



# **Technical Document**

## **AESTD1002.2.15-02**

### **Recommendation for delivery of recorded music projects**



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# AES Technical Council Document

## Recommendation for Delivery of Recorded Music Projects (Including Stems and Mix Naming Conventions)

131203 rev 53

This document has been created as a *Recommendation for Delivery of Recorded Music Projects*. It specifies the *physical deliverables* that are the foundation of the creative process, with the understanding that it is in the interest of all parties involved to make them accessible for both the short and long term. Thus, this document recommends reliable backup, delivery and archiving methodologies for current audio technologies, which should ensure that music will be completely and reliably recoverable and protected from damage, obsolescence and loss.

The Recording Academy® P & E Wing Delivery Specifications Committee, comprised of producers, engineers, record company executives and others working primarily in Nashville, New York and Los Angeles, in conjunction with the AES Technical Committee on Studio Practices and Production and the AES Nashville Section, developed the original Delivery Recommendations. During its development, the committee met regularly at The Recording Academy® Nashville Chapter offices to debate the issues surrounding the short and long term viability of the creative tools used in the recording process, and to design a specification in the interest of all parties involved in the recording process. The committee reached consensus in July 2002 and the committee's recommendations were finalized and presented to The Recording Academy Producers & Engineers Wing membership, the overall recording community, and to press in Nashville on July 19, 2002. The document was also presented to the AES in the Studio Practices and Production Technical Committee meeting on October 7, 2002 in Los Angeles, and on March 24, 2003 in Amsterdam. Updates to the document were introduced in 2004, 2005 and 2008. The current revision was completed in August 2013. It was presented to the AES Technical Committee on Recording Technology and Practices in October 2013, reviewed by Mark Yonge (AES Standards), and approved by the same Technical Committee in 2014.

It is our intention to review the document vis à vis recording and storage techniques, hardware and formats periodically to ensure its continuing relevance within commonly accepted industry practices.

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## Summary of the Delivery Recommendations

There are two Recommendations for Music Delivery:

1. Minimum
2. Preferred (includes "Minimum")

For each of three recording technologies:

1. Analog Multi and Two Track Tape
2. Proprietary-Format Multi and Two Track Hard Disk Recorder (Proprietary HDD)
3. Digital Audio Workstation or DAW (HDD)

### Delivery Recommendations:

The Minimum Delivery Recommendation provides the capability to reuse the original recording in the short-term and, if necessary, to re-create the original recording and/or mix as closely as possible. This will allow the owner of the master (generally the Record Label) quicker access to the elements of the project in use at the conclusion of the mixing process.

The Preferred Delivery Recommendation provides a more robust solution to the long-term issues that confront Record Labels in their efforts to maintain their assets. It is therefore the Committee's recommendation that all of the audio tracks be "flattened" and migrated to the Broadcast Wave file format.

For further information about the file structure of the Broadcast Wave File please read AES31-2-2012, "AES standard on network and file transfer of audio - Audio-file transfer and exchange - File format for transferring digital audio data between systems of different type and manufacture" (free of charge to AES members). On the EBU Web site at <http://tech.ebu.ch/publications>, you will also find supplements [t3285-s1](#) through [t3285-s5](#) for extensions to the basic file format. A "flattened" file is one segment of digital audio that plays continuously from the start of the track to the end.

The Deliverables Committee now supports the use of Interleaved **Stereo Broadcast Wave Files**. The Deliverables Committee is aware of the increase in usage of multi-channel interleaved BWF files and is following the standards efforts closely. AES Standard AES31-2-2012, AES standard on network and file transfer of audio - Audio-file transfer and exchange - File format for transferring digital audio data between systems of different type and manufacture (<http://www.aes.org/publications/standards/search.cfm?docID=53>) was first published in 2006 and updated in 2012. However, we do not recommend the use of **Multichannel** interleaved BWF files until this standard is more broadly implemented.

A **standard** file format (such as the Broadcast Wave format defined by AES31-2) and enterprise-class storage media provide access to the audio files after the proprietary equipment used to create them may no longer be available.

To fulfill the Minimum Delivery Recommendation: Deliver to the record label the Primary Master (from Table 1) and two Secondary Masters (Backups or “Safeties”) for each and every master. The Secondary Masters (Backups or “Safeties”) should be delivered in two approved storage media taken from the Acceptable Transitional Master Backup Storage Media listing (Table 2). The Secondary Masters (Backups/”Safeties”) should have sampling rates and precisions equal to or better than the “Original Master” (88.2, 96, 176.4, 192, 352.8, and 384 kHz are recommended, as are 24 or greater bit depths). These same sampling rates and precisions are required for A/D conversion. Also, there should be no level adjustments, truncation, dither or noise-shaping, or modification of the digital signal. Please note: It is not advisable to “upsample” the Primary Master in order to create a Secondary Master.

