

Latency and Delay Compensation with Host-Based Pro Tools Systems

A few years ago, Automatic Delay Compensation was added to Pro Tools|HD systems to improve mixing and increase recording accuracy with Pro Tools TDM systems. When activated, the Automatic Delay Compensation feature automatically makes adjustments in Pro Tools HD software to compensate for all latencies in the I/O, internal and external routing, and plug-in algorithm processing, ensuring that recordings and mixes stay perfectly time aligned and phase accurate.

Host-based Pro Tools systems such as Pro Tools LE and Pro Tools M-Powered, on the other hand, do not have this Automatic Delay Compensation feature. In most cases, however, mixer latencies with host-based systems are not a factor. In cases where delay compensation is necessary to ensure that audio stays time aligned, there is a way to manually compensate for plug-in latencies by using the DigiRack Time Adjuster plug-in, or by slightly moving or “nudging” tracks.

A Little Background on Delay Compensation

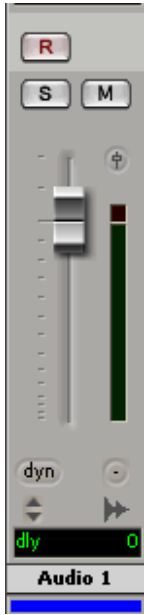
So you may be asking yourself: Why and when do I need to worry about delay compensation? When mixing, problems with latency can arise in one of two scenarios. The first scenario is when an external processor or a plug-in algorithm induces enough latency to cause problems with musical timing. For example, if you’re using a look-ahead peak limiter plug-in such as Digidesign Maxim on a track, its audio will be late or delayed in the mix because Maxim’s processing algorithm induces 1024 samples of latency. The good news is that the majority of plug-ins do not have latency in their algorithms, and only a few of them have latency so great that it causes problems with musical timing.

Another case in which latency can become problematic when mixing is when you’re maintaining nearly identical signal sources on separate tracks or paths—e.g., a pair of bass tracks (one signal direct, the other signal from a mic’d bass amp/cabinet combo). Problems can arise when inserting a plug-in with latency on one of those tracks, causing the two nearly identical sources to no longer be time aligned. When the tracks are combined this can cause certain frequencies to be cancelled out. Fortunately in most mixes the majority of material consists of unique mono and stereo sources, which typically are not problematic.

Delay Compensation: TDM vs. Host-Based Mixing Architecture

Hardware-accelerated Pro Tools|HD systems are more prone to timing related issues because of the inherent delays required to route audio signals to and from the hardware DSPs that power the Pro Tools TDM mixing environment. This is why the Automatic Delay Compensation feature is especially important with Pro Tools|HD systems.

The mixing engine in host-based Pro Tools systems works a bit differently; the mixing architecture in these systems is such that all internal routing and plug-in connection delays need no compensation. The place where latencies *can* become an issue with host-based Pro Tools systems is with plug-ins or external processors that have processing latency in their algorithms. Fortunately there are some simple remedies to alleviate such delays.

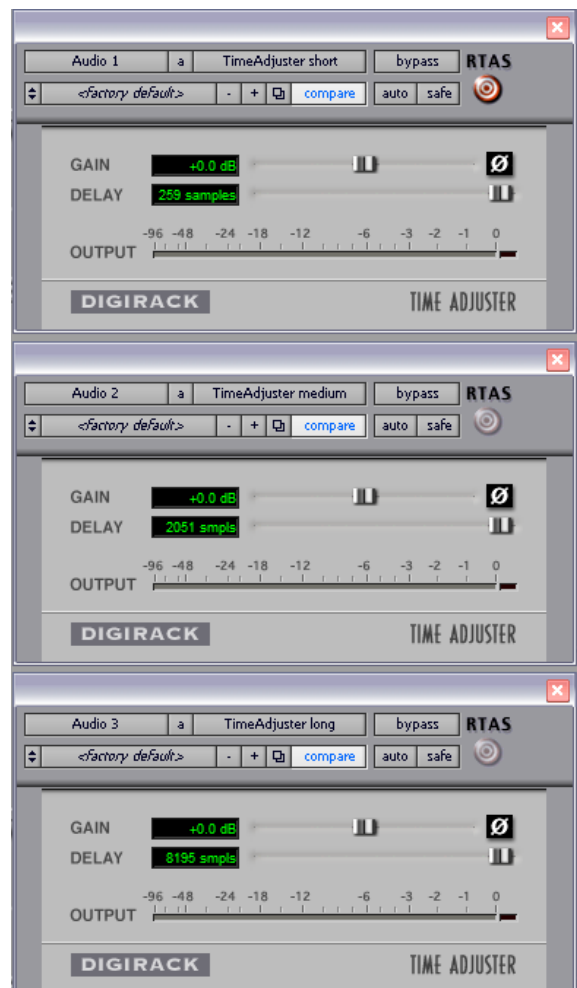


Most RTAS plug-ins do not have processing latencies. For those that do induce latency, there is an easy way to find out the number of samples of delay on a track so you can manually correct it. Simply **Ctrl + Click** (Win) or **Command + Click** (Mac) on the Vol/Peak/Delay view below the track fader in the Pro Tools Mix window (see figure 1). This same method can also be used to find any delays incurred using external effects processors.

