

CEA Standard

Standard Method of Measurement for Digital Versatile Disc-Video Players

CEA-896-A R-2010

December 2002



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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.

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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.smppte.org>

VESA Standards:

Video Electronics Standards Association, 920 Hillview Court, Suite 140, Milpitas, CA 95035, USA;

1-408-957-9270

<http://www.vesa.org>

2.2 Informative References

2.2.1 Informative Reference List

1. *IRE Standards on Television: Methods of Testing Monochrome Television Broadcast Receivers, Proceedings of the IRE*, Vol. 48 No. 6, June 1960.
2. Jack, Keith; *Video Demystified*, HighText Publications.
3. NTC Report No. 7, Video Facility Testing Technical Performance Objectives, Network Transmission Committee of the Video Transmission Engineering Advisory Committee (Joint Committee of Television Network Broadcasters and the Bell System), June 1975 (Revised January 1976).
4. Robin, Michael and Michel Poulin; *Digital Television Fundamentals, 2nd Edition*, McGraw Hill.
5. Taylor, Jim; *DVD Demystified, 2nd Edition*, McGraw Hill.
6. Tektronix, Inc.; *A Guide to Digital Television Systems and Measurements*, Application Note 25W-7203-2; October 1996.
7. Tektronix, Inc.; *Baseband Video Testing With Digital Phosphor Oscilloscopes*, Application Note; 1998.
8. Tektronix, Inc.; *Frequency-Response Testing Using a (SIN X)/X Signal and the VM 700A/T Video Measurement Set*, Application Note 25W-11149-0; November 1996.
9. Tektronix, Inc.; *Glossary of Video Terms and Acronyms*, Application Note 25W-15215-0, January 23, 2002.
10. Tektronix, Inc.; *NTSC Systems Television Measurements*, Application Note 25W-7049-4; October 10, 2001.
11. Tektronix, Inc.; *NTSC Video Measurements*, Application Note 25W-7247-1A; July 1997.
12. Tektronix, Inc.; *Solving the Component Puzzle*, Application Note 25W-7009-2A; June 1997.

2.2.2 Informative Reference Acquisition

HighText Publications:

P.O. Box 1489, Solana Beach, CA 92075

IRE Standards:

The Institute of Radio Engineers (IRE) merged with the American Institute of Electrical Engineers (AIEE) on January 1, 1963 to form the Institute of Electrical and Electronic Engineers (IEEE). Methods of Testing Monochrome Television Broadcast Receivers was renamed IEEE 190-1960, and has since been withdrawn by the IEEE, meaning that IEEE no longer endorses the standard. However, the old standard is available from Global Engineering Documents at:

Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5776, USA;
 1-800-854-7179
<http://global.ihs.com>

McGraw-Hill Publications:
 McGraw-Hill Professional, 2 Penn Plaza, 12th Floor, New York, NY 10121-2298
 1-800-262-4729
<http://www.books.mcgraw-hill.com>

NTC Reports:
 The NTC was the Network Transmission Committee of the Video Transmission Engineering Advisory Committee, a joint committee of television network broadcasters and the Bell System. NTC Report No. 7 is no longer in print. Check with your local technical library.

Tektronix Application Notes:
 Tektronix, Inc., 14200 SW Karl Braun Drive, P. O. Box 500, Beaverton, OR 97077
 1-800-835-9433
<http://www.tektronix.com>

2.3 Definitions

ATE Frequency List

A list of test frequencies to be used when testing with automated test equipment. For the purposes of this standard, this list of frequencies is: 21, 30, 41, 50, 61, 80, 100, 181, 199, 300, 400, 499, 600, 700, 800, 900, 997, 1999, 3000, 4001, 5000, 6000, 7000, 7993, 9000, 10000, 11000, 12001, 13000, 13999, 15000, 16001, 17000, 18001, 19000 and 19997 Hz.

Component Video

Three signals Y (Luminance), Pr and Pb. The Y signal carries a luminance signal with a peak amplitude of 714 mV (100 IRE) plus a negative-going sync pulse of 286 mV conforming to the timing requirements of EIA/CEA-770.1-C. The sync pulse is the only timing reference for Y, Pr and Pb. Pr shall be amplitude scaled R-Y according to $Pr = (R-Y)/1.772$, and shall have a maximum peak amplitude, after scaling, of ± 350 mV (± 49 IRE) about blanking level. Pb shall be amplitude scaled B-Y according to $Pb = (B-Y)/1.772$, and shall have a maximum peak amplitude, after scaling, of ± 350 mV (± 49 IRE) about blanking level. Black level setup may be either none or 7.5 IRE ± 2 IRE from blanking level to the reference white level. Further detail of the Component Video signal is contained in EIA/CEA-770.1-C.

Composite Video

A single signal consisting of five major parts (Y, I, Q, sync and burst). A detailed description is available in NTSC RS-170A and Part 73.699 of the FCC rules. Note that the tolerances in RS-170A are slightly tighter than those in FCC Part 73.699. The following is basic data for the composite signal: $Y = 0.3R + 0.59G + 0.11B$; maximum peak amplitude including setup = 714 mV, which is 100 IRE; setup = 7.5 IRE, ± 3 IRE; $I = 0.877(R-Y)$; and $Q = 0.493(B-Y)$. I and Q ride 90 degrees out of phase on a carrier at the burst frequency of 3.579545 MHz. Sync provides the timing for both horizontal and vertical sync. Maximum peak amplitude for sync is 286 mV, which is 40 IRE. Note: For DVDs setup is not used, but most players have the capability of creating and output signal with setup.

