Auto-Tune™

User's Manual

Version 1.3

ANTARES™

Creating the Future of Music Technology

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Welcome!

I would like to extend my congratulations to you on purchasing the most powerful intonation correction tool in the world. With your purchase of Auto-Tune, you have created a relationship with my company which I hope will be long and gratifying.

As a registered user of Auto-Tune, you are entitled to notification of software upgrades, technical support, and to special introductory offers on upcoming products. We will be in contact with you to announce new opportunities and to solicit your feedback.

At AnTares Systems, we are committed to excellence in service, quality, and technology innovation. You can count on us to listen to you and to keep our promises to you.

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CHAPTER 1

Getting Started

Auto-Tune is the world's first software tool designed specifically to correct intonation problems in vocals and other solo recordings. Auto-Tune uses state-of-the-art technology (much of it taken from the geophysical industry) to continuously track the pitch of input sound and provide output sound at corrected pitches.

I remember, as if it was yesterday, sitting in my Junior High School band, happily playing away on my flute. Suddenly I realized my conductor was screaming and jumping up and down on the podium. What was this about? Then, I realized she was screaming at me. And just in time too - since I was able to duck and watch a baton fly past my head, missing me by inches. "Why [expletive] can't you play in tune?" I was asked. But I was in tune. Everybody else was out of tune. It was then I began to learn about intonation.

Many people struggle with intonation. Some of our most celebrated entertainers spend hours in the studio doing retake after retake, trying to sing expressively and in tune. Afterwards, their producers spend more time trying to correct intonation problems using inadequate tools.

Auto-Tune is dramatically changing all of that. Because of Auto-Tune, sessions focus on feeling and expression, rather than retakes. Studio hours are cut back and production costs are lowered.

Using Auto-Tune, you can easily make corrections to pitch that used to be very difficult, if not impossible. And you don't need a refined sense of intonation to use Auto-Tune. Auto-Tune has two modes of operation: Automatic and Graphical. The Automatic Mode can be casually applied and draws an entire piece to a well-centered pitch. This mode solves most intonation problems without effort or expertise.

When pitch errors are large, or when you want more expressive control of pitch, the Graphical Mode is provided allowing you to fix intonation problems on a case-by-case basis.

How To Use This Manual

Auto-Tune has a transparent user-interface and is extraordinarily easy to use. However, because Auto-Tune does things that have never been done before, some aspects of the user-interface will not be immediately obvious. You must read either Chapter 3, Auto-Tune Tutorial, or Chapter 4, Auto-Tune Controls, to learn the essential information you will need to operate Auto-Tune.

The Contents Of This Manual

Chapter 1: Getting Started

The chapter you are reading.

Chapter 2: Introducing Auto-Tune

This chapter explains basic facts about pitch and how Auto-Tune functions to correct for pitch errors. The basic functionality of Auto-Tune is discussed, and information you need to use it effectively is provided.

Chapter 3: Auto-Tune Tutorial

This chapter introduces you to details of how Auto-Tune works by guiding you through several tutorials. All of the important controls are explained. Also, important hints and tips are presented that will help you use Auto-Tune effectively. If you only read one chapter, read this one.

Chapter 4: Auto-Tune Controls

This chapter is reference information for all of the controls used in the Auto-Tune interface. Much of the information in this chapter is also presented in

Chapter 3, however, some of the less important controls are only explained in Chapter 4.

Installing Auto-Tune

Instructions for installing Auto-Tune are located in the "Auto-Tune Read-me" file on the key disk. Please refer to this file for the most up-to-date information on installing and de-installing Auto-Tune.

Software Notes

The TDM version of Auto-Tune is used within ProTools and other programs that access TDM through DAE.

The TDM environment is supported by hardware from Digidesign called the DSP Farm. Each DSP Farm card contains DSP chips on which Auto-Tune and other DSP plug-ins run. The TDM system requires that one chip on the DSP Farm be used for the Mixer plug-in. Assigning a large number of voices will sometimes require the Mixer plug-in to use of two DSP chips on the DSP Farm.

Auto-Tune processes one audio channel per DSP chip.

Owner Registration

Your purchase of Auto-Tune entitles you to technical support, special introductory offers on new products from AnTares Systems, and notification of software updates. Software updates will be published as the program evolves.

Please fill out and return the Owner Registration Card. The information on the card will allow us to communicate more effectively with you and will enable us to serve you better in the future.

Technical Support

If you have some problem using Auto-Tune that can't be solved by reading the manual, call Richarde & Co. (the AnTares Systems distributor) at (800) 446-2356, or (408) 688-8593 Monday through Friday between 9 AM to 5 PM PST.

Also, you might find what you want at our web page:

www.antares-sytems.com

You can also e-mail:

techsupport@antares-systems.com

CHAPTER 2

Introducing Auto-Tune

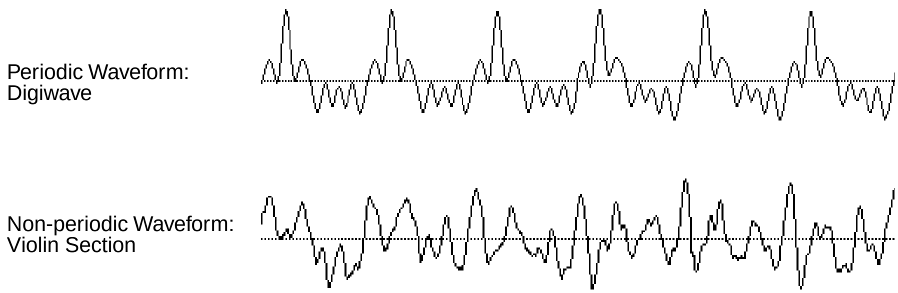
Auto-Tune is a breakthrough in digital signal processing (DSP) in the music industry. It puts you in control of pitch. Moreover, Auto-Tune is a precision instrument for controlling pitch, allowing you to apply nuances of intonation to any performance. These nuances were only previously available to synthesized music if the engineer involved was willing to do a lot of work.

Access to this new level of control is achieved by any Auto-Tune user who has a basic understanding of pitch and how Auto-Tune functions to correct for pitch errors. This chapter presents basic terminology and introduces Auto-Tune's operating paradigm, giving you information you need to use it effectively.

What Is Pitch?

Pitch is a quality of sound relating to the frequencies of the energy involved. Some sounds are very complex and don't involve energy of specific frequencies. Even then, there is pitch. Compare, for example the pitch of hissing steam with the rumble of an earthquake. Other sounds, although still complex, have more specific pitch. A symphony orchestra playing a scale in unison is an example of this. The waveforms involved are very complex; nonetheless, you are able to easily sense the pitch.

Vocalist and the majority of individual instruments have the most clearly defined quality of pitch. The sound-generating mechanism of these sources is a vibrating element (vocal chords, a string, an air column, etc.). The sound that is generated consists of energy at a frequency (called the fundamental) and energy at frequencies that are integer multiples of the fundamental frequency (called harmonics). These sounds have a waveform (pressure as a function of time) that is periodic. This means that the waveform repeats itself, such as the periodic waveform shown in the diagram, below.



Other sounds are more complex. The non-periodic waveform, above, is from a violin section playing a single tone. Our ears still sense a pitch, but the waveform does not repeat itself

This non-periodic violin section is a summation of a number of individually periodic violins. The summation is non-periodic because the individual violins are slightly out of tune with respect to one another.

Some Terminology

The pitch of periodic waveforms is defined as the number of cycles per second of the waveform. This unit is named Hertz (abbreviated Hz.). The standard instrumental tuning is A3 = 440 Hz.

Pitches are often described relative to one another as intervals, or ratios of frequency. For example, two pitches are said to be one octave apart if their frequencies differ by a factor of two. Pitches which are integer multiples of one-another sound more “harmonious” when played together, whereas pitches that are not are said to be “dissonant”.

Pitch ratios are measured in units called “cents”. There are 1200 cents per octave. For example, two tones that are 2400 cents apart are two octaves apart and have a pitch ratio of 4 (or 1/4).

The twelve-tone Equal Tempered Scale consists of tones that are, by definition, 100 cents apart. These are called semi-tones. This scale is the ubiquitous scale used (or rather approximated) in 99.9% of all Western tonal music. The twelve equally-spaced tones of the Equal Tempered Scale happen to contain a number of intervals that approximate integer ratios in pitch. The following table shows these approximations:

Interval	Cents	Nearby Ratio	Ratio Cents
minor second	100	16/15	111.73
major second	200	9/8	203.91
minor third	300	6/5	315.64
major third	400	5/4	386.31
perfect fourth	500	4/3	498.04
tritone	600		
perfect fifth	700	3/2	701.95
minor sixth	800	8/5	813.69
major sixth	900	5/3	884.36
minor seventh	1000	16/9	996.09
major seventh	1100	15/8	1088.27
octave	1200	2	1200

TABLE 1. The Equal Tempered Scale

As you can see, the intervals in the Equal Tempered Scale are NOT equal to the harmonious integer ratios. Rather, the Equal Tempered Scale is a compromise. It became widely used because once a harpsichord or piano is tuned to that scale, any composition in any key could be played and no one chord would sound better or worse than that same chord in another key. In modern times, synthesizers can generate any intonation at any moment, allowing the use of ideal pitch ratios when ever they are desired.

