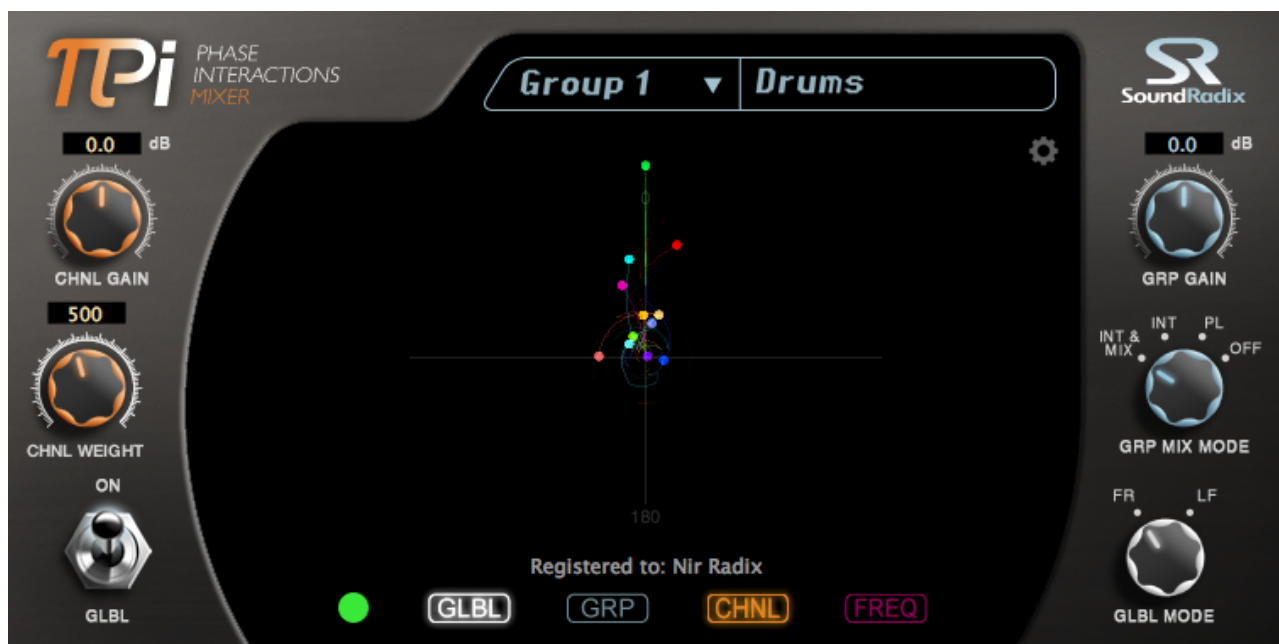# Pi - Phase Interactions Mixer

User Manual

Overview

Pi is an innovative, multi-channel phase interactions mixer plug-in engine for Mac & PC.

Pi works to improve the summing of a DAW or a mixer. Pi dynamically minimizes frequency cancellations between instruments within the mix, improves mono compatibility and brings back the lost depth and focus lost when overlapping frequencies collide.

Good phase relationships between mixer tracks, are a key to great sounding mix.
Normally, where mixer channels are summed into a single stereo mix bus, instruments overlap and interact with each-other across the frequency range and phase position.
Often, a bass track could be temporarily out-of-phase with the kick or rhythm guitar tracks, and when summed into a mix, end up canceling each-other over the overlapping frequency range, causing a temporary "hole" in the low end. Similarly, a snare track could end up sounding thin in a mix when the toms resonance are out of phase with the snare.

Enter Pi.

Designed to enhance any mix, Pi dynamically rotates the phase of the individual mixer channels to achieve maximum phase correlation within the mix. Pi minimizes negative interaction and significantly improves the overall sound of the mix.
Just drop Pi into the last insert slot of your DAW mixer channels and listen. Use any of the 64 groups to bind related instrument channels to enhance your mix even further.

