

ANSI/CTA Standard

**Standard Method of Measurement for Digital
Versatile Disc-Video Players**

ANSI/CTA-896-A R-2010

(Formerly ANSI/CEA-896-A R-2010)

December 2002



**Consumer
Technology
Association**

NOTICE

Consumer Technology Association (CTA)TM Standards, Bulletins and other technical publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for his particular need. Existence of such Standards, Bulletins and other technical publications shall not in any respect preclude any member or nonmember of the Consumer Technology Association from manufacturing or selling products not conforming to such Standards, Bulletins or other technical publications, nor shall the existence of such Standards, Bulletins and other technical publications preclude their voluntary use by those other than Consumer Technology Association members, whether the standard is to be used either domestically or internationally.

Standards, Bulletins and other technical publications are adopted by the Consumer Technology Association in accordance with the American National Standards Institute (ANSI) patent policy. By such action, the Consumer Technology Association does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the Standard, Bulletin or other technical publication.

This document does not purport to address all safety problems associated with its use or all applicable regulatory requirements. It is the responsibility of the user of this document to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before its use.

This document is copyrighted by the Consumer Technology Association and may not be reproduced, in whole or part, without written permission. Federal copyright law prohibits unauthorized reproduction of this document by any means. Organizations may obtain permission to reproduce a limited number of copies by entering into a license agreement. Requests to reproduce text, data, charts, figures or other material should be made to the Consumer Technology Association.

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

Published by
©CONSUMER TECHNOLOGY ASSOCIATION 2015
Technology & Standards Department
www.CTA.tech

All rights reserved

FOREWORD

This standard was developed under the auspices of the Recording and Imaging Subcommittee of the Consumer Electronics Association's Video Systems Committee, and is now maintained by the joint CEA and Custom Electronic Design & Installation Association (CEDIA) R10 Residential Systems Committee.

CONTENTS

1 SCOPE	1
2 REFERENCES	1
2.1 Normative References	1
2.1.1 Normative Reference List.....	1
2.1.2 Normative Reference Acquisition	1
2.2 Informative References	2
2.2.1 Informative Reference List.....	2
2.2.2 Informative Reference Acquisition.....	2
2.3 Definitions	3
2.4 Symbols and Abbreviations	4
2.5 Compliance Notation	5
3 STANDARD TEST CONDITIONS	6
3.1 Power Supply Requirements.....	6
3.2 Environmental Conditions.....	6
3.3 Equipment Preconditioning.....	6
3.4 Test Signals.....	6
3.5 DVD Player Video Output Options	6
3.6 Audio Signal Levels.....	6
3.7 Standard Load Impedance.....	7
4 OUTPUT RESISTANCE MEASUREMENTS	8
4.1 Video Output Resistance	8
4.1.1 Measuring system block diagram	8
4.1.2 Test pattern definition	8
4.1.3 Measurement Method.....	8
4.1.4 Reporting Method	10
4.2 Audio Output Resistance	10
4.2.1 Measuring system block diagram	10
4.2.2 Test Signals.....	10
4.2.3 Measurement Method.....	10
4.2.4 Reporting Method	12
5 VIDEO TESTS AND RATINGS	13
5.1 SMPTE Bars	13
5.1.1 Measuring system block diagram	13
5.1.2 Test pattern definition	13
5.1.3 Measurement method.....	15
5.1.4 Reporting method	15
5.2 Color Accuracy	15
5.2.1 Measuring system block diagram	15
5.2.2 Test pattern definition	15
5.2.3 Measurement method.....	16
5.2.4 Reporting method	17
5.3 Color Burst Measurements	17
5.3.1 Measurement system block diagram	18
5.3.2 Test pattern definition	18
5.3.3 Measurement method.....	18
5.3.4 Reporting method	18
5.4 Composite Sync Measurements	18
5.4.1 Measurement system block diagram	19
5.4.2 Test pattern definition	19
5.4.3 Measurement method.....	19

