Analog Channel

The Analog Experience

User Manual

McDOWELL SIGNAL PROCESSING, LLC

McDSP Analog Channel Plug-in Manual

McDSP
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from the entire McDSP development team.

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Getting Started with Analog Channel

Each McDSP plug-in is delivered inside an installer application, and uses the Interlok copy protection software to authorize each plug-in. This section describes how to install and authorize a McDSP plug-in. General system requirements are also described.

System Requirements

McDSP HD and Native plug-ins are compatible with Pro Tools™ HD, Pro Tools™ LE and Pro Tools™ M-Powered systems as well as Audio Unit compatible DAWs including Logic, Digital Performer (DP) and Ableton Live. Additionally, a third party software application that supports the TDM, RTAS, or AudioSuite plug-in standard may be supported.

McDSP plug-ins support Mac OS 10.5.x (Leopard), 10.6.x (Snow Leopard), Windows XP, Vista, and Windows 7. Supported versions of Pro Tools ™ include 7.4.x and 8.x or greater. Supported versions of Audio Unit compatible DAWs including Logic, Digital Performer (DP) and Ableton Live must be versions that support the Mac OS 10.5x (Leopard) or 10.6x (Snow Leopard).

McDSP plug-ins require an iLok USB Smart Key for authorization.

Supported Plug-in Formats

McDSP plug-ins are available in TDM, RTAS, AudioSuite, and Audio Unit (AU) formats.

Hardware

McDSP plug-ins support any Avid (Digidesign) or approved third party hardware supported in Pro Tools™ 7.4.x and 8.x or greater, including HD and HD Accel hardware and interfaces, 002, 003, the Mbox product line, and M-Audio interfaces. McDSP plug-ins also support approved hardware for DAWs supporting Audio Units (AU) including Apogee, MOTU, and RME.

All McDSP HD plug-ins, except Synthesizer One, also support the Avid (Digidesign) VENUE D-SHOW systems.

The McDSP Mac versions are compatible with both Intel and PowerPC based computers. The McDSP Windows versions require an Intel Pentium 4 or greater processor.*

** McDSP Windows test machines are chosen to follow the Avid (Digidesign) recommended systems guide, which currently is the Dell Precision™ Workstation 670 with 2.79 GHz Xeon processor. All products are guaranteed to run on that system. Older Intel processors (i.e. Pentium III and predecessors) and AMD processors are not officially supported, although some users have had limited success with newer AMD processors (i.e. Dual Opteron 1.79 GHZ, Athlon 64 2.20 GHz, and Athlon 64 XP 3700).*

Please visit mcdsp.com for the latest information about compatibility.

Installing the Analog Channel Plug-In

Installation on Mac OS X

The Analog Channel plug-in package includes this manual, ReadMe and Release Notes, a folder of presets for the Analog Channel plug-in, and the Analog Channel plug-in. Two copies of the Analog Channel Licensing Agreement are included - one in this pdf manual and a second as a separate text file. The Analog Channel plug-in manual requires that Adobe Acrobat reader (or similar .pdf reader) is installed.

Both online and boxed version will come with a Analog Channel installer that will automatically install the Analog Channel plug-in and its presets on your system. The authorization of the Analog Channel plug-in is still required after running the installer, and those steps are detailed in the following sections.

Installing the Analog Channel plug-in and presets with the Installer:

The online version of the package has been prepared for Internet delivery, and is transmitted as a compressed file in zip format (.zip). In Mac OS X 10.5.x or 10.6.x, simply double click the *.zip file to unpack the installer. The boxed plug-in package purchased at your local dealer will be on CDROM. As with the online version, these 'physical' versions of the Analog Channel plug-in package should be copied into a local folder on your system.

- Insert the McDSP 'HD Disk,' 'Native Disk,' or 'LE Disk' CDROM onto an available CDROM drive.
- Navigate to the Analog Channel plug-in folder on the CDROM - the installer application is contained therein.
- Run the Analog Channel plug-in Installer application to install (copy) the Analog Channel plug-in, presets, and documentation to a local folder on your system. The plug-in will be placed in the 'Plug-Ins' folder, and the presets will be placed in the 'Plug-Ins Settings' folder.
- If a previous version of the Analog Channel plug-in (or other HD, Native, or LE version) was already in the plug-ins folder, it will automatically be updated (or replaced) by the installer.

Installation on Windows XP and Vista

The Analog Channel plug-in package includes this manual, ReadMe and Release Notes, a folder of presets for the Analog Channel plug-in, and the Analog Channel plug-in. Two copies of the Analog Channel Licensing Agreement are included - one in this pdf manual and a second as a separate text file. The Analog Channel manual requires that Adobe Acrobat reader (or similar .pdf reader) is installed.

Both online and boxed version will come with a Analog Channel installer that will automatically install the Analog Channel plug-in and its presets on your system. The authorization of the Analog Channel plug-in is still required after running the installer, and those steps are detailed in the following sections.

Installing the Analog Channel plug-in and presets with the Installer:

The Analog Channel plug-in package purchased at your local dealer will be on CDROM and contain a Windows self extracting executable (.exe) similar to the online Analog Channel plug-in package prepared for Internet delivery. Both the boxed and online versions of the Analog Channel plug-in executable file will automatically install the plug-in and its presets on your system. Double click the file to launch the installer which will install the Analog Channel plug-in, presets, and documentation. At any time after installation, you may access the documentation from the Windows 'Start Menu' under the 'McDSP' group.

Authorization of the Analog Channel plug-in is still required after running the installer, and those steps are detailed in the following sections. Note that after installing new versions of the PACE iLok drivers with the Analog Channel plug-in installer, you will be prompted by the Analog Channel plug-in installer to reboot your system. If you are not prompted by the installer, there is no need to reboot.

- Insert the McDSP 'HD Disk,' 'Native Disk,' or 'LE Disk' CDROM onto an available CDROM drive.
- Navigate to the Analog Channel plug-in folder on the CDROM - the installer application is contained therein.
- Run the Analog Channel plug-in Installer application to install the Analog Channel plug-in, presets, and documentation to a local folder on your system. The plug-in will be placed in the 'Plug-Ins' folder, and the presets will be placed in the 'Plug-Ins Settings' folder.
- If a previous version of the Analog Channel plug-in (or other HD, Native, or LE version) was already in the plug-ins folder, it will automatically be updated (or replaced) by the installer.

Installation on VENUE D-SHOW systems

The Analog Channel plug-in package for VENUE D-SHOW systems includes presets for the Analog Channel plug-in and the Analog Channel plug-in. The Analog Channel Licensing Agreement is displayed when installing the product on D-SHOW. The pdf manual can be obtained by running the Mac OS X or Windows XP/Vista version of the Analog Channel Pro Tools plug-in installer on any available computer.

Both online and boxed versions will come with a VENUE compatible installer that will automatically install the Analog Channel plug-in and its presets on your system. The authorization of the Analog Channel plug-in is still required after running the installer, and those steps are detailed in the following sections.

Note that all McDSP HD plug-ins, except Synthesizer One support the Digidesign VENUE D-SHOW system.

Installing the Analog Channel plug-in and presets on VENUE with the 'HD Disk':

The boxed Analog Channel plug-in package purchased at your local dealer will contain a CDROM titled 'HD Disk' that is specially formatted to work with your VENUE console. The VENUE installers are also available online as a compressed zip file download, however you will have to take additional steps to create your own VENUE installer CD-R, see additional instructions below before proceeding with these instructions. Both the boxed and online versions of the Analog Channel installer are the same and will install both the plug-in and its presets on your system.