The “Master” is defined as a collection of the various original components of the recording process for a given production, each in their originally recorded formats, and collected in a form that is ready for transition to the next phase of the process. For example, the recorded ‘Masters’ from the tracking and overdubbing processes are collected in a form that is ready for transition to the mixing process. The mixed ‘Masters’ are collected in a form that is ready for transition to the mastering process. The mastered ‘Master’ is ready for transition to the manufacturing process. “*Masters*” include (but are not limited to) all open reel tapes, hard disk drives (HDD), and incremental backups made during the recording process. They include all of the original components of the recording process for a given production each in their originally recorded formats. There should be no deletions of useful material from the “*Masters*”, such as out-takes, artist’s talking, incomplete or unreleased recordings, etc. The constitution of “useful material” is determined by agreement between Record Company and Producer prior to the commencement of the recording project.

A Glossary of Technical Terms as well as a Glossary of Recording Technologies are also provided with the document. Some industry-standard nomenclature has been refined (for instance, “Masters” and “Tracks”).

### Crediting and Documentation

The Producer of a recording project is responsible to work in concert with the artist to assign recording credits and to then supply accurate crediting information to the designated person at the record label or media company who is authorized to receive that information for the purpose of metadata and official credits.

Additionally, it is highly recommended that both paper and electronic documentation accompany all Master deliverables and Backup/Safety media. Traditionally, this

documentation has included tracking sheets, engineer notes, set-up notes, sketches of microphone placement, and any other pertinent data. The Committee recommends that all Masters and Backups have comprehensive but concise labeling. We recommend a label such as the **Media ID Label**, a document developed by the Audio Engineering Society Nashville Section that can be completed and affixed to each Master and Backup/Safety. The Media ID Label provides important data about each physical Master and Backup/Safety deliverable and which can be included along with Broadcast Wave files. Also, a document like the **Recording Map** should be completed and maintained throughout the course of the Recording Project as it details information about the original sources, transfers and backups/safeties. Please note that the Producers and Engineers Wing continues to work with various standards organizations around the world as the collection of studio metadata continues to evolve.

*To fulfill the Preferred Delivery Recommendations:*

In addition to the Master and Backups/Safeties described in the Minimum Delivery Recommendation above, each track of each song should be “flattened” or converted to continuous Broadcast Wave Files without processing or automation. The Broadcast Wave Files should then be transferred to an Approved Long Term Backup Storage Medium (Table 4). In some situations ancillary processing may be understood to be a key component of the final product (volume level automation, compression, etc.) This processing may be included in a separate “*flattened*” file in addition to the unprocessed “flattened” file, as mutually agreed by the Producer and the Record Company.

*Regarding Time Code for the Broadcast Wave Files: If time code was supported in the recording process* the original positional reference should be incorporated in the Broadcast Wave file format in the "Time Reference" field of the "bext" chunk as a high-precision 64-bit integer representing the 'first sample count since midnight', and equivalent to the timecode value of the start of the file. All files/regions for each track should be consolidated to a single file. There should be no more than one (1) file per track. Every effort should be made for all Broadcast Wave files to be a bit-for-bit copy of the original digital tracks.

*If no time code or positional reference was used in the recording process*, all recorded tracks should be converted to continuous Broadcast Wave file format with a start time of the sample count equivalent to 01:00:00:00 (wherever possible, e.g. 2” Analog Tape as well as AIFF files may have no time code present). All tracks including partial tracks, such as guitar solos, background vocals, etc. should have the same start time to maintain proper time relationships between tracks.



Table 1. **Primary Master Delivery Media**<sup>5</sup>

Recording Technology		Media
<b>ANALOG RECORDER</b>	24 tk	2" analog tape
	16tk	2" or 1" analog tape
	8 tk	2" or 1" analog tape
	2 tk	1/4", 1/2" or 1" analog tape
<b>HARD DISK RECORDER</b>	IZ RADAR V	refer to factory
	Tascam X-48/X-48 MK II	(HFS/HFS+ / FAT 32) SCSI HDD,
<b>DIGITAL AUDIO WORKSTATION</b>	ProTools HD & HD-LE	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	Nuendo	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	Cubase VST	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	Digital Performer	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	Apple Logic	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	Sonic Studio	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	Merging Technologies Pyramix (PCM & DSD)	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	SADIE (PCM & DSD)	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt
	Sonoma (DSD)	FW-400/ 800 HDD USB 2.0/ 3.0, Thunderbolt

<sup>5</sup> The P&E Wing's Delivery Specifications Committee will review this document vis à vis recording techniques, hardware and formats periodically for their continuing relevance within commonly accepted industry practices. This Committee is open to all comment from interested parties, and notification of meetings is available by e-mailing [p&ewing@grammy.com](mailto:p&ewing@grammy.com).

