

The TASA Standard

Recommendations from the TASA Ad Hoc Committee
for regulating motion picture trailer audio volume.

INTRODUCTION

With the advent of stereo and multi-channel digital trailers, loud trailer sound became the number one complaint in movie theatres. Trailers were far louder than the features they preceded, and theatres compensated by turning down the volume of the trailers and thus features. To solve this problem, the TASA AD HOC COMMITTEE created a STANDARD for trailer volume to rectify the situation. It should be noted that the TASA Committee believes the complexity of the problem is such that any “Solution” must be tried and proven in the field; the procedures may be imperfect at first due to the complexity of the problem. The actual “number” or “upper volume limit” may be adjusted periodically as experience in the field demands.

Since the original implementation of the TASA Standard in 1999, the measurement procedures described herein have been adopted as an International Standard.

The standard is divided into five sections and an annex:

- 1) **MEASURING TECHNIQUES.** This section defines in engineering terms the techniques used to quantify trailer volume into useful units of measurement.
- 2) **THE NUMERICAL UPPER LIMIT.** This is the actual “number” or upper volume limit that trailers should not exceed using the measuring techniques set forth in section 1.

- 3) **THE TASA CERTIFICATE.** This section outlines the *modus operandi* for independent audio engineering firms to “certify” trailers that satisfy the TASA Standard.
- 4) **INDEPENDENT AUDIO ENGINEERING COMPANY QUALIFICATIONS.** This section details the qualifications that independent audio engineering companies must have in order to issue TASA Certificates.
- 5) **POST RELEASE BLIND PRINT CHECKING.** This section outlines the recommended procedures for blind field checks to insure compliance by all parties participating in the TASA Standard.

INFORMATIVE ANNEX: DUB STAGE AND OPTICAL CAMERA RECOMMENDED PRACTICES. This section details the recommended procedures to be followed at the dub stages and at the optical camera.

PART ONE: MEASURING TECHNIQUES

Recommended Practice: Method of Measurement for Equivalent Perceptual Loudness of Motion Picture Soundtracks.

1.1 SCOPE:

“The Method of Measurement for Equivalent Perceptual Loudness of Motion Picture Soundtracks” is a system for producing a NUMBER that relates to the perceptual loudness of motion picture soundtracks. The number produced can be used to quantify and regulate the maximum audio volume of motion picture trailers.

1.2 DEFINITIONS:

DFFS: Distribution Format Sound System.

Frequency weighting equalizer: a device having a frequency response that makes the system correspond with perceived loudness, roughly accounting for the frequency response of human hearing.

Frequency response: the amplitude response of a system as a function of input frequency, usually rated in decibels over a frequency range.

Pink noise: random, stochastic signal having a continuous spectrum with equal energy per equal logarithmic intervals of frequency, and with Gaussian probability distribution of instantaneous amplitude.

Sound Equivalent Level: the average amplitude of sound measured over an interval of time, calculated according to the equation in section 1.4.3.

Trailers: previews of coming attractions presented prior to a feature film in a motion picture theatre.

1.3 REFERENCES:

Relative and Absolute Sound Pressure Levels for Motion Picture Multi-channel Sound Systems – SMPTE Recommended Practice – RP200 – A12.004 – 1690

“Are Movies too Loud?” – Ioan Allen, SMPTE Journal (March 22nd 1997)