5.4.4 Reporting method	19
5.5 Component Sync Measurements	19
5.5.1 Measurement system block diagram	20
5.5.2 Test pattern definition	20
5.5.3 Measurement method	20
5.5.4 Reporting method	20
5.6 Chroma Noise Measurements	20
5.6.1 Measuring system block diagram	20
5.6.2 Test pattern definition	21
5.6.3 Measurement method	21
5.6.4 Reporting method	22
5.7 Flat Field Analysis	22
5.7.1 Measuring system block diagram	22
5.7.2 Test pattern definition	22
5.7.3 Measurement method	22
5.7.4 Reporting method	22
5.8 100 IRE White Field Analysis	23
5.8.1 Measuring system block diagram	23
5.8.2 Test pattern definition	23
5.8.3 Measurement method	23
5.8.4 Reporting method	24
5.9 Gray Fields 10 to 90 IRE	24
5.9.1 Measuring system block diagram	24
5.9.2 Test pattern definition	25
5.9.3 Measurement method	25
5.9.4 Reporting method	25
5.10 0 IRE Black Field	25
5.10.1 Measuring system block diagram	25
5.10.2 Test pattern definition	26
5.10.3 Measurement method	26
5.10.4 Reporting method	26
5.11 Luminance Sweep	26
5.11.1 Measuring system block diagram	26
5.11.2 Test pattern definition	27
5.11.3 Measurement method	27
5.11.4 Reporting method	27
5.12 Multiburst Luminance	27
5.12.1 Measuring system block diagram	28
5.12.2 Test pattern definition	28
5.12.3 Measurement method	29
5.12.4 Reporting method	29
5.13 Component Sweep	29
5.13.1 Measuring system block diagram	30
5.13.2 Test pattern definition	30
5.13.3 Measurement method	30
5.13.4 Reporting method	30
5.14 Multiburst Component	31
5.14.1 Measuring system block diagram	31
5.14.2 Test pattern definition	32
5.14.3 Measurement method	32
5.14.4 Reporting method	32
5.15 EIA Resolution Chart	33
5.15.1 Measuring system block diagram	33
5.15.2 Test pattern definition	33

5.15.3 Measurement method.....	34
5.15.4 Reporting method.....	34
5.16 Pixel Resolution.....	34
5.16.1 Measuring system block diagram.....	35
5.16.2 Test pattern definition.....	35
5.16.3 Measurement method.....	35
5.16.4 Reporting method.....	36
5.17 Moving TVL Pattern.....	36
5.17.1 Measuring system block diagram.....	36
5.17.2 Test pattern definition.....	36
5.17.3 Measurement method.....	37
5.17.4 Reporting method.....	37
5.18 Labeled Sweep Chart.....	38
5.18.1 Measuring system block diagram.....	38
5.18.2 Test pattern definition.....	38
5.18.3 Measurement method.....	38
5.18.4 Reporting method.....	39
5.19 Comparative Resolution – Black On White.....	39
5.19.1 Measuring system block diagram.....	39
5.19.2 Test pattern definition.....	39
5.19.3 Measurement method.....	40
5.19.4 Reporting method.....	40
5.20 Comparative Resolution – White On Black.....	40
5.20.1 Measuring system block diagram.....	40
5.20.2 Test pattern definition.....	41
5.20.3 Measurement method.....	41
5.20.4 Reporting method.....	41
5.21 Simultaneous All Channel Ramp.....	41
5.21.1 Measuring system block diagram.....	42
5.21.2 Test pattern definition.....	42
5.21.3 Measurement method.....	42
5.21.4 Reporting method.....	42
5.22 All Channel Shallow Ramp.....	43
5.22.1 Measuring system block diagram.....	43
5.22.2 Test pattern definition.....	43
5.22.3 Measurement method.....	44
5.22.4 Reporting method.....	44
5.23 All Channel Shallow Ramp Matrix.....	44
5.23.1 Measuring system block diagram.....	44
5.23.2 Test pattern definition.....	44
5.23.3 Measurement method.....	45
5.23.4 Reporting method.....	45
5.24 Y Valid Ramp.....	46
5.24.1 Measuring system block diagram.....	46
5.24.2 Test pattern definition.....	46
5.24.3 Measurement method.....	47
5.24.4 Reporting method.....	47
5.25 Each Channel LSB Ramp.....	47
5.25.1 Measuring system block diagram.....	47
5.25.2 Test pattern definition.....	47
5.25.3 Measurement method.....	48
5.25.4 Reporting method.....	48
5.26 10-Step Component.....	48
5.26.1 Measuring system block diagram.....	49

