mix,

214: kAnalogParameterDistortion2Threshold,
215: kAnalogParameterDistortion2Hysteresis,
216: kAnalogParameterDistortion2Tone,
217: kAnalogParameterDistortion2Mix,

218: kAnalogParameterDegrade2NumberOfBits,
219: kAnalogParameterDegrade2SampleRateReduction,
220: kAnalogParameterDegrade2Filter,

// global effects
221: kAnalogParameterGlobalEffect1Enable,
222: kAnalogParameterGlobalEffect1Send,

223: kAnalogParameterGlobalDelay1Delay1,
224: kAnalogParameterGlobalDelay1Division1,
225: kAnalogParameterGlobalDelay1Feedback1,
226: kAnalogParameterGlobalDelay1Delay2,
227: kAnalogParameterGlobalDelay1Division2,
228: kAnalogParameterGlobalDelay1Feedback2,
229: kAnalogParameterGlobalDelay1Filter,
230: kAnalogParameterGlobalDelay1Sync,

231: kAnalogParameterReflection1Type,
232: kAnalogParameterReflection1Predelay,
233: kAnalogParameterReflection1Brightness,
234: kAnalogParameterReflection1Length,

235: kAnalogParameterReverb1Type,
236: kAnalogParameterReverb1Predelay,
237: kAnalogParameterReverb1Brightness,
238: kAnalogParameterReverb1Decay,

239: kAnalogParameterGlobalEffect2Enable,
240: kAnalogParameterGlobalEffect2Send,

241: kAnalogParameterGlobalDelay2Delay1,
242: kAnalogParameterGlobalDelay2Division1,
243: kAnalogParameterGlobalDelay2Feedback1,
244: kAnalogParameterGlobalDelay2Delay2,
```

```
245: kAnalogParameterGlobalDelay2Division2,
246: kAnalogParameterGlobalDelay2Feedback2,
247: kAnalogParameterGlobalDelay2Filter,
248: kAnalogParameterGlobalDelay2Sync,

249: kAnalogParameterReflection2Type,
250: kAnalogParameterReflection2Predelay,
251: kAnalogParameterReflection2Brightness,
252: kAnalogParameterReflection2Length,

253: kAnalogParameterReverb2Type,
254: kAnalogParameterReverb2Predelay,
255: kAnalogParameterReverb2Brightness,
256: kAnalogParameterReverb2Decay,

// global
257: kAnalogParameterVoiceTrigger,
258: kAnalogParameterTriggerNote,
259: kAnalogParameterVoiceSteal,
260: kAnalogParameterNumberOfVoices,
261: kAnalogParameterPitchbendRange,
262: kAnalogParameterTranspose,
263: kAnalogParameterPan,
264: kAnalogParameterVolume,
265: kAnalogParameterPortamentoType,
266: kAnalogParameterPortamentoFingered,
267: kAnalogParameterPortamentoUp,
268: kAnalogParameterPortamentoDown
```

The parameter values depend on whether the parameter is integer based, or an enumeration value. The enumeration values for an audio source are:

```
// audio source
0: kAnalogAudioSourceNone,
1: kAnalogAudioSourceOscillator1,
2: kAnalogAudioSourceOscillator2,
3: kAnalogAudioSourceOscillator3,
4: kAnalogAudioSourceExternalAudio,
5: kAnalogAudioSourceRingModulator,
6: kAnalogAudioSourceFilter1Input,
7: kAnalogAudioSourceFilter1Output,
8: kAnalogAudioSourceFilter2Input,
9: kAnalogAudioSourceFilter2Output
```

The enumeration values for the oscillator types are:

```
// oscillator types
0: kAnalogOscillatorTypeSawtooth,
1: kAnalogOscillatorTypeTriangle,
2: kAnalogOscillatorTypePulse,
3: kAnalogOscillatorTypeSine,
4: kAnalogOscillatorTypeSineSquareRoot,
5: kAnalogOscillatorTypeSineSquared,
6: kAnalogOscillatorTypeSineWarp1,
7: kAnalogOscillatorTypeSineWarp2,
```

```
8: kAnalogOscillatorTypeAsymmetricSine,  
9: kAnalogOscillatorTypeGlottal,  
10: kAnalogOscillatorTypeWhiteNoise,  
11: kAnalogOscillatorTypePinkNoise,  
12: kAnalogOscillatorTypeRedNoise
```

The enumeration values for the filter types are:

```
// filter types  
0: kAnalogFilterTypeOnePoleLowpass,  
1: kAnalogFilterTypeTwoPoleLowpass,  
2: kAnalogFilterTypeFourPoleResonantLowpass,  
3: kAnalogFilterTypeOnePoleHighpass,  
4: kAnalogFilterTypeTwoPoleHighpass,  
5: kAnalogFilterTypeFourPoleResonantHighpass,  
6: kAnalogFilterTypeOnePoleResonantAllpass,  
7: kAnalogFilterTypeTwoPoleResonantAllpass,  
8: kAnalogFilterTypeFourPoleResonantAllpass,  
9: kAnalogFilterTypeStateVariableLowpass,  
10: kAnalogFilterTypeStateVariableBandpass,  
11: kAnalogFilterTypeStateVariableBandstop,  
12: kAnalogFilterTypeStateVariableHighpass,  
13: kAnalogFilterTypeSlope,  
14: kAnalogFilterTypeThreshold,  
15: kAnalogFilterTypeComb
```

The enumeration values for the routing sources are:

```
// routing source  
0: kAnalogRoutingSourceNote,  
1: kAnalogRoutingSourceVelocity,  
2: kAnalogRoutingSourceReleaseVelocity,  
3: kAnalogRoutingSourceMonophonicAftertouch,  
4: kAnalogRoutingSourcePolyphonicAftertouch,  
5: kAnalogRoutingSourceControllerA,  
6: kAnalogRoutingSourceControllerB,  
7: kAnalogRoutingSourceControllerC,  
8: kAnalogRoutingSourceControllerD,  
9: kAnalogRoutingSourceExternalAudio,  
  
10: kAnalogRoutingSourceModulator1,  
11: kAnalogRoutingSourceModulator2,  
12: kAnalogRoutingSourceModulator3,  
13: kAnalogRoutingSourceModulator4,  
14: kAnalogRoutingSourceModulator5,  
15: kAnalogRoutingSourceModulator6,  
16: kAnalogRoutingSourceModulator7,  
17: kAnalogRoutingSourceModulator8,  
18: kAnalogRoutingSourceModulator9,  
19: kAnalogRoutingSourceModulator10,  
20: kAnalogRoutingSourceModulator11,  
21: kAnalogRoutingSourceModulator12,  
22: kAnalogRoutingSourceModulator13,  
23: kAnalogRoutingSourceModulator14,  
24: kAnalogRoutingSourceModulator15,
```

25: kAnalogRoutingSourceModulator16

The enumeration values for the routine destinations are:

```
// routing destination
0: kAnalogRoutingDestinationPitch,
1: kAnalogRoutingDestinationVolume,
2: kAnalogRoutingDestinationPan,

// oscillators
100: kAnalogRoutingDestinationOscillator1Frequency,
101: kAnalogRoutingDestinationOscillator1Random,
102: kAnalogRoutingDestinationOscillator1Symmetry,
103: kAnalogRoutingDestinationOscillator1FMAmount,
104: kAnalogRoutingDestinationOscillator1Pan,
105: kAnalogRoutingDestinationOscillator1Volume,

106: kAnalogRoutingDestinationOscillator2Frequency,
107: kAnalogRoutingDestinationOscillator2Random,
108: kAnalogRoutingDestinationOscillator2Symmetry,
109: kAnalogRoutingDestinationOscillator2FMAmount,
110: kAnalogRoutingDestinationOscillator2Pan,
111: kAnalogRoutingDestinationOscillator2Volume,

112: kAnalogRoutingDestinationOscillator3Frequency,
113: kAnalogRoutingDestinationOscillator3Random,
114: kAnalogRoutingDestinationOscillator3Symmetry,
115: kAnalogRoutingDestinationOscillator3FMAmount,
116: kAnalogRoutingDestinationOscillator3Pan,
117: kAnalogRoutingDestinationOscillator3Volume,

// filters
200: kAnalogRoutingDestinationFilter1Cutoff,
201: kAnalogRoutingDestinationFilter1Spread,
202: kAnalogRoutingDestinationFilter1CMAmount,
203: kAnalogRoutingDestinationFilter1Resonance,
204: kAnalogRoutingDestinationFilter1Overdrive,

205: kAnalogRoutingDestinationFilter2Cutoff,
206: kAnalogRoutingDestinationFilter2Spread,
207: kAnalogRoutingDestinationFilter2CMAmount,
208: kAnalogRoutingDestinationFilter2Resonance,
209: kAnalogRoutingDestinationFilter2Overdrive,

// routings
300: kAnalogRoutingDestinationRouting1Amount,
301: kAnalogRoutingDestinationRouting2Amount,
302: kAnalogRoutingDestinationRouting3Amount,
303: kAnalogRoutingDestinationRouting4Amount,
304: kAnalogRoutingDestinationRouting5Amount,
305: kAnalogRoutingDestinationRouting6Amount,
306: kAnalogRoutingDestinationRouting7Amount,
307: kAnalogRoutingDestinationRouting8Amount,
308: kAnalogRoutingDestinationRouting9Amount,
```

