

CTA Bulletin

Home Theater Video Design

CTA/CEDIA-CEB23-B

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(Formulated under the cognizance of the CTA/CEDIA **R10 Residential Systems Committee**.)

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Foreword

CTA/CEDIA-CEB23-B Home Theater Video Design was created by CTA/CEDIA R10 Residential Systems Committee.

CTA/CEDIA-CEB23-B provides a recommended approach to theater installation and performance objectives outlined with recommendations for the design of high-performance home theaters that meet or exceed the commercial experience.

To meet those objectives, CTA/CEDIA-CEB23-B describes:

- Optimized Room layout and environment/system design
- Image performance objectives/specifications
- Recommended practices for image evaluation and calibration
- Compliance with international video standards and digital rights management

CEDIA and its certified Electronic Systems Contractors (ESCs) follow these practices, where applicable, to deliver high value to dedicated home theater environments, helping ensure full performance potential for the equipment and the room.

A cinematic experience is at its simplest definition an experience causing participants to feel as if they were watching a Digital Cinema Projector in a commercial movie theater. Commercial movie theaters are designed as an environment that supports, without distraction, creative storytelling using motion cinema as its medium. Anything that introduces or creates visual distractions is likely to erode the feeling of being in a cinema. Unlike projection screens used in meeting rooms, schools or sports bars, home cinema screens should display a projected image without themselves becoming a noticeable part of the viewing environment.

It should be noted that there is a significant difference between a dedicated theater and a multi-purpose media room. By definition, a dedicated theater is designed for only one purpose: watching movies and television. In contrast, a multi-purpose media room is designed not only for watching movies and television but also as a space used for entertainment.

Although a properly completed home theater provides the best quality video experience, many principles within CTA/CEDIA-CEB23-B are relevant to all levels of video. Thus, whether completing the ultimate home cinema or a setting up a simple flat panel on a wall, utilizing these principles can enhance the viewer's experience.

Revision History

1. Included additional illustrated graphics for examples of possible variations for client preferences for viewing distance to help further clarify that viewing distances in a Custom Home Theater are to be determined during client interviews to determine the client's seating preferences in commercial cinema environments.
2. Included coverage and technical explanations of Gamma evolving into E.O.T.F. in 2011 as defined by the ITU.BT1886 document.
3. Added in design for update capability so a system will respond to Metadata enabling new Color Gamuts, HDMI 2.0a specification for the capability for multiple HDR EOTFs - and other upcoming UHD TV features.
4. Added physical system design features that will enable ease of updating interconnects to insure compliance to the scheduled evolution of connectivity in both the 4K and 8K era.
5. Altered the contrast ratio previously specified with the following two changes:
 - a. Changed the video test pattern to a 4 x 4 checkerboard to follow other recently published documents by ANSI/InfoComm.
 - b. Added in a "Minimum" acceptable target contrast ratio of "at least 100:1 Intraframe and 1200:1 Sequential" plus the current "High End Theater" recommendation of the "ideal minimum of 150:1 Intraframe and 200:1 Sequential".
6. Included a recommendation for color uniformity.
7. Added color accuracy targets for compliance to content creation standards.
8. Included HDCP 2.2 compliance and testing to the recommendation on interconnects.
9. Eliminated the recommendation for legacy analog connectivity.
10. Under "Aspect Ratios and Masking" added "Digital Video Processing" as another option for changing the shape of the projected image.

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Home Theater Video Design

1. Introduction

Home theater rooms are gathering spaces with one main purpose: watching movies. These rooms can also have other uses like listening to and performing music, entertaining, gaming, or simply lounging. *Home Theater Video Design* provides the parameters for the proper design of a home theater that meets relevant industry guidelines. Additionally, these practices ensure that a home theater supports other multi-media uses such as music, gaming, photo viewing, web browsing, and broadcast TV.

Whether used as a dedicated space or a multi-purpose space, a properly executed home theater should be able to faithfully reproduce the picture and sound content. That's because the film director and the entire crew working alongside the director carefully craft the content to create an emotionally engaging story that can transport the audience to faraway lands in faraway times. Therefore, it is important that the professionals who deliver the home theater experience be aware of the precise set of video and audio standards by which film content is created. The best way to ensure that an ESC's projects are successful and that customers are satisfied is simply adhering to movie technical production standards.

When designing a home theater, many factors come into play. Several are interdependent and interactive, and the design process will invariably be iterative. Every step will need to be revisited and altered, continuing around the circle of decision points multiple times until the work is finished. Strive for the ideal, but some compromises – in the name of space, layout, safety, aesthetics, and results of customer interviews – are inevitable. For example, the picture screen and front speakers will compete for space since they need to be in the same location. Of the several ways to deal with that issue, some yield better overall results than others. Ultimately, the best sounding and best looking home theater experience is the one with the most intelligent set of compromises!

2. References

2.1 Informative Reference

The following references contain provisions that, through reference in this text, constitute informative provisions of this bulletin. At the time of publication, the edition indicated was valid. All publications and documents are subject to revision, and parties to agreements based on this bulletin are encouraged to investigate the possibility of applying the most recent edition of the publication and document indicated below.

2.1.1 Informative Reference List

1. CTA/CEDIA-CEB22 *Home Theater Recommended Practice: Audio Design*, March 2009
2. CEDIA Electronic Systems Technical Reference Manual, Second Edition (2012)
3. CIE 1931 XYZ *Color Space*, International Commission on Illumination (CIE)
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12. Digital Cinema Initiatives, LLC - Digital Cinema Systems Specification version 1.2, and 3D Specification updates 2015
13. A Case for Redundant Array of Inexpensive Disks (RAID)," David A Patterson, Garth Gibson, and Randy H Katz, University of California, Berkley Department of Electrical Engineering and Computer Sciences, 1988

2.2 Informative Reference Acquisition

1. CTA standards and bulletins:
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