


ANTARES

USER'S GUIDE



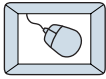
Auto-Tune™

Antares Advanced Tuning Effects

Plug-in for Mackie Digital Mixers

MACKIE®
Digital Systems™

Iconography



This icon identifies a description of how to perform an action with the mouse.



This icon identifies a description of how to perform an action from the console.



This icon will lead you to some further explanations of features and practical tips.



This icon marks information which is very important, so please make sure you have a read.

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Part No. 820-252-00 Rev. A 03/2001

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Contents

Introduction	4
About Antares	4
About the D8B UFX Card	5
About Auto-Tune	5
Let's Get Started	6
Requirements	6
Authorizing the Plug-in	6
Unlock Procedure	7
Configuring the Plug-in	8
Using the Auto-Tune Plug-in	10
Front Panel Overview	10
Global Controls	11
Auto-Tune Controls	13
Vibrato Controls	18
Saving, Loading, and Resetting a Preset	19
Automation and Snapshot Control	22
FX Routing	23
More about Scales	28

Note: Any future revisions of this guide will be available for viewing and downloading from our website: www.mackie.com.

Introduction

Thank you for purchasing Auto-Tune from Antares. It is one of the exciting new family of 24-bit plug-ins for the D8B, specifically designed for the new Mackie Universal Effects (UXF) card.

The Auto-Tune plug-in is a precision instrument for controlling pitch, allowing you to apply nuances of intonation to virtually any performance. This plug-in is an implementation of the Antares Auto-Tune pitch correcting software for the Mac and PC. It employs state-of-the-art digital signal processing algorithms to continuously detect the pitch of a periodic input signal (typically a solo voice or instrument) and instantly and seamlessly change it to a desired pitch (defined by a number of user-programmable scales).

About Antares

Antares Audio Technologies is renowned as a developer of innovative, DSP-based audio software and hardware, including the ATR-1 Intonation Processor, MDT (Multi-band Dynamics Tool) and JVP (Antares Voice Processor) DSP plug-ins.



About the D8B UFX Card

The UFX card provides robust processing power for computation-heavy plug-ins. The UFX card is a 4-in/4-out architecture, which means it can support four mono, two mono and one stereo, or two stereo sends simultaneously. Up to four UFX cards can be installed in the D8B, allowing up to sixteen simultaneous single-channel effects, eight stereo plug-ins, or combinations thereof.



Note: Earlier D8Bs were fitted with 16 MB of memory. It is recommended that you increase this to 32 MB (as fitted in newer D8Bs) if you install more than one UFX card. Memory upgrade instructions are supplied with each UFX card.

About Auto-Tune

Auto-Tune is very easy to use. Simply identify a key and scale and the affected signal will automatically conform to that scale in real time, while preserving all of the expressive nuance of the original. Auto-Tune can work while the track is being recorded (instead of as a separate post-recording process). In other words, the tracked vocal goes to tape (or disk) already in tune. Of course, you can always process a track that has already been recorded. Micro-adjustments can be automated using hands-on D8B controls instead of a mouse, a huge advantage when correcting melodies that have modulated to other keys or modes. Up to 4 channels of Auto-Tune can be engaged per UFX card. With 4 UFX cards installed, that's up to 16 channels of pitch correction!

Let's Get Started

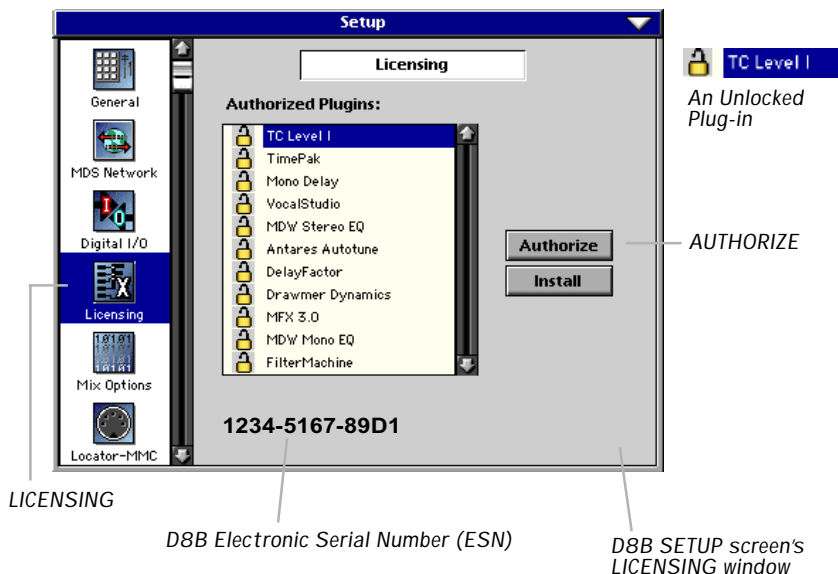
Requirements

- One or more Mackie UFX cards
- Mackie Real Time OS 3.0 Software
- Plug-in Software

We will assume you have successfully installed a Mackie UFX card and Mackie Real Time OS 3.0 software upgrade. If you have encountered problems with the installation of hardware or software please see their associated user guides or contact Mackie support (www.mackie.com).