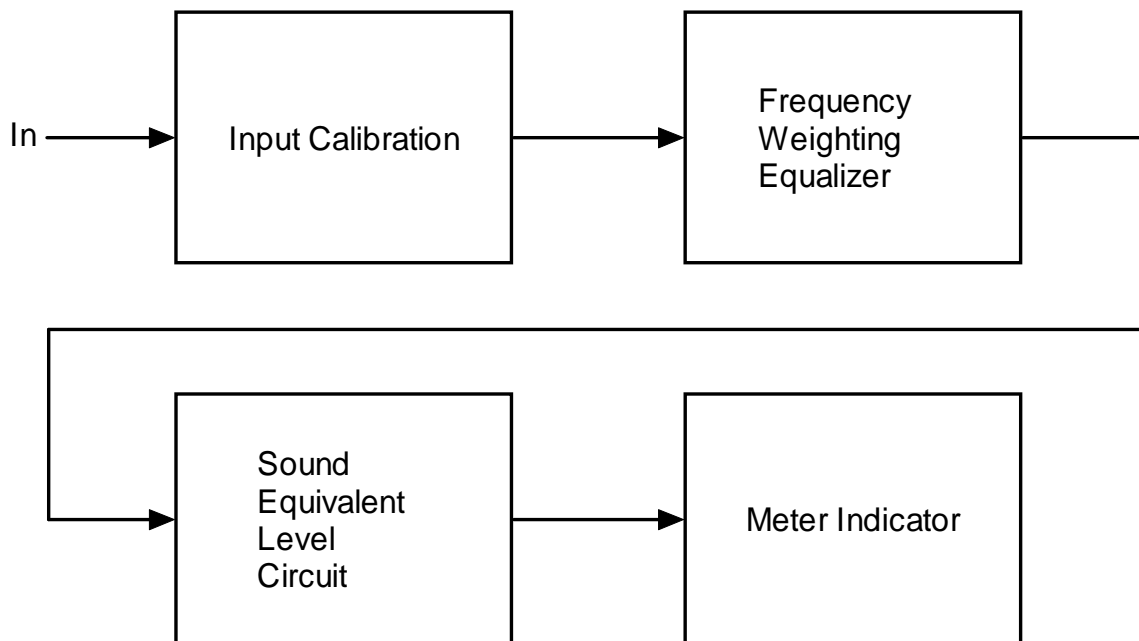
British Standard BS 5550 – 7.4.2:2000 Specification for maximum recording levels for commercials and trailers.

ISO 21727 Cinematography – Method of measurement of perceived loudness of motion-picture audio material.

1.4 METHOD OF MEASUREMENT

The method of measurement shall be as described by the block diagram given below, with an Input Calibration section, a Frequency Weighting Equalizer to better correspond to human hearing response than un-weighted measurements, a Sound Equivalent Level section for assessing the cumulative effect of the energy of the sound level over the time interval of the program, and a Meter Indicator. The elements of the block diagram are further defined in sections 1.4.1 – 1.4.4. The measurement interval, and the accuracy and precision of measurements are given in sections 1.4.5 – 1.4.6.

Other methods of measurement are permissible so long as the results are equivalent to those specified herein within the required accuracy of section 1.4.6.



Block Diagram of Method of Measurement

1.4.1 INPUT CALIBRATION

The input calibration section shall scale an input voltage, defined for each of the Distribution Format Sound Systems (DFSS), to a voltage that corresponds to a reference Sound Pressure Level. Each DFSS shall provide calibration information and test materials, such as test films or discs, to Independent Audio Engineering Companies in order to make possible independent verification of soundtrack level on any trailer.

For example, using SMPTE Standards, -20 dBFS on a digital medium represents the reference level. A DFSS may produce $+4$ dBu at -20 dBFS, and may be designed so that such an electrical reference level produces 85 dBC Sound Pressure Level re: $20 \mu\text{Pa}$ for each channel.

For multi-channel sound, each of the source channels shall be electrically summed in the correct proportion to the Sound Pressure Level calibration of the individual channels. For example, if the surround level is calibrated at 82 dBC for each channel rather than 85 dB given in the example above, the contribution of each surround channel to the sum shall be 3 dB less than a screen channel.

To prevent differences between electrical addition (vector) and acoustical addition in the reverberant field of a room (scalar), each of the channels shall employ a separate detector circuit, and the output of each of the detector circuits shall be added.