Dialog Normalization	A means of allowing the user (<i>i.e.</i> , a consumer watching a DVD program) to set the audio output at a consistent level. This is accomplished by including a code in an AC-3 bitstream that indicates at what level the audio was recorded. The playback equipment then uses this code, along with the setting that the user has selected for the output level, to determine how much audio amplification is needed for the program material being played.
Dither	Dither is a technique whereby white noise is added to an audio signal to reduce D/A quantizing distortion and prevent DACs from muting during tests of silence signals.
Individual Frequency List	A list of individual test frequencies. For the purposes of this standard, this list includes: 21, 41, 61, 121, 181, 199, 499, 997, 1999, 4001, 7993, 12001, 13999, 16001, 18001 and 19997 Hz.
Rated Load Impedance	The load impedance intended for connection to the output terminals of the DVD player under test.
Rated Output Level	The standard output level applied to the Rated Load Impedance.
Root Mean Square	The square root of the mean of the squares of a series of instantaneous values of a varying waveform, commonly abbreviated as "RMS."
S-Video	Two signals Y (luminance) and C (chroma). The Y signal carries a luminance signal with a maximum peak amplitude of 714 mV (100 IRE) plus a negative-going sync pulse of 286 mV. The sync pulse in the Y channel is the basic timing reference for both the Y and the C channels; however, the burst packet is carried on the C channel.
Total Harmonic Distortion plus Noise	A measurement of all of the energy within a specified bandwidth at the output of an amplifier when a single specific frequency is being fed into the input of the amplifier, minus the energy at that specific frequency at the output of the amplifier.

2.4 Symbols and Abbreviations

AC	Alternating Current
A/D	Analog-to-Digital
ATE	Automated Test Equipment
cd/m ²	Candelas per Square Meter
CEA	Consumer Electronics Association
D/A	Digital-to-Analog
DAC	Digital-to-Analog Converter
DC	Direct Current
DN	Dialog Normalization
DVD	Digital Versatile Disc
HPF	High Pass Filter
IFL	Individual Frequency List
LFE	Low Frequency Effects
LPF	Low Pass Filter
LSB	Least Significant Bit
MSB	Most Significant Bit
nsec	Nanoseconds
PCM	Pulse Code Modulation

pF	Picofarad (one farad x 10^{-12})
RMS	Root Mean Square
S/N	Signal-to-Noise Ratio
THD+N	Total Harmonic Distortion plus Noise
TVL	TV Lines
μsec	Microseconds

2.5 Compliance Notation

As used in this document, “shall” and “must” denote mandatory provisions of the standard. “Should” denotes a provision that is recommended but not mandatory. “May” denotes a feature whose presence does not preclude compliance, and implementation of which is optional. “Optional” denotes items that may or may not be present in a compliant device.

3 STANDARD TEST CONDITIONS

When reporting the results of tests conducted in accordance with this standard the user shall note that the measurements were made in accordance with CEA-896. If the user makes additional measurements that are not specified in this standard, then this shall be noted in the report.

3.1 Power Supply Requirements

The supply voltage shall be within $\pm 1\%$ of the rated supply voltage. Direct-current powered DVD players shall be tested at the recommended supply voltage $\pm 1\%$, and this voltage shall be stated.

The supply voltage frequency in the case of AC operated DVD players shall be 50 or 60 Hz $\pm 2\%$.

The supply voltage waveform shall be a sine wave with harmonic distortion no greater than 2.0%. For DC operated DVD players, the DC supply voltage waveform shall have a ripple content no greater than 0.1%.

3.2 Environmental Conditions

Unless otherwise stated by the manufacturer or the laboratory conducting the test measurements, all measurements shall be made at an ambient temperature of 23 degrees Celsius with relative humidity of 50%, $\pm 5\%$. Measurements may be made at any ambient temperature between 15 and 35 degrees Celsius, and a relative humidity between 45% and 75%, provided that no significant measurement error (i.e. no significant difference from the measurements at 23 degrees Celsius and 50% $\pm 5\%$ relative humidity) results.

3.3 Equipment Preconditioning

The unit to be tested shall be switched on for a period of 30 minutes prior to measurement, unless the omission of the stabilization time does not result in any errors.

3.4 Test Signals

Test signals to be used for measurement of DVD players shall be those described in this standard.

3.5 DVD Player Video Output Options

Some DVD players have the option of compressing the picture content so that black video is delivered to the display device at either 7.5 IRE or 0 IRE. All measurements using the signals described in this standard shall be performed with the DVD player output set for 0 IRE black level, unless otherwise noted.

3.6 Audio Signal Levels

The audio signal levels described in this standard are referenced to the maximum audio level that may be represented by the digital signal (e.g., 0 dB is the maximum audio level, which is represented by all bits being set to "1," and -10 dB is 10 dB below that level.)

If the DVD player under test has a volume control, tests shall be conducted with the volume control adjusted for maximum audio output.

If the DVD player under test has other audio controls, such as loudness or automatic level controls, then the position of these controls must be indicated when data is reported. If no such indication is made in the report, it is assumed that any such features were turned off during testing.

3.7 Standard Load Impedance

For video measurements, a load consisting of a 75 ohm $\pm 0.25\%$ resistor shall be connected to the video output terminal.

For audio measurements, a load consisting of a 10,000 ohm $\pm 1\%$ resistor in parallel with a 200 pF $\pm 5\%$ capacitor shall be connected to each line output terminal.

4 OUTPUT RESISTANCE MEASUREMENTS

4.1 Video Output Resistance

This test measures the video output resistance of the player, which is typically 75 ohms.