*Hard Disk Drives should be delivered in safe, shockproof cases.*

Table 2. ***Transitional*** Master Backup Storage Media

Storage Technology	Media	Manufacturer
<b>COMPUTER TAPE ARCHIVE</b>	LTO 4/5/6	Quantum, Hewlett-Packard, IBM, and others
<b>COMPUTER OPTICAL DISK</b>	CD-R	(many)
	CD-RW	(many)
	DVD±R	(many)
	DVD±RW	(many)
	DVD±DL (dual-layer)	(many)
	Blu-Ray	(many)
<b>COMPUTER HARD DRIVE</b>	External HDD	(many)

### Delivery Adapted for The Future

The Delivery Specifications Committee expects that direct delivery (via secure connection on the Internet, etc.) will be commonplace in the future, and uploading files to very large-scale digital libraries will be one of many options. *Digital preservation files should readily adapt to any general computing infrastructure* that is in place or anticipated to be put in place by the owners of the masters.

The Deliverables Committee continues to evaluate various technologies such as Solid State Drives (SSD) and Flash memory. Until more longevity studies are published, the committee does not consider them to be archival in nature.

### Archiving/Storage Applications

The Committee recognizes the necessity of *incremental archiving/storage applications*. Currently there are many widely distributed applications for Mac, PC & Linux, and a number of enterprise-class storage applications available. Some other “personal” storage applications are available as well. The Committee views the significance of choosing an appropriate archiving application, commercial or not, in terms of the reliability of the *archiving process* as well as the reliability of *long-term support*. There are *significant* implications in the choice of storage applications, such as platform, vendor, operating system, and application version. (For instance, current Macintosh OS's do not include drivers sufficient to interface directly with LTO systems) Verification of a newly created archive is an integral part of the archiving workflow, and is *essential*. Many LTO tape-based libraries are written directly as TAR (Unix Tape Archive).

Utilizing TAR by means of a "command line interface" requires a working knowledge of Unix commands, but is very powerful. If you are not writing a TAR archive, it is imperative that you document the application and operating system used to create the backup.

With the release of LTO-5, LTFS (Linear Tape File System) was introduced to the LTO community as an open-source program allowing users to create a “directory” of the contents of the LTO tape. This information can be saved as a pdf document to show the contents of the LTO tape. In addition, the LTFS file system allows for “drag and drop” retrieval and storage of individual files of a mounted tape, without having to unpack the entire tape to save or retrieve a file. LTFS should be a consideration for those who have LTO-5 or higher drives.

Lastly, one must consider the bit-level integrity of the preservation files. There are a variety of freely available tools available to create checksums for individual files, and even tools that check for data errors when copying entire drives with various file types (BagIt). Many of these tools can be found at the Federal Agencies Digitization Guidelines Initiative (FADGI) <http://www.digitizationguidelines.gov/>. Whenever possible, the goal is to create bit-level accurate copies when moving files to another carrier.

**We cannot emphasize enough that long-term restorability is the goal of the Committee and its Recommendations. A “backup” alone does not guarantee the safety or viability of the archived asset. It is also important to know that periodic migration of the backup media is necessary – the shelf life of a carrier is of no use when making archival backup decisions.**

Based on the preceding criteria, acceptable media for the Preferred deliverables are listed in Table 3, below:

Table 3. **Long Term Master Backup Storage Media**

Storage Technology	Media	Manufacturer
COMPUTER TAPE ARCHIVE	LTO-4 LTO-5 LTO-6	Fuji, Hewlett-Packard, IBM, and others

Note: LTO tapes are “n-2” read and “n-1” read/write capability. Those with archives on LTO-1, LTO-2 and LTO-3 should strongly consider moving to a later generation tape.