Note that after installing new versions of the PACE iLok drivers with the Analog Channel plug-in installer, you will need to reboot your system. You will not be prompted to reboot, and if you don't you may see an error message saying "TPkd driver required, and a reboot. Please reboot or reinstall the software.' If you see this message, simply reboot the console and try again.

- Insert the McDSP 'HD Disk' CDROM onto the CD drive. Note that neither the McDSP 'Native Disk' nor the 'LE Disk' contains VENUE compatible installers.
- Ensure your system is in 'CONFIG' mode, you cannot install plug-ins in 'SHOW' mode.
- Navigate to the 'OPTIONS' page and then select the 'PLUG-INS' tab.
- You should now see the Analog Channel plug-in available on the left hand side.
- Select the Analog Channel plug-in and select 'INSTALL.'
- If a previous version of the Analog Channel plug-in was already installed, it will be updated by the installer.

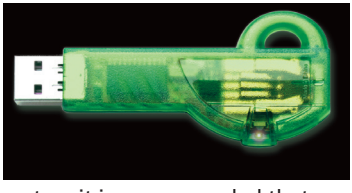
Creating a VENUE D-SHOW Installer CD-R from the online zip file:

If you do not have a boxed copy of Analog Channel with the included 'HD Disk' CDROM, you can still obtain a copy of the VENUE compatible installers from the www.mcdsp.com website. Once you have located and downloaded the latest VENUE compatible installers from the McDSP website, you will have to take several additional steps to create a VENUE compatible Installer CD-R. For your convenience, all VENUE compatible products are located in the same downloadable zip file, so you will only have to create one CD-R to install all compatible McDSP products.

- Unzip the downloaded file and locate the folder named "TDM Plug-Ins" inside the unpacked folder.
- Using any CD-R burning application, burn this folder and its contents to an ISO format CD-R. It is recommended that you use a brand new CD-R for this, and do not rewrite an older CD-R.
- Once you have burned this folder to a CD-R, you should see it at the root level of the disk (i.e. "D:\TDM Plug-Ins"). Important: If the "TDM Plug-Ins" folder is not located at the root level of the CD-R or has been renamed, the VENUE console may not properly recognize the installer disk.
- At this point, you can follow the 'HD Disk' installation instructions above to complete the installation.

Authorizing your McDSP Plug-ins

Authorizing with a pre-programmed iLok Smart Key



McDSP bundles such as the Emerald Pack come with a pre-programmed iLok Smart Key. Simply insert the iLok into any available USB port on your computer. The iLok's indicator light will illuminate when the iLok has a proper connection. The plug-ins included in the bundle require no further authorization steps. As with any iLok on your system it is recommended that your iLok be registered and synchronized with iLok.com

Authorizing with an iLok License Card

All McDSP plug-ins require that a valid authorization is present on your iLok USB Smart Key. McDSP plug-ins that are purchased individually provide this authorization on a plastic License Card (about the size of a credit card), with a small punch-out iLok License Chip. After being separated from the License Card, this iLok License Chip is to be inserted into the 'key slot' of the iLok USB Smart Key in order to transfer the authorization from the License Card to the iLok USB Smart Key. Note that each License Card holds ONE plug-in authorization. The following instructions detail this process

Important Note: The Authorization Wizard will prompt the user to register their iLok USB Smart Key at iLok.com. iLok.com is a service offered by PACE Anti-Piracy, Inc. and this step is recommended but NOT REQUIRED by McDSP to complete the authorization of the plug-in. If you choose to register your iLok USB Smart Key at iLok.com, care must be taken to record your ilok.com account information (i.e. write down your User ID and Password in a safe place). If your iLok.com account information is lost, the iLok cannot be registered to another account and unfortunately there is nothing McDSP can do to help you. See iLok.com for more details about the benefits of using PACE's iLok.com service.

Note: Images in this section are for illustration only, the actual product and screens will be the name of the product you are authorizing.

Authorizing a McDSP Plug-in from a License Card with the Authorization Wizard:

The Authorization Wizard is used to install an authorization from a License Card to the iLok USB Smart Key. To use the Authorization Wizard for the plug-in you purchased, perform the following steps:

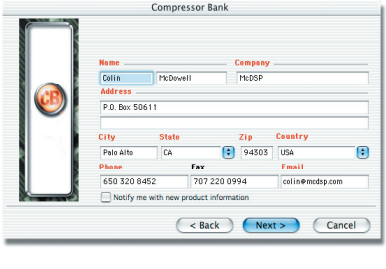
- Insert your iLok USB Smart Key into an available USB port.
- On a Mac: Locate and launch the 'Authorizer' application found in the 'Authorize' folder in the plug-in package for the McDSP plug-in you purchased on the CD-ROM.
- On Windows XP or Vista, just launch the DAW host to authorize the individual McDSP plug-in you purchased.

Note: When authorizing the plug-in on Windows XP or Vista with a new iLok USB Smart Key, you must insert the iLok USB Smart Key and complete the Windows 'Found New Hardware Wizard' before attempting to authorize the plug-in.

- Select the 'Authorize' button to be guided through the Authorization Wizard.

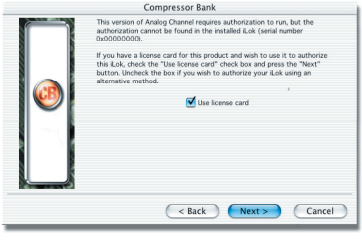
Note: Selecting the 'Quit' button at any time will not authorize the plug-in or allow it to be used for a trial period. If 'Quit' is selected, the plug-in will not be available in the DAW host insert menu.

- McDSP plug-ins require that the user personalize their copy of the plug-in. A dialog is displayed soliciting this information.



Note that the product registration card enclosed with the plug-in MUST ALSO be filled out as well and returned to McDSP via mail (or fax to 707-220-0994). This additional mail-in registration will entitle the user to future upgrades and advance information from McDSP.

- Once the plug-in is personalized, click the 'Next' button to continue.
- Check the 'Use License Card' box and press the 'Next' button.



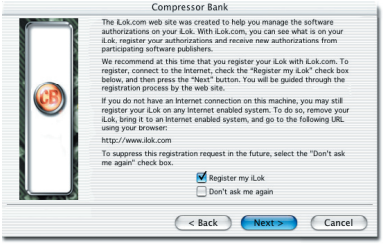
Note: Although the Authorization Wizard may appear to allow authorization by challenge response, that method is currently NOT SUPPORTED McDSP plug-ins.

- Separate the small punch-out iLok License Chip (the removable metal and plastic tab) from the License Card by pushing the cutout up and out with your thumb. Do not force your finger downward.

- The iLok License Chip may now be inserted into the 'key slot' of the iLok USB Smart Key. If the iLok USB Smart Key does not appear to be present on the system, ensure the iLok USB Smart Key is connected to a valid USB port and that the green LED is lit inside the iLok USB Smart Key. To insert the License Chip into the iLok USB Smart Key, orient the iLok USB Smart Key's USB end to the left, and the loop end to the upper right. Insert the metal chip end of the iLok License Chip (the License Chip tab should have the metal chip side facing up towards you, not down). You should be able to visually verify that the License Chip makes contact with the iLok USB Smart Key metal card reader.