4.1.1 Measuring system block diagram



4.1.2 Test pattern definition

Many patterns will work. The white field might be the easiest to use because it produces maximum output level.

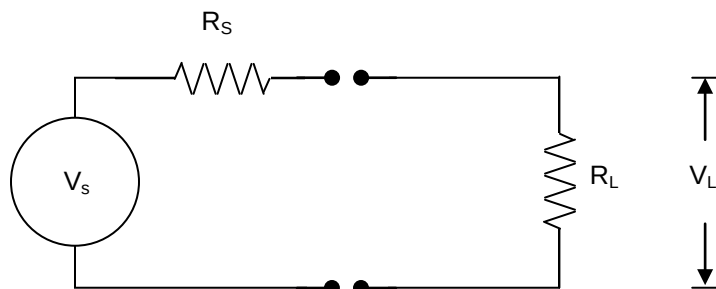
4.1.3 Measurement Method

Use two resistors to determine the series resistance. Both resistors must be at or above the nominal load resistance (in this case 75 ohms). To minimize errors, try to use one load of 75 ohms and the other a higher value that is high enough to accurately measure a voltage difference, say 150 ohms. (One does not want to go lower than the rated impedance as this may cause the amplifier to saturate.) One probably does not want to go higher than, say, 200 ohms. The value of the resistors used is critical, and should be accurately known to within $\pm 0.25\%$.

Measure the peak-to-peak voltage across each resistor. This may be sync tip to white peak for example. Solve for the series resistance (internal resistance).

As an example:

V_S = Source voltage
 R_S = Source series resistance
 R_L = Load resistance
 V_L = Voltage across load



Ohms Law says that $V = R * I$, therefore:

$$V_S = (R_S + R_L) * \frac{V_L}{R_L}$$

Assume a 150 ohm load and a 75 ohm load.

For a 150 ohm load:

$$V_S = (R_S + 150) * \frac{V_L}{150}$$

For a 75 ohm load:

$$V_S = (R_S + 75) * \frac{V_L}{75}$$

$V_S = V_S$, therefore:

$$(R_S + 150) * \frac{V_{L(150)}}{150} = (R_S + 75) * \frac{V_{L(75)}}{75}$$

and

$$\frac{(V_{L(150)} * R_S) + (V_{L(150)} * 150)}{150} = \frac{(V_{L(75)} * R_S) + (V_{L(75)} * 75)}{75}$$

and

$$\frac{(V_{L(150)} * R_S)}{150} + V_{L(150)} = \frac{(V_{L(75)} * R_S)}{75} + V_{L(75)}$$

and

$$V_{L(150)} - V_{L(75)} = \frac{(V_{L(75)} * R_S)}{75} - \frac{(V_{L(150)} * R_S)}{150}$$

Multiplying both sides by 75*150 gives:

$$(11250 * V_{L(150)}) - (11250 * V_{L(75)}) = ((150 * V_{L(75)}) - (75 * V_{L(150)})) * R_S$$

and thus R_S can be calculated from the voltage drop across a 75 ohm and a 150 ohm load as follows:

$$R_S = \frac{11250 * V_{L(150)} - 11250 * V_{L(75)}}{(150 * V_{L(75)}) - (75 * V_{L(150)})}$$

Note that this formula will change if different load values are used.

Whatever load values are used, plug in the appropriate values and solve for R_S .

4.1.4 Reporting Method

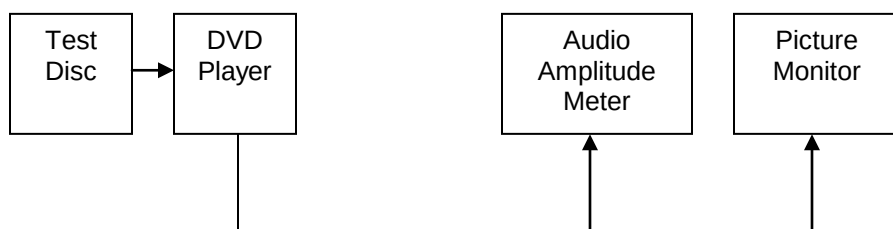
Report the channel tested and the output resistance. A suggested reporting method is as follows:

Composite Video Output Resistance: 78 ohms

4.2 Audio Output Resistance

This test measures the audio output resistance of the DVD player.

4.2.1 Measuring system block diagram



4.2.2 Test Signals

The test signal to be used is the 1 kHz at 0 dB (left and right) tone.

4.2.3 Measurement Method

Use two resistors to determine the series resistance. Both resistors must be at or above the nominal load resistance (in this case 10k ohms). To minimize errors, try to use one load of 10k ohms and the other a higher value that is high enough to accurately measure a voltage difference, say 20k ohms. (One does not want to go lower than the rated impedance as this may cause the amplifier to saturate.) The value of the resistors used is critical, and should be accurately known.

Verify that there is no clipping.

Measure the voltage across each resistor. Solve for the series resistance (internal resistance).

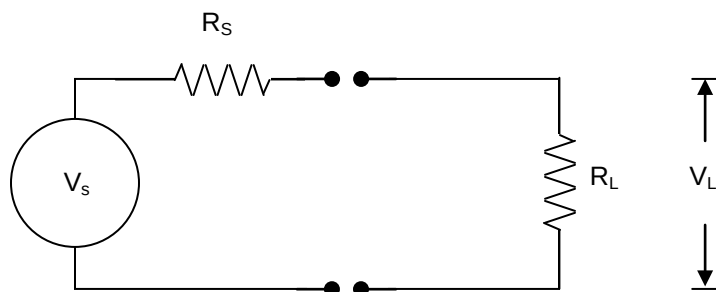
As an example:

V_S = Source voltage

R_S = Source series resistance

R_L = Load resistance

V_L = Voltage across load



Ohms Law says that $V = R * I$, therefore:

$$V_S = (R_S + R_L) * \frac{V_L}{R_L}$$

Assume a 20000 ohm load and a 10000 ohm load.