## **Quick Reference Guide**

For Delivery of Masters and Backups/Safeties  
(Or “What The Producer Delivers To Receive Final Payment”)

### **Minimum Delivery**

For all of the Recording Technologies listed below, the Producer and/or Engineer should deliver to the Record Label:

- a.) The Masters, in their originally-recorded formats (Table 1),
  - b.) Two Secondary Backup/Safety masters as follows:
    - 1.) one Secondary Backup/Safety in one of the mediums from the “Currently Acceptable Transitional Storage Media Listing”, (Table 2),
    - 2.) a second Secondary Backup/Safety, in a different medium than the Backup/Safety archive as b.1), also listed on the “Currently Acceptable Transitional Storage Media Listing” (Table 2), and...
  - c.) Catalog Files for HDD Backup/Safeties, if applicable.
- Digital Backups/Safeties should have sampling rates and precisions equal to or better than the Master.

In addition to the physical masters and safeties, include “Traditional” Documentation (Tracking Sheets, Lyrics, Charts, Orchestral Arrangements and Parts, Mix Documentation). For a guideline as to what constitutes documentation, we recommend using The Media ID Label for specific labeling of each element in the delivery, and The Recording Map for detailing the recording process and related methodologies as mentioned above in “Crediting and Documentation”.

### **Preferred Delivery**

In addition to the Minimum Delivery elements listed above, the Preferred Delivery would include “Flattened” continuous Broadcast Wave Files of every multi-track and two-track element, without processing or automation, on a currently-approved Long Term Master Backup Storage Media (Table 3). In some situations, processing is considered to be a key component of the final product (volume level automation, compression, etc.) This may be included as a separate file in addition to the unprocessed ‘flattened file’, as mutually agreed by the Producer and the Record Company.

### **If You Are Recording or Mixing To:**

Analog Multi-Track or Two Track, 2”, 1”, 1/2”, or 1/4” Analog Tape is the Master.

Note: High-quality Analog to Digital conversion should be used to convert Analog Masters to Digital Backups/Safeties in either PCM or DSD form using sample rates of at least 88kHz and 24bits or greater depth. We strongly encourage all users of DSD technology to contact the DSD technology provider directly for further guidance. We would also warn that much of the available DSD technology is proprietary. Proprietary-Format Hard Disk Drive Multi- or Two Track, the Proprietary HDD is

the Master. (for Alesis Masterlink, CD-R is always the Master)

Digital Audio Workstation (DAW), the HDD is the Master

Note: See Table 1. **Primary** Master Delivery Media for specifics regarding above.

## Stems and Mix Naming Conventions

*Recommendations for Mix Stem Delivery and Mix Naming Conventions for Recorded Music Projects*, has been created to help ensure a client's needs are properly met.

Mix stems are often requested of mix engineers. An increased frequency of requests for stems and the uncertainty about their ultimate usage has made them an increasingly debated topic. The Producers and Engineers Wing of The Recording Academy formed a cross-genre, cross-geographical Mix Stem Committee of industry professionals to research this issue. From this committee's research and discussions, the following document ensued. The principal focus of this document is to establish a consistent audio file naming convention and suggested deliverable stem set. In addition to this committee's technical recommendations, there are several important issues surrounding stems that also need to be addressed. These issues include, but are not limited to, fair compensation for mix stem creation, proper crediting for mix stem creation and use, and appropriate or integral use of mix stems, all of which this committee considers equally important.

As the deliverable responsibilities for mix engineers have increased, so has the need for clear definitions of those deliverables along with reasonable expectations as to which deliverables are included as part of the mixer's base fee. Mix stems are not considered part of the list of "standard" mix versions normally required for delivery. As creating and printing stems require extra time to produce and generally are created upon request, additional costs in studio time and engineering time will normally be incurred. These additional charges for stem production are best negotiated with the mixer prior to the commencement of mixing.

Mix stems are comprised of actual components of the mix master. The vulnerable nature of mix stems opens up the possibility of abuse and misuse. Integral use of mix stems is highly encouraged by this committee. Although mix stems are comprised of actual components of the mix master, their sum is not considered to be an acceptable replication of the mix master and therefore should not be used as such. This committee also encourages that proper crediting be applied to mix stem creation and use, and that the crediting is embedded for the life of the stem.

Mix stems have many current uses and reuses as well as additional future possible uses. Some of the current uses include live concert stem playback, remixes, video games, and film. Stem delivery requirements vary greatly depending on their intended end use--even individual gaming companies require different stem sets. Therefore, the stem set outlined in this document is only considered to be a typical stem delivery set for general music production and is not specific to any single use.