The Purpose of Pitch Correction

When voices or instruments are out of tune, the emotional qualities of the performance are lost. Correcting intonation solves this problem and restores the performance. Auto-Tune is mostly used to solve these gross intonation problems. However, as you shall see, Auto-Tune is also a precision instrument, allowing intonation to be controlled to extraordinary degrees of accuracy. This allows the tonal aspects of music to be controlled accurately and easily to achieve any desired consonance or dissonance in harmonies.

Don't try to raise the pitch more than an octave. Auto-Tune has a built-in limitation of not being able to raise a pitch more that one octave (1200 cents). This is not considered a problem since most pitch corrections will be +/- 20 cents.

How Auto-Tune Detects Pitch

In order for Auto-Tune to automatically correct pitch, it must also detect the pitch of the input sound. It’s easy for you to calculate the pitch of a periodic waveform: Simply measure the time between repetitions of the waveform. Divide this time into one, and you have the frequency in Hertz.

Auto-Tune does the same thing: It looks for a periodically repeating waveform and calculates the time interval between repetitions.

The pitch detection algorithm in Auto-Tune is virtually instantaneous. Like your eye-ball, it can see the repetition in a periodic sound within a few cycles. This usually occurs before the sound has sufficient amplitude to be heard. Used in combination with a slight delay (about 1 to 10 milliseconds), the output pitch can be detected and corrected without artifacts in a seamless and continuous fashion.

<u>Auto-Tune will not detect pitch when the input waveform is not periodic</u>. Hence, Auto-Tune will fail to tune up a violin section. (It is possible to tune up an out of tune violin section, either tuning the sound as is, or by tuning up the individual players within the sound. This is done on samples for synthesizers using the AnTares Systems Infinity software. Using Infinity, you can actually made a community orchestra sound like the New York Philharmonic. But Infinity processes samples, whereas Auto-Tune is used on performances.)

Back to Auto-Tune, if the input waveform is not periodic, Auto-Tune will fail. At times, this can be a problem. Consider, for example, a breathy voice, or a voice recorded with a wind sound. The added noise is non-periodic, and Auto-Tune will have difficulty determining the pitch of this sound. There is a slider (the Tracking slider, discussed in Chapter 4) that will allow Auto-Tune to be more casual about what it calls “periodic”, which will help in these cases.

If you have problems processing a particular sound, zoom it up and look at it. If it is non-periodic, Auto-Tune will not work. If you can correct that problem, by using EQ or re-recording, then those are options available to you.

The precision by which Auto-Tune detects pitch is extraordinary. At a frequency of 400 Hz and a sample rate of 44100, the Auto-Tune DSP algorithm computes the pitch to an accuracy of .0001 samples per cycle, or .0004 Hz. At this resolution, the very question “What is pitch?” becomes relevant. That is, as the pitch of typical performances continuously change, the amount of variation in pitch, even over the time of a few cycles, changes greatly in comparison to the accuracy by which Auto-Tune computes pitch. The pitch computed by Auto-Tune is a mathematical estimate of the cycle period repetition rate over the last two (or sometimes the last four) cycles.

Auto-Tune was designed to detect and correct pitches up to C6. In reality, if a pitch goes higher than C6, Auto-Tune will often interpret the pitch an octave lower. This is because it interprets a two cycle repetition as a one cycle repetition. These pitches can be corrected by the usual means. On the low end, Auto-Tune will detect pitches as low as A0 (55Hz). This range of pitches allows intonation correction to be performed on all vocals and almost all instruments.

How Auto-Tune Corrects Pitch

Auto-Tune changes the instantaneous pitch and introduces no distortion in the output. It does this using the same basic computations used in samplers to re-tuned samples.

This is different from other pitch-shifting algorithms which put noise in sounds as a result of FFT (Fast Fourier Transform) overlap-and-save algorithm phase errors. The Auto-Tune algorithm is very clean and transparent. It isn’t possible to tell that a sound has been processed by Auto-Tune - except that it is in-tune.

The accuracy of pitch correction in Auto-Tune is exceptional. In the worst case, a continuously varying tone can be corrected (at the discretion of the user) to within an error of at most one cycle in 80 seconds (assuming the Retune slider is set to zero). These accuracies are equivalent to the .01 cent accuracies by which the various scales of the Automatic Mode (discussed below) are internally specified. These accuracies are also equivalent to the accuracies of the clocks which control music studio functions.

Chapter three will step you through a demonstration where two badly out of tune C2's are independently tuned to the same standard with no beat cycles. (Beat cycles are the perceptual result of hearing two tones that are close in frequency. As the relative phase of the fundamental and harmonics change from in phase to out of phase, constructive and destructive reinforcement occurs which alternately makes the composite sound loud and soft.)

Auto-Tune Modes: Automatic and Graphical

Auto-Tune has two separate and distinct ways to operate, almost as if there were actually two separate programs in one package. These are called modes, and are named the Automatic Mode and the Graphical Mode. The Automatic Mode and Graphical Mode function separately; when one is active, pitch corrections of the other are not performed.

Both the Automatic and Graphical Mode allow the "bypass" button to be used. Even though bypass is a well known plug-in control, I mention it because it functions seamlessly and can be used to punch pitch correction on and off during processing.

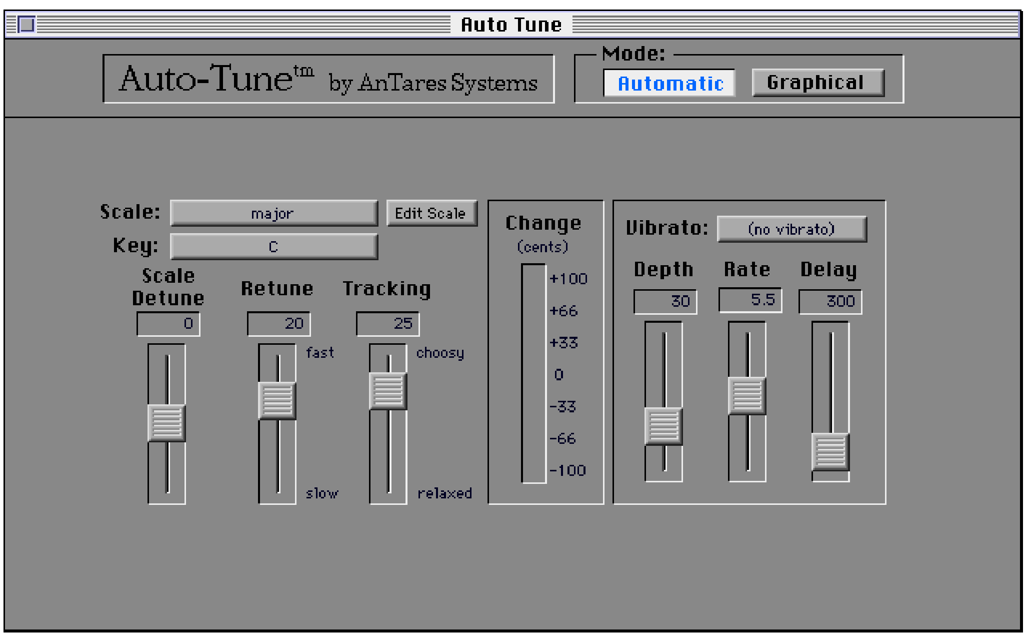
The Automatic Mode

The Automatic Mode works by continuously tracking the pitch of the input sound and comparing it to a scale. The scale tone having pitch closest to the input is continuously identified. An output pitch is generated which is closer to the scale tone than the input pitch. You have control of the scale.

Major, minor, chromatic and 26 historical, ethnic and microtonal scales provide unprecedented control of the output tonality. Scale pitches can be disabled causing no pitch correction. Scale pitches can also be removed allowing a wider range of pitch correction for neighboring pitches. The scale can be de-tuned, allowing pitch correction to any pitch center. You also choose the key of the scale.

You have control over how rapidly, in time, the pitch adjustment to the scale tone is made. This is done with the Retune slider (fast to slow settings). Fast Retune settings are more appropriate for short duration tones and for mechanical instruments, like an oboe or clarinet. A fast setting will remove a vibrato. Slow Retune settings are appropriate for longer tones where you want expressive pitch gestures (like vibrato) to come through to the output. A slower setting can leave a vibrato unmodified but accurately adjust the pitch center to be in-tune.