For a 20000 ohm load:

$$V_S = (R_S + 20000) * \frac{V_L}{20000}$$

For a 10000 ohm load:

$$V_S = (R_S + 10000) * \frac{V_L}{10000}$$

$V_S = V_S$, therefore:

$$(R_S + 20000) * \frac{V_{L(20k)}}{20000} = (R_S + 10000) * \frac{V_{L(10k)}}{10000}$$

and

$$\frac{(V_{L(20k)} * R_S) + (V_{L(20k)} * 20000)}{20000} = \frac{(V_{L(10k)} * R_S) + (V_{L(10k)} * 10000)}{10000}$$

and

$$\frac{(V_{L(20k)} * R_S)}{20000} + V_{L(20k)} = \frac{(V_{L(10k)} * R_S)}{10000} + V_{L(10k)}$$

and

$$V_{L(20k)} - V_{L(10k)} = \frac{(V_{L(10k)} * R_S)}{10000} - \frac{(V_{L(20k)} * R_S)}{20000}$$

Multiplying both sides by 10000*20000 gives:

$$(200000000) * V_{L(20k)} - (200000000 * V_{L(10k)}) = ((20000 * V_{L(10k)}) - (10000 * V_{L(20k)})) * R_S$$

and thus R_S can be calculated from the voltage drop across a 10k ohm and a 20k ohm load as follows:

$$R_S = \frac{200000000 * V_{L(20k)} - 200000000 * V_{L(10k)}}{(20000 * V_{L(10k)}) - (10000 * V_{L(20k)})}$$

Note that this formula will change if different load values are used.

Whatever load values are used, plug in the appropriate values and solve for R_S .

4.2.4 Reporting Method

Report the channel tested and the output resistance. A suggested reporting method is as follows:

Left Stereo Output Resistance: 10.5 kohms

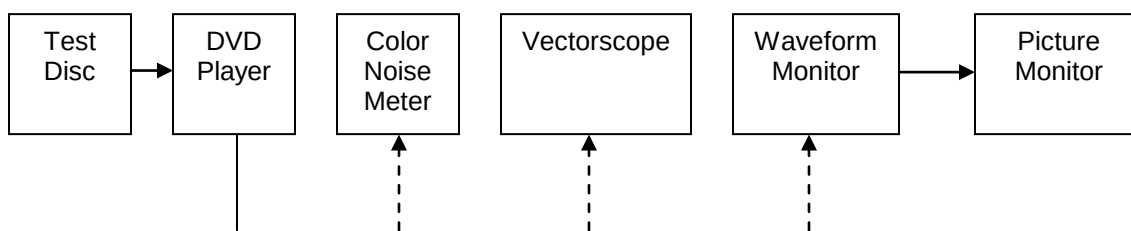
5 VIDEO TESTS AND RATINGS

Unless otherwise specified, all measurements shall be made under the standard test conditions described in Section 3, with output terminations in place.

5.1 SMPTE Bars

This signal may be used to set the monitor color, tint, and brightness adjustments. This is the only signal in this standard with 7.5 IRE set-up. Although this signal may be used to measure the amplitude and phase of the various colors in a SMPTE split field color bar signal, it is not intended for this purpose here. More precise methods of measuring amplitude and phase are described later in this standard.

5.1.1 Measuring system block diagram



Note: A color noise meter, waveform monitor and vectorscope may be part of a single test instrument. If they are not, then individual instruments should not be simultaneously connected to the DVD player in a manner that will cause the DVD player's output to be distorted by the combined impedance of the test instruments.

5.1.2 Test pattern definition

This is the SMPTE split field color bar with reverse blue bars and pluge black-level referenced signals in the lower part of the pattern. Also contained in the lower portion of the pattern are the I and Q modulated chrominance signals and white bar. The parameters for this signal are defined in SMPTE 303M.