Authorizing the Plug-in

If you have D8B v 3.0 b186 or greater, the plug-in is already installed on the D8B hard drive, however an authorized unlock code must be entered to unlock the plug-in for normal operation.



Unlock Procedure

1. Locate your D8B's Electronic Serial Number (ESN). This is displayed at the bottom of the Licensing window, which is accessed from the Setup screen. The 12 digit ESN is made from numbers 0–9 and letters A–F. It is unique to the D8B processor, and is not the serial number label on the rear of the control surface or CPU chassis.
2. You will also need your plug-in's serial number which is printed on the floppy disk label.
3. To obtain the unlock code, have the ESN and plug-in serial number ready. Then you have two options:
 - Log on to the Mackie plug-in authorization web page: (<http://www.mackie.com/d8bauthorize.htm>)
 - or
 - Telephone Mackie Tech Support at 800-258-6883.
4. When you have obtained an unlock code, open the D8B Setup window, and click **Licensing**.
5. With your plug-in highlighted in the Licensing window, click **Authorize**, and enter your unlock code in the UNLOCK CODE box. Click **Enter**, and enjoy your newly expanded console.

Plugin

Please call Mackie Designs at 425-437-4333 (USA) or visit our Plugin Authorization Website @ www.mackie.com/d8bauthorize.htm to obtain the unlock code for this plugin. Your D8B Serial Number is displayed below. If you have an unlock code, enter it below or hit cancel. The plugin will operate in DEMO mode until authorized now or at a later time.

UNLOCK CODE:

D8B Serial Number: ESN (serial #)

Configuring the Plug-in

After booting the D8B you must assign the Auto-Tune plug-in to a UFX card. See FX Routing on page 23 for more details.

Assign the Auto-Tune Plug-in to a UFX card



1. Click the Plugins menu and select **Plugins**, (or Ctrl+P on the keyboard).

Plugins	Windows
Plugins	Ctrl+P

2. In the Plugin Configuration window, locate the card slot that contains the UFX card you wish to assign to.
3. In the Mode column, click the Mono/Stereo toggle button and set it to **Mono**.

Plugin Configuration			
SLOT	INPUT	PLUGIN	MODE
1	Aux 1	MFX 3.0	
2	.		N/A
3			
4			
5	Aux 3	MFX 3.0	
6	.		N/A
7			
8			
9	Aux 5	Antares Autotune	MONO
10		none	
11		none	MONO
12		none	
13		none	STEREO
14		none	
15		none	MONO
16		none	

4. In the Plugin column, select **Antares Autotune** from the drop-down menu.

9	Aux 5	Antares Autotune
10		none
11		Mono Delay
12		MDW Mono EQ
13		Antares Autotune



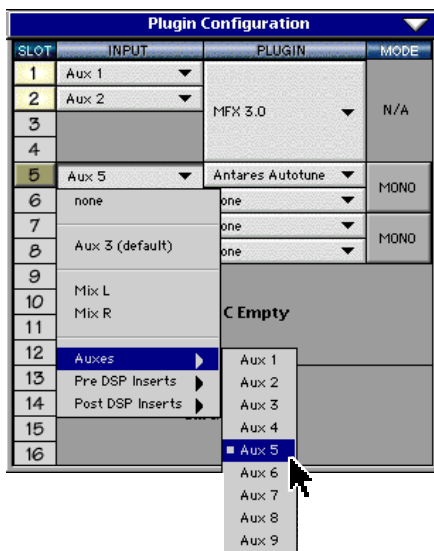
Note: A plug-in can also be loaded from the Setup section on the console.

Assign an Input Source to the Plug-in



- Click the plug-in's INPUT button to select an input source. In the example below, we have chosen the **Aux 5 Bus** as the input to the plug-in installed in slot 5.

When a plug-in is fed from an aux bus, its output appears on the FX Return channels (faders in the EFFECTS bank). The return channel is determined by the slot number and whether the effect output is mono or stereo. For example, a reverb with a mono input and stereo output that is installed in Slot 5 has its outputs on FX 5 and FX 6. **Note:** The default state for all FX channels is MUTE. You won't hear the effect until you unmute its FX return channel(s).

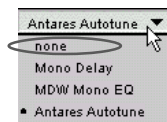


A plug-in can also receive its input from a channel pre- or post-DSP insert or the main stereo left and right bus. When a plug-in is inserted “in line” in this manner, its output is routed directly back into the channel. See FX Routing on page 23 for more details.

Removing the Plug-in



- In the Plugin column, select **none** from the drop-down menu.
- Click **OK** in the Alert dialog box.