The Automatic Mode can also introduce a vibrato into the sound. The Vibrato Section lets you control the depth, rate and delay of the vibrato. You can also choose the style of pitch variation in the vibrato (sine, ramp or square).You would use the Vibrato Section when you have a vocalist who

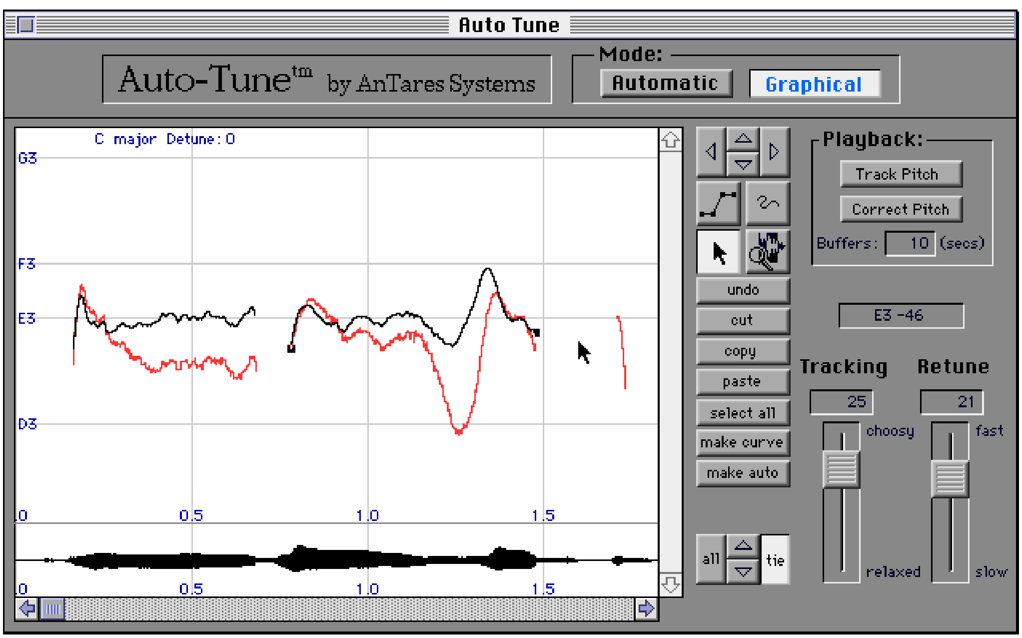


has not learned to use his (or her) own vibrato. It can also be used for special sound design effects.

A fast pitch adjustment to remove an existing vibrato can be used in conjunction with the Vibrato Section to replace a vibrato with a new one. This will not always give good results, though, (as discussed in Chapter 3), because there are usually accompanying changes in the loudness of the sound.

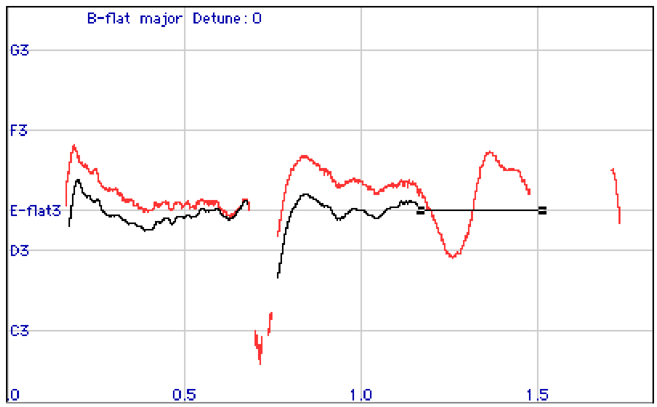
The Graphical Mode

The Graphical Mode is similar to the Automatic Mode in that it also continuously tracks the pitch of the incoming sound and modifies the output pitch to be closer to a desired pitch. But in the Graphical Mode, the desired pitch



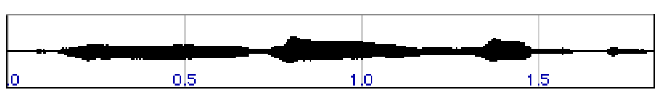
is not a scale tone, rather it is given graphically by you and is called the "target pitch function". As in Automatic Mode, the rate of change towards the desired pitch (the target pitch function) is controlled by the Retune slider.

The Graphical Mode uses the Pitch Graph:



In this graph, higher pitches are upwards and increasing time is to the right. The lighter (red) curve is the input sound pitch and the darker line is a target pitch function. The light, horizontal lines are scale pitches. The key annotation, scale names, scale pitches and Detune value are those defined in the Automatic Mode. They do not affect the computations of the Automatic Mode in any way. They are merely annotated on the Pitch Graph to guide you in setting the target pitch function. To change them, choose the Automatic Mode and change the Key popup, Scale popup, or the Detune slider, respectively. Moving the detune slider down (more negative) causes the horizontal line to go down (flatter).

The Graphical Mode also uses the Envelope Graph:



This graph shows the envelope of the sound whose pitch is shown in the Pitch Graph. The horizontal scale of this graph will either 1) show the entire envelope of the pitch-detected sound or 2) align the envelope to the horizontal scale and position of the Pitch Graph.

In Graphical Mode, the user draws the target pitch function using line and curve drawing tools. Complete image sizing and scrolling controls are provided. A graphical editor allows easy editing, including cut, copy and paste functions.

The basic steps you will perform in Graphical Mode are:

- Select some sound for processing. For ProTools III, this is done in the Edit window.
- Bring up Auto-Tune and press the Track Pitch button, then play back the sound. The pitch will be detected and then displayed in the Pitch Graph as a red curve.
- Create a target pitch function using the graphical tools and adjust the Retune slider for the desired effect.
- Play back the sound. This will cause the pitch to be corrected as specified.

In Graphical Mode, Auto-Tune sometimes identifies the pitch to be an octave lower than it really is. In these cases, simply correct the pitch as you would if the pitch was lower (ex. +/- 20 cents). Auto-Tune will apply this correction to achieve the desired result.

In Graphical Mode, it is important that the sound played back for pitch correction begins precisely at the same spot as the sound played back for pitch detection. This is because the plug-ins do not know the absolute “time-of-day”. The specified target pitch will be applied to whatever sound occurs after playback begins, even if it is a completely different sound.

CHAPTER 3

Auto-Tune Tutorial

"I don't want to know how it works –
I want to know how to work it!"

– Keith Emerson

This chapter introduces you to how Auto-Tune works by guiding you through several tutorials. All of the important controls are explained. Also, tips are presented that will help you use Auto-Tune effectively. If you only read one chapter, read this one.

Disk 2 contains a session named "Auto-Tune Tutorial". Install Auto-Tune and start that session.

Lesson 1: Automatic Mode Controls

This lesson will exercise the Automatic Mode controls of Auto-Tune using a synthetic sweep signal. The Automatic Mode works by continuously tracking the pitch of the input data and comparing it to a scale. The scale tone having its pitch closest to the input is identified. An output pitch is created which is closer to the scale tone than the input.

1. Setup the "A2-A3-A2 sweep" file for processing through Auto-Tune.
2. In TDM, assign Auto-Tune as a new insert to the desired track. In Cubase, select "No Effect" then select "Auto-Tune". This will initialize the controls to known values.
3. Set the Key popup to A.
4. Set the Retune slider to zero.
5. In TDM, set Bypass 'on' and play the sweep to hear the input sound. In Cubase, you can turn off the effect.

6. In TDM, set Bypass 'off'. In Cubase, click on "Pre" in the channel's audio monitor and drag the slider all the way down. Play the sound again.

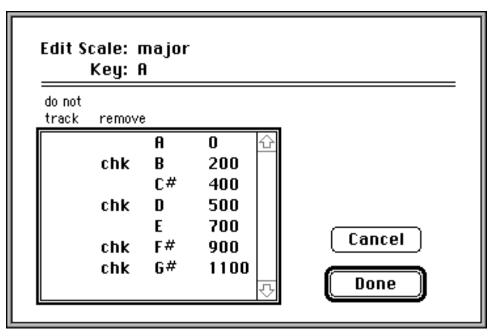
What you just heard was an A major scale. This is because Auto-Tune continuously compared the input pitch to the A major scale and corrected the output pitch so that the output was closer in pitch to the scale tones. Now do the following:

1. Press the Edit Scale button.

The left most column is labelled "do not track". Clicking in this column places a "chk" indicator. This has the effect that when the pitch of the incoming sound is close to a tone so edited, the output pitch is not changed from the input. This is like a pitch dependent bypass.