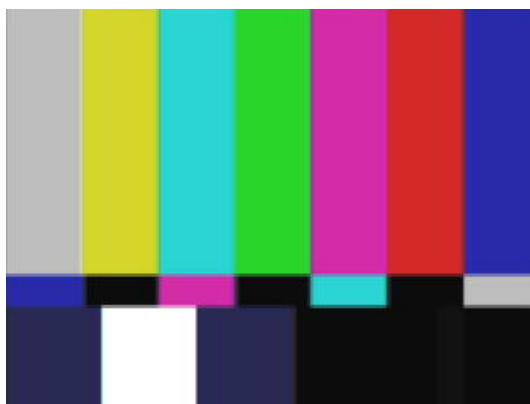


Figure 1: SMPTE split field color bars

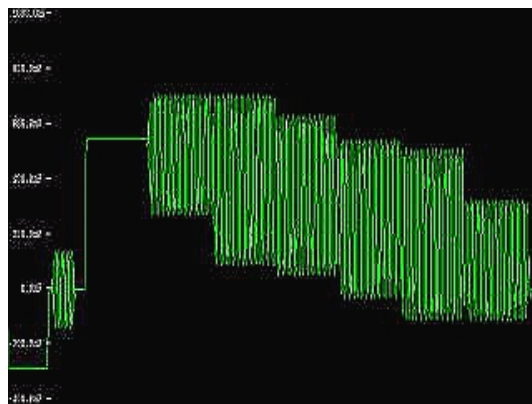


Figure 2: SMPTE split field color bars waveform – top row

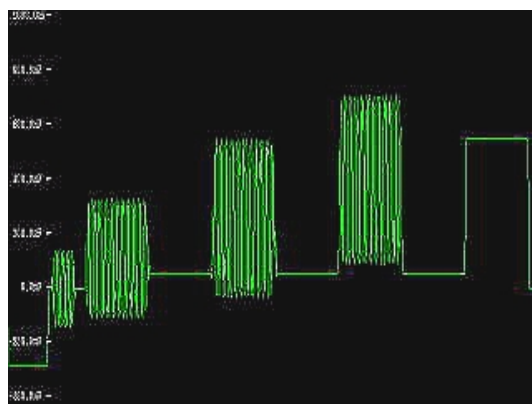


Figure 3: SMPTE split field color bars waveform – middle row

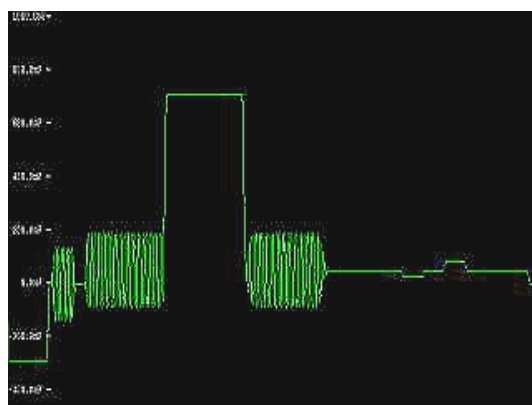


Figure 4: SMPTE split field color bars waveform – bottom row

5.1.3 Measurement method

This signal is not intended to be used for obtaining quotable measurements. It is intended only for ensuring that the test equipment is working properly during equipment set-up.

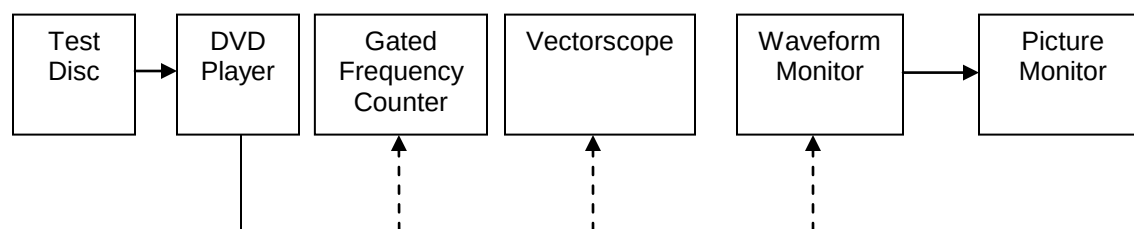
5.1.4 Reporting method

This signal is not intended to be used for obtaining quotable measurements.

5.2 Color Accuracy

This test measures the amplitude (and phase for NTSC) of the seven colors in a standard color bar signal in order to determine the colorimetry performance of the DVD player.

5.2.1 Measuring system block diagram



Note: A gated frequency counter, waveform monitor and vectorscope may be part of a single test instrument. If they are not, then individual instruments should not be simultaneously connected to the DVD player in a manner that will cause the DVD player's output to be distorted by the combined impedance of the test instruments.

5.2.2 Test pattern definition

Three sets of color bars are defined. They include:

100 / 0 / 100 / 0 bars;
 100 / 0 / 75 / 0 bars; and
 100 / 0 / 50 / 0 bars.

The notation used to describe the color bars follows this convention: (the maximum value of luminance) / (the minimum value of luminance) / (the maximum value of chrominance) / (the minimum value of chrominance). The color bar patterns are illustrated in Figure 5, Figure 6 and Figure 7.

The color bar signals used are the same as the 8-bar NTSC 100% amplitude, 100% saturated color bar signal without setup. Consequently, the luminance component levels of the seven color bars, including the black bar, are 53.6 millivolts lower than the luminance components in the EIA color bars. The peak amplitude of 714 millivolts for the white bar is unchanged.

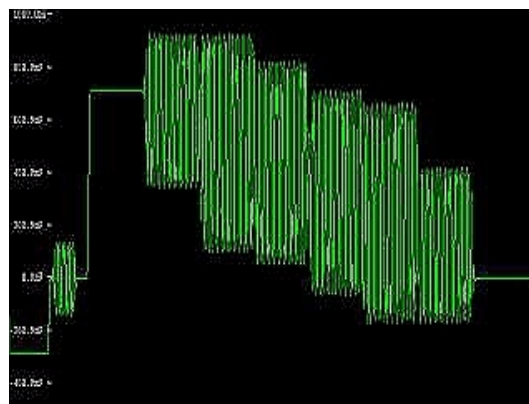
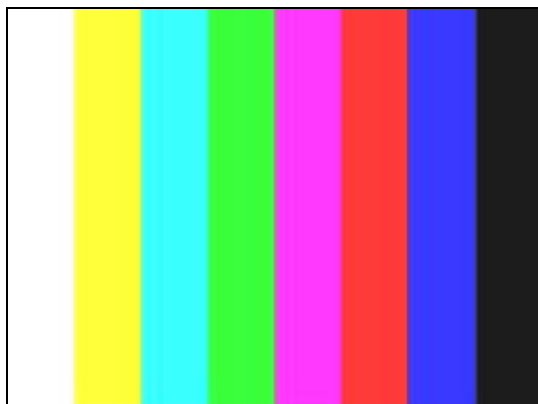