Features

- Groundbreaking, true multi-channel engine, dynamically optimizes phase relationships between mix channels for optimal sounding mix
- Three-mode track grouping for enhanced related instruments and multi-mic setup phase correlation optimization
- Full Range and Low Frequency global optimization modes
- Four mode multi-channel phase correlation display, enables a unique view of the phase relationships within the mix
- Internal, inter-channel sample accurate routing, no complicated side-chaining required
- Available for Mac & PC in AAX, RTAS, VST and AU formats, 64 and 32 bits where applies.

Compatibility

Minimum Requirements Mac: Intel Mac Dual Core 2GHz or faster, 4GB RAM, Mac OS X 10.6.x or higher, AAX, RTAS, VST or VST Compatible DAW.

Minimum requirements PC: Intel Duo 2GHz or faster, 4GB RAM, Microsoft Windows XP or higher, AAX, RTAS or VST Compatible DAW.

Installation

Mac: Unpack the downloaded zip file and run the Pi-Installer.pkg. Select your type of installation and follow the installer's instructions.
PC: Unpack the downloaded zip file and run the Pi-Installer.exe. Select your type of installation and follow the installer's instructions.

Using Pi

Insert Pi in the last effect insert slot on every mixer channel of your mix, *excluding* auxiliary channels, group buses or the master mix.
Channel's gain plays a significant role when determining the energy of a channel in the mix and the best phase state for the channel. In order to achieve maximum efficiency, It is recommended to insert Pi into a post-fader effect slot when the DAW allows. Otherwise, use the CHNL GAIN to set the level of the channel, and set the volume fader of your DAW to unity gain.
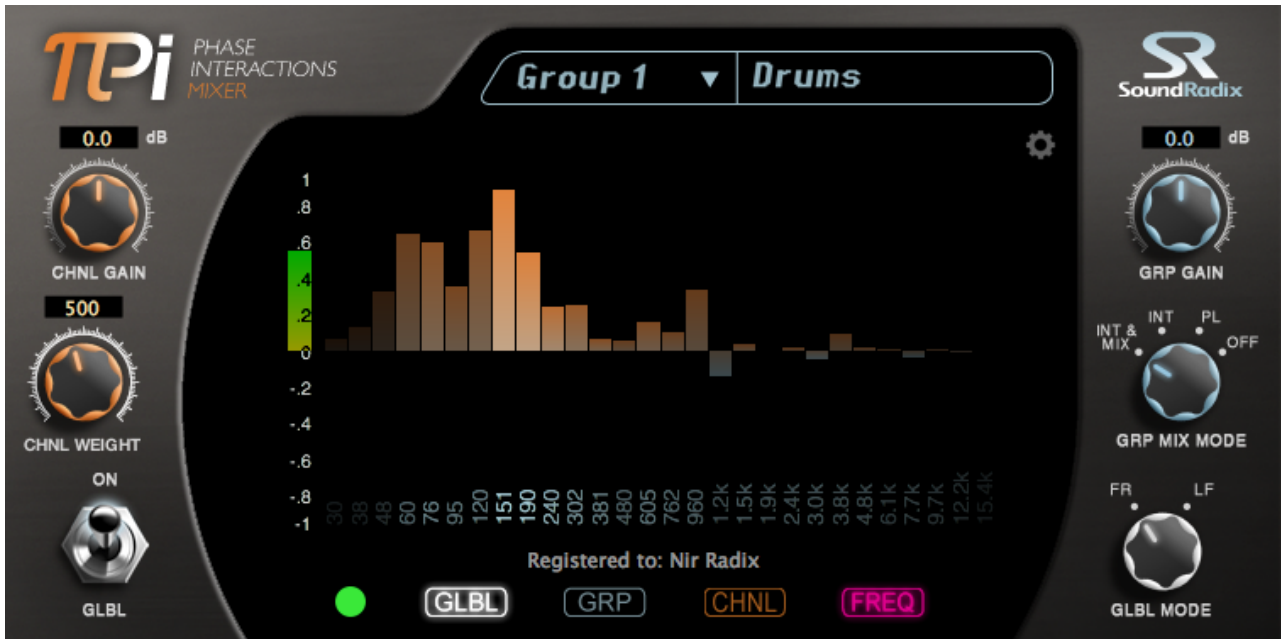
CHNL GAIN

Channel Gain, sets the overall gain of the channel.