The next column is labeled "remove". Clicking in this column causes the tone to be removed from the scale, as if it were never there to begin with.

2. Press the mouse when the cursor is under the "remove" column so that the "chk" symbol appears next to the tones B, D, F# and G#. The dialog will appear



3. Press Done and play the sound again.

You just heard a A-major triad because you had removed all other tones from the scale.

On scales with more than 7 tones, the Edit Scale dialog appears with additional buttons. The “set major scale” and “set minor scale” buttons cause all tones to be removed except those nearest the diatonic Equal Tempered Scale of the current key. On microtone scales, additional “Microtonal tuning data” appears in the window that shows the cents values for various ideal intervals. These can be used to help tune up the scale by allowing you to select tones that are in tune with other pitches in the harmonic structure.

1. Press the Edit Scale button.
2. Press the mouse under the “do not track” column so that the “chk” symbol appears across from E.
3. Press Done and play the sound again.

You just heard the effect of not tracking the E. Over the duration when the output should be E, Auto-Tune entered a bypass mode.

1. Move the Retune slider to about 30.
2. Play the sound again. Compare the 30 setting to the 0 setting.

The setting of 0 is fast: Auto-Tune makes instantaneous pitch changes. The setting of 30 is slower. Auto-Tune makes gradual pitch changes. This slider controls how rapidly the pitch correction is applied to the incoming pitch. 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 related volume changes will remain). Retune values from 10 to 50 are typical for vocals.

1. Set the Retune slider to 0.
2. Press the Edit Scale button.
3. Press the mouse under the “remove” column so that the “chk” symbol appears next to all the tones except F#.

Edits made using the Edit Scale dialog depend on the scale. That is, each scale retains its own edits separate from the other scales.

4. Press Done and play the sound again. As the sound is playing, slide the Scale Detune slider.

You are hearing the output pitch change with the Detune slider movement. This is because the Detune slider changes the pitch standard of the scale. If you have a tone you know 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.

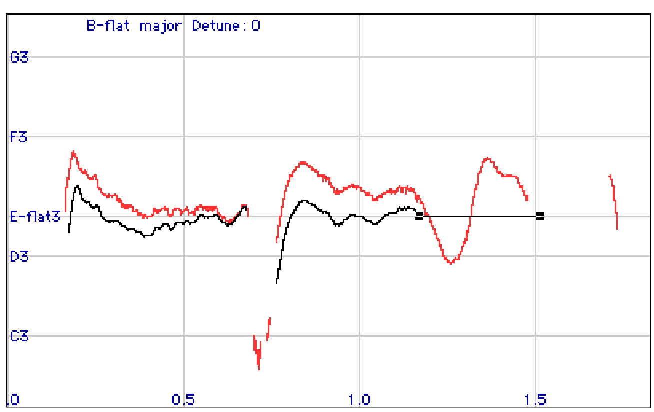
1. Set the Vibrato popup to “sine wave” and play back the sound.
2. Experiment with the vibrato controls to learn their effects.

Lesson 2: Graphical Mode

This lesson will show you how to use the Graphical Mode controls of Auto-Tune. The Automatic Mode and Graphical Mode function separately; when one is active, corrections of the other are not performed.

The Graphical Mode is similar to the Automatic Mode in that it continuously tracks the pitch of the incoming sound and modifies the output pitch to be closer to a desired pitch. In the Graphical Mode, the desired pitch is not a scale tone, rather it is given graphically by you and is called the “target pitch function”. As in Automatic Mode, the rate of change towards the desired pitch (the target pitch function) is controlled by the Retune slider.

The Graphical Mode uses the Pitch Graph:



The appearance of the Pitch Graph is affected by the Key, Scale and Detune setting in the Automatic Mode. These parameters do not affect the computations performed in Graphical Mode. They merely provide you with information about the location of scale tones so that you may draw in your desired pitches.

The basic steps you will perform in Graphical Mode are:

- Select some sound for processing.
- Bring up Auto-Tune and press the Track Pitch button and play the sound. The pitch will be detected and then displayed in the Pitch Graph as a red curve.
- Create a target pitch function using the Graphical tools and adjust the Retune slider for the desired effect.
- Play back the sound. This will cause the pitch to be corrected as specified.

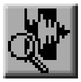
Let's begin the tutorial:

1. Setup the “A2-A3-A2 sweep” file for processing through Auto-Tune.
2. In TDM, assign Auto-Tune as a new insert to the desired track. In Cubase, select “No Effect” then select “Auto-Tune”. This will initialize the controls to known values.
3. Set the Key popup to A.
4. Press the Graphical Mode button.
5. Press the Track Pitch button.
6. Play the sweep signal through Auto-Tune.

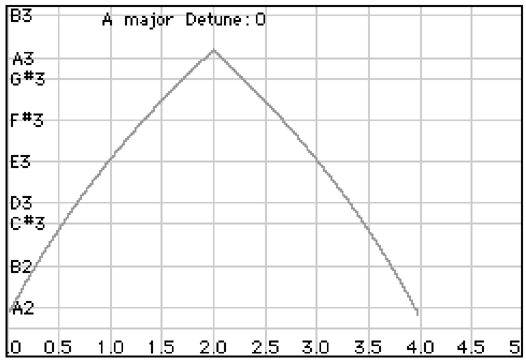
In TDM, after the playback stops, or is stopped by you, the Track Pitch button will pop itself back out and a red curve will appear in the Pitch Graph.

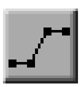
In Graphical Mode, it is important that the sound played back for pitch correction begins precisely at the same spot as the sound played back for pitch detection. This is because the TDM plug-ins do not know the absolute “time-of-day”. The specified target pitch function will be applied to whatever sound occurs after playback begins, even if it is a completely different sound.

This is the pitch of the sweep signal. In Cubase, you will have to press the "Track Pitch" button again to stop the tracking function.



1. Press the Zoom/Select tool and drag out a box on the Pitch Graph that encloses the red curve. You will see the following:

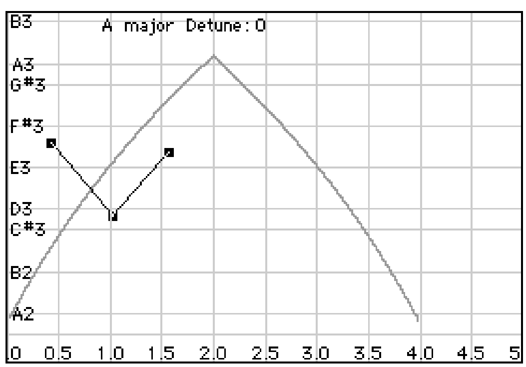




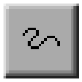
2. Press the Line tool and enter a line similar to that below. By clicking multiple points on the Pitch Graph, line segments joining the points will be drawn. If you move the cursor outside the Pitch Graph during point entry, the graph will be automatically scrolled.

   To exit, double-click a point or press <esc> on the keyboard.

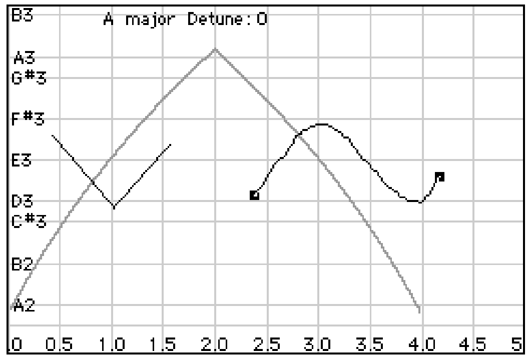
   To erase the last point entered, press <delete> on the keyboard.



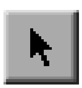
3. Play back the sound to hear the effect.



4. Select the Curve tool, then click and hold down the mouse on the Pitch Graph. A curve will be drawn as the mouse is dragged. To exit, lift up on the mouse. Create a curve similar to the one shown:



5. Play back the sound to hear the effect.
6. Listen to the effect of the Retune slider as you change the values between 0 and about 50.



7. Experiment with the Pointer tool. This tool is used to select and drag lines and curves.

   Clicking on white space in the Pitch Graph causes all objects to become de-selected. Clicking on white space and dragging causes object end points to become selected. Shift-clicking (and dragging) is used to select contiguous points. Dragging off the Pitch Graph automatically scrolls the graph.

   Every line or curve has two end points. If both end points are selected, the object is said to be selected. If you click on an object which is not selected, it becomes selected. If you click on an object that is already selected, it (and anything else that is selected) stays selected so you can drag it.

   Dragging causes the selected objects to be moved. Any objects that have one end-point selected will be stretched during dragging. Dragging is constrained by neighboring unselected objects.

In Cubase, if you hold down the option key and then click to drag, the cursor will be restricted to vertical only movements. This is particularly handy after using the “Make Curve” button, discussed below.