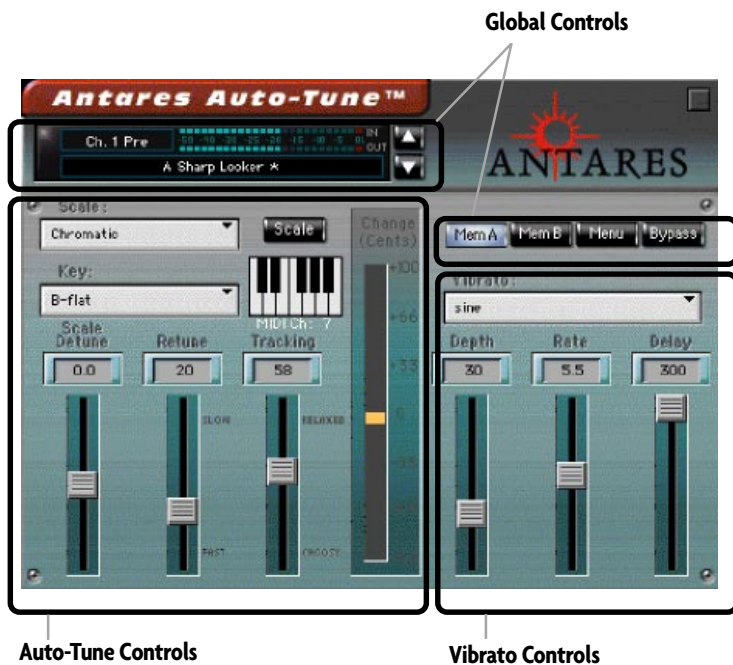
Note: A plug-in can also be deleted from the Setup section on the console.

Using the Auto-Tune Plug-in

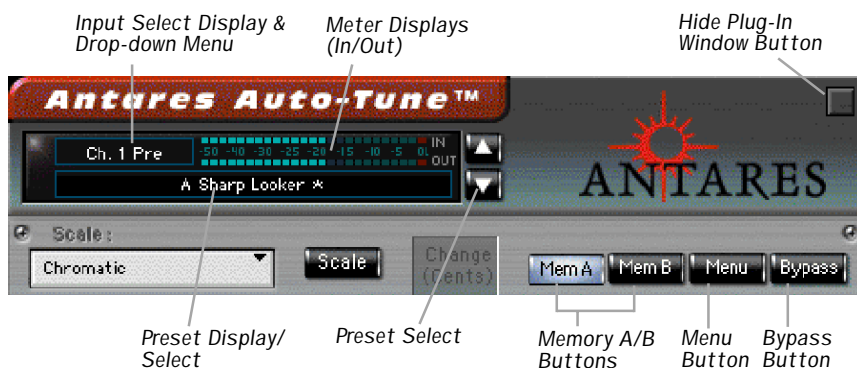
Front Panel Overview

You can think of Auto-Tune as being broken into three sections.

1. Global Controls
2. Auto-Tune Controls
3. Vibrato Controls



Global Controls



Input Select

Assign Auto-Tune's input from any of the DB8's pre, post, or auxiliary channels.

Input and Output Meters

The input meter represents the incoming signal from the D8B, with a range from -50 dB to 0 dB. The output meter is located just beneath the input meter.

Menu Button

The drop-down menu button will enable familiar functions such as undo, redo, load, save, reset, cut, copy and paste. See page 19 for more details.

Hide Button

The small button located at the top right of the GUI will hide the Auto-Tune window.

Preset Selection and Display

Toggle the up/down arrows to select from an array of factory presets or your own saved user presets.



Note: The Input Source can be set from either the plug-in GUI or the plug-in configuration Window.

Memory A/B

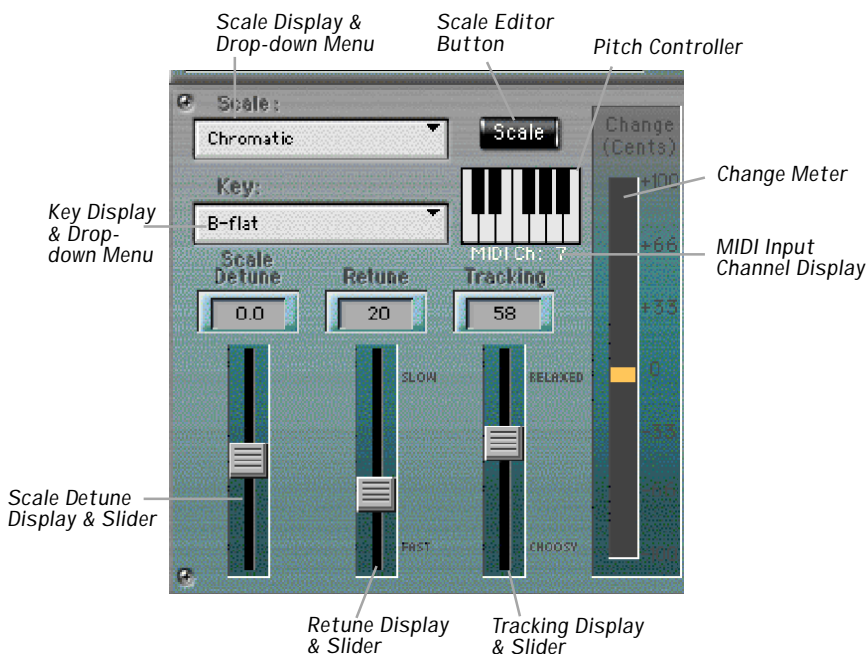
Memory A and Memory B are two separate storage banks that let you temporarily store setups. This is handy for quickly referencing and comparing sounds while you are creating edits.