The committee recommends that all future contracts for music production, such as artist, producer, engineer, mixer, etc., contain language specifically addressing

compensation for mix stem creation, crediting for mix stem creation and purposes mix stem use.

## **Definitions:**

Mix Master definition – A mono, stereo or multi-channel surround mix created during the mixing process containing all the final desired elements of the multi-track production. The Master Mix is considered to be the final mix master approved by the artist, producer and engineer intended for commercial release.

Mix Version definition – Any mono, stereo or multi-channel surround mix created during the mixing process containing all of the elements of the master mix with any one of the mixes elements perspective changed. For example, a vocal up of the mix master would be considered a mix version

Mix Stem definition – Any mono, stereo or multi-channel surround version created during the mixing process that does NOT contain all of the elements of the Master mix. Mix Stems contain all relevant audio, processing, volume, panning and effects associated with that Stem's featured elements relevant to the mix master.

Instrumental Track definition -- a complete replica of the mix master containing no vocals.

No Lead Vocal definition – a replica of the master mix that includes backing vocals but contains no lead vocal and/or no artist vocals. Often referred to as “TV Track”.

*It's important to note that the No Lead Vocal mix and Instrumental mix by definition are considered stems. Since they are currently part of a standard delivery, for the purposes of this document they are listed in the version category.*

## **Participant Identification:**

Crediting – For any future mix that uses previously created Mix Stems, a mixing credit should be given to the mixer of those Stems along with any other mixing credits.

ISRC Codes –The industry expects to see a more granular version of the ISRC code in the future. When that happens we expect that ISRC Codes can be assigned to mix stems and mix versions.

## Mix Stem and Version Naming Convention:

With so many digital audio files being involved in each audio project, it is important that Mix versions and Stem file names contain all relevant information within their file names, easy to understand at a glance. For example:

**LH\_BodyAndSoul\_Master\_96k\_24b\_R01.wav**

The above audio file name example contains the following information, each separated by an underscore:

### Artist Identifier:

A 2 to 4 letter name code used consistently throughout a project. Most often the artist's initials are used for this. In this example "LH" is used.

### Song Title:

Listed after the artist initials is the song title, or useful abbreviation thereof. Capitalize each word or word fragment. Title contains no spaces, punctuation or diacritical markings (accents), so names are universally file compatible. Song title names should be less than 15 characters if possible. Lengthy titles maybe routinely abbreviated by other programs when imported.

### Mix Version or Stem type:

After the song title, list the mix or stem identifier. "Master" is the example shown above. Again capitalize each word or word fragment so title contains no spaces.

### Sample Rate:

Sample rate at which the audio file was created is listed after the mix version or stem type.

### Bit Depth:

Bit depth at which the audio file was created.

### Revision Number:

A 2-digit revision identifier with an "R" preceding it is listed last. The higher the number, the more recent the version created.

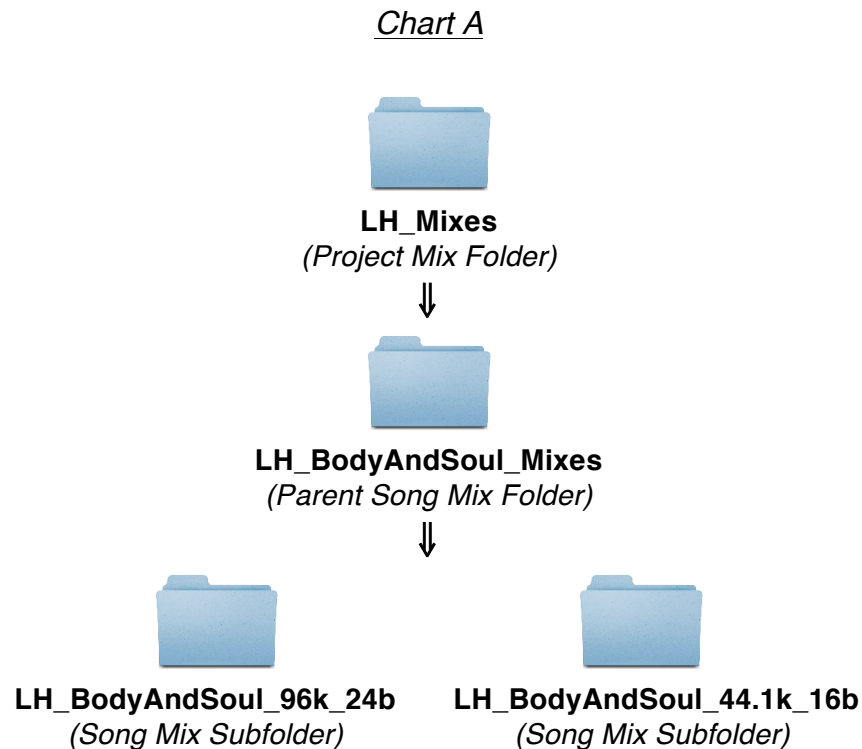
### \*File Extension:

Generally generated during file creation, if you have the option to show or hide the file extension it should always be shown. Only one period should be used in the title and should only be placed before the file extension.