1. Select one or more objects and play with undo, cut, copy, paste and select all.

In TDM, the Auto-Tune clipboard is shared by all Auto-Tune's simultaneously. But it is not shared by other plug-ins, DAE applications (e.g. Pro-Tools) or other applications. Hence, after you cut objects from one track, you can paste them into the Auto-Tune Pitch Graph of another track, and not interfere with other clipboards.

Keyboard equivalents:

The following are keyboard equivalents to the respective Graphical Mode buttons:

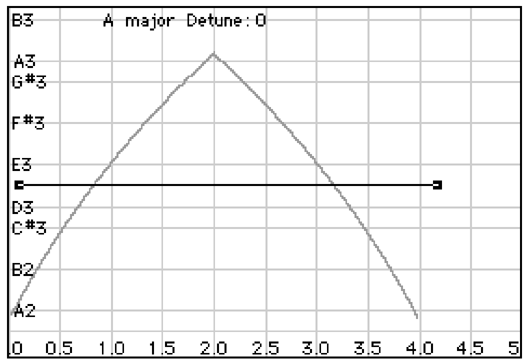
Control Key	Function
a	Select All
z	Undo
x	Cut
c	Copy
v	Paste

TABLE 2. Edit Control Keys

Lesson 3: A Quiz

So, you think you're getting the hang of this? Well, if you really are, you'll be able to answer the question at the end of this lesson.

1. Use the techniques above to achieve the following Pitch Graph. Note the horizontal target pitch function:



2. Set the Retune slider to 0 and play back the sound.

The pitch you will hear is a steady tone, as you would expect.

3. Now set the Retune slider to about 50 and play back the sound.

The pitch you now hear starts out sharper and then becomes flatter. Why?

In TDM, the Auto-Tune settings, including all the scale edit data, the input sound pitch, input sound envelope and target pitch data are saved with the session and can be saved and recalled in ProTools III using the "Export Settings..." and "Import Settings..." options of the "Effect" menu.

Lesson 4: Precision

This lesson is actually more like a demonstration to show the extraordinary precision by which Auto-Tune can track and correct intonation problems. It will, though, give you a little more practice using Auto-Tune. If this doesn't sound interesting, please proceed to Lesson 5, below, which is an important tutorial of some Graphical Mode techniques.

1. Arrange the files "C2 Ahhh v3" and "C2 Ohhh v1" so that they are in separate tracks and can be played at the same time. In Cubase, make each track input to a different Auto-Tune effect.
2. In TDM, assign Auto-Tune as a new insert to the desired track. In Cubase, select "No Effect" then select "Auto-Tune". This will initialize the controls to known values.
3. In each Auto-Tune, set the Retune slider to 0.
4. In each Auto-Tune, set the Key popup to B-flat.
5. In TDM, in each Auto-Tune, press the Bypass buttons to bypass processing. In Cubase, turn the effects off.
6. Play back the sounds so you can hear them together without processing.

Believe it or not, these are vocal samples from a CD of samples. Sounds nasty, doesn't it?

7. In TDM, Press Bypass in each Auto-Tune so processing is occurring. In Cubase, turn the effects on.

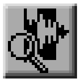
If you've done everything right, you will hear the samples so well in tune that they sound like one voice.

Lesson 5: Using the Make Curve Button

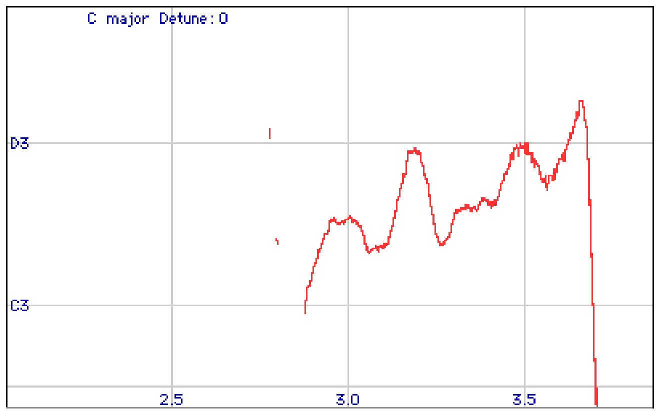
The make curve button is an important tool in Auto-Tune. It allows you to make precise and natural pitch corrections in Graphical Mode.

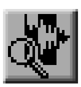
1. Setup the "Crowd All" file for processing through Auto-Tune.

2. In TDM, assign Auto-Tune as a new insert to the desired track. In Cubase, select “No Effect” then select “Auto-Tune”. This will initialize the controls to known values.
3. Press the Graphical Mode button.
4. Press the Track Pitch button.
5. Play the “Crowd All” file.

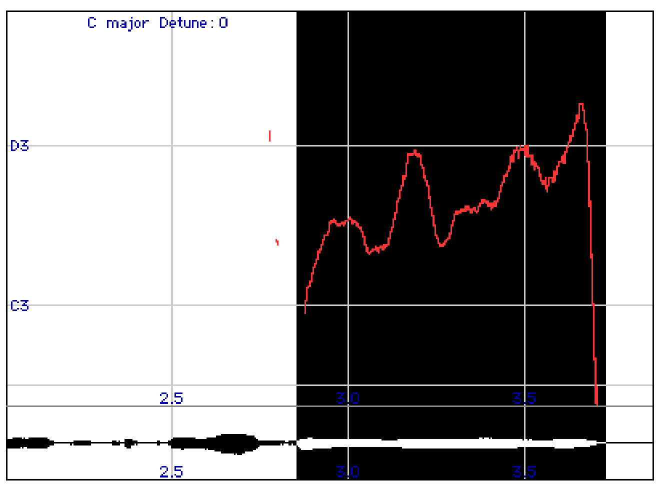


6. Press the Zoom/Select tool and drag out a box on the pitch view that encloses the red curve for the “-gether” part of the last word, “to-gether”. You will see the following:



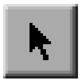


7. Use the zoom/select tool and drag out a selection of “-gether” in the Envelope Graph. You will see the following:



8. Press the Make Curve button. Auto-Tune will compute a new curve object from the existing pitch data.

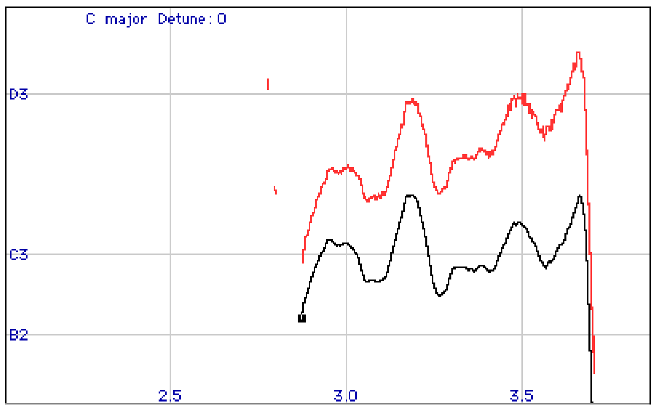
The new curve may be difficult to see at first because it will exactly overlay the red curve.



9. Both ends of the new curve will be selected. Use the pointer tool and click on the white space of the Pitch Graph. That will cause no points to be selected.

10. Use the Pointer tool again and click precisely on the left end of the curve. Drag this straight up, stretching the curve so it falls along the D3 tone.

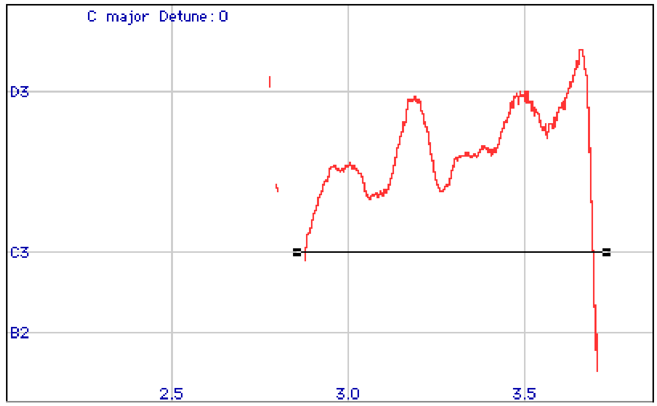
11. Grab the curve by clicking on it and drag it straight down so it falls on the C3 line. The Pitch Graph should now appear:



12. Set the Retune slider to 0 and play back the sound.

I can't say much for her voice in this segment, but at least this one note is a little better in tune. An alternative approach is given next:

1. Use the line tool to draw a horizontal tine as shown below.



2. Set the Retune slider to 20 and play back the sound.

Vibratos and other pitch gestures occur with related loudness gestures. Specifically, with vibratos, some vocalists produce mostly pitch variations and little loudness variations while others produce small pitch variations and a lot of loudness variations. (Some have called the latter a Tremolo.) Nonetheless, almost all voices seem to produce a combination of both pitch and related loudness variations. Therefore, trying to take an existing vibrato and change it (say speed it up) sometimes sounds unnatural because the new pitch variation does not correspond to the old loudness variation.