- The green LED in the iLok USB Smart Key will light when it is ready to receive and transmit data.
- Upon inserting the iLok License Chip, a message will be displayed indicating the authorization was installed successfully. Click 'Ok' in the message dialog.

- Once the authorization is installed on the iLok USB Smart Key, a dialog is displayed prompting the user to register their iLok USB Smart Key at the www.ilok.com website. The iLok.com website was created to allow users to manage the software authorizations on their iLok USB Smart Key. THIS STEP IS NOT REQUIRED TO COMPLETE THE AUTHORIZATION OF MCDSP SOFTWARE. The registration of the iLok USB Smart Key to an iLok.com account can be bypassed by clearing the checkbox. The user may also choose to not be asked to register again. While iLok.com is a great resource for the iLok USB Smart Key, your iLok USB Smart Key may only be linked to one iLok.com account. That is, an individual iLok USB Smart Key can only be registered to one account at a time--but a single account can have multiple iLok USB Smart Keys. If the iLok.com account information is lost, the iLok USB Smart Key cannot be registered to another account. However, an iLok USB Smart Key may be transferred between accounts if all the authorizations have been transferred off the iLok USB Smart Key. Register the iLok USB Smart Key to an iLok.com account only when you are ready to retain all the needed iLok.com account information (User ID and Password).



- A 'Finished' dialog is displayed showing what authorization method was used.
- Click 'Finish' to exit the Authorization Wizard.

Authorizing with iLok.com

Required for demo, upgrade, and replacement authorizations only

iLok.com can be accessed from any Macintosh or PC with an Internet connection. You can do this at home, a friend's, or at the office as long as there is an internet connection to access iLok.com--note that you don't have to use your DAW host computer! You simply use this computer to connect to iLok.com and transfer authorizations to your iLok Smart Key. The iLok Smart Key can then be moved to your DAW host to complete authorization of your plug-in.

You will need:

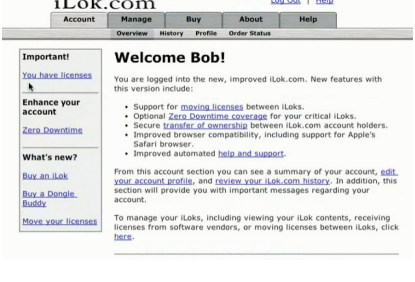
- A computer with an Internet connection. Either a Macintosh running OS 9.2 to OS 10.5 or a PC running Windows 98, ME, 2000, XP, or Vista
- An iLok USB Smart Key
- A valid iLok.com account. Visit www.iLok.com and set up a free account, if you have not already done so.

1) Download and install the required client software from iLok.com.

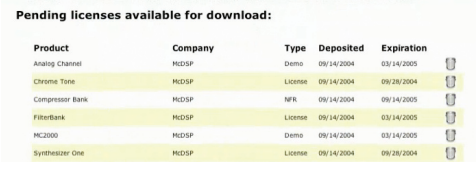
2) Download the desired McDSP plug-in Installer from: http://www.mcdsp.com/support/updating.html

3) To receive an upgrade or replacement authorization, email your iLok.com account information to: support@mcdsp.com
To receive a demo authorization, email your iLok.com account information to: authorize@mcdsp.com

Insert your iLok Smart Key into an available USB port and ensure that the indicator light is lit. Once your demo, upgrade, or replacement authorization is available for transfer, your iLok.com account will display the notice saying "You have licenses" on the upper left. Begin by selecting that link.

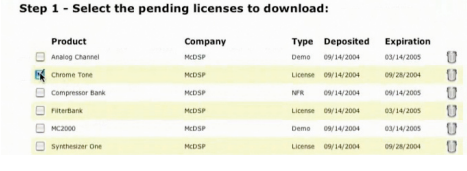


The next page will display the pending licenses available for download. This page will also display the name of the plug-in, its manufacturer, the type of authorization (Demo, Not For Resale, or License), the date the authorization was deposited, and the date when the authorization will no longer be available for download from the server.

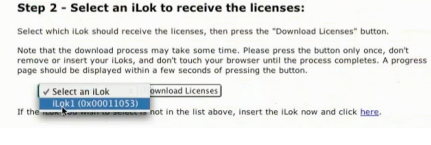


Before any transfer of authorizations can take place, you must synchonize your iLok Smart Key with iLok.com. This may take a moment to process depending on your internet connection.

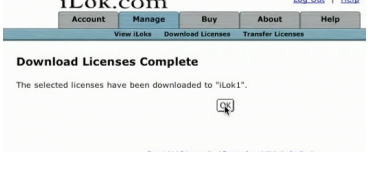
Once you have synchronized your iLok, you can select the authorization(s) you wish to transfer to your iLok.



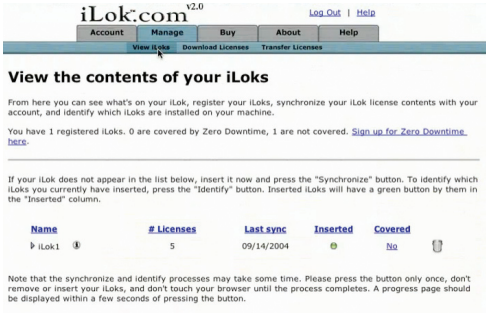
If you have multiple iLoks connected to your computer, it is important to select the correct iLok you wish the authorizations to be transferred to. Then click "Download Licenses" to begin the process. Again, this may take a moment depending on your internet connection.



When the transfer finishes you will be asked to confirm the completion of the transaction, thereby letting you know that the transfer was successful.



If you wish to go back into your account and visually confirm the transaction for yourself, select “View iLoks” Then select the iLok you had the authorizations transferred to.



That’s it! Dont forget to log out and move the iLok Smart Key to your DAW host system if you are using another computer for Internet access. Also, you may need to install a different version of the plug-in if you are upgrading or replacing.

Transferring Authorizations with iLok.com

You may freely transfer any authorization within your iLok.com account between any of your registered iLok Smart Keys. If you wish to transfer an authorization out of your iLok.com account to a different user, it will require additional support from PACE Anti-Piracy, Inc and may be subject to a service fee or limited by manufacturer restrictions. Check the www.ilok.com website for updates and developments regarding iLok USB Smart Keys and the Pace Interlok Copy Protection system.

Registering your McDSP Plug-in

To register your McDSP plug-in, fill out and return the product registration card enclosed with the boxed plug-in package by mail or fax 707-220-0994. Registering your product entitles you to future upgrades and advance information from McDSP. Each individual product must be registered (even if you have multiple copies), and the product must be registered to an individual, not an entity. If you represent a company it is your company's responsibility to notify McDSP in writing if the individual who registered the plug-in is no longer with the company. The Company must also be able to supply matching registration information to successfully transfer ownership of the plug-in.

Using your McDSP Plug-ins

Starting a McDSP Plug-in:

Follow the installation, authorization, and registration instructions above. Launch your DAW host, and the McDSP plug-in and its presets are ready for use. Refer to your DAW User Manual for details on general plug-in operation.

Exiting a McDSP Plug-in

A McDSP plug-in is exited by closing the plug-in window, or de-instantiating the plug-in. Your DAW host sessions will save instantiated plug-in configurations and their settings. Refer to your DAW User Manual for details on general plug-in operation.