Figure 5: 100 / 0 / 100 / 0 color bar pattern and associated waveform

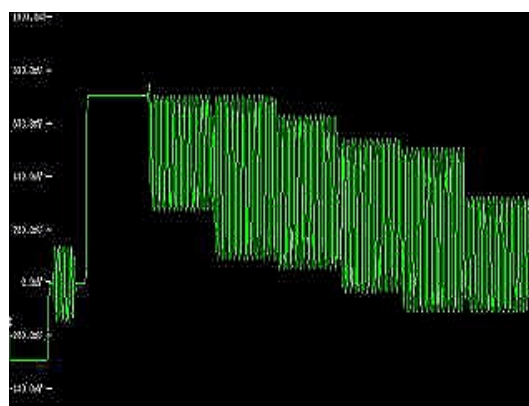
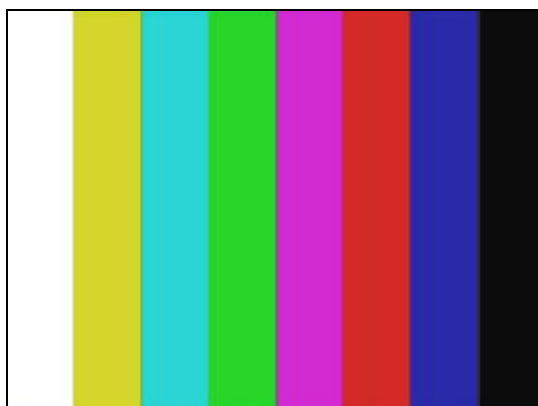


Figure 6: 100 / 0 / 75 / 0 color bar pattern and associated waveform

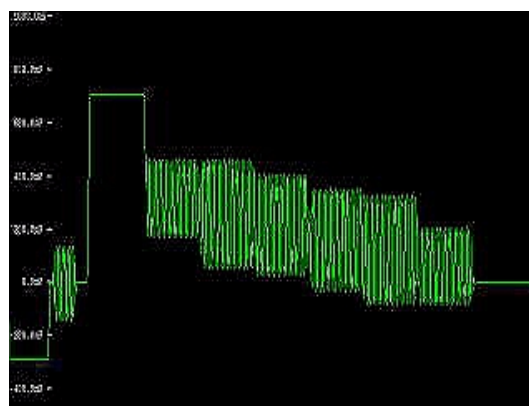


Figure 7: 100 / 0 / 50 / 0 color bar pattern and associated waveform

5.2.3 Measurement method

For each color bar signal use the waveform monitor to determine the luma level for each of the eight bars in the signal.

For each color bar signal use the waveform monitor to determine chroma level for each of the eight bars in the signal.

For each color bar signal use the vectorscope to determine the phase angle for the yellow, cyan, green, magenta, red and blue bars in the signal.

5.2.4 Reporting method

If any data is reported, the data for either the 75% or 100% color bars must be reported, and it must be clearly indicated which one is being reported. Inclusion of other data is optional. Show the measurement item, value and units. For composite video and S-video, the measurement items are the luminance level, chroma level and phase angle for each of the bars (white, yellow, cyan, green, magenta, red, blue and black). For component video the amplitude values for all eight bars are reported for Y, Pr and Pb.

The following is a suggested reporting format for composite video. Component video color bars would be represented by amplitude values for Y, Pr and Pb in mV.

100 / 0 / 75 / 0 color bars

Luma Level White Bar	99.80 IRE
Luma Level Yellow Bar	66.90 IRE
Luma Level Cyan Bar	53.30 IRE
Luma Level Green Bar	44.50 IRE
Luma Level Magenta Bar	31.00 IRE
Luma Level Red Bar	23.20 IRE
Luma Level Blue Bar	8.80 IRE
Luma Level Black Bar	0.20 IRE

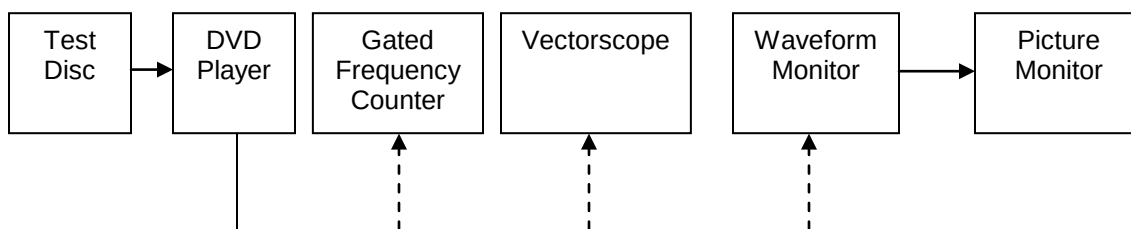
Chroma Level White Bar	0.00 IRE
Chroma Level Yellow Bar	67.10 IRE
Chroma Level Cyan Bar	94.50 IRE
Chroma Level Green Bar	89.00 IRE
Chroma Level Magenta Bar	87.50 IRE
Chroma Level Red Bar	94.80 IRE
Chroma Level Blue Bar	67.00 IRE
Chroma Level Black Bar	0.10 IRE

Chroma Phase Yellow	167.00 DEG
Chroma Phase Cyan	283.00 DEG
Chroma Phase Green	240.00 DEG
Chroma Phase Magenta	60.30 DEG
Chroma Phase Red	104.0 DEG
Chroma Phase Blue	347.00 DEG

5.3 Color Burst Measurements

For composite and S-Video, the “color burst” part of the signal, is used by the decoder to determine how to decode the color information. The difference in phase between the burst frequency (3.579545 MHz) and the chrominance signal, determines the color or tint. Errors in this frequency result in incorrect colors.