```
309: kAnalogRoutingDestinationRouting10Amount,  
310: kAnalogRoutingDestinationRouting11Amount,  
311: kAnalogRoutingDestinationRouting12Amount,  
312: kAnalogRoutingDestinationRouting13Amount,  
313: kAnalogRoutingDestinationRouting14Amount,  
314: kAnalogRoutingDestinationRouting15Amount,  
315: kAnalogRoutingDestinationRouting16Amount,  
  
// modulators  
400: kAnalogRoutingDestinationModulator1Delay,  
401: kAnalogRoutingDestinationModulator1Parameter1,  
402: kAnalogRoutingDestinationModulator1Parameter2,  
403: kAnalogRoutingDestinationModulator1Parameter3,  
404: kAnalogRoutingDestinationModulator1Parameter4,  
  
405: kAnalogRoutingDestinationModulator2Delay,  
406: kAnalogRoutingDestinationModulator2Parameter1,  
407: kAnalogRoutingDestinationModulator2Parameter2,  
408: kAnalogRoutingDestinationModulator2Parameter3,  
409: kAnalogRoutingDestinationModulator2Parameter4,  
  
410: kAnalogRoutingDestinationModulator3Delay,  
411: kAnalogRoutingDestinationModulator3Parameter1,  
412: kAnalogRoutingDestinationModulator3Parameter2,  
413: kAnalogRoutingDestinationModulator3Parameter3,  
414: kAnalogRoutingDestinationModulator3Parameter4,  
  
415: kAnalogRoutingDestinationModulator4Delay,  
416: kAnalogRoutingDestinationModulator4Parameter1,  
417: kAnalogRoutingDestinationModulator4Parameter2,  
418: kAnalogRoutingDestinationModulator4Parameter3,  
419: kAnalogRoutingDestinationModulator4Parameter4,  
  
420: kAnalogRoutingDestinationModulator5Delay,  
421: kAnalogRoutingDestinationModulator5Parameter1,  
422: kAnalogRoutingDestinationModulator5Parameter2,  
423: kAnalogRoutingDestinationModulator5Parameter3,  
424: kAnalogRoutingDestinationModulator5Parameter4,  
  
425: kAnalogRoutingDestinationModulator6Delay,  
426: kAnalogRoutingDestinationModulator6Parameter1,  
427: kAnalogRoutingDestinationModulator6Parameter2,  
428: kAnalogRoutingDestinationModulator6Parameter3,  
429: kAnalogRoutingDestinationModulator6Parameter4,  
  
430: kAnalogRoutingDestinationModulator7Delay,  
431: kAnalogRoutingDestinationModulator7Parameter1,  
432: kAnalogRoutingDestinationModulator7Parameter2,  
433: kAnalogRoutingDestinationModulator7Parameter3,  
434: kAnalogRoutingDestinationModulator7Parameter4,  
  
435: kAnalogRoutingDestinationModulator8Delay,  
436: kAnalogRoutingDestinationModulator8Parameter1,  
437: kAnalogRoutingDestinationModulator8Parameter2,
```

```
438: kAnalogRoutingDestinationModulator8Parameter3,
439: kAnalogRoutingDestinationModulator8Parameter4,

440: kAnalogRoutingDestinationModulator9Delay,
441: kAnalogRoutingDestinationModulator9Parameter1,
442: kAnalogRoutingDestinationModulator9Parameter2,
443: kAnalogRoutingDestinationModulator9Parameter3,
444: kAnalogRoutingDestinationModulator9Parameter4,

445: kAnalogRoutingDestinationModulator10Delay,
446: kAnalogRoutingDestinationModulator10Parameter1,
447: kAnalogRoutingDestinationModulator10Parameter2,
448: kAnalogRoutingDestinationModulator10Parameter3,
449: kAnalogRoutingDestinationModulator10Parameter4,

450: kAnalogRoutingDestinationModulator11Delay,
451: kAnalogRoutingDestinationModulator11Parameter1,
452: kAnalogRoutingDestinationModulator11Parameter2,
453: kAnalogRoutingDestinationModulator11Parameter3,
454: kAnalogRoutingDestinationModulator11Parameter4,

455: kAnalogRoutingDestinationModulator12Delay,
456: kAnalogRoutingDestinationModulator12Parameter1,
457: kAnalogRoutingDestinationModulator12Parameter2,
458: kAnalogRoutingDestinationModulator12Parameter3,
459: kAnalogRoutingDestinationModulator12Parameter4,

460: kAnalogRoutingDestinationModulator13Delay,
461: kAnalogRoutingDestinationModulator13Parameter1,
462: kAnalogRoutingDestinationModulator13Parameter2,
463: kAnalogRoutingDestinationModulator13Parameter3,
464: kAnalogRoutingDestinationModulator13Parameter4,