Analog Channel

The Analog Channel plug-in has two configurations to emulate all things analog:

AC101 - Analog Channel emulation - the AC101 plug-in is a fully adjustable analog amplifier. Instead of letting maximum signal peaks hit and distort at 0 dB (the maximum signal in a digital system), AC101 gently rolls of the dynamic range at a user set level - preventing digital clipping and smoothing out signal transients. A drive control setups how 'hot' the channel is processing audio, and even the attack and release times of the pre-amp's distortion character are adjustable. And AC101 is one of the most efficient McDSP plug-ins ever created - even a modest system can run a great number of AC101 plug-ins - roughly one for each track - without difficulty.

AC202 - Analog Tape and Analog Tape Machine emulation - the AC202 configuration has standard tape-machine parameters such as bias, tape speed, and IEC1/2 standards are provided. Control well beyond the limits of the actual devices includes adjustable low frequency roll off and head bump - independent of tape speed. You can select from several playback head types, and even control the rate at which the system recovers from a tape saturation state.

Feature List:

- Power and Flexibility: AC101 provides analog channel modeling in mono and stereo formats. AC202 emulates the most popular tape playback systems, modern and vintage tape formulations, at all the professional playback speeds and IEC standards. See the Reference section for a complete listing of all Analog Channel configurations and their specifications.
- Playback head emulation -taken from the specs and measurements of popular manufacturers of tape 'reproducers' - there are more playback head types in the AC202 Analog Tape Emulation plug-in than there are tape machines found in major studios. Control well beyond the limits of the 'real' devices include adjustable low frequency roll off and head bump - independent of playback speed.
- Double-Precision Arithmetic
- Analog Saturation Modeling
- Double precision processing
- Ultra Low Latency

The Quick Start Tour: Analog Channel

Start your DAW host and instantiate the Analog Channel plug-in

- Launch your DAW host and open a session.
- Verify the Display-> Mix Window Shows->Inserts View option is checked.c
- In one of the inserts, select the Analog Channel AC101 plug-in.
- In one of the inserts, select the Analog Channel AC202 plug-in.
- If the insert selection does not show Analog Channel plug-ins, verify that Analog Channel has been installed correctly.
- For more information on starting your DAW host and working with plug-ins, see the Reference Guide provided by your prefered DAW.

Analog Channel AC101 Overview

The Analog Channel AC101 plug-in has the following features:

- Input and Output controls, Auto Output level setting
- Drive control to set amount of signal drive, or selecting the 'hotness' of the channel
- Compression/Saturation LED indicators
- Compression, Release and Attack characteristics of this 'digital pre-amp'
- Simultaneous metering of Input and Output levels, and a real-time Input-Output transfer function display

Saturation:

- Drive Gain
- Comp (Saturation) Curve
- Attack
- Release

Output:

- Input Gain
- Output Gain
- Auto Output Mode

Metering:

- Input
- Gain Reduction
- Output

Controls: AC101

Input and Output

- **Input** - amount of signal level increase (or decrease) at input stage
- **Output** - amount of signal level increase (or decrease) at output stage
- **Auto Output** - automatically updates output level based on all other AC101 controls to allow near consistent levels while adjusting saturation effect (Output control is disabled when Auto Output selected)

Gain Stage Controls

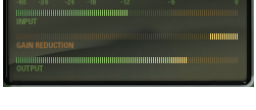
- **Drive** - amount of signal level increase (or decrease) at key signal stage to saturation algorithm
- **Comp** - compression (saturation) response curve. The greater the Comp control value, the more extreme the compression (saturation) response

TC Circuit

- **Attack** - rate saturation/compression is applied as signal levels increase
- **Release** - rate saturation/compression is unapplied as signal levels decrease

Displays

Meters



Analog Channel has meters showing input levels, the amount of compression gain reduction, and output levels.

Peak LEDs are also provided with the input and output meters to indicate when signal clipping occurs.

Analog Channel AC202 Overview

The Analog Channel AC202 plug-in has the following features:

- Input and Output controls, Auto Output level setting
- Playback head control section - Head Type, Roll Off, and Head Bump
- Bias control as found in the professional analog ‘reproducers’
- Release control determines tape saturation rate
- All professional playback speeds, IEC1 and IEC2 standards
- Vintage and Modern tape formulations
- Simultaneous metering of Input and Output levels, and a real-time Input-Output transfer function display

Playback Head:

- Roll Off
- Head Type
- Head Bump

Tape Machine:

- Bias
- Release
- Tape Speed
- EQ Type
- Tape Type

Output:

- Input Gain
- Output Gain
- Autp Output Mode

Playback head response

Metering:

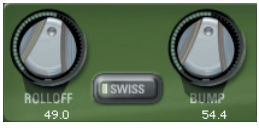
- Input
- Gain Reduction
- Output

Controls: AC202

Input and Output

- **Input** - amount of signal level increase (or decrease) at input stage
- **Output** - amount of signal level increase (or decrease) at output stage
- **Auto Output** - automatically updates output level based on all other AC101 controls to allow near consistent levels while adjusting saturation effect (Output control is disabled when Auto Output selected)

Playback Head Controls



- **Roll Off** - frequency at which playback head response shape is most prominent. Signal levels at frequencies below the Roll Off frequency are also reduced
- **Bump** - amount of playback head response shape applied to input signal
- **Playback Head Type** - playback head type taken from various models of popular analog tape machines

Tape Machine Controls

- **Bias** - amount of signal level increase (or decrease) applied to the input to the tape biasing circuit
- **Release** - rate tape saturation/ compression is unapplied as signal levels decrease
- **Speed** - playback speeds - 7.5, 15, and 30 ips
- **EQ Type** - IEC EQ standards for analog tape 'reproducers' - IEC1 and IEC2 curves supported
- **Tape** - types of tape formulations

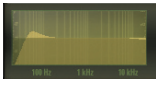
Displays

Meters

Analog Channel has meters showing input levels, the amount of compression gain reduction, and output levels.

Peak LEDs are also provided with the input and output meters to indicate when signal clipping occurs.

Playback Head Response



As the AC202 Roll Off, Head Type, and Head Bump controls are adjusted, the Playback Head display is updated to show the frequency response of the playback head circuit.

General Information

Basics

To adjust any of the Analog Channel controls the user can:

- Hold the <Command> key while dragging the slider for fine control, or
- Click on the text box to highlight and edit the numeric value to get precise control (if a value outside the valid range is input, the control will default to the nearest allowed value when enter is hit) and hit <Enter>, or
- Click on the text box to highlight the numeric value and then use the arrow keys to increase or decrease the numeric value, or
- Use the <Option> key to bring all the controls to their default values, or
- Use hardware controller surfaces supported by the Analog Channel plug-in including the Mackie HUI and Digidesign's ICON™, ProControl™ and Control 24.

Control Linking

There is no control linking capability in the Analog Channel at this time.

Automation

All Analog Channel controls are completely automatable. See your DAW User Manual for automating plug-ins section.

Presets: Using the Presets and Making Your Own

The Analog Channel presets are inspired by various tape machines made from manufacturers such as Studer, Otari, MCI, Ampex, Sony, and Tascam. A variety of other presets are named for their application ('vocal', 'drums', 'guitar') are also available. The presets can be accessed from the Pro Tools™ "plug-in Librarian" and "plug-in Settings" pop-up menus.