5.3.1 Measurement system block diagram



Note: A color noise meter, waveform monitor and vectorscope may be part of a single test instrument. If they are not, then individual instruments should not be simultaneously connected to the DVD player in a manner that will cause the DVD player's output to be distorted by the combined impedance of the test instruments.

5.3.2 Test pattern definition

Any pattern with color burst (almost all) may be used. Color bars are recommended.

5.3.3 Measurement method

Using a gated frequency counter, accurately measure the frequency of the color burst. Using a waveform monitor or oscilloscope, measure the peak-to-peak amplitude of the burst sine wave, and the number of cycles.

5.3.4 Reporting method

It is recommended that the burst frequency be reported as the $\pm$ error from the exact burst frequency, as shown. Burst width may be reported in cycles or microseconds. A suggested reporting method is as follows:

Color Burst

Burst error: -30 Hz
 Burst level: 38.5 IRE
 Burst width: 9.0 cycles

5.4 Composite Sync Measurements

The sync signal is a critical part of the composite or S-video signal.

5.4.1 Measurement system block diagram



Note: A color noise meter, waveform monitor and vectorscope may be part of a single test instrument. If they are not, then individual instruments should not be simultaneously connected to the DVD player in a manner that will cause the DVD player's output to be distorted by the combined impedance of the test instruments.

5.4.2 Test pattern definition

Many patterns may be used. White field or red field is recommended as there are not black levels leading into, or out of sync. This makes measuring some sync related timing less difficult.

As a minimum it is recommended that horizontal sync width and amplitude be measured. Additionally, the items shown in reporting method can also be measured and reported.

5.4.3 Measurement method

With an oscilloscope or waveform monitor measure the horizontal sync width and amplitude.

5.4.4 Reporting method

Horizontal Sync Measurements

Sync Rise Time	160 nsec
Sync Fall Time	130 nsec
Sync Width (4.7)	4.7 μ sec
Sync Level	37.5 IRE
Sync-Burst start	5.5 μ sec
Front Porch	1.6 μ sec
Sync to Setup	9.6 μ sec

Horizontal Blanking Measurements

H-Blanking Start	-3.0 μ sec
H-Blanking End	9.4 μ sec
H-Blanking Width	11.3 μ sec

5.5 Component Sync Measurements

The sync signal is a critical part of the component signal.

5.5.1 Measurement system block diagram



Note: A color noise meter, waveform monitor and vectorscope may be part of a single test instrument. If they are not, then individual instruments should not be simultaneously connected to the DVD player in a manner that will cause the DVD player's output to be distorted by the combined impedance of the test instruments.

5.5.2 Test pattern definition

Any pattern may be used.

5.5.3 Measurement method

Using an oscilloscope or waveform monitor, measure the horizontal sync width and amplitude.

5.5.4 Reporting method

Show the measurement item, value and units. A suggested reporting method is as follows:

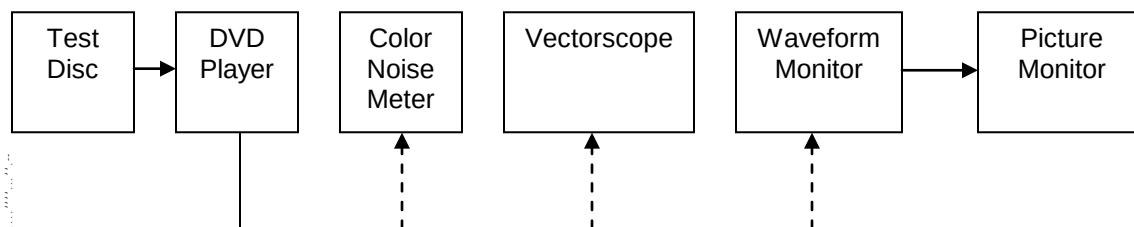
Component Sync

Component Sync Width (4.7): 4.7 μ sec
 Component Sync Level: 291.3 mV

5.6 Chroma Noise Measurements

This test measures the amplitude-modulated noise component (chroma AM S/N) and the phase-modulated noise component (chroma PM S/N) of the chrominance channel using a 75% amplitude 100% saturation red field signal, green field signal and blue field signal. Typically, only the red field signal's S/N is published. This test is intended for use with composite video and S-video.

5.6.1 Measuring system block diagram



Note: A color noise meter, waveform monitor and vectorscope may be part of a single test instrument. If they are not, then individual instruments should not be simultaneously connected to the DVD player in a manner that will cause the DVD player's output to be distorted by the combined impedance of the test instruments.

5.6.2 Test pattern definition

This test shall be performed on a 75% amplitude (100% saturation) red field signal. It may also be performed on a similar blue field or green field signal. The red field test pattern and its associated waveform are illustrated in Figure 8. The blue and green field patterns are illustrated in Figure 9.