These considerations are also important when correcting pitch. It isn't always best to draw in a different pitch gesture at the desired pitch even though that gesture may have worked well elsewhere.

The following techniques usually work well in this regard:

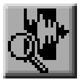
- The first technique uses the Make Curve button to create a curve of the existing pitch and drag that curve up or down, or stretch it by dragging one end vertically. The Retune slider can then be set very fast (0 to 5). This will force a precise re-tuning, but it will sound very natural since the target pitch curve will follow the original loudness gestures of the voice.

- The second technique is to draw a flat line segment across the duration of a tone at the desired pitch and then use the Retune slider set in the range 20 to 40. This has the effect of gently moving the pitch downwards the desired pitch. The slower values of 20 to 40 will let through a vibrato but still draw the overall pitch closer to being in tune. The average pitch will eventually settle to the given line and the pitch gestures will occur both sharper and flatter than that line. The settling time is about twice the Retune slider time. 20 to 40 will let through about one-half of a typical vibrato. Slower settings will let through more vibrato but will cause the new pitch to be reached more slowly.

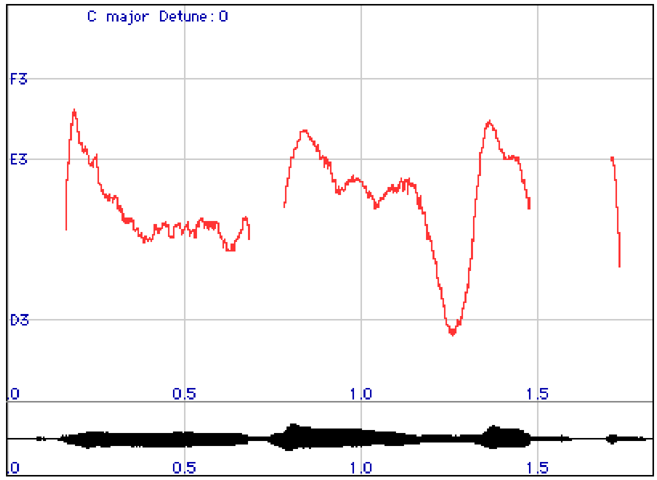
Lesson 6: Using the Make Auto Button

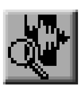
The make auto button allows you to create pitch corrections that occur in the Automatic Mode.

1. Setup the “Crowd All” file for processing through Auto-Tune.
2. In TDM, assign Auto-Tune as a new insert to the desired track. In Cubase, select “No Effect” then select “Auto-Tune”. This will initialize the controls to known values.
3. Press the Graphical Mode button.
4. Press the Track Pitch button.
5. Play the “Crowd All” file.

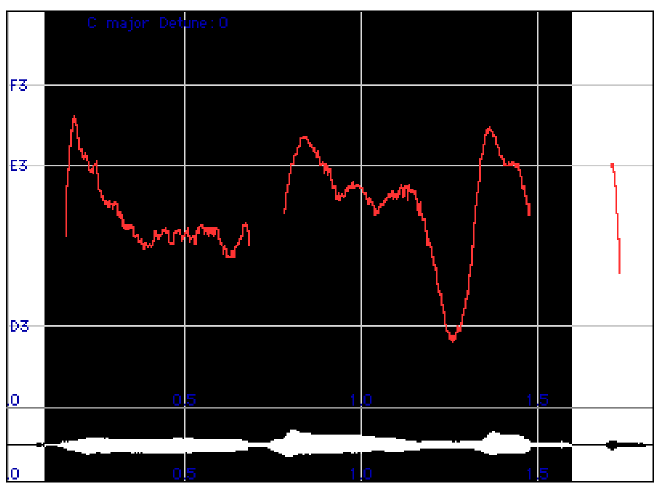


6. Press the Zoom/Select tool and drag out a box on the pitch view that encloses the red curve for the “crowd all rushed” words. You will see the following:

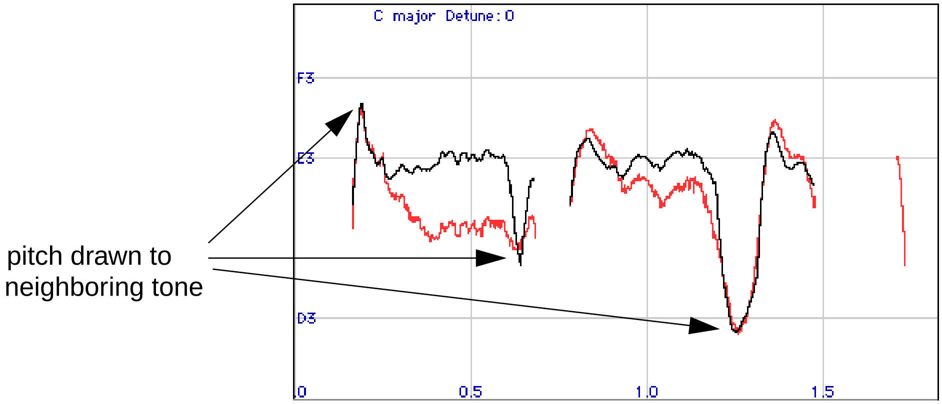




7. Use the zoom/select tool and drag out a selection in the Envelope Graph, as shown:



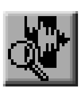
8. Press the Make Auto button. Auto-Tune will compute a new curve object from the existing pitch data:



Assuming this entire phrase is at the pitch E3, then there are several problem spots, indicated above, where the pitch is being incorrectly adjusted towards neighboring tones.

9. To hear the processed sound that would produced in Automatic Mode, set the Graphical Mode Retune Slider to 0, (fast) and play back the sound.

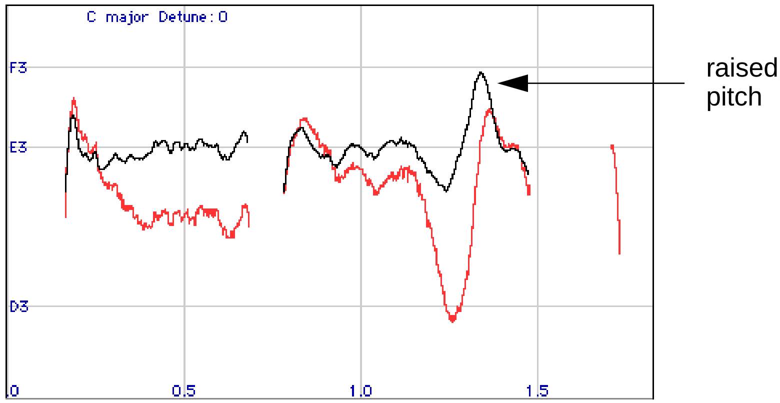
10. Switch to the Automatic Mode and press the Edit Scale button. Press the mouse when the cursor is under the “remove” column so that the “chk” symbol appears next to the tones C, D and F.



11. Switch to the Graphical Mode and use the zoom/select tool to drag out a selection in the Envelope Graph, as in Step 8.

12. Press the Make Auto button. Auto-Tune will compute a new curve object from the existing pitch data:

Note how the pitch deviations from Step 9 have been removed. Also, note the “raised pitch” indicated above. This occurs because the Automatic Mode Retune slider value of 20 is slow compared to the rapidly increasing pitch that is occurring at that point in time. Even with the raised pitch, the average output pitch is centered on E3.



More Information and Usage Tips

The decision to use the Graphical Mode instead of the Automatic Mode is taken when the Automatic Mode doesn't achieve the desired result. This is most often the case when pitch errors cross the boundary from one tone to another and you don't want to mess with continually adding and removing tones from the scale.

In Graphical Mode, correcting pitch involves listening to a short passage and making several attempts at a correction. The time-of-day limitation forces you to always start playback at the same point. Hence, Auto-Tune is best used like an editor: Fix a spot, bounce it to another track with processing applied, and move on.

In TDM, the Auto-Tune clipboard is shared by all Auto-Tune's simultaneously. But it isn't shared by other plug-ins, DAE applications (e.g. ProTools) or other applications. Hence, after you cut objects from one track, you can paste them into the Auto-Tune Pitch Graph of another track, and not interfere with other clipboards.

In TDM, the Auto-Tune settings, including all the scale edit data, the input sound pitch, input sound envelope and target pitch data are saved with the session and can be saved and recalled in ProTools using the “Export Settings...” and “Import Settings...” options of the “Effect” menu.The shared clipboard, “Export Settings...”, “Import Settings...” and the Make Curve button can be used in combination to create and use libraries of vibratos and other pitch gestures.