Refer to your DAW User Manual for accessing and saving plug-in presets.

A Word on Preset Compatibility

The Analog Channel presets are inspired by tape machines manufactured from companies such as Studer, Ampex, MCI, Sony, Otari, and Tascam (*). The presets can be accessed from the Pro Tools™ "plug-in Librarian" and "plug-in Settings" pop-up menus.

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While Analog Channel emulates the sounds of these tape machines, McDSP makes no representation or warranty that Analog Channel is identical to or duplicates these devices.

Using the AC101 Plug-in

Basics

The Analog Channel AC101 plug-in is an analog amplifier, or analog channel. Instead of allowing the user to drive signal levels into digital clipping at 0 dB, the AC101 plug-in provides gentle, continuous soft-limiting/compression (or saturation pending the attack/release times), at a signal level selected by the user. AC101 can be used as a fail-safe for preventing unwanted clipping, or as a creative tool to smooth/warm-up digital tracks and provide otherwise unavailable analog character to a digital system. Even the sound of large analog mixing consoles can be closely matched using the AC101 plug-in.

A Closer Look

Input, Output, and Auto Output

The Analog Channel AC101 Input and Output levels are completely adjustable (+/- 24 dB). The AC101 amplifier model compression/saturation region is between -9 and 0 dB, so being able to set input levels within this range is needed to let the compression/saturation effects be audible. Similarly, because the input gain may be high, an output control is also provided to trim the signal back to its original level. AC101 is great at reducing the harsh audio artifacts caused by digital clipped - however care should be take to not clip at either the input or output stages of AC101.

An Auto Output mode will set the output level automatically such that a constant signal level is maintained as input and drive levels are adjusted. Note the input signal level must be at or very near 0 dB for the Auto Output control to operate correctly.

Drive

Once the desired input level has been set, the Drive control attenuates the amount of input signal used to calculate the amplifier response. Drive values less than 0 dB reduce the amount of compression/saturation in the output, and drive values greater than 0 dB increase the compression/saturation effect.

Compression (Comp) Control

The compression (saturation, or distortion it may also be called) curve is user selectable from the Compression (Comp) control. The greater the control value, the more compression/saturation is possible. The Input-Output Transfer Curve Display is updated as this control is changed for visual feedback. The compression curve can even go negative, creating a greater amount of harmonic distortion (and other 'bad' effects).

A significant difference between AC101 and a standard compressor is that AC101 has no threshold. The amplifier operation does not depend on input signals exceeding some level, and then act accordingly. Instead, the amplifier circuit is 'always on' - like a Class A amplifier - and the transition from a linear region to a non-linear region of operation is totally continuous. For the user processing audio thru AC101, this equates to a process than can limit/compress/saturate high signal levels in a consistent and precise manner.

Attack and Release

The rate at which the amplifier transfer function curve is engaged and dis-engaged is selected by the Attack and Release controls. Note the attack control range is limited - 0.03 msec (1 sample) to 10 msec to insure the amplifier compression/saturation curve has an effect on the input signal, and is able to prevent digital clipping. Users should monitor the output meter and output peak LED to verify clipping at the output does not occur for input signals with high peak levels.

In a real-world device, such as a Class A pre-amp on an analog mixing console, the attack and release times would be preset (fixed) for optimum performance. In the software world, we have created presets to get ideal responses while giving the user total control over the amplifier design via the Compression, Attack, and Release controls.

Using the AC202 Plug-in

Basics

The Analog Channel AC202 plug-in is an emulator of the most popular analog tape machines (and tape mediums) known to the professional audio recording industry. Playback systems from Studer, Otari, MCI, Ampex, Sony, and Tascam are available in a single 'reproducer' (*). Playback low frequency roll-off and head bump are completely adjustable - independent of playback speed. Modern and vintage tape formulations, IEC standards, and tape saturation release (not found on any other 'reproducer') round out the control section of the world's most flexible tape playback/recorder.

A Closer Look

Input, Output, and Auto Output

The Analog Tape AC202 Input and Output levels are completely adjustable (+/- 24 dB). The AC202 tape formulations dynamic range rounds of at about -4 dB (-12 dB for the vintage formulation), so being able to set input levels within this range is needed to let the compression/ saturation effects be audible. Similarly, because the input gain may be high, an output control is also provided to trim the signal back to its original level. AC202 is great at reducing the harsh audio artifacts caused by digital clipped - however care should be take to not clip at either the input or output stages of AC202.

An Auto Output mode will set the output level automatically such that a constant signal level is maintained as input and drive levels are adjusted. Note the input signal level must be at or very near 0 dB for the Auto Output control to operate correctly.

Playback Head Section - Roll Off, Bump, Head Type

The AC202 plug-in Playback Head control section allows the replication of nearly any 'reproducer' ever made. Head models from Studer, Otari, MCI, Ampex, Sony, and Tascam (*) are a menu selection away. Even large facilities do not stock all these machines under one roof, much less can keep them maintained

consistently. The corresponding head model 'nicknames' used in AC202 are Swiss, Japan-O, USA-M, USA-A, Japan-S, Japan-T.

Real-world factors such as track width, playback head wear, playback head spacing from the actual tape, and proper calibration ultimately affect low frequency loss and the amount of heap ripple, or 'bump'. The AC202 plug-in instead just gives user control over low frequency roll-off and head bump - even independent of tape speed. No longer is there debate over 15 ips for great low-end response vs. 30 ips for better high frequency response!

The playback head response is also displayed in real-time in the Playback Head and Tape Response Display - no more calibration tapes required.

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Bias

The AC202 plug-in has a bias control like nay other professional tape machine. But instead of frequency sweeps and test tones to confirm system frequency response, the tape playback response is shown in a purple curve as the Bias control is updated. Time consuming calibration and maintenance is no longer required.

In general, under-biasing (bias < 0 dB) increases dynamic range and boosts high frequencies pending tape speed and IEC standard used. Over-biasing (bias > 0 dB) decreases dynamic range and reduces high frequencies pending tape speed and IEC standard used. Over-biasing also increases the effect the tape formulation character has on the audio (considered desirable by most tape medium enthusiasts).

McDSP has modeled a 'vintage' and 'modern' tape formulation type. The suggested maximum biasing level for the 'vintage' type (less dynamic range, more character) is between +6 and +9 dB. The suggested maximum biasing level for the modern type (less dynamic range, more character) is between +9 and +12 dB. The user can adjust the Bias control as desired, although some extreme over-biasing can occur if these maximums are exceeded.

Release

For each tape machine, a saturation state can be reached when the tape is over biased as described in the 'Bias' section above. The machine returns to a linear state once the input audio drops back to a nominal level, at rate specific to each tape machine. For this reason, the AC202 plug-in has a Release control that determines how quickly the plug-in recovers from the tape saturation state and returns to the linear state of operation. The AC202 Release control range is from 10 msec to 1000 msec (1.0 second).

Playback Speed

The common playback speeds of professional audio tape recorders/ reproducers are 7.5, 15, and 30 inches per second (ips). Changes in playback speed affect tape saturation, dynamic range, and the low frequency roll off of the playback. With the exception of the last item, the AC202 plug-in emulates all these characteristics of playback speed variations. The low frequency roll-off is controlled independently via the Roll Off control - a significant improvement over the actual devices!