5.26.2 Test pattern definition	49
5.26.3 Measurement method.....	49
5.26.4 Reporting method	49
5.27 10-Step Luminance.....	50
5.27.1 Measuring system block diagram	50
5.27.2 Test pattern definition	50
5.27.3 Measurement method.....	51
5.27.4 Reporting method	51
5.28 Modulated Ramp.....	51
5.28.1 Measuring system block diagram	52
5.28.2 Test pattern definition	52
5.28.3 Measurement method.....	52
5.28.4 Reporting method	52
5.29 Contrast Box Negative	53
5.29.1 Measuring system block diagram	53
5.29.2 Test pattern definition	53
5.29.3 Measurement method.....	53
5.29.4 Reporting method	54
5.30 Checkerboard.....	55
5.30.1 Measuring system block diagram	55
5.30.2 Test pattern definition	55
5.30.3 Measurement method.....	55
5.30.4 Reporting method	55
5.31 Matrix	56
5.31.1 Measuring system block diagram	56
5.31.2 Test pattern definition	56
5.31.3 Measurement method.....	57
5.31.4 Reporting method	57
5.32 Luminance Setup.....	60
5.32.1 Measuring system block diagram	60
5.32.2 Test pattern definition	60
5.32.3 Measurement method.....	61
5.32.4 Reporting method	61
5.33 NTC 7 Composite.....	62
5.33.1 Measuring system block diagram	62
5.33.2 Test pattern definition	62
5.33.3 Measurement method.....	63
5.33.4 Reporting method	63
5.34 NTC 7 Combination	64
5.34.1 Measuring system block diagram	64
5.34.2 Test pattern definition	64
5.34.3 Measurement method.....	65
5.34.4 Reporting method	65
5.35 Component Sinx/x	65
5.35.1 Measuring system block diagram	65
5.35.2 Test pattern definition	66
5.35.3 Measurement method.....	66
5.35.4 Reporting method	66
5.36 Luminance Sinx/x	67
5.36.1 Measuring system block diagram	67
5.36.2 Test pattern definition	67
5.36.3 Measurement method.....	68
5.36.4 Reporting method	68
5.37 Bowtie.....	68

5.37.1 Measuring system block diagram	69
5.37.2 Test pattern definition	69
5.37.3 Measurement method.....	70
5.37.4 Reporting method	70
5.38 Butterfly	70
5.38.1 Measuring system block diagram	70
5.38.2 Test pattern definition	70
5.38.3 Measurement method.....	71
5.38.4 Reporting method	71
5.39 Flesh Tone.....	71
5.39.1 Definition	71
5.39.2 Measuring system block diagram	72
5.39.3 Test pattern definition	72
5.39.4 Measurement method.....	73
5.39.5 Reporting method	73
5.40 Macrovision®.....	73
5.40.1 Measuring system block diagram	73
5.40.2 Test pattern definition	73
5.40.3 Measuring method	74
5.40.4 Reporting method	74
6 AUDIO TESTS AND RATINGS	75
6.1 PCM (48 kHz, 16 bits) - Total Harmonic Distortion + Noise (THD+N)	75
6.1.1 Measuring system block diagram	75
6.1.2 Test signals	75
6.1.3 Measurement method.....	75
6.1.4 Reporting method	75
6.2 PCM (48 kHz, 16 bits) - Balance and Level.....	75
6.2.1 Measuring system block diagram	76
6.2.2 Test signals	76
6.2.3 Measurement method.....	76
6.2.4 Reporting method	76
6.3 PCM (48 kHz, 16 bits) – Signal-to-Noise Ratio	76
6.3.1 Measuring system block diagram	76
6.3.2 Test signals	76
6.3.3 Measurement method.....	77
6.3.4 Reporting method	77
6.4 PCM (48 kHz, 16 bits) – Frequency Response	77
6.4.1 Measuring system block diagram	77
6.4.2 Test signals	77
6.4.3 Measurement method.....	78
6.4.4 Reporting method	78
6.5 PCM (48 kHz, 16 bits) – Separation.....	79
6.5.1 Measuring system block diagram	79
6.5.2 Test signals	79
6.5.3 Measurement method.....	79
6.5.4 Reporting method	80
6.6 PCM (48 kHz, 16 bits) – Low Level Signals	80
6.6.1 Measuring system block diagram	80
6.6.2 Test signals	80
6.6.3 Measurement method.....	80
6.6.4 Reporting method	81
6.7 PCM (48 kHz, 16 bits) – Dynamic Range	81
6.7.1 Measuring system block diagram	81
6.7.2 Test signals	81