\*The overall file name length should not exceed 255 characters. Illegal characters include but are not limited to: / *backslash*, *question mark*, < *left angle bracket*, > *right angle bracket*, \ *forward slash*, : *colon*, ; *semi colon*, | *pipe*, ' *single quote*, " *double quote*, + *plus sign*, \* *asterisk*, blank spaces, #



*pound sign, % percent, & ampersand, { left bracket, } right bracket, \$ dollar sign, ! exclamation mark, @ at sign, = equal sign*



### **Project Mix Folder Hierarchy:**

Chart A (shown above) shows a suggested folder hierarchy for a project mix folder. The project mix folder contains all parent song mix folders for the project. A parent song mix folder is created for each song of the project and placed in the project mix folder. There will be one parent mix folder per song. Additional song mix subfolders maybe created and placed inside each parent song folder in order to organize multiple audio file sample rates for each song.

All folders should follow a similar naming convention as shown above. This folder name contains the artist identifier, the song title, and contents. Since all files in the folder may not have the same sample rate and bit depth, sample rate and bit depth are not notated in the parent folder titles.

Note: Different versions of the same song (i.e. clean or explicit) should be treated as different titles with different parent folders. Along with any new mixes or stems for this version of the song, copies of any identical mixes and/or stems should be copied to that title's parent folder and re-named accordingly.

## **Recommendations for Music Delivery (non-film, non-game specific):**

A standard master mix delivery is considered to include the mix master, vocal up, and the following two stems, instruments only and no lead vocal. In the event a mix is recalled, it would be considered a new delivery thusly a new set of mix versions should be created.

### Recommended Mix Versions for delivery:

AA\_SongTitle\_MixMaster

AA\_SongTitle\_VocUp

\*AA\_Songtitle\_InstOnly      This stem would be the same as the mix master excluding all lead, harmony and background vocals.

\*AA\_SongTitle\_NoLdVoc      This stem would be the same as the mix master excluding any harmony or background vocals. Traditional called TV Track.

\*AA\_Songtitle\_LdVocOnly      This stem would be the same as the mix master but would only include the lead vocal with all eq, compression and fx.

\*AA\_SongTitle\_BgvOnly      This stem would be the same as the mix master but would only include the background vocals with all eq, compression and fx.

Some refer to the lead vocal only and the background vocals only as a cappella stems. These stems are normally used by the mix engineer to address vocal level changes to the mix when the client is not able to recall the mix.

## **Recommendations for Music Delivery (non-film, non-game specific) cont.**

Mix stems are NOT considered to be a part of standard mix delivery, but in some cases are requested. If a definitive stem set is not specified, then the following generic stem set may be used.

### Recommended Stem Versions:

AA\_SongTitle\_LdVocWet      Wet - with effects i.e. reverb, delay, modulation, etc

AA\_SongTitle\_BgvWet      Wet - with effects i.e. reverb, delay, modulation, etc

AA\_SongTitle\_Drums      All instruments, acoustic, electric and programmed, that make up the essential "drum" groove.

AA\_SongTitle\_AuxPerc      All other percussion instruments, loops, etc that enhance the primary groove.

AA_SongTitle_Bass	All instruments, acoustic, electric and programmed, that make up the essential “bass” part.
AA_SongTitle_EGtrs	All electric guitars**
AA_SongTitle_AGtrs	All acoustic guitars**
AA_SongTitle_Keys	All acoustic keyboard instruments

Additional specialty instrument stems maybe done depending on genre and program material. Below are some examples of specialty stems.

AA_SongTitle_Strings	All strings acoustic and programmed
AA_SongTitle_Brass	All brass and wind instruments acoustic and programmed
AA_SongTitle_SFX	Any sound effects; dialog, sound bites of speeches, etc.

\* Though technically Stems, many consider these to be standard required delivery mix versions.