IEC Standards

The frequency response of signal recorded to tape is not a flat response. In fact, the response is not very ideal for high-fidelity audio recording. In order to compensate for this effect, the recorded signal is equalized to a standardized response. This not only improves the fidelity of the signal recorded to tape, but allows reproducers to be manufactured with the same standards. These standardized responses are controlled by the International Electro-technical Commission (IEC), and have developed into two generally accepted types: IEC1 (also known as IEC, CCIR, and DIN - mostly used in Europe), and IEC2 (also known as NAB - mostly used in the US).

In the digital domain the recorded signals do not suffer the frequency response problem of the tape medium. However, because these standards determine how the audio is recorded to and reproduced from tape, they affect the character of the tape saturation of the tape machine. Hence the AC202 plug-in allows the selection of IEC1 or IEC2 equalization, and the subsequent sonic affects are displayed in the Tape Playback Head and Tape Response Display. Note how the purple saturation curve changes as the IEC1 or IEC2 standards are selected for the various tape speeds.

Tape Formulations

In the world of tape, not only does the tape machine influence how the audio is heard, the tape medium itself is also a sonic factor. A great number of tape formulations have been created since the tape machine was first developed. The AC202 plug-in has consolidated them all into two generally accepted formulation categories:

- **Modern:** current manufacturing technologies create a tape with a much greater dynamic range than earlier formulations. These tapes have a large linear region, and hence have a smaller non-linear (saturation) 'character'. This makes for recordings as true as possible to the original material.
- **Vintage:** older tape mediums tend to have less dynamic range, and suffer from greater distortion/saturation. These tapes, however, have 'character' that newer ones do not, and have been used with great success in recording audio.

Tape Playback Head and Tape Response Display

A conventional tape machine (recorder or reproducer) requires a great deal of maintenance, to insure the unit performs consistently. This requirement is complicated by the subjective criteria of each user - the 'optimal' setup may differ from project to project.

Fortunately in the digital domain, the 'good' things about tape machines and the tape medium can be modeled, and the models can perform consistently over time. Additionally, the 'optimal' setup is only a few control changes away (instead of a tedious calibration session).

The rapid setup of the virtual tape machine in the AC202 plug-in is facilitated by the visual feedback of its controls and the Tape Playback Head and Tape Response Display.

The yellow curve shows the playback head response - low frequency roll-off and head bump levels update as the playback head type, Roll-off, and Bump controls on the AC202 plug-in are updated. The dark green curve shows the amount of tape saturation caused by the under/over biasing of the virtual tape machine, and how the biasing changes for different playback speeds and IEC equalization. Note the dark green curve is showing the frequency response of the virtual tape when signal levels are high (above -12 dB, as per the Bias and Input controls). Altering the Release control and using an extreme over-biased or under-biased setting is a good way to experiment (and audition) the tape saturation effect.

Modeling Analog Mixing Consoles with AC101

The Analog Channel plug-in models a wide variety of vintage and contemporary analog devices. Tape 'reproducers', Class A amplifiers, and even large analog mixing consoles can be emulated with the Analog Channel plug-in. This chapter highlights some of the modeling capabilities of Analog Channel. . The user is additionally directed to various presets included in the Analog Channel plug-in package.

The AC101 configuration is designed to emulate the characteristics of an analog amplifier stage. Many presets have been included with the Analog Channel plug-in to demonstrate the AC101 configuration abilities. Additionally, three ProTools sessions (no audio) have been created with an AC101 (mono) on every track of a 24-track mixer. An AC202 is placed on the stereo master fader. Some notes about using these session 'templates':

- The AC101 is placed in the first insert of each mixer channel.
- Signal level should be set by the Input control of the AC101 plug-in - leave the ProTools mixer fader at unity. The signal level can then be set without digital clipping, and the analog amplifier characteristics imparted to the mixer as well.
- The AC202 at the master fader is optional - just trying to give the total analog studio sound! Users may also want to experiment with an AC101 on the master fader
- Stereo tracks (not a part of these sessions) present an interesting (and subtle) application of the AC101 plug-in. The stereo channels can be processed together using a AC101 stereo config, or SEPERATELY (a multi-mono AC101 - PT 5.1 and later have this ability). Using a multi-mono AC101 on a stereo track can affect the 'stereo character' of the channel, and of the overall mix. Try it!

Modeling Analog Mixing Consoles with AC202

The AC202 configuration is designed to emulate the various aspects of 'recording to tape', including different tape machines and tape formulations, bias setups, tape speeds, and IEC EQ standards.

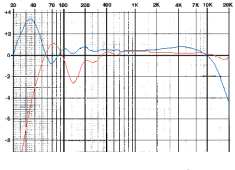
Each of the following sections contains graphs representing the frequency response of analog tape machines, as measured by the a third party engineer Jack Endino. Mr. Endino, having taken care over the course of his career to measure the responses of tape machines he has used, has been kind enough to share some of his data with McDSP engineering.

Ampex MM 1200

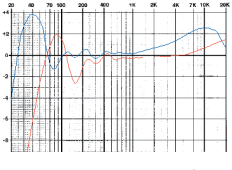
Made down the street from McDSP in Redwood City California, many of the products created by Ampex as early as the 1960's are still in use in the professional audio industry today. Below are measurements of an Ampex MM 1200 setup for 16 and 24 tracks. Note how the head bump is greater for the higher track count - head bump/ripple increases as track width decreases. The blue curve is 15 ips, the red curve is 30 ips.

Also note how the responses in Fig 4.3 show a slightly under-biased machine. This was likely operator choice.

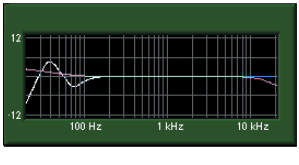
Focusing on the playback head response, there are two primary ripples - an overshoot at about the low frequency roll-off, immediately followed by a smaller undershoot. These characteristics have been placed into the playback head type called 'USA-A'. An example of the AC202 plug-in Ampex-style playback head response is shown to the right.



Ampex MM 1200 (16 tracks)



Ampex MM 1200 (24 tracks)

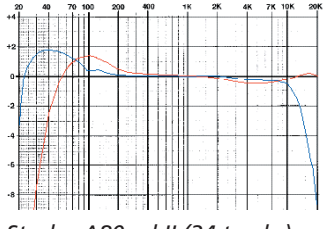


AC202 plug-in Ampex-style playback head response

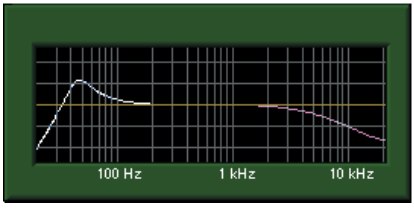
Studer A80 mkII

The Studer line of analog tape machines is ubiquitous in the recording industry. Below a Studer A80 mkII is shown. Note the single overshoot of the playback head at very low frequencies.