The track's energy plays a major role in determining the track's weight within the mix. Therefore, it is recommended to set the channel gain using the CHNL GAIN or insert Pi post-fader where available.
CHNL GAIN is always active, even when GLBL ON is set to OFF, to allow level accurate comparison.

CHNL WEIGHT

Since gain plays a major role in channels' phase influence and sensitivity in a mix, some program material can get strongly influenced by other channels in the mix when their level is relatively low or when they decay into lower levels. With CHNL WEIGHT It is now possible to manually adjust the channel's low level and overall phase sensitivity and intensity within the mix. As CHNL WEIGHT increases - the less sensitive and more influential it'll be to other channels in the mix. This can help minimize artifacts on some program material, especially on low level, mid-range sustain notes and tails.

GLBL ON

Global On. Toggles all instances of Pi within the mix On and Off.

Working With Groups

Pi prioritizes channels within a group to allow custom phase optimization configurations. Use any of the available sixty-four groups to bind related tracks such as multi-mic'd drum kit or guitar amp+DI for optimal phase correlation.

Grouping can be used to further tune how Pi works on your tracks. For example, it's possible to phase-lock a group of channels so their relative phase is locked while optimizing their sum and the tracks outside of the group to each-other. Similarly, grouping a bass and a kick, Pi will optimize them to each-other first before performing a second cycle of optimization with the rest of the tracks.

Group Selection Drop-Down Menu

Assigns the channel to any of the sixty-four available groups.

Group Name

Name that group!

GRP GAIN

Group Gain. Adjusts the overall gain of the group.

GRP MIX MODE

Group Mix Mode.

INT & MIX - Internal & Mix. Optimizes the phase relationships of the channels within the group and the rest of the channels in the mix.
INT - Internal. Optimizes the phase relationships of the channels within the group only.
PL - Phase Lock. Optimizes the phase relationships of the channels within the group with the mix while keeping the tracks within the group phase locked. This mode is suitable for tracks recorded in M/S mode etc. where keeping the recording phase locked is crucial.
OFF - Turns Pi off for all the channels within the group.

GLBL MODE

Global phase relationships optimization mode.

FR - Full Range. When set to this mode, Pi works to optimize phase relationships across the entire frequency range.
LF - Low Frequency. When set to this mode, Pi focuses on optimizing the phase relationships frequencies below 800 Hz.

Display Modes

GLBL - Global mode. Displays the phase relationship of the channel to all the channels in the mix.
GRP - Group mode. Displays the phase relationship of the channel to the channels within the group.
**CHNL** - Displays the overall phase relationships of the channels within the mix. Each channel in the mix is represented as a uniquely colored dot on top of a 360 degrees phase correlation and level monitor.
FREQ - Frequency phase correlation meter. Displays the phase correlation of the channel across the frequency range.

Color Identifier

Identifies the channel color within the mix in CHNL display mode.