\*\* can be combined into one stem \_Gtrs

## Glossary of Technical Terms

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**32 / 44.1 / 48 / 88.2 / 96 / 176.4 / 192 / 352.8 / 384kHz** – Refers to the sample rate of a PCM digital signal or recording (samples per second).

**16 bit / 24 bit / 32 bit** – Refers to the data bit *width* (sometimes called bit depth), or precision of a PCM digital signal (or recording).

**AIFF** – Audio Interchange File Format. A computer filetype that contains digital audio data. Notably, the AIFF format does not support time stamping.

**Blu-Ray** – An optical disk technology that utilizes a short-wavelength (hence, “blue”) laser to write and read, allowing far greater amounts of data to be reliably stored.

**Broadcast Wave File** – A computer file type which contains, among other items, digital audio data. The AES31-2 Broadcast Wave File format originated as an EBU (European Broadcast Union) specification whose data format is based on the Microsoft RIFF wave format but carrying additional metadata including a unique identifier and high-precision time reference. Technical specifications are available at [www.aes.org/publications/standards/search.cfm?docID=31](http://www.aes.org/publications/standards/search.cfm?docID=31).

**BWF** – Broadcast Wave Format. Same as above.

**B-Wave** – Broadcast Wave Format. Same as above.

**CD** – Compact Disc. 5.25 inch Optical storage medium that allows storage of either 74 min./650 MB or 80 min./700 MB of information.

**CD-R** – Compact Disc, recordable *one time*. The CD-R is 5.25-inch optical media with same storage capability as CD.

**CD – RW** – Compact Disc Recordable/Writable. 5.25-inch Compact Disc format that may be written to, erased, and re-written many times.

**Channel** – one indivisible “stream” of audio. “One” channel would refer to a mono source, “two” channels might refer to a stereo source, 6 channels (and perhaps more) could refer to a “Surround” source.

**Consolidate (as it refers to audio files)** – The process of taking the constituent audio files with edits & etc for a single track (“vocal”, “guitar” & etc) and combining them into *one continuous file*.

**DAW** – Digital Audio Workstation. ProTools, Nuendo, Digital Performer, Emagic Logic, Sonic Solutions, SADiE & etc.

**Deliverables** – Materials turned into the Record Label upon completion of a project. Refers to all media and documentation. NARAS Master Delivery Specifications set a Minimum and Recommended set of delivery requirements.

**DVD** – Digital Versatile Disc - 5.25 inch Optical storage format that allows for storage of 4.7 GB for single sided media and 9.4 GB for double-sided media. There are many types of consumer DVD's (e.g., the well-known DVD-Video, and more recently DVD-A, which provides multiple formats including 5.1, or surround, audio) and personal computer formats (DVD-R, DVD-RW, DVD+RW, DVD-RAM), some of which are not compatible with certain players.

**Enterprise-Class Storage Media** – Media types that are in use by large corporations (Fortune 500, etc.). These storage types include LTO.

**FAT32** – Logical disk format method used by Windows-compatible machines and most others. Directly compatible with AES31-1-2001, "AES standard for network and file transfer of audio - Audio-file transfer and exchange Part 1: Disk format.

**Firewire Drive** – Hard disk utilizing an IEEE1394/**Firewire** physical interface and typically composed of a Firewire to IDE bridge chip and, inside the box, most often an IDE/EIDE drive.

**Flatten (Audio Files)** – Refers to the process of taking audio files used on a Digital Audio Workstation and converting them into one continuous file for each track. Also referred to as “Consolidation” (see above).

**HDD** – Hard Disk Drive.

**Linux / Unix <tar>** – Logical format originally developed for archival of files on Unix Machines. tar is an acronym for “Tape Archive”. tar format is accepted as a universal and open-source logical storage format. It is *most often* used with streaming tape physical media.

**LTO** – Linear Tape Open. Magnetic Tape Format co-developed by Hewlett-Packard, Seagate and IBM. Multiple vendors for both drives and media.

**Master** – A “Master” is defined as a collection of the various original components of the recording process for a given production; each in their originally recorded formats, and collected in a form that is ready for transition to the *next phase* of the process. (For example, the ‘Master’ from the tracking process is collected in a form that is ready for transition to the overdubbing process. The ‘Master’ from the overdubbing process is then prepared for the mixing process. The mixed ‘Master’ is in a form that is ready for transition to the mastering process. And so on; e.g, the *mastered* ‘Master’ is ready for transition to the manufacturing process (where, presumably, other ‘Masters’ may prevail).

