

HD Radio Time and Level Alignment

Overview and Importance of System Alignments

HD Radio is a hybrid technology that utilizes two separate but identical streams of audio simultaneously broadcast over the analog and digital program channel. Due to signal processing delays introduced in the digital audio path of HD Radio system, the analog audio must be delayed to synchronize (aligned in time) to the digital audio. This time alignment is necessary as the HD Radio receiver transitions or blends from the analog to the digital signal when first tuned to a station or at the edge of the digital signal coverage where the receiver will blend back to the analog signal. Aligning the signal requires the main analog audio signal to be delayed approximately 8 seconds to match the digital audio's time delay. The audio levels between the two audio streams must also be matched so there is a smooth transition when the receiver blending occurs. When the audio delay and level are set correctly, the blend between the analog and digital streams are seamless.

Time Alignment

- The analog delay can be set in the HD Radio exporter/exciter or in an external delay. The external delay can be a dedicated audio delay unit or can be incorporated in one of the professional audio processors.
- The relative time delay between the analog and digital audio paths should be within 1 audio sample. This can be achieved with the use of an automatic feedback receiver, which is highly recommended. If such a device is not available, then manual calibration should be done and periodic monitoring is suggested.
- If the Exporter and the Engine are not co-located, then GPS sync is required so that the timing between the two locations is locked. Not establishing such a GPS sync would result in periodic audio dropouts in the receiver

See the link below for additional information on network timing on our website:

http://www.ibiquity.com/broadcasters/quality_implementation/iboc_white_papers

- A professional HD Radio monitor should be incorporated to make these measurements or an HD Radio receiver capable of 'split mode' reception (left channel digital, right channel analog). This audio can then be recorded and the time difference between the 2 channels observed on a simple audio editor.
- The ideal method of keeping the time alignment in tolerance is to have a split-mode receiver fed back into the exporter to automatically adjust the delay between the 2 streams. A few of the manufacturers are in the process of working on this solution. There is also at least one HD Radio monitor manufacturer that is managing the analog audio in real time and adjusting the delay as needed.
- Multicast channels require no time alignment as they are independent of the analog and HD1 audio.

Audio Level Alignment

- Audio level alignment is perceptual and should be adjusted using one of the monitors mentioned above. However, in their absence they can be matched "by ear". The levels of the two streams should be within 1 dB of each other.
- The multicast channels should also be adjusted so that the apparent loudness difference between HD1, HD2, HD3, etc. is not noticeable.
- The audio level alignment of the station should be checked at least once per week and adjusted as needed.
- The digital audio processor output should be adjusted to full scale to achieve the best dynamic range to the input of the exporter/exciter. The TX Gain should then be increased or decreased as needed to match the perceived analog audio loudness by monitoring a suitable HD Radio receiver.

**** Time and level alignment** is one of the most, if not the most important technical parameter when implementing HD Radio technology. The radio listener will not tolerate a station that jumps back and forth in time or one in which he needs to constantly adjust the volume control. Simply by listening and monitoring your HD Radio programming as you would your analog station will help keep your station sounding its best.