Settings Window
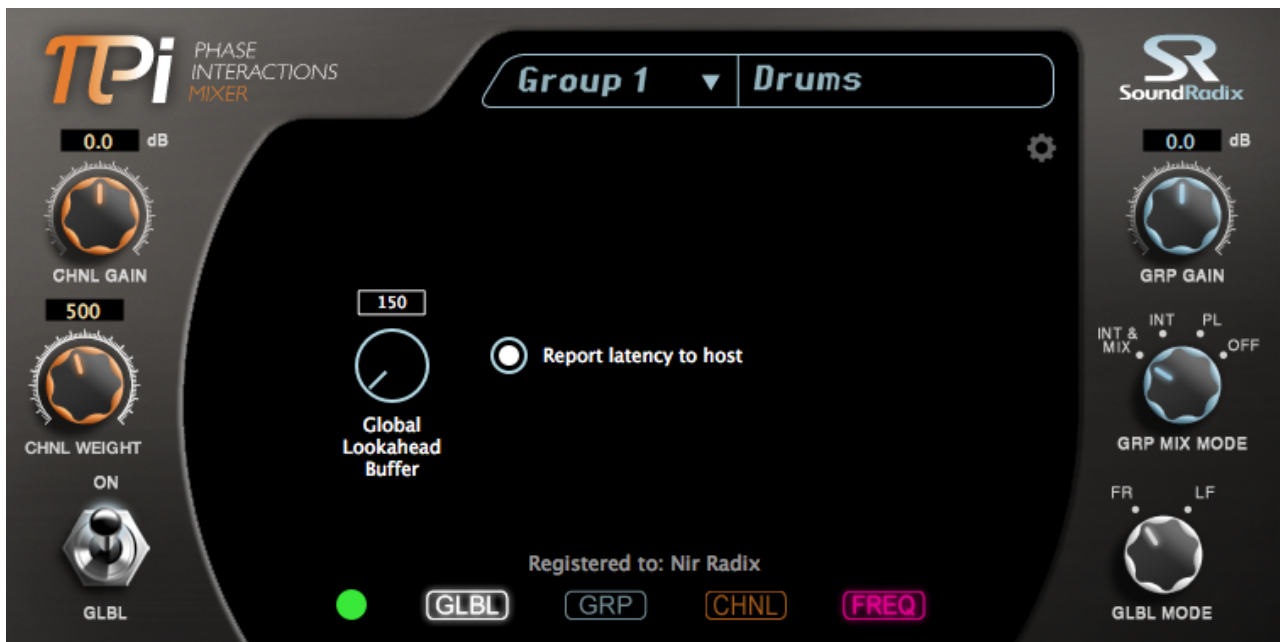
Global Lookahead Buffer

Allows the use of larger audio buffers and other high latency plug-ins. If Pi doesn't get all the samples it needs in time due to a larger audio buffer or other high latency plug-in, it can't do its magic and it'll displays Sync Errors. If you're getting Sync Errors messages, Increase the lookahead buffer until they're gone. Click on the Sound Radix logo to open the About screen and access this setting.

Report latency to host

Toggles latency reporting to the host for hosts without latency compensation such as legacy Pro Tools LE or systems with limited latency compensation such as Pro Tools TDM.

Important Notes

Avid Pro Tools Users:

Pi needs a 150 ms look-ahead to perform its magic. Therefore, please set your Latency Compensation Engine settings (Setup > Playback Engine) to Maximum.

Avid Pro Tools TDM users:

Due to the limitation of the available delay compensation in TDM systems, Pro Tools TDM cannot compensate for the latency required for Pi, therefore, a delay of 150 ms will be added.
Please note that in order to keep the tracks in sync, it is necessary to insert Pi into all the channels of the mix, *excluding* auxiliaries, groups and the master bus. Alternately, a sample delay plug-in could be used.

Hosts with multi-format VST and AU support

Because Pi instances needs to communicate in the background with each-other, please use a single format of your choice throughout your project file. Mixing VST and AU instances in the same project file will break Pi's functionality.

Apple Logic Pro Users:

Due to the unique way Logic processes audio, Pi requires longer look-ahead, and therefore higher latency, to guaranty audio stream sync to Pi. Therefore, you may experience a 500 ms audible delay when mangling other plug-in parameters in real-time. Otherwise, Logic fully compensates for the latency and playback is not effected.

MOTU Digital Performer Users:

DP's Plug-in real time preferences has to be set to Real-time for Pi to work its magic.
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Pi Phase Interactions Mixer Flow Chart
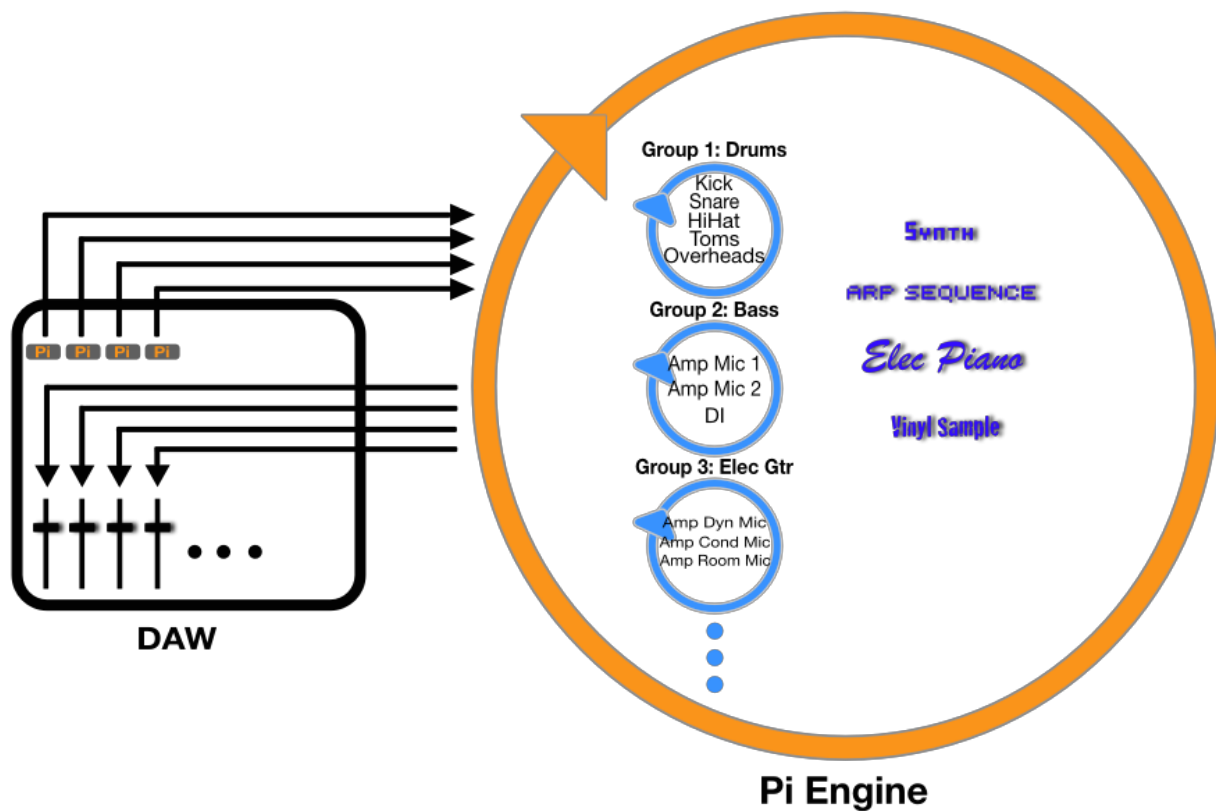
Frequently Asked Questions

Q: What is the difference between Auto-Align and Pi?
A: Auto-Align and Pi complement each other.
Auto-Align finds and applies a fixed time shift to eliminate the comb filter that usually occurs with multi-mic recordings of an instrument. Pi dynamically rotates the phase of the tracks in the mix to improve their phase relationships. It's constantly on the move.
For a multi-mic recording Auto-Align is more effective across the entire frequency range. Pi works its magic on all the tracks in the mix.

Q: Is Pi suitable for electronically generated music? Also is the plug in intended to be put on every track or more low frequency related stuff like bass, kick drum, pads, etc.?
A: Pi works for pretty much anything you'll throw at it. The more interactions and overlapping frequencies you have between your tracks, the more impact Pi is going to make on your mix. Naturally, tracks with more low-end content tend to interact more with each-other.

Q: Does Pi works well with analog console emulation plug-ins such as Slate VCC?
A: Absolutely.

Q: Say I have 2 tracks I want to "sync" the phase on as close as possible. If I assign both to the same Group, and I give the main track a weight of 200 and the "lesser" track a weight of 100... is that the same as assigning the main track a weight of 1000 and the "lesser" track a weight of 500? Or does the higher weight value also mean the track is more "effected"?
A: No. CHNL WEIGHT is dynamic by nature. For the strongest phase correlation, just assign the tracks into the same group within Pi and properly set their gain.
As CHNL WEIGHT increases - the less sensitive and more influential the channel will be to other channels phase in the mix. Most of the time, it's best to leave CHNL WEIGHT at its default minimum value (100).