"Masters" include (but are not limited to) all analog master tapes, hard disks, optical media, and all backups in turn made of *these* during the recording process. The Masters include all of the various original components of the recording process for a given production in each of their originally recorded formats. These ‘Masters’ should have no deletions of useful material (out-takes, artist talking, incomplete or unreleased recordings, etc.). The constitution of “useful material” is determined by agreement between Record Company and Producer prior to the commencement of the recording project.

**Metadata** - Metadata is data (or “information”) about data or other information.

**MO** – Magneto-Optical. Storage method which uses an optical laser and a magnetic field to record data on an optical disk.

**Optical Storage Media** – Understood as recordable media which consists of several materials, one of which is heated with a laser to allow absorption (instead of reflection) to expose the ‘pits’ in the material which, when read by a laser, can be interpreted as data. CD-R, CD-RW DVD-R, DVD-RW & etc.

**PCM** – Pulse Code Modulation that refers to an encoding process used when converting analog audio to a binary digital file that may be written in a variety of formats.

**PDF** – Portable Document Format. An Adobe product standard that generalizes document format; it allows the same document format to be created on, and

transferred between many different types of computers.

**PHDD** – Proprietary Hard Disk Drive.

**Positional Reference** – Timing reference used during the recording/ overdub/ mixing process used to synchronize devices and mix automation.

**SACD** – Super Audio Compact Disc. 5.25 inch optical format utilizing Direct Stream Digital (DSD) technology to record and play music with a “single-bit” running at a high sampling frequency (2.8224 MHz).

**SDII** – Sound Designer II. Used to refer to a type of audio data file originally developed by Digidesign. Limited to a maximum sample rate of 48kHz. Not recommended for any use.

**Time Code** – The most common type of Positional Reference, usually refers to SMPTE time code (developed by the Society of Motion Picture and Television Engineers). The number (30, 29.97, 29.97drop-frame, 25, 24) specifies the timecode reference in number in frames per second.

**Track** – “Track”, for the purpose of audio storage, is a place where elements of program (music & etc) material are put. Meanings abound, however...

Track (n.): Originally, in analog tape recording, a term synonymous with one channel of content. An Ampex 301 3-track recorder had the capability of 3 separate channels of audio.

Track (n.): (proposed modern definition for audio recording) A unique, irreducible element in the context of a “production”. A modern “track” may contain one or more channels of program material (e.g., the “lead vocal track” would most often be a single-channel track, whereas the “live room track” recorded on a DAW in surround, may have 4 or more “channels” of audio). Tracks might also include, or even be limited to, MIDI or sequencing data.

The word “Track” has various additional meanings in and around music and production.

Track (n.): One individual selection on a CD or an “LP” or etc.

Track (v.): The process of recording. (example, “to track a session”)

Track (v.): Logistically, to locate. (example, “can you track down a drummer who can play in tempo?”)

## Appendix 1.

### Recommendation for Delivery of Recorded Music Projects (Including Stems and Mix Naming Conventions)

#### Introduction

The use of digital technology and the availability of powerful yet relatively inexpensive computing hardware and software has exponentially expanded both the scope and variety of creative tools used in the recording process. However, the continued evolution and even consequent obsolescence of these very tools increasingly threatens our ability to revisit the original master tracks, even in the short-run.

With this in mind, Nashville members of the P&E Wing of The Recording Academy® formed a Delivery Specifications Committee, which has created The Delivery Recommendations for Master Recordings document. This is a concise yet expansive document containing guidelines for both short-term (transitional) and long-term (archival) storage of master recordings, which are the very essence of the recording artist's work and the core of the record industry's asset base. It is essential that all concerned - producers, engineers, artists, record labels and manufacturers - work together to ensure that these often-irreplaceable artistic historical assets are preserved.

The document includes a "snapshot" of the formats most widely in use today. It will maintain its relevance with bi-annual updates by the Delivery Specifications Committee, which will gather in open meetings to discuss new formats and technologies as they evolve, and to note expiring technologies and materials at risk. The Delivery Recommendation document stresses the importance of documentation and creating documentation in machine-readable formats ready for "ingestion" into data farms. There is little agreement at this time as to the format of the documentation; it is nonetheless critical to notate the recording project in detail, and we provide some examples of a starting point.

It is vitally important to address these issues now, as professional recording formats have never before been subject to such an accelerated rate of obsolescence.



Kyle Lehning



George Massenburg

Delivery Specifications Committee Co-Chairs  
The Producers & Engineers Wing of the Recording Academy and the AES  
Technical Committee on Studio Practices and Production  
September 30, 2003

Appendix 2.

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