1.4.2 FREQUENCY RESPONSE AND TOLERANCE OF FREQUENCY WEIGHTING EQUALIZER

The frequency weighting equalizer is based on an International Telecommunications Union recommended filter for the assessment of background noise in audio programs. This filter (more accurately, equalizer) has also been found to be useful for the purpose of assessing the human response to the loudness of soundtracks. The frequency

response of the equalizer, and the tolerance on the response, is given in the following table:

<i>Frequency in Hz</i>	<i>Response in dB</i>	<i>Tolerance in dB</i>
31	-35.5	± 2.0
63	-29.5	± 1.4
100	-25.4	± 1.0
200	-19.4	± 0.85
400	-13.4	± 0.7
800	-7.5	± 0.55
1000	-5.6	± 0.5
2000	0.0	± 0.5
3150	3.4	± 0.5
4000	4.9	± 0.5
5000	6.1	± 0.5
6300	6.6	± 0.0
7100	6.4	± 0.2
8000	5.8	± 0.4
9000	4.5	± 0.6
10000	2.5	± 0.8
12500	-5.6	± 1.2
14000	-10.9	± 1.4
16000	-17.3	± 1.65
20000	-27.8	± 2.0
31500	-48.3	$+ 2.8, -\infty$

Note that for the purposes of insertion gain, the frequency 2.0 kHz is used for the 0 dB reference level. For the purposes of tolerance, the insertion gain is to be adjusted at the reference frequency of 6.3 kHz to 6.6 dB,

since this is the center frequency of the boost in the equalizer. If a 1 kHz reference frequency is used, levels shall be offset by 5.6 dB, as shown in the table.

1.4.3 SOUND EQUIVALENT LEVEL

The Sound Equivalent Level shall be calculated according to the following:

$$L_{eqM} = 10 \log_{10} \left(\frac{1}{n} \sum_{i=1}^n 10^{\frac{L_i}{10}} \right)$$

where L_{eq} is the Sound Equivalent Level in decibels, with M indicating the use of the frequency weighting given above, n is the number of seconds in the total time interval, and L_i is given by:

$$L_i = 10 \log_{10} \left(\frac{1}{n} \sum_{i=1}^n \frac{p_i^2, \text{meas}}{p_i^2, \text{ref}} \right)$$

where n is the number of instantaneous pressures measured over 1 second, p_i^2 is the instantaneous sound pressure, measured (*meas*) or reference (*ref*) as given, and the period over which p_i is averaged is 1 second. The reference Sound Pressure Level is 20 μPa .

Note that the Sound Equivalent Level is measured in the electrical domain using the calibration supplied by the Input Calibration section.

1.4.4 METER INDICATION

The meter indication shall be the result of the frequency weighting equalizer and the sound equivalent level circuit, with scaling to represent the acoustical Sound Pressure Level which the program material would produce when playing the test material specified in the next paragraph at the Standard Fader Setting over a sound system calibrated to the standard of the DFSS in use.

The frequency response of theatrical sound systems, the B-chain response, specified in SMPTE 202, is deliberately not to be accounted for in this method of measurement. The X curve response is not to be a part of the frequency weighting equalizer.

Note: Acoustical rather than electrical summation of the channels, and the fact that the X curve is not accounted for in the electrical measurement described herein, will probably make the electrical based measurement described in this method of measurement different from the reading of a Sound Level Meter - even if one were to be equipped with the frequency equalizer specified herein and made to measure Leq_M . In addition, variations from room to room, including seat location selection, would make Sound Level Meter measurements unreliable.

1.4.5 MEASUREMENT INTERVAL

The length of the measurement in time shall correspond ± 3 seconds to the length of the audio program material. In practice, the start button of the measuring device shall be pushed within 3 seconds of the first audio heard by the audience. The stop button shall be pushed within 3 seconds of the final audio heard by the audience. The measurement does not stop during any silences within the body of the trailer. The measurement does not start with the academy leader, the green card or any other visual or footage reference; the only section to be measured for this standard is the section between the 1st audio heard, plus or minus 3 seconds, and the final audio heard, plus or minus 3 seconds.

Any material measured using these procedures with a duration of 30 seconds or less shall be measured to within ± 1 second of the length of the program. In other words, the start button of the measuring device shall be pushed within 1 second of the first audio, and the stop button shall be pushed within 1 second of the final audio.