Bypass

This allows the input signal to pass through Auto-Tune without being processed. Click the button again to resume processing. Switching the Bypass state will not cause any audio artifacts, so it can be used in real time for live performance, recording or mixing applications.

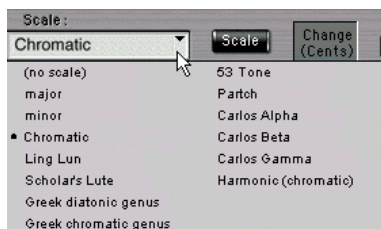
Auto-Tune Controls

This section is a reference for all of the Auto-Tune controls and describes the function of each control.



Scale Selection

Select the desired scale from the drop-down scale list. The first three scales are equal tempered. These are the ubiquitous scales typically found in Western tonal music. The other scales are historical, ethnic, and microtonal scales.



An in-depth discussion of these scales and their history is beyond the scope of this guide. The interested reader will find more information in *Tuning In – Microtonality In Electronic Music* by Scott R. Wilkinson, published by Hal Leonard Books. For a brief synopsis of scales, see *More About Scales* on page 28 of this guide.

Scale Editor

Click the **Scale** button to open the Scale Editor window. Edits made using this dialog are associated with each scale. That is, each scale retains its own edits separate from the other scales. When finished editing, click the **Done** button to close the window.



Scale Display Key Display

Do Not Track	Remove	Note	Value
<input type="checkbox"/>	<input type="checkbox"/>	C	0
<input type="checkbox"/>	<input checked="" type="checkbox"/>	C#	100
<input checked="" type="checkbox"/>	<input type="checkbox"/>	D	200
<input type="checkbox"/>	<input checked="" type="checkbox"/>	D#	300
<input type="checkbox"/>	<input type="checkbox"/>	E	400
<input type="checkbox"/>	<input type="checkbox"/>	F	500
<input type="checkbox"/>	<input checked="" type="checkbox"/>	F#	600
<input checked="" type="checkbox"/>	<input type="checkbox"/>	G	700
<input type="checkbox"/>	<input checked="" type="checkbox"/>	G#	800
<input type="checkbox"/>	<input type="checkbox"/>	A	900
<input type="checkbox"/>	<input checked="" type="checkbox"/>	A#	1000
<input type="checkbox"/>	<input type="checkbox"/>	B	1100

Go to Previous Page
 Go to Next Page
 Set to Major Scale
 Set to Minor Scale
 Cancel Button (to close without saving)
 Done Button (to close and save)

Do Not Track Column Remove Column Note Value Column Cent Value Column

The Edit Scale window displays each note of the currently selected scale in the currently selected key. If the selected scale includes more than twelve notes, use the Page Up/Down buttons to scroll through all of the available notes. Beside each note name are two check boxes: Do Not Track and Remove. If neither of these boxes are selected, Auto-Tune treats this note as a normal scale note, i.e., when the input pitch is close to this note, Auto-Tune will correct the pitch to this note at the rate set by the Retune Speed control.

If the Do Not Track box is selected, when the input pitch is close to this note the input will be passed through with no correction. If the Remove box is selected, then the note is simply removed from the current scale. For example, selecting the Chromatic scale and then setting C#, D#, F#, G#, A# to Remove would cause a C Major scale to remain. In that case Auto-Tune would always retune the input to the closest note of the C Major scale.

Do Not Track	Remove	Note	Value
<input type="checkbox"/>	<input type="checkbox"/>	C	0

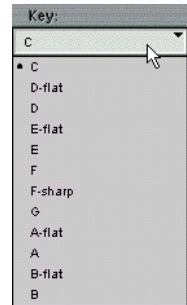


Why Remove?

A pitch error greater than 49 cents could allow Auto-Tune to choose notes in a given scale that otherwise would not be played as the incorrect pitch moves through the scale. The scale and key selected by the user might be appropriate but if the pitch error is too great, an undesirable note from the scale could be played. In this instance select the Remove box associated with the culprit note.

Key Selection

To select the desired key, click the Key button and then click the desired note from the drop-down list. This determines the pitch of the first tone of the scale according to the standard $A_3 = 440$ Hz.



Pitch Controller

The Pitch Controller is used to force the input to an exact pitch. Trigger the desired note(s) by selecting keys on the keyboard image or by using a MIDI input controller. As long as a key is selected or held/triggered from an external controller, the chosen note will adjust the input pitch. Only when you release the note will the input return to its original pitch. An external MIDI controller can also be used to gain immediate access to multiple octaves.