In Cubase, the slider settings and the popup menu settings are saved and restored by VSP. These can also be saved and restored by you with the “File” popup in the effects rack.

Finally, expect some strange results. I have one example where the singer relaxes at the end of a phrase. The pitch drops a minor third, which is easily corrected by a short, flat line segment and a small Retune value. But, in addition to the pitch dropping, the tone quality of the voice also softens. Getting the pitch right still leaves this strange sound...

CHAPTER 4

Auto-Tune Controls

"Just the facts, Ma'am"

- Bill Gannon, Dragnet

This chapter is reference text for all of the controls used in the Auto-Tune interface. This chapter simply describes the function of each control. How these controls are used together for intonation correction is described in Chapter 3, Auto-Tune Tutorial. Much of the information in this chapter is also presented in Chapter 3. However, some of the less important controls are only explained here.

Automatic Mode Controls

The Scale popup

The Scale popup selects the scale that is used. The first three scales are equal tempered. These are the ubiquitous scales currently 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 manual. The interested reader will find more information in "Tuning In - Microtonality In Electronic Music" by Scott R. Wilkinson, published by Hal Leonard Books. The following is a brief synopsis of the scales:

Modern equal temperament:

- **major**: a seven-tone equal tempered major scale.
- **minor**: a seven-tone equal tempered minor scale.
- **Equal Tempered chrom.**: a twelve-tone equal tempered chromatic scale.

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.
- **Werckmeister III chrom.**: a twelve-tone scale. This scale was a first attempt (about Bach's time) to allow an instrument to played in any scale. It was in response to this scale that Bach wrote *Well-Tempered Clavier*.
- **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 and narrower than those found in twelve-tone equal temperament.
- **24 Tone**: Also know 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.

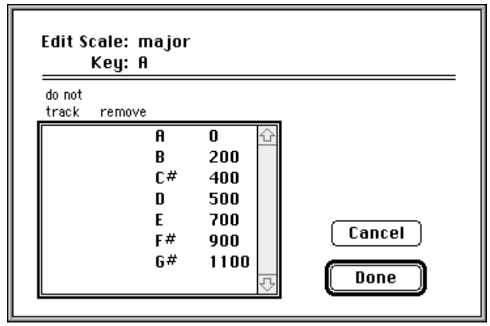
- **Carlos Gamma**: This scale achieves perfect purity of the primary intervals 3/2, 4/3 and 5/4. This scale divides the octave into 34.188 steps forming intervals of 35.1 cents.
- **Harmonic (chromatic)**: This twelve-tone scale is created in the partials in the fifth octave of the harmonic series. The scale degrees that correspond to the classic just intervals are the major second, major third, perfect fifth and major seventh.

The Key popup

This determines the pitch of the first tone of the scale according to the standard A3 = 440 Hertz. For example, if you select D, the current scale will have D3 as its root and will be tuned to D3 = 440 * 2 / 3 = 293.33 Hz which is exactly 600 cents below A3 = 440 Hz.

The Edit Scale button

Press the Edit Scale button to see the scale editing dialog. Edits made using this dialog depend on the scale. That is, each scale retains its own edits separate from the other scales. If a seven tone scale is being edited, the Edit Scale dialog appears:



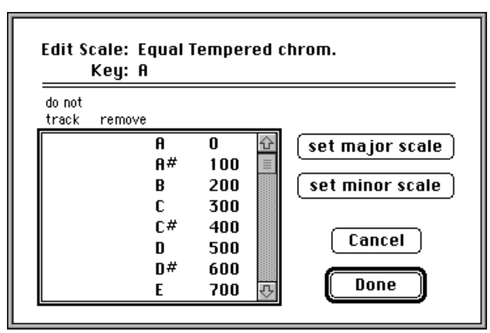
The top line shows the current scale as selected from the Scale popup. The second line shows the current key.

The left most column is labelled “do not track”. Clicking in this column places a “chk” indicator. This has the effect that when the pitch of the incoming sound is close to a tone so edited, the output pitch is not changed from the input. This is like a pitch dependent bypass.

The next column is labeled “remove”. Clicking in this column causes the tone to be removed from the scale, as if it were never there to begin with.

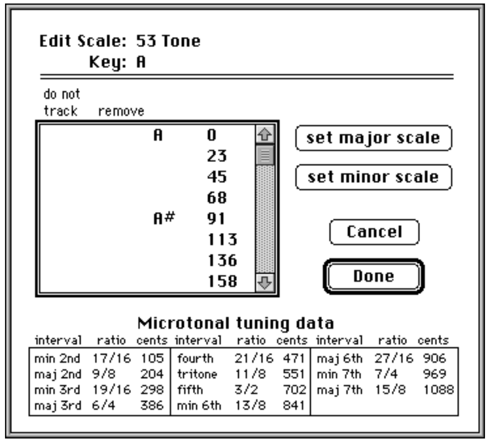
The next column is the note name as derived from the key. The right column is pitch in cents relative to the first tone of the scale. Internally, these numbers are stored to two decimal places.

If a scale with more than seven tones is being edited, the Edit Scale dialog appears:

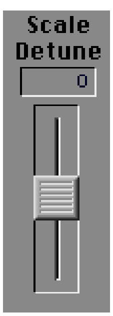


The “set major scale” button, when clicked, will check tones in the remove column such that the remaining scale is a major scale. Similarly for “set minor scale”.

If a scale with more than twelve tones is edited, the Edit Scale dialog appears:



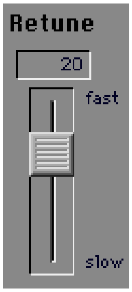
The microtuning data at the bottom is presented as information to help you make decisions concerning what tones to include and exclude from the scale.



The Scale Detune slider

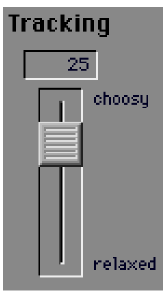
The Scale Detune slider allows the scale to be re-tuned. The values are cents (100 cents = a semitone). A value of zero implements the standard A3 = 440 Hertz. That is, if the key is D, the scale will have D as its root and will be tuned to D3 = 440 * 2 / 3 = 293.33 Hz which is exactly 600 cents below A3 = 440 Hz.

Moving the Scale Detune slider up, say to 20, will cause the scale to be raised up twenty cents in pitch. This will have the effect of tuning a soloist to a sharper scale. If you have a tone you know 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.)



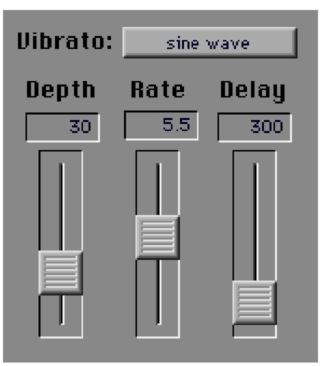
The Retune slider

The Retune slider 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.



The Tracking slider

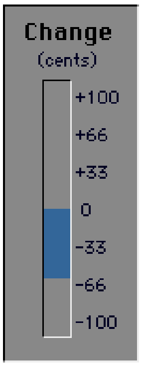
Auto-Tune requires a periodically repeating sound-wave, characteristic of a voice or solo instrument in order to track the pitch of the input. The Tracking slider controls how much variation in the incoming waveform is allowed. Usually you can set the Tracking slider to 25 and forget it. This control is useful with difficult to track sounds, such as a breathy voice, wind noise or a “Jimmy Durante” kind of growling voice. However, tracking is not guaranteed and a “relaxed” setting may introduce distortion and popping.



The Vibrato Section

The Vibrato Section contains one popup and three sliders. The Vibrato popup allows you to select the shape of the vibrato’s pitch variation through time. The choices are: (no vibrato), sine wave, square and sawtooth. The Depth slider varies from 0 to 100 cents, controlling the amount of pitch variation in the vibrato. The Rate slider varies from .1 to 10.0 Hz and controls the speed of the vibrato. The Delay slider varies from 0 to 3000 milliseconds, controlling the speed of onset of the vibrato. For example, if it is set to 1000, the first 500 milliseconds of a new tone will contain no vibrato and the next 500 milliseconds will make a transition from no vibrato to the full vibrato.

The vibrato is re-started every time the Automatic Mode matches the incoming pitch to a different scale tone. Also, the vibrato is applied after the effects of the Retune slider. Hence, even with a slow retune value of 50, a square wave vibrato will make instantaneous changes in pitch.

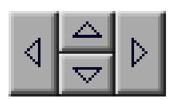


The Change meter

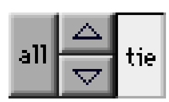
The Change meter shows you how much the pitch is being changed, measured in cents (100 cents = one semitone).