1.4.6 ACCURACY AND PRECISION OF MEASUREMENT

Independent Audio Engineering Companies that measure trailers to check for TASA compliance (See Parts 3 and 4), shall maintain the accuracy of the measurement procedure to within ± 0.3 dB. This tolerance on accuracy shall include a summation of all sources of error, including, but not limited to: input calibration error, insertion gain, error in the frequency weighting filter or elsewhere, calculation of the sound equivalent level, and meter indication. Independent Audio Engineering Companies shall not be responsible for the accuracy errors that occur due to calibration error on the part of the Distribution Format Sound Systems, which shall be maintained by the manufacturers of the various sound systems, including variations due to hardware and software upgrades.

The precision considered in a pass/fail response shall be to the nearest 1 dB. The Independent Audio Engineering Companies may maintain internal records to greater precision.

PART TWO: THE NUMERICAL UPPER LIMIT

2.1 A FLEXIBLE NUMBER

Any volume standard for trailers must take into account feature volume as well as playback habits of theatres in order to be effective. Establishing a standard will have an element of trial and error in the field, and may not be achievable in a single precipitous drop in trailer volume. It may be prudent to take several conservative drops in volume over the course of several months in order to reach a desirable level without accidentally “overshooting” and making the trailers too low. To this end, the TASA Ad Hoc Committee meets periodically to determine whether or not the standard requires revision.

PART THREE: THE TASA CERTIFICATE

3.1 “COMPLIANCE” REQUIRES A TASA CERTIFICATE

The upper volume limit established by TASA can be adhered to on the dub stage and on the optical track negative, (or other theatrical release medium), but full TASA compliance requires that an “Independent Audio Engineering Company” (an “I.A.E.”) measure either a composite print or a soundtrack-only print of the trailer, using the measuring techniques and upper limit guidelines established in Parts 1 and 2 of the TASA Standard. If the mix passes the TASA Standard, the Independent Audio Engineering Company will issue a “TASA Certificate of Compliance”. Only when the I.A.E. has issued the TASA Certificate will the trailer have satisfied the TASA Standard.

3.2 I.A.E. CERTIFICATION

Independent Audio Engineering Companies who wish to issue TASA Certificates must apply for Certification by the TASA Committee. Applications should be submitted in writing to the chairperson of the TASA Committee for consideration by the full committee.

3.3 I.A.E. DECERTIFICATION

Independent Audio Engineering Companies can be decertified at any time by the TASA Committee for engineering or administrative failures.

3.4 METER CALIBRATION GRACE

If a trailer fails to pass the TASA Standard at an I.A.E. and the certifying engineer discovers that *unintentional* Leq_M meter mis-calibration on the dub stage was to blame, the certifying engineer may still issue a TASA Certificate. No further certificates may be issued for trailers mixed on that dub stage until the meter is recalibrated.

3.5 TASA CERTIFICATE INFORMATION

The TASA Certificate must include: the name of the I.A.E., the name of the trailer certified, the name of the studio, the date mixed, the dub stage, the Leq_M number measured, the name and signature of the certifying engineer, and any other pertinent information.

PART FOUR: INDEPENDENT AUDIO ENGINEERING COMPANY QUALIFICATIONS

In order to be certified by the TASA Committee, any Independent Audio Engineering Company must meet the following standards:

4.1 The trailer volume measuring work must be performed by, or under the direct management and responsibility of either:

- a) a registered Professional Engineer with a current license from the State of California, or
- b) a recognized audio expert, with recognition consisting of Fellow grade membership in the Audio Engineering Society, the British Kinematograph Sound and Television Society, the Institute of Electrical and Electronics Engineers, or the Society of Motion Picture and Television Engineers, or
- c) any engineer who demonstrates to the TASA Technical Committee proficiency in the measuring techniques described in part one.

4.2 The I.A.E. shall maintain primary standards for rms ac voltage and thus equivalent Sound Pressure Level reference traceable to the National Institute for Standards and Technology. The I.A.E. must maintain the

necessary test equipment to qualify the frequency response of the equalization network, and tone burst generators as required to qualify the time response of the sound equivalent level measurement to within the requirements of the section “Accuracy and Precision of Measurement”. The I.A.E. shall be responsible for the calibration of its own equipment, and for maintaining the accuracy of measurement described in the Standard.