Note: If you are using a MIDI tempo map or tracking with timecode you can easily program (record) a note value into a MIDI sequencer at a precise location. In this way it is possible to correct a particular problem where the performance might otherwise be fine - using as little processing as possible.

Scale Detune

The Detune parameter allows you to change the pitch standard of Auto-Tune from the default A = 440Hz. The values are cents (100 cents = 1 semitone or half step). The range of adjustment is from -10 to +10 (10 being 100 cents).

The Detune function can be used to tune a vocal performance to some irreparably out-of-tune instrument (a piano or organ, for example), or to allow correction to other than the conventional 440Hz standard. If you have a tone that you want to use as the pitch standard, select that tone and play it in a loop. Adjust Scale Detune until the Change meter reads zero. (You may be required to use the Edit Scale dialog to remove adjacent tones so that Auto-Tune doesn't tune to the wrong tone.)



Scale Detune

Change Meter

Retune Speed

Retune Speed controls how rapidly the pitch correction is applied to the incoming sound. The units are milliseconds. A value of zero will cause instantaneous changes from one tone to another and will completely suppress a vibrato (note that any related volume changes will remain). Values from 10 to 50 are typical for vocals. Larger values let through more vibrato and other interpretative pitch gestures but also slow down how rapidly pitch corrections are made. Although the above suggestions can be used as starting points, finding the correct Speed setting for a particular performance is largely a matter of trial-and-error and depends on such attributes as song tempo, note duration and vocal style, among others.



Retune Slider Tracking Slider Change Meter

Tracking

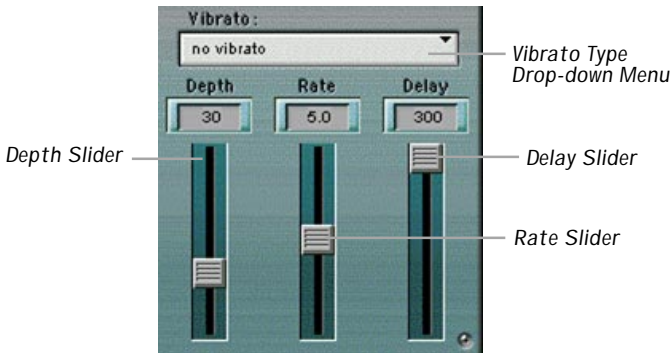
In order to accurately identify the pitch of the input, Auto-Tune requires a periodically repeating waveform, characteristic of a voice or solo instrument. The tracking control determines how much variation is allowed in the incoming waveform for Auto-Tune to still consider it periodic. If you are working with a well-isolated solo signal (e.g., tracking in a studio or off of a multitrack tape) you can typically set the tracking control to 25 and forget it. If, on the other hand, your signal is noisy or not well-isolated (as might be more common in a live performance situation) or you are dealing with a breathy voice, it may be necessary to allow more signal variation (higher tracking numbers). However, under these circumstances tracking is not guaranteed and a too “relaxed” setting may introduce distortion and popping.

Change Meter

The Change meter shows you how much the pitch is being changed, measured in cents (100 cents = 1 semitone or half step). For example, if the meter is reading +66, it indicates that the input pitch is 66 cents too flat and Auto-Tune is raising the pitch by 66 cents to bring the input back to the desired pitch.

Vibrato Controls

The Vibrato Section contains one drop-down menu and three sliders. The Vibrato drop-down allows you to select the shape of the vibrato's pitch variation through time. The choices are: (no vibrato), sine wave, square, and sawtooth. Depth varies from 0 to 100 cents, controlling the amount of pitch variation in the vibrato. Rate varies from 0.1 to 10.0 Hz and controls the speed of the vibrato. Delay varies from 0 to 300 milliseconds, controlling the speed of onset of the vibrato.



The vibrato is restarted every time Auto-Tune matches the incoming pitch to a different scale tone. Also, the vibrato is applied after the effects of the Retune Speed control. Hence, even with a slow retune value of 50, a square wave vibrato will make instantaneous changes in pitch.

Saving, Loading, and Resetting a Preset

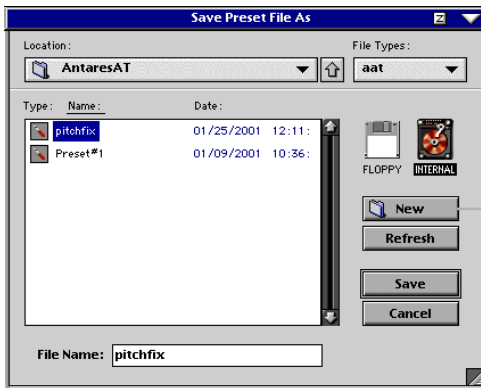
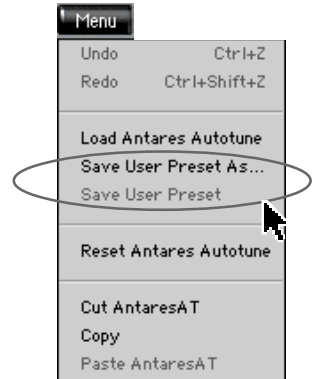
Auto-Tune settings can be saved and recalled from the hard drive. You can save and load files using either Memory A or Memory B.