Q: I already made some grouptracks (Drums, vocals etc). Can't I just insert here or do I have to make new group tracks within the Pi plugin?
A: No, because the tracks are already summed by the DAW group track by the time they get to Pi, there will be very little Pi can do from there to help the mix.

Q: I would think PI should go FIRST correcting the phase of the raw tracks (as if I had tracked everything perfectly) as opposed to last because there are a number of eqs, fx, etc. that produce desirable phase-shift as part their sound (vintage eqs, phasers, stereo wideners, etc.) and if PI is last it is basically fighting to correct the phase shift that I have 'intentionally' added by selecting an EQ for it's 'sound' thus undoing the very thing that EQ added to the track. Wouldn't it be like using a linear EQ on everything which is not desirable?
A: Well, Pi is not trying to fix the phase shifts within your sound (e.g. it won't make your eq linear), but rather make all the tracks in your mix work better with each other. If Pi is inserted in the first insert slot, it'll optimize the channels phase relationships without taking into consideration the phase changes that has occurred due the processes you have in your channel.

Q: This plug in appears to not like modulation effects like console plug ins with crosstalk emulation on, things seems to be moving all over the place unnaturally?
A: Crosstalk emulation probably throws Pi into a "mental deadlock". It has duplications of all the channels going multiple times into Pi's engine... If the crosstalk emulation sound is not sample-accurate and delayed even by a few samples, you're pretty much creating a glorious comb-filter effect for all your tracks in the mix.

Q: Why Pi doesn't work with side-chains? Is there a workaround?
A: When both the side-chain source and receive tracks run through Pi, it creates a feedback loop in Pi. The easiest workaround is to duplicate the side-chain source track for triggering only, remove the Pi instance from its signal path and use it as the side-chain source.

Q: Say you have inserted Pi on a range of audio channels (say these are drum channels), and have all sent them to a single Pi-group. now is there a way to determine the priority of channels within that group? i.e. for instance determining that the kick drum audio stream receives no selective all-pass filtering, as you consider that track a crucial element you'd not want to have altered (instead, you'd want the other tracks within that Pi-group to frequency-phase-shift when needed). if this is not achievable through a setting, how does pi determine which audio stream within the group 'gets preference' (and thus is not altered / is less altered)?

A: Weight knob is your friend. Tracks with higher weight values are going to have higher "priority" or "gravity" in a mix.

(Warning - geeky text ahead)

If you think of a tracks' current phase position as a point in space, and you have multiple points at various distances from each-other, and the goal is to minimize the distance between the various points, you can achieve the same results by either moving all the points toward one specified point or calculate the best and shortest rout for all the points to another point in space. The difference between the two scenarios is that in the first case the point with more Weight is not going to move as much while other points will have to make greater distance.

Q: Say you have three Pi-groups, where one is set to INT&MIX, and the remaining two are set to phase-lock. ie. you want these two groups to remain intact, and have the third group (the one set to INT&MIX) alter its phase dynamically to the two phase-locked groups. now, what happens when the two phase-locked groups contain at the same instant phase-inverted signals? do they cancel each other out (as they're set to phase-lock), or does one of them alter its phase so they remain phase-correlated? (which one gets preference though?)

A: Phase-locked groups will optimize the tracks within them to the mix without changing the phase relationships of the tracks within the group. So in your case scenario, if at given point the two groups are phase-inverted, Pi will rotate the phase-locked groups in phase with each-other like they were a single channels.

Q: would you then recommend placing two Pi instances in a row on a channel for the following scenario: a Pi-grouped set of channels within which you want one of the channels to 'dominate' (receive the least amount of phase shifting), therefore using the weight knob you mentioned to achieve just that. followed by another instance of Pi set to phase lock, where one would use the weight knob to set the priority of the whole Pi-group against other pi-groups, to determine which group receives more or less phase treatment?

A: No. Placing two instances of Pi on a single track will break it.

Importance / priority of tracks and groups in the mix are determined by volume and weight while weight is adjusting individual tracks. Therefore, to give higher priority to a whole group, simply increase the group gain within Pi.

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