Graphical Mode Controls

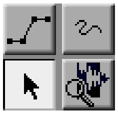
The Arrow buttons



The arrow buttons next to the Pitch Graph control the horizontal and vertical scaling of the graph.

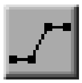


The arrow buttons next to the Envelope Graph control the vertical scales as expected, but the left and right arrows are replaced by “all” and “tie”. These control the horizontal scale: “all” shows the entire envelope recorded during pitch detection and “tie” slaves the scale and position of the Envelope Graph to that of the Pitch Graph.



The Graphical tools

These buttons are the graphical tools. They allow you to draw and edit the target pitch function.

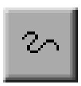


The Line tool

Use this tool to click multiple points on the Pitch Graph. Line segments joining the points will be drawn. Any existing line or curve will be over-written. If you move the cursor outside the Pitch Graph during point entry, the graph will be automatically scrolled.

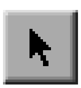
To exit, double-click a point or press the <esc> on the keyboard.

To erase the last point entered, press the <delete> on the keyboard.



The Curve tool

Select this tool, then click and hold down the mouse on the Pitch Graph. A curve will be drawn out as the mouse is dragged. Any existing line or curve will be over-written. To exit, lift up on the mouse.



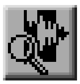
The Pointer tool

This tool is used to select and drag target pitch function objects (lines and curves). When this tool is selected, clicking on white space in the Pitch Graph causes all objects to become de-selected. Clicking on white space and dragging causes object end points to become selected. Shift-clicking (and dragging) can also be used to select contiguous points. Dragging off the Pitch Graph automatically scrolls the graph.

Every object (line or curve) has two end points. If both end points are selected, the object is said to be selected. If you click on an object which is not selected, it becomes selected. If you click on an object that is already selected, it (and anything else that is selected) stays selected so you can drag it.

Dragging causes the selected objects to be moved. Any objects that have one end-point selected will be stretched during dragging. Dragging is constrained by neighboring unselected objects.

In Cubase, if you hold down the option key and then click to drag, the cursor will be restricted to vertical only movements. This is particularly handy after using the “Make Curve” button, discussed below.



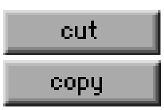
The Zoom/Select tool

Use the zoom/select tool in the Pitch Graph to press and drag a zoom box. After you lift the mouse, the scale and position of the Pitch Graph will be changed to show the area enclosed by the box. Dragging off the Pitch Graph automatically scrolls the graph.

This tool can also be used in the Envelope Graph to select a range of time, which allows the Make Curve button to become active.

The Undo button

This is the Undo button. It becomes active whenever the target pitch curve is modified. Clicking it allows you to undo and redo the last change.



The Cut and Copy buttons

The Cut and Copy buttons active whenever an object is selected. Cut removes selected objects. Cut and Copy move selected objects to the Auto-Tune clipboard. You can then paste the objects, elsewhere, in any Auto-Tune window.

In TDM, the Auto-Tune clipboard is shared by all Auto-Tune's simultaneously. But it is not shared by other plug-ins, DAE applications (e.g. ProTools) or other applications. Hence, after you cut objects from one track, you can paste them into the Auto-Tune Pitch Graph of another track, and not interfere with other clipboards.

The Paste Button

The Paste button is active after objects have been cut or copied to the clipboard. Pressing it places the contents of the clipboard in the middle of the current Pitch Graph view. Hence be careful the Pitch Graph view does not contain anything you want to keep before you press paste.

The Select All Button

The Select All button causes all target pitch function objects to become selected.

Keyboard equivalents:

The following are keyboard equivalents to the respective Graphical Mode buttons:

Control Key	Function
a	Select All
z	Undo
x	Cut
c	Copy
v	Paste

TABLE 3. Edit Control Keys

The Make Curve button

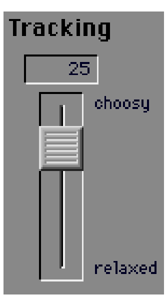
The Make Curve button is enabled whenever there is any input sound pitch (red) data. If a range of time has been selected by applying the zoom/select tool in the Envelope Graph, the Make Curve button works in the selected time range only. Pressing the Make Curve button causes curve objects to be created from input sound pitch (red) data. These curve objects can then be dragged and stretched for very effective pitch correction. This technique is described in Chapter 3.

The Make Auto button

The Make Auto button is enabled whenever there is any input sound pitch (red) data. If a range of time has been selected by applying the zoom/select tool in the Envelope Graph, the Make Auto button works in the selected time range only. Pressing the Make Auto button causes curve objects to be created from input sound pitch (red) data. The Make Auto computation uses the input sound pitch curve to precisely create target pitch function curves that are equivalent to the pitch of the Automatic Mode output. That includes the Scale edits, the Detune slider, the Retune slider and the Vibrato section.

Note that the Automatic Mode Tracking slider is not involved, because its function is used to determine the input sound pitch. In Graphical Mode, the input sound pitch has already been determined, (e.g. the red sound pitch curve), hence the Automatic Mode Tracking slider is not involved in the “make auto” computation.

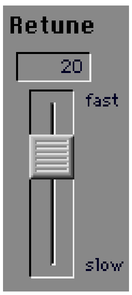
After you use the Make Auto button, you may choose to hear the sound that would be produced in Automatic Mode. To do this, move the Retune slider to 0 (fast). This will faithfully reproduce the effect of the computed curve.



The Tracking slider

The DSP computes the pitch of the incoming sound during pitch tracking and pitch correction. The Graphical mode Tracking slider is similar in function but separate from the Tracking slider in the Automatic Mode. In both modes, it controls how much variation in the incoming waveform is allowed. Usually you can set the Tracking slider to 25 and forget it. This control is useful with difficult to track sounds, such as a breathy voice, wind noise or a “Jimmy Durante” kind of growling voice. However, tracking is not guaranteed and a “relaxed” setting may introduce distortion and popping.

Be cautious about changing the Tracking slider after performing the Track Pitch function. Auto-Tune uses the Tracking slider setting during Track Pitch and during Correct Pitch functions. Changing the Tracking slider settings will cause different parts of the sound to be pitch corrected. If you change this slider before Pitch Correction, your target pitch function may inadvertently make corrections you did not intend, possibly resulting is strange artifacts.



The Retune slider

The Retune slider is only used during pitch correction. It’s similar in function but separate from the slider by that name in the Automatic Mode, however, the desired pitch is not the scale tone, but rather the target pitch function. This slider allows you to specify how quickly the algorithm will change the pitch of the input sound towards the target pitch function. A value of zero will cause the output pitch to equal the target pitch function, precisely. Depending on the target pitch function, this may give unnatural sounding results. Larger values will let you use simple line segments for the target pitch function and still let through the natural pitch gestures of the input sound.

The Playback controls

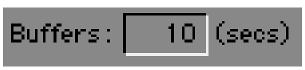
The Track Pitch button

After you select some sound for pitch correction, press this button. It will press in and flash “waiting”. Next, start playback. When the first sound occurs, this button will show “tracking”. The pitch and envelope of the sound is being recorded for display in the Pitch and Envelope Graphs. This recording will stop when any of the following happen: 1) The Track Pitch button is pressed again, 2) playback stops or is stopped (TDM only), or 3) when the available buffer space (see below) is used up.

The Correct Pitch button

After you have used the graphical tools to create a target pitch function, this button is used to apply the target pitch function to the incoming sound. In TDM, this button presses itself in for you when playback is started. In Cubase, you must press the button before playback is started. After it is pressed, it would (briefly) show “processing”, followed by flashing “waiting”. When playback begins and the first sound occurs, this button will show “correcting”.

In TDM, if you do not want pitch correction to occur, use the bypass button. In Cubase, if you do not want pitch to occur, do not press the Correct Pitch button.



The Buffer size control

This control (the number can be edited) is the number of seconds of buffer space that are permanently reserved for pitch tracking and pitch correction data. In TDM, 3,500 bytes/second are required for each buffer. In Cubase, the number is 4,410 bytes/second. There is a different buffer for each plug-in occurrence. This space is allocated from within DAE or Cubase, respectively. If more space is requested than can be provided, you must increase DAE’s or Cubase’s size (select DAE’s or Cubase’s icon and press “Get Info” in the “File” menu).

The Use Cursors button

This is a control in TDM only. Auto-Tune sets the cursor to different shapes in the graphs to help you grab and drag objects. Some DEA applications mistakenly think they own the cursor when it is in a plug-in window. This may cause the cursor to flash. If this annoys you, press in the “use cursors” button. It will then say “no cursors” and Auto-Tune will not set the cursor.

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