To Save a Preset:



1. Click and hold the **Menu** button.
2. Select **Save User Preset** to overwrite the file currently opened.
3. Select **Save User Preset As** to save to a new file name. The Save Preset File As dialog box appears.
4. A default name for the preset is automatically displayed, such as Preset#1. If you want to rename it, simply type in the name you want, using up to 32 characters.



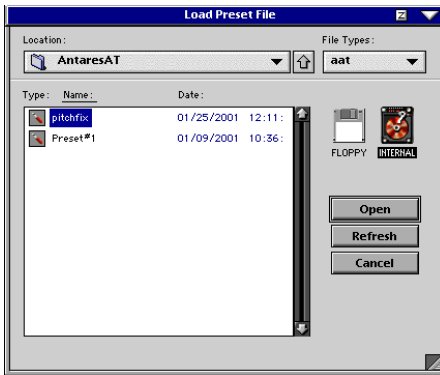
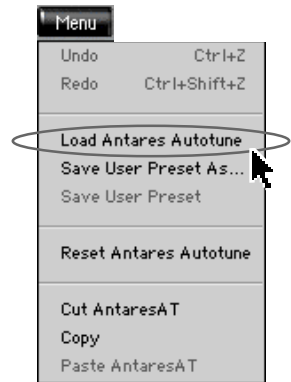
A new sub folder can be easily created to help organize custom patches.

5. Select **INTERNAL** (default hard drive) or **FLOPPY**.
6. Click **Save** to complete the operation.

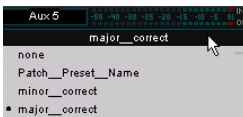
To Load a Preset:



1. Click **Mem A** or **Mem B** to choose the memory location from which to load the file.
2. Click and hold the **Menu** button.
3. Select **Load Antares Autotune** to open a file. The Load Preset File dialog box appears.



4. Click **INTERNAL** if the file is on the internal drive, or click **FLOPPY** if the file is on a floppy disk.
5. Select the preset you want to load.
6. Click **Open** to load the selected preset.



You can also load a preset from the Preset Display.

To Reset the Plug-in:

Reset will reload the previous patch.



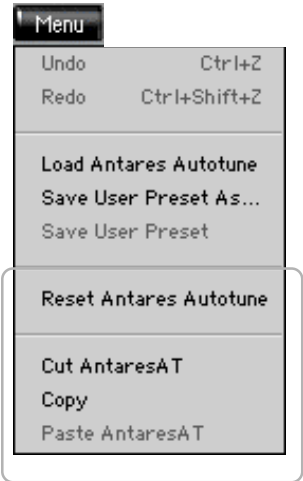
1. Click and hold the **Menu** button.
2. Select **Reset Antares Autotune**.

To Cut Preset Settings:



1. Click and hold the **Menu** button.
2. Select **Cut AntaresAT**.

The current settings are temporarily stored in the clipboard memory in case you want to paste them to a new preset. The plug-in also reverts to its default state (it is reset).



To Copy Preset Settings:



1. Click and hold the **Menu** button.
2. Select **Copy**.

The current settings are temporarily stored in the clipboard memory in case you want to paste them to a new preset.

To Paste Preset Settings:



1. Click and hold the **Menu** button.
2. Select **Paste AntaresAT**.

The current settings are replaced with the setting in the clipboard memory.

Automation and Snapshot Control

Dynamic Real Time

To write automation on a loaded plug-in:

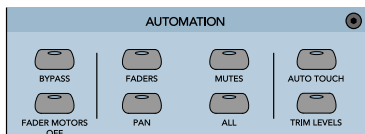
On The Console



1. Engage AUTO TOUCH.



2. Engage ALL, disengage BYPASS, and send timecode to the console – the POSITION readout will change to show TC is being received.



3. Move a parameter or recall a patch (user or factory preset).

Subsequent edits to any recorded automation moves may be performed in the Mix Editor. Enable the channel view by clicking on the Channel View button, then choose the plug-in you wish to view from the page drop-down menu. This displays a list of available channel and plug-in automation tracks on a parameter basis.



Note: Parameters can be controlled from either the GUI plug-in graphic parameters (using a mouse to modify the parameters) or via the VFD V-Pots and SELECT buttons (with the plug-in parameters called up on the VFD readout).

Dynamic Off-line

To write a snapshot on a loaded plug-in:



• Use the Event Automation Track, available under the Window Menu as 'Event Track', to load plug-in user (previously stored) or factory preset patches, at a specific time during automation playback.



General Note:

Plug-in settings are recalled as part of a console Snapshot, but may also be recalled as Presets (patches). If you are recalling snapshots and presets, be aware that one may override the other.