Figure 1 (left): The Delay view shows the amount of delay in samples. The Audio 1 track to the left reports zero samples of delay.

Once you've found out the number of samples of delay on a track, you can manually compensate for this delay by using the DigiRack Time Adjuster plug-in (see figure 2) on the *other* tracks in the session to regain the time alignment between all tracks. Alternatively, instead of using the Time Adjuster plug-in on other tracks in Pro Tools to compensate for latency on a single track, one can simply move or "nudge" the track in question backwards the same number of samples as reported by the track's Delay view (see figure 3 on the next page).

Figure 2 (right): All Pro Tools systems include three separate Time Adjuster plug-ins. Time Adjuster short allows you to delay the audio signal up to 259 samples, Time Adjuster medium up to 2051 samples, and Time Adjuster long up to 8195 samples.



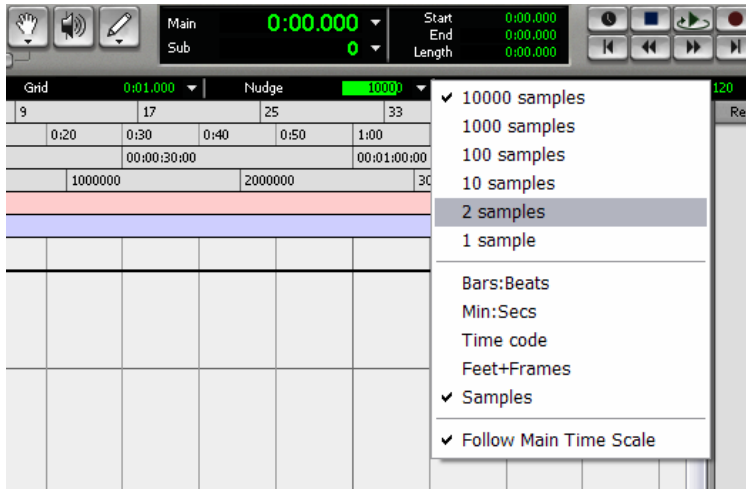


Figure 3: Setting the Nudge value to a low Sample setting allows for easily moving or “nudging” tracks backwards on the timeline to compensate for latency.

Latency and Recording

With Pro Tools LE and Pro Tools M-Powered systems, recorded tracks are automatically adjusted to compensate for any recording latency. To accomplish this, Pro Tools automatically moves newly recorded audio files to compensate for any recording latency, ensuring that recorded tracks stay perfectly time aligned with other tracks in the session. When recording tracks, it’s usually best to have the audio buffer at a low setting to minimize monitoring latency during recording; this can be adjusted via the H/W Buffer Size in the Playback Engine settings. When mixing, it’s usually better to increase the H/W Buffer size.

USB vs. FireWire Audio Interface Monitoring Latency

FireWire audio interfaces such as the Digi 002 and Mbox 2 Pro have less through latency than USB 1.1 interfaces such as Mbox 2. This is mainly due to the fact that the bus cycle (i.e., the time it takes to send a signal in and/or out of the system) with FireWire interfaces (8000 Hz) is faster than the bus cycle of USB 1.1 interfaces (1000 Hz). There are also slight differences in latency that are platform and processor dependent (Win vs. Mac, Pentium 4 vs. G5, etc.). To alleviate the additional latency with USB 1.1 interfaces, Mbox 2 and Mbox 2 Mini have a hardware monitoring option, allowing users to monitor the signal before going into Pro Tools LE software for near-zero latency monitoring. Users can adjust the “Mix” knob on these interfaces to alter the balance between the input signal and the signal post Pro Tools software.

Figure 4 (right): Figure 4 shows a typical use of the Time Adjuster plug-in. In this instance, a drum mix has been sent to two Auxiliary Inputs, one with compression and one without. The compressed drum track is reporting 6 samples of delay. To compensate for this, the Time Adjuster short plug-in has been added to the Drums Dry track, adding 6 samples of delay—ensuring that both drum mixes play back at exactly the same time and thus remain phase accurate.