465: kAnalogRoutingDestinationModulator14Delay,
466: kAnalogRoutingDestinationModulator14Parameter1,
467: kAnalogRoutingDestinationModulator14Parameter2,
468: kAnalogRoutingDestinationModulator14Parameter3,
469: kAnalogRoutingDestinationModulator14Parameter4,

470: kAnalogRoutingDestinationModulator15Delay,
471: kAnalogRoutingDestinationModulator15Parameter1,
472: kAnalogRoutingDestinationModulator15Parameter2,
473: kAnalogRoutingDestinationModulator15Parameter3,
474: kAnalogRoutingDestinationModulator15Parameter4,

475: kAnalogRoutingDestinationModulator16Delay,
476: kAnalogRoutingDestinationModulator16Parameter1,
477: kAnalogRoutingDestinationModulator16Parameter2,
478: kAnalogRoutingDestinationModulator16Parameter3,
479: kAnalogRoutingDestinationModulator16Parameter4,

// global effects
500: kAnalogRoutingDestinationGlobal1Send,
501: kAnalogRoutingDestinationGlobal2Send
```

The enumeration values for the LFO types are:

```
// LFO types
0: kAnalogLFOTypeSine,
1: kAnalogLFOTypeTriangle,
2: kAnalogLFOTypePulse,
3: kAnalogLFOTypeSawtoothUp,
4: kAnalogLFOTypeSawtoothDown,
5: kAnalogLFOTypeRandom
```

The enumeration values for the note divisions used for LFO sync or delay sync are:

```
// division
0: kAnalogDivisionWhole,
1: kAnalogDivisionHalf,
2: kAnalogDivisionQuarter,
3: kAnalogDivisionEighth,
4: kAnalogDivisionEighthTriplets,
5: kAnalogDivisionSixteenth,
6: kAnalogDivisionSixteenthTriplets,
7: kAnalogDivisionThirtySecond
```

The enumeration types for the voice triggering are:

```
// voice trigger types
0: kAnalogVoiceTriggerPolyphonic,
1: kAnalogVoiceTriggerLegatoLast,
2: kAnalogVoiceTriggerLegatoLow,
3: kAnalogVoiceTriggerLegatoHigh,
4: kAnalogVoiceTriggerExternalAudio
```

The enumeration types for voice stealing are:

```
// voice stealing types
0: kAnalogVoiceStealOldest,
1: kAnalogVoiceStealLow,
2: kAnalogVoiceStealMiddle,
3: kAnalogVoiceStealHigh
```

The enumeration types for the portamento are:

```
// portamento types
0: kAnalogPortamentoTypeOff,
1: kAnalogPortamentoTypeUp,
2: kAnalogPortamentoTypeDown,
3: kAnalogPortamentoTypeUpAndDown
```

The enumeration types for the reflection types are:

```
// reflection types
0: kReflectionTypeSparse,
1: kReflectionTypeDiffuse,
2: kReflectionTypeRandom,
3: kReflectionTypeReverse
```

The enumeration types for the reverb types are:

```
// reverb types  
0: kReverbTypeRoom,  
1: kReverbTypeChamber,  
2: kReverbTypeSmallHall,  
3: kReverbTypeLargeHall
```

System Exclusive Implementation

With system exclusive messages, you can control:

- master volume
- master balance
- left volume
- left balance
- global effects send 1/2
- global effects mute 1/2

Universal Real Time

Master volume:

```
$f0
$7f // device: universal real time ID
$04 // sub ID 1: device control
$01 // sub ID 2: master volume
$hh // volume high
$l1 // volume low
$f7
```

Master balance:

```
$f0
$7f // device: universal real time ID
$04 // sub ID 1: device control
$02 // sub ID 2: master balance
$hh // balance high
$l1 // balance low
$f7
```

BitHeadz System Exclusive

Effects send:

```
$f0
$00 // device: BitHeadz ID
$01
$20
$00 // sub ID 1: effects send
$ee // sub ID 2: effect 0 or 1
$hh // send high
$l1 // send low
$f7
```

Effects mute:

```
$f0
$00 // device: BitHeadz ID
$01
$20
$01 // sub ID 1: effects mute
```

System Exclusive Implementation

```
$ee // sub ID 2: effect 0 or 1
$hh // mute high
$l1 // mute low
$f7
```

Effects solo:

```
$f0
$00 // device: BitHeadz ID
$01
$20
$02 // sub ID 1: effects solo
$ee // sub ID 2: effect 0 or 1
$hh // solo high
$l1 // solo low
$f7
```

Master volume left & right:

```
$f0
$00 // device: BitHeadz ID
$01
$20
$10 // sub ID 1: volume left & right
$mn // sub ID 2: left (0) or right (1)
$hh // volume high
$l1 // volume low
$f7
```


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