FX Routing

The Plug-in Configuration Window

The screenshot shows the 'Plug-in Configuration' window with the following callouts:

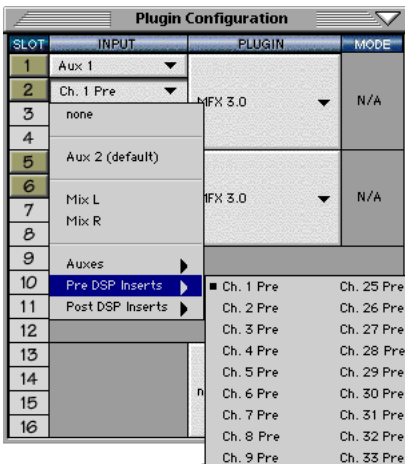
- Plug-in display toggle
- Input Channel Assignment Drop-down Menu Button
- Card Slot Column
- Input Source Assignment Column
- Plug-in Assignment Column
- Close Window
- Stereo/Mono Mode Column
- Stereo/Mono Toggle Button

SLOT	INPUT	PLUGIN	MODE
1	Aux 1	DelayFactor	STEREO
2	Aux 2		
3		none	MONO
4		none	
5			
6		none	N/A
7			
8			
9		none	STEREO
10			
11		none	MONO
12		none	
13			
14	Card D Empty		
15			
16			

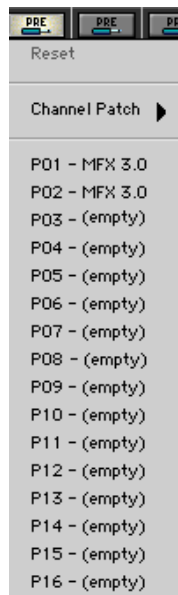
Inserting a Plug-in into a Channel

A pre- or post-DSP channel insert can also be used as the input source for a plug-in. When a channel insert point is selected, the plug-in output returns to the channel. The FX return path is disconnected, although the plug-in output is still displayed on the FX return channel meter.

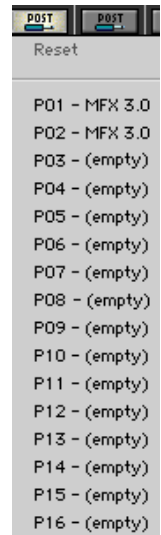
A plug-in channel insert assignment can be made from the Plugin Configuration window, or from a drop-down menu from the mixer screen.



Plug-in Configuration Window



Pre-DSP Drop-down



Post-DSP Drop-down

This assignment can also be made from the control surface and VFD by holding in the desired channel's SELECT button for two seconds, then paging over to Plug Pre or Plug Post, selecting the input source, then selecting the desired plug-in slot from the follow-on menu.

Using an Aux Send with a Plug-in



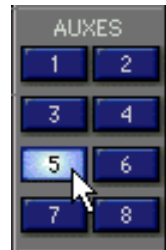
- Click the associated INPUT menu button and select an Aux input source. In the example below, we have chosen the **Aux 5** Bus.

Plugin Configuration			
SLOT	INPUT	PLUGIN	MODE
1	Aux 5		
2	none	IFX 3.0	N/A
3			
4	Aux 1 (default)		
5	Mix L	one	STEREO
6	Mix R	one	
7		one	
8	Auxes	Aux 1	
9	Pre DSP Inserts	Aux 2	
10	Post DSP Inserts	Aux 3	
11		Aux 4	
12		Aux 5	
13		Aux 6	
14	Card	Aux 7	
15		Aux 8	
16		Aux 9	
		Aux 10	

Send the Input Signal to the Aux Bus



- Send a signal to a D8B mixer input channel (MIC/LINE or TAPE IN).
- Assign the input channel V-Pot/GUI Control Pot to an aux send. We have chosen **AUX 5** according to the example above.
- Use the **AUX 5** control to adjust the input level to the plug-in.



GUI Control Pot Assigned to AUX 5



Remember to select an aux send before using the V-pot or GUI Control Pot on the mixer input channel (MIC/LINE or TAPE IN).

You will see the plug-in's input meter become active as you raise the mixer input channel's aux send.

Set the plug-in input/output signal levels as you would with any effect, so the meter reaches its upper-most range every so often (always trust your ears first). This can be accomplished from the console or GUI.

Pre-Fader and Post-Fader Auxiliary Sends

Normally, effect sends are post-fader, so the signal sent to the effect follows the program level in the mix. Occasionally you may wish to feed an effect from a pre-fader source so that the signal level from the aux control is independent of the channel fader position. Aux sends are selectable pre- or post-fader globally (all Aux 1's for instance) from the Mix Options screen in the Setup window, or individually on a channel-by-channel basis either from the channel strip or the Fat Channel.



In the channel strip, Alt-click the Aux Send level indicator to toggle between pre- and post-fader operation. Post-fader is indicated by a red bar, pre-fader is indicated by a yellow bar.