These measurements show the common debate between using 15 and 30 ips for recording. At the slower 15 ips speed, the low frequency response is great, yet high frequency loss is minimized if the 30 ips speed is used. The AC202 plug-in mitigates this problem by making low frequency roll-off operate independently of playback speed. The AC202 plug-in playback head called 'Swiss' is based on this kind of Studer machine. A response from the AC202 plug-in (via the Tape Playback Head and Tape Response Display) is shown below:



Studer A80 mkII (24 tracks)

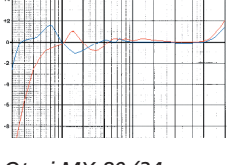


AC202 plug-in Studer playback head response

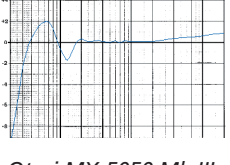
Otari MX-80

The Otari analog tape machines were the work-horse of many facilities. Below measurements of a MX-80 at 15 ips (blue) and 30 ips (red) are shown, as well as a MX-5050 Mk III half-inch 8-track. Note the high frequency boost, possibly indicating the machine was slightly underbiased.

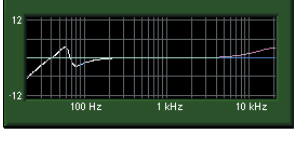
The Otari playback head responses are interesting in that they are somewhat flat just above its low frequency roll-off, and then have an over and under-shoot ripple. The AC202 plug-in playback head called 'Japan-O' is based on the Otari MX-80 and Otari MX-5050 Mk III half-inch 8-track.



Otari MX-80 (24 tracks)



Otari MX-5050 Mk III (8 tracks)

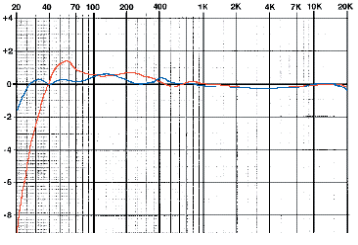


AC202 plug-in Otari playback head response

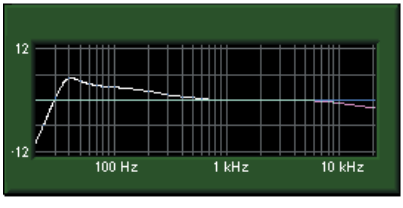
Sony APR-5000

In addition to the Playstation, Sony has made some very good (and expensive) analog tape machines. The Sony APR-5000 half-inch 2-track is shown below.

The APR-5000 playback head response at 30 ips (red) shows strong head bump effect without excessive ripple. The AC202 plug-in playback head called 'Japan-S' is based on the Sony APR-5000.



Sony APR-5000 (2 tracks, half-inch)

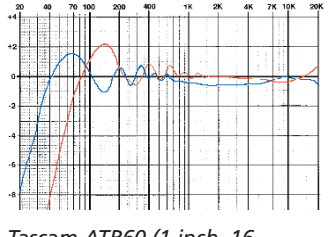


AC202 plug-in Sony-style playback head response

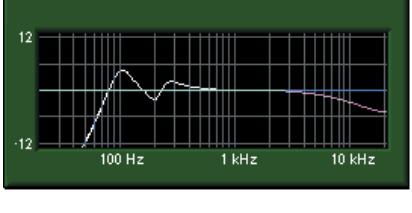
Tascam ATR60

The measurements below of a Tascam ATR60-16 1-inch 16-track show the problems of using a poorly calibrated machine. Although the head bump character is useful for audio, the ripples in the response are not desirable (can you imagine having to re-calibrate the machine to these responses for a remix of the same project?). The loss of low frequencies below 100 Hz at 30 ips (red) is definitely not appropriate for audio.

The ATR60 does show how a few well-placed playback head response ripples can make for 'good sonics'. The AC202 plug-in playback head called 'Japan-T' is based on a more ideal Tascam machine with only a primary and secondary playback head ripple.



Tascam ATR60 (1 inch, 16 tracks)



AC202 plug-in 'ideal' Tascam playback head response

Other Analog Channel Presets

Several other presets have been included in your Analog Channel plug-in package. These settings were created to highlight the flexibility and utility of Analog Channel. The AC101 analog channel emulator presets can be used to smooth a track or entire mix, and even be pressed into service as a gentle bus compressor/limiter. The AC202 analog tape machine emulator presets bring the sound of tape to the digital domain - great for sweetening drum, vocal, and bass tracks, and of course the entire mix!

Analog Channel is the most flexible analog emulator on the planet. We hope you enjoy using it as much as we did creating it!

Applications

Class A Glue

Many digital audio workstation users have noticed how their mix inside the digital environment can be altered significantly when bussed through an analog console. The differences are in part due to the amplification stages in these consoles. Where the digital system reproduces its dynamic range in a linear fashion (with the awful digital clip at the top of its range), the analog circuit has a built-in limiting action for high signal levels. This allows signal peaks to hang on slightly longer as they become slightly compressed. This 'glue' action can affect the listener's perception of the music, particularly in the percussive elements. The stereo field can even become different as signals panned from center are 'glued' during high peaks. In the digital mixer this effect does not exist.

Using AC101 as a multi-mono plug-In on the stereo buss, try out the "Console 1", "Console 2", and "Console 3" presets that come with the plug-In. The differences can be extremely subtle, and will only occur during signal peaking. But note how the stereo field and overall feel of the music can change with the plug-In engaged.

But there is always the question of how 'hard' to hit the AC101 plug-in. A good way to evaluate what the AC101 plug-in is doing is to observe the three-state LED next to the Drive control. When the green LED is lit, no signal saturation / distortion / compression is occurring. The middle and upper LEDs indicate some amount of saturation, etc. is occurring. Increasing the Drive control until the middle LED is lit during signal peaks is a good setting generally. If the middle LED is not lit even when the Drive control is maxed out, increase the Input level control until this occurs.

Digital Clip Removal

The AC101 plug-In can also correct the occasional digital clip in recorded tracks. By selecting the fastest attack time (to insure each clip is captured), the AC101 plug-In can smooth out the digital clipping and make the event appear to more like distortion on an analog mixing buss.

Varying the Release and Comp controls is a good way to audition different AC101 'effects' on the clipped signal. Faster release times will make the clip 'recovery' occur quickly, and avoid pumping effects of moderate to long release times, although sometimes a longer release time is subjectively better. Be sure the Comp control is at least at 50% of its maximum value so the AC101 plug-in has a good range in which to smooth out the signal clip.

Threshold-less Compressor

Unlike a compressor, the AC101 algorithm has no internal threshold. This means its transition between doing 'nothing' and 'something' is seamless. For this reason, the AC101 plug-in can be used to achieve some subtle compression-like effects. Here's how…

Use the Drive and Comp (short for Compression / Saturation / Distortion Curve – dang I should have just called it 'Curve') controls to vary the amount of effect – in this case the amount of 'compression'. Set the Curve control at its maximum setting to make the changes as audible as possible. Now vary the attack and release controls as you would normally when using a compressor. Release ranges between 100 and 300 msec can give a more compressor like sound. I find 300 to 600 msec are a little more 'natural' sounding. Anything under 100 msec is really pushing your luck as far as getting too much distortion, but field use has shown some folks like to go as low as 10 msec, hence the control range. Release times greater than 600 msec tend to make AC101 hang on too long for me, but when the overall effect is desired to be as unobtrusive as possible (i.e. change so slowly the casual listener does not hear the effect), it can work. For attack ranges, 0.1 msec to 0.5 msec are good for a wide variety of material. However it is important to note that really fast attack times can cause some buzzing. I keep the attack around 1 to 3 msec to avoid the bass-buzz effect. Also note how you can use slower attacks (greater than 3 msec) as the Comp control is increased to its maximum. When the compression / saturation / distortion curve has enough 'bend' in it, there is more headroom for overshoots to occur, and hence a slow attack is ok. But watch for output clipping!