4.3 The I.A.E. shall not be owned in whole or in part by any entity that produces, distributes, or exhibits motion pictures or associated trailers intended for theatrical exhibition. An exception to this rule can be made if the Independent Audio Engineering Company excludes itself from measuring the related company’s product; i.e. if the company is owned by a parent company that produces films on occasion, the I.A.E. must exclude itself from certifying the parent company’s product. The I.A.E. in these circumstances must make its equipment and personnel available to be supervised (at the I.A.E.’s expense) by an engineer approved by the TASA Committee.

4.4 The I.A.E. shall not be owned in whole or in part by any entity that manufactures or distributes a Distribution Format Sound System.

4.5 The I.A.E. shall not be owned in whole or in part by any entity that edits, mixes, or otherwise makes trailers for theatrical feature films. The same exception can be made for this rule as the one for 4.3: The I.A.E. cannot certify product that it or its related company has worked on unless supervised by an engineer approved by the TASA Committee.

4.6 The I.A.E. shall not be owned in whole or in part by any entity that produces soundtrack negatives or prints for trailers for theatrical feature films.

PART FIVE: POST RELEASE BLIND PRINT CHECKING

5.1 The TASA Committee recommends that any studio or entity adopting the TASA STANDARD will in so adopting, be giving the certifying I.A.E. implicit and unconditional permission to pull one print of each trailer at random (from the lab or depot of the studio's choice) for a blind volume check. The I.A.E. will double check the audio volume using the engineering standards set forth in section 1. This will serve to insure full compliance by all parties.

5.2 An I.A.E. performing a post release check on a trailer may issue a notice of TASA noncompliance if the trailer print fails the Standard.

5.2.1 An I.A.E. may also issue a notice of noncompliance if a studio does not make a randomly pulled blind check print available.

5.3 The I.A.E. will forward a copy of the notice of noncompliance to the chair of the TASA Committee, to the studio that released the trailer, and to any other entities that adopt the TASA Standard.

INFORMATIVE ANNEX: DUB STAGE AND OPTICAL CAMERA RECOMMENDED PRACTICES

6.1 Trailers shall be mixed at volume levels that are comfortable to the ear on the dub stage. Care should be taken on dialog levels in particular, such that they do not exceed normal feature film levels.

6.2 Upon completion of a trailer mix, the mixer shall measure the Leq_M . If the resultant number exceeds the recommended upper limit in effect at the time of the mix, the mixer shall remix the trailer to lower the volume until it meets the upper limit or falls below. If the Leq_M number is below the upper limit, the mixer **shall not** raise the volume of the mix solely to meet the upper limit since this would likely result in painfully loud dialog levels.

6.3 Upon completion of the mix, the mixer shall note the Leq_M number into a log to be kept on the dub stage. In addition, the mixer shall fill out a **dub stage report** which lists the trailer mixed, the dub stage, and the Leq_M number measured on the stage. This dub stage report shall be forwarded with a trailer soundtrack-only print, composite print, or other digital audio delivery medium to the I.A.E. for final TASA certification. The reason for the dub stage report is to help the I.A.E. check the calibration on the dub stages. If every mix that gets checked by an I.A.E. comes with a report, then every mix will help confirm that the Leq_M meters are in calibration. This will prevent out- of-calibration meters from being discovered only when a mix fails the TASA Standard.

6.4 Under no circumstance should studios bracket tracks at the optical camera. All sound decisions must be made on the dub stage with the guidance of the sound mixer.

FINAL NOTES

The TASA Ad Hoc Committee is comprised of marketing post production representatives from all of the studios, as well as engineers from the digital sound companies, mixers, and independent audio experts. The TASA Committee does not endorse any one company's product or services. All TASA volume recommendations are recommendations only. The TASA Committee believes the method of measurement described herein is the best available at the time of this writing. If and when better volume assessment techniques are developed, the TASA

Committee may amend the TASA Standard. Any outside agencies that endorse or adopt the TASA Standard may make these recommendations mandatory at their own discretion.