Channel Strip



Fat Channel

In the Fat Channel, clicking on the small indicators below the Aux knobs toggles between pre- and post-fader operation. Yellow indicates pre-fader, post-fader is indicated by the background color.

The FX Return Channel

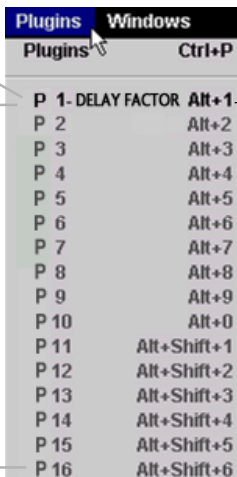


- Switch the D8B Bank Select to **EFFECTS (49-72)** and bring up faders one and two (channels 49 and 50). You will also see meter activity associated with these channels.



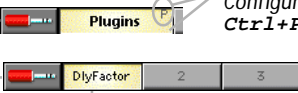
FX Channels 1&2
(channels 49&50)

Stereo Plug-in



The Plug button toggles between Windows menu buttons and FX buttons (lower left on the D8B mixer screen).

Plugins button opens the Patch Configuration window (or **Ctrl+P** on the keyboard).



Here the Delay Factor plug-in is selected for display.

More About Scales

Historical Tunings

- **Ling Lun:** a twelve-tone scale dating from 2700 B.C. China.
- **Scholar's Lute:** a seven-tone scale dating from 300 B.C. China.
- **Greek diatonic genus:** a seven-tone scale from ancient Greece.
- **Greek chromatic genus:** a seven-tone scale from ancient Greece.
- **Greek enharmonic genus:** a seven-tone scale from ancient Greece.
- **Pythagorean:** a twelve-tone scale dating from 600 B.C. Greece. This scale is derived by tuning twelve pure perfect fifths upward and adjusting the octaves downward. This leads to some pure intervals and some very impure intervals.
- **Just (major chromatic):** a twelve-tone scale. Just intonation tunes the most frequently used intervals to be pure (integer ratios in frequency). These tunings depend on the mode (major or minor) and the key. This scale is tuned for major mode.
- **Just (minor chromatic):** (See Just (major chromatic), above)
- **Meantone chrom.:** a twelve-tone scale. This tuning is a combination of Pythagorean and Just tunings so that music in a wider variety of keys could be usable.



- **Vallotti & Young chrom:** a twelve-tone scale. Another derivative of the Pythagorean scale designed to allow arbitrary keys.
- **Barnes-Bach (chromatic):** a twelve-tone scale. A variation of the Vallotti & Young scale designed to optimize the performance of Bach's Well-Tempered Clavier.

Ethnic Tunings

- **Indian:** This 22-tone scale is used in India to perform ragas.
- **Slendro:** This five-tone Indonesian scale is played by ensembles called gamelans.
- **Pelog:** This seven-tone Indonesian scale is more interesting than Slendro and is now the primary scale in Balinese music.
- **Arabic 1:** This 17-tone scale is the original Arabic scale adopted from the Pythagorean scale.
- **Arabic 2 (chromatic):** This twelve-tone scale is the modern version of the Arabic scale popular in Arabic music today.

Contemporary Tunings

Equal-tempered scales with a large number of tones are typically used to play common tonal harmony with greater purity of intervals and chords. The typical approach is to analyze a passage (or less) of music and select tones from a scale that will best approximate the desired pure intervals.

- **19 Tone:** This scale has greater purity of minor thirds and major thirds (and conversely, minor and major sixths) than twelve-tone equal temperament. A disadvantage is that perfect fifths are narrower than those found in twelve-tone equal temperament.

- **24 Tone:** Also known as the quarter-tone scale, this scale is used for variety but has no advantage in terms of ratios that better approximate pure intervals.
- **31 Tone:** In addition to intervals that better approximate pure intervals, this scale also contains good approximations to Indonesian pelog and slendro scales.
- **53 Tone:** Related mathematically to the cycle of fifths, the 53-tone scale has very pure major and minor thirds, and fifths and fourths.
- **Partch:** Harry Partch is considered the father of modern microtonality. This scale was devised by him and used in instrument building and performances.
- **Carlos Alpha:** Wendy Carlos performed extensive computer analysis to devise a number of equal-tempered scales with good approximations for the primary harmonic intervals and their inversions. This scale is good at approximating the primary intervals including $7/4$. This scale divides the octave into 15.385 steps, forming intervals of 78.0 cents.
- **Carlos Beta:** This scale divides the octave into 18.809 steps, forming intervals of 63.8 cents.
- **Carlos Gamma:** This scale achieves perfect purity of the primary intervals $3/2$, $4/3$ and $5/4$. This scale divides the octave into 34.188 steps, forming intervals of 35.1 cents.
- **Harmonic (chromatic):** This twelve-tone scale is created in the partials in the fifth octave of the harmonic series. The scale degrees that correspond to the classic Just intervals are the major second, major third, perfect fifth, and major seventh.

Complimentary Doodle Page



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