Drums

Two great uses AC202 on drums are the elimination of rumble at extremely low frequencies, and the separation of the bass and snare drums sounds. The playback head system in AC202 can address these sonic issues.

Setup a drum sub mix, insert the AC202 plug-In on the master fader of the sub mix. Starting with the factory default preset settings, increase the Bump control to its

maximum setting. This will give roughly 6 dB of gain at the frequency value indicated by the Freq control. Move the Freq control around until the sweet spot (region with the most signal content) of the bass drum. Note how alternating between the different playback head types affects the tone of the bass and snare drums. The 'USA-A' and 'USA-M' playback heads also can do a good job of separating the bass and snare drums. The subtle gain reduction between the main bump and secondary bump of the playback head response helps isolate each sound from the other. Furthermore, the playback head response will eliminate low frequency content below the bass drum. This is a necessity in improving the low end of any drum mix (or mix in general!). The punch of the bass and snare is preserved while low frequencies below the signal content of the drum kit itself.

Guitar

The AC202 Plug-In can further the pursuits of THE guitar tone with the playback head section. Insert the AC202 Plug-In on a guitar track (distorted or clean). Starting with the factory default setting, select the 'USA-M' playback head. Using a Freq control value of 100 Hz and a Bump of 100 (6 dB), a subjectively pleasing EQ curve is setup. Over-biasing at 15 ips (even 7.5 ips) will give a tone closer to that of many guitar amplifiers and speakers. Use a Release control time of at least 1.0 seconds to avoid any pumping effects (unless desired).

Master Fader

Dumping the entire Pro Tools 2-track master into a tape machine was very common when Analog Channel first came out. Many users discovered the great sounds of those analog reel-to-reel machines by using the AC202 plug-in. Still, the flexibility of AC202 can sometimes prevent users from finding that elusive 'sound', so here are some tips on how to use AC202 on a master fader.

For starters, put AC202 on the master fader as you start mixing. Many 'old school' folks like to mix with a compressor on the master, and this idea works well for AC2.02 There are a variety of presets that come with Analog Channel, but here are some good starting settings. I like the USA-A (Ampex) or USA-M tape head types, with about 20 to 40% head bump, at a roll off frequency between 30 and 60 Hz. The roll off frequency should be auditioned on the drum tracks mostly, as the head bump will be accenting the kick from the drum kit, and the bass instruments to some extent as well. Once a sweet spot is found (i.e. that kick really starts to resonate) the head bump can be varied to taste. Try 15 or 30 ips tape speed for most music styles – the 7.5 ips speed is a really retro kind of sound! The vintage tape formulation is derived from Ampex 456 (rock and roll!) tape, while the modern tape formulation is from GP9 (high dynamic range / low distortion) tape. The Bias control sounds great anywhere from 0 to about 6 dB. More than 6 dB can be excessive, but always experiment with the full range of any control at least a few times before settling on a good setting.

Using the VU styled meters, set the left meter to display the output, and the right meter to show gain reduction (GR). The visual monitoring of the gain reduction is key to seeing the AC202 is producing some of the tape compression kinds of effects you're most likely looking for.

Analog Channel Plug-in Reference Guide

Analog Channel Emulator (AC101) Specifications

Parameter	Range	Function
INPUT	-24 to +24 dB	Amount of gain applied to input signal before processing
Ø (PHASE)	ON/OFF	Polarity (phase) of the final output. When yellow LED is lit, signal is 180 from original
DRIVE	-12 to +12 dB	The amount of signal used to limit (saturate) the input signal
SATURATION STATE LEDS	ORANGE hard limiting and/or saturation. YELLOW soft limiting GREEN linear region	The continuous state of the Analog Channel AC101 plug-in is tracked by three basic 'states' showing how hard the analog amplifier model is being driven.
COMP	1 to 10 (linear/digital to non-linear/ analog)	Allows various soft limit (saturate) curves to be selected. These curves are displayed in the Input-Output real-time display graph.
VA	Virtual Analog	The VA button toggles the meter display between the original tube meters and a VU styled meter (the ballistics are more appropriate for modern productions, and display a +3 dBfs peak).
ATTACK	0.1 to 10.0 msec	The rate that the soft limit (saturate) curve characteristic begins to alter the input signal
RELEASE	10.0 to 1000.0 msec	Sets the rate the effect is disabled
OUTPUT	-24 to +24 dB	Amount of make-up gain applied to master signal.
METERING	Input, Output	The input and output signals are continuously metered. Peak LEDs for both channels light when the signal level is about to clip.

Analog Tape Machine Emulator (AC202) Specifications

Parameter	Range	Function
INPUT	-24 to +24 dB	Amount of gain applied to input signal before processing.
ROLL OFF	20 - 100 Hz	Low Frequency Roll-off
BUMP	0 - 100%	Determines the amount of head ripple up to 6 dB
PLAYBACK HEAD TYPE	Selector - various models from popular analog tape machines	The roll-off and head 'ripple' (bump) differ for each playback head type.
BIAS	-12 to +12 dB	The Bias control operates just like on a real analog machine. Underbias increases signal level and high frequency boost, overbias decreased dynamic range, causes high frequency saturation (loss).
RELEASE	10 msec to 1.0 sec	Release controls the rate playback recovers from the tape saturation state.
PLAYBACK SPEED	7.5, 15, and 30 ips (inches per second)	Playback speed most common to professional audio recording are 7.5, 15, and 30 ips (inch per second).
IEC EQUALIZATION	IEC1 (Europe) and IEC2 (US)	IEC EQ standard for US (IEC2) and Europe (IEC1) are available.
TAPE FORMULATIONS	Modern and Vintage	Tape formulation 'Modern' is a high dynamic range contemporary tape, while 'Vintage' is a less-dynamic range, more 'character' when over-biased tape.
OUTPUT	-24 to +24 dB	Amount of make-up gain applied to master signal. Auto Output mode disables the Output control, and maintains constant signal level for the given Input and Bias control settings.
METERING	Input, Output and Gain Reduction	The input, output, and gain reduction levels are continuously monitored.

DSP Delay

The delay incurred by any of the Analog Channel plug-in configurations is 3 (THREE) samples on HD systems. This is the absolute minimum number of delay samples a TDM plug-in can have. The McDSP plug-ins are designed in this manner to provide the user with the closest analog mixing console experience possible (analog inserts such as EQ and compression do not cause a processing delay when inserted into a track).

DSP Usage

Pro Tools™ HD and HD Accel DSP hardware

The TDM versions of the Analog Channel plug-in configurations use a varying amount of DSP resources for each Analog Channel configuration. The table below is a listing of these DSP usages. The DSP Allocator utility provided by Avid™ (Digidesign) can be used to display DSP resource allocation when Pro Tools™ is running.

Maximum Instantiation Counts

Configuration	# Instantiations per DSP on HD systems	# Instantiations per DSP on HD Accel systems
AC101 (MONO)	28	56
AC101 (STEREO)	17	34
AC202 (MONO)	9	18
AC202 (STEREO)	4	8

For TDM hardware, all Analog Channel configurations can run on the same DSP simultaneously. Analog Channel supports all higher sample rates on HD systems (96kHz, 192kHz). At these higher sample rates the number of instances is reduced by 2 and 4, respectively.

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