6.7.3 Measurement method.....	81
6.7.4 Reporting method.....	81
6.8 PCM (48 kHz, 20 bits) - Total Harmonic Distortion + Noise (THD+N)	82
6.8.1 Measuring system block diagram	82
6.8.2 Test signals	82
6.8.3 Measurement method.....	82
6.8.4 Reporting method.....	82
6.9 PCM (48 kHz, 20 bits) - Balance and Level.....	82
6.9.1 Measuring system block diagram	83
6.9.2 Test signals	83
6.9.3 Measurement method.....	83
6.9.4 Reporting method.....	83
6.10 PCM (48 kHz, 20 bits) – Signal-to-Noise Ratio.....	83
6.10.1 Measuring system block diagram	83
6.10.2 Test signals	83
6.10.3 Measurement method.....	84
6.10.4 Reporting method.....	84
6.11 PCM (96 kHz, 24 bits) - Total Harmonic Distortion + Noise (THD+N)	84
6.11.1 Measuring system block diagram	84
6.11.2 Test signals	84
6.11.3 Measurement method.....	84
6.11.4 Reporting method.....	84
6.12 PCM (96 kHz, 24 bits) - Balance and Level.....	85
6.12.1 Measuring system block diagram	85
6.12.2 Test signals	85
6.12.3 Measurement method.....	85
6.12.4 Reporting method.....	85
6.13 PCM (96 kHz, 24 bits) – Signal-to-Noise Ratio.....	85
6.13.1 Measuring system block diagram	86
6.13.2 Test signals	86
6.13.3 Measurement method.....	86
6.13.4 Reporting method.....	86
6.14 PCM (96 kHz, 24 bits) – Frequency Response.....	86
6.14.1 Measuring system block diagram	87
6.14.2 Test signals	87
6.14.3 Measurement method.....	87
6.14.4 Reporting method.....	88
6.15 PCM (96 kHz, 24 bits) – Low Level Signals.....	88
6.15.1 Measuring system block diagram	88
6.15.2 Test signals	88
6.15.3 Measurement method.....	89
6.15.4 Reporting method.....	89
6.16 PCM (96 kHz, 24 bits) – Dynamic Range	89
6.16.1 Measuring system block diagram	89
6.16.2 Test signals	89
6.16.3 Measurement method.....	90
6.16.4 Reporting method.....	90
6.17 AC3 - Total Harmonic Distortion + Noise (THD+N).....	90
6.17.1 Measuring system block diagram	90
6.17.2 Test signals	90
6.17.3 Measurement method.....	91
6.17.4 Reporting method.....	91
6.18 AC3 - Balance and Level.....	91
6.18.1 Measuring system block diagram	91

6.18.2 Test signals	91
6.18.3 Measurement method.....	91
6.18.4 Reporting method	91
6.19 AC3 – Signal-to-Noise Ratio	92
6.19.1 Measuring system block diagram	92
6.19.2 Test signals	92
6.19.3 Measurement method.....	92
6.19.4 Reporting method	93
6.20 AC3 – Frequency Response	93
6.20.1 Measuring system block diagram	93
6.20.2 Test signals	93
6.20.3 Measurement method.....	94
6.20.4 Reporting method	94
6.21 AC3 – Separation	95
6.21.1 Measuring system block diagram	95
6.21.2 Test signals	95
6.21.3 Measurement method.....	96
6.21.4 Reporting method	97
6.22 AC3 – Reference Tones.....	97
6.22.1 Measuring system block diagram	97
6.22.2 Test signals	97
6.22.3 Measurement method.....	98
6.22.4 Reporting method	98
6.23 DTS® – Total Harmonic Distortion + Noise (THD+N)	98
6.23.1 Measuring system block diagram	99
6.23.2 Test signals	99
6.23.3 Measurement method.....	99
6.23.4 Reporting method	99
6.24 DTS® – Balance and Level	99
6.24.1 Measuring system block diagram	99
6.24.2 Test signals	100
6.24.3 Measurement method.....	100
6.24.4 Reporting method	100
6.25 DTS® – Signal-to-Noise	100
6.25.1 Measuring system block diagram	100
6.25.2 Test signals	100
6.25.3 Measurement method.....	101
6.25.4 Reporting method	101
6.26 DTS® – Frequency Response	101
6.26.1 Measuring system block diagram	102
6.26.2 Test signals	102
6.26.3 Measurement method.....	102
6.26.4 Reporting method	102
6.27 DTS® – Separation	103
6.27.1 Measuring system block diagram	103
6.27.2 Test signals	103
6.27.3 Measurement method.....	104
6.27.4 Reporting method	104

TABLES

Table 1: Signals for Matrix Combination Pattern	56
Table 2: Frequency Response Results Example	88
Table 3: Signals for AC3 Signal-to-Noise Tests	92

Table 4: Signals for AC3 Separation Tests	95
Table 5: Signals for AC3 Reference Tone Tests	98
Table 6: Signals for DTS® Signal-to-Noise Tests	101
Table 7: Signals for DTS® Channel Separation Tests	104

FIGURES

Figure 1: SMPTE split field color bars	13
Figure 2: SMPTE split field color bars waveform – top row	14
Figure 3: SMPTE split field color bars waveform – middle row	14
Figure 4: SMPTE split field color bars waveform – bottom row	14
Figure 5: 100 / 0 / 100 / 0 color bar pattern and associated waveform	16
Figure 6: 100 / 0 / 75 / 0 color bar pattern and associated waveform	16
Figure 7: 100 / 0 / 50 / 0 color bar pattern and associated waveform	16
Figure 8: 75% amplitude 100% saturation red field pattern and waveform	21
Figure 9: 75% amplitude 100% saturation blue and green flat fields	21
Figure 10: 100 IRE white field test pattern and associated waveform	23
Figure 11: 50 IRE gray field test pattern and associated waveform	25
Figure 12: 0 IRE black field test pattern and associated waveform	26
Figure 13: 60% Luminance sweep test pattern	27
Figure 14: 60% multiburst luminance test pattern	28
Figure 15: 100% multiburst luminance test pattern	29
Figure 16: 0.5 MHz to 6.75 MHz component sweep pattern at 100% amplitude	30
Figure 17: 100% multiburst component test pattern	32
Figure 18: EIA resolution chart	34
Figure 19: Pixel resolution test pattern	35
Figure 20: Moving TVL pattern	37
Figure 21: Luminance sweep test pattern	38
Figure 22: Comparative resolution black-on-white test pattern	40
Figure 23: Comparative resolution white-on-black test pattern	41
Figure 24: Simultaneous all-channel ramp test pattern	42
Figure 25: All channel shallow ramp test pattern	43
Figure 26: All channel shallow ramp matrix	45
Figure 27: Y valid ramp test pattern and waveform	46
Figure 28: Each channel LSB ramp test pattern	48
Figure 29: 10-step component test pattern	49
Figure 30: 10-step luminance test pattern and waveform	51
Figure 31: Modulated ramp test pattern and waveform	52
Figure 32: Contrast box negative test pattern	53
Figure 33: Checkerboard test patter	55
Figure 34: Matrix test pattern	57
Figure 35: Luminance setup test pattern	61
Figure 36: NTC 7 composite test pattern	62
Figure 37: NTC 7 composite waveform	63
Figure 38: NTC 7 combination test pattern	64
Figure 39: NTC 7 combination waveform	65
Figure 40: Component sinx/x waveform	66
Figure 41: Luminance sinx/x waveform	67
Figure 42: Bowtie signal pattern and component sine wave packets	69
Figure 43: Bowtie patterns indicating near-perfect and moderate differences between relative amplitude and timing of the component signals	69
Figure 44: Butterfly test pattern	71

Figure 45: Flesh tone pattern..... 72
Figure 46: Pseudo sync and vertical blanking interval AGC pulses..... 74

(This page intentionally left blank.)

STANDARD METHOD OF MEASUREMENT FOR DVD-VIDEO PLAYERS

1 SCOPE

This standard defines a suite of test signals for use in assessing the electrical performance of NTSC-based DVD-Video players, as well as a recommended method for reporting this performance. It does not define test signals for assessing the performance of non-“DVD-Video” signals in DVD players (e.g., compact disc, DVD-Audio signals, etc.)

2 REFERENCES

The following references contain provisions which, through reference in this text, constitute normative provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below.

2.1 Normative References

2.1.1 Normative Reference List

1. ANSI NAPM IT7.228-1997, Audiovisual Systems - Electronic Projection - Fixed Resolution Projectors.
2. EIA/CEA-770.1-C, Analog 525 Line Component Video Interface – Three Channels, November 2001.
3. Flat Panel Display Measurements, Version 2.0, Video Electronics Standards Association, June 1, 2001.
4. SMPTE 303-M, Television – Color Reference Pattern, 2002.

2.1.2 Normative Reference Acquisition

ANSI NAPM Standards:

Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776, USA;
1-800-854-7179

<http://global.ihs.com>

EIA/CEA Standards:

Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776, USA;
1-800-854-7179

<http://global.ihs.com>

SMPTE Standards:

Society of Motion Picture and Television Engineers; 595 West Hartsdale Avenue; White Plains, New York
10607 USA

1-914-761-1100

<http://www.smpete.org>