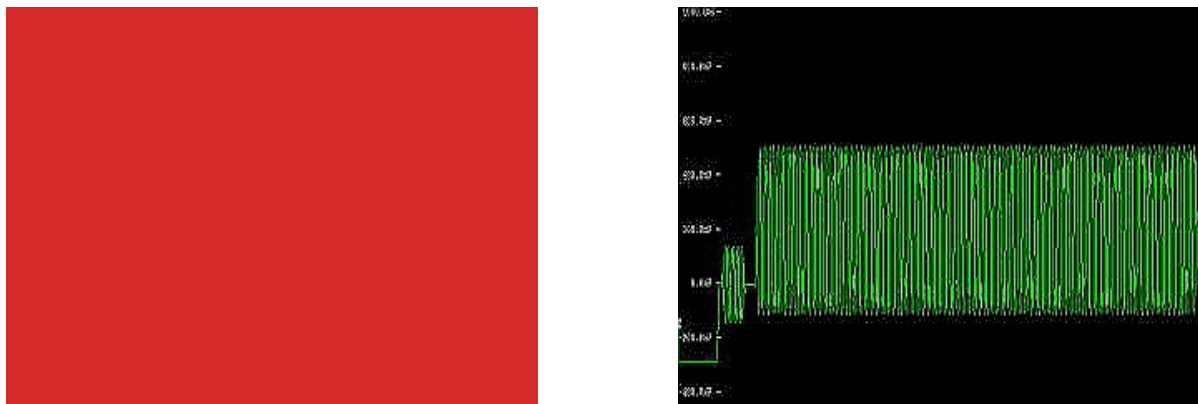


Figure 8: 75% amplitude 100% saturation red field pattern and waveform



Figure 9: 75% amplitude 100% saturation blue and green flat fields

5.6.3 Measurement method

Using the waveform monitor in the test setup illustrated in section 5.6.1, measure and record the maximum and minimum level of the red field signal. Verify that the peak-to-peak amplitude of the red signal equals 75% on the waveform monitor. This is the $V_{ref_{p-p}}$ referred to below.

Using the color noise meter in the test setup illustrated in section 5.6.1, measure and record the chroma AM S/N and chroma PM S/N. Note: No quotation of the chrominance AM S/N or chroma PM S/N is complete without stating the HPF (high pass filter) and LPF (low pass filter) settings. Comparison of signal-to-noise ratios measured with different HPF and LPF settings can lead to incorrect conclusions. Chroma S/N measurements shall be reported with filter settings of 10 kHz for the HPF and 500 kHz or 1 MHz for the LPF.

$$\text{Chrominance AM} = 20\log(\text{AM Noise}_{\text{RMS}}/\text{Vref}_{\text{p-p}})$$

$$\text{Chrominance PM} = 20\log(\text{PM Noise}_{\text{RMS}}/\text{Vref}_{\text{p-p}})$$

Where:

$\text{Vref}_{\text{p-p}}$ is the chrominance voltage corresponding to 100% amplitude of the non-composite video signal.

5.6.4 Reporting method

If any data is reported, the red field data must be reported. The green and blue field data may be reported, if desired. Show the measurement item, value and units, as well as the filters used. A suggested reporting method is as follows:

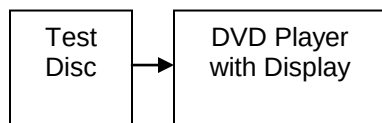
Red Field

Chroma AM Noise (10 kHz HPF, 500 kHz LPF)	-66.40 dB RMS
Chroma PM Noise (10 kHz HPF, 500 kHz LPF)	-67.90 dB RMS

5.7 Flat Field Analysis

The same 75% amplitude (100% saturation) red field, green field and blue field signals used for the tests in 5.6 are used for this test. The white, gray and black field signals (0 to 100 IRE) described in 5.8, 5.9 and 5.10 may also be used. Here, the signals are used to assist in the identification of bad pixels in DVD players with integral displays.

5.7.1 Measuring system block diagram



5.7.2 Test pattern definition

See 5.6.2.

5.7.3 Measurement method

Look for defective pixels on the display.

5.7.4 Reporting method

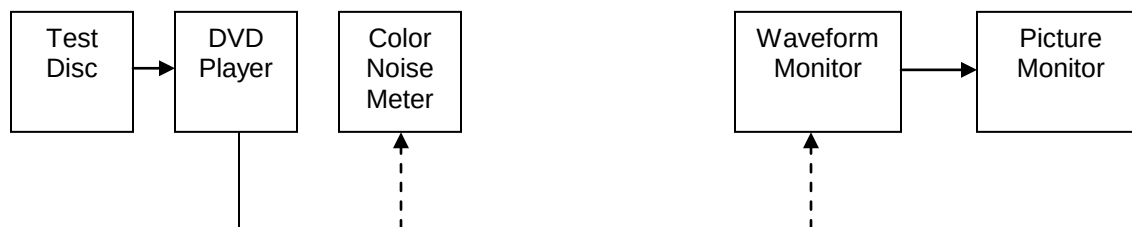
Report the number of defective pixels of each color, the type of defect (e.g., always on, always off, flashing, etc.), the location with respect to the center of the screen (x,y or polar coordinates with respect to the center of the screen), and the test pattern with which the pixel was identified. A suggested reporting format is as follows:

<u>Test Pattern</u>	<u>Location</u>	<u>Defect Type</u>
red field	+3,-4 cm	blue pixel always on

5.8 100 IRE White Field Analysis

This test measures the amplitude and S/N of a 100 IRE white field signal.

5.8.1 Measuring system block diagram



Note: A color noise meter, waveform monitor and vectorscope may be part of a single test instrument. If they are not, then individual instruments should not be simultaneously connected to the DVD player in a manner that will cause the DVD player's output to be distorted by the combined impedance of the test instruments.

5.8.2 Test pattern definition

This test shall be performed on a 100 IRE white field signal with no setup. The white field test pattern and its associated waveform are illustrated in Figure 10.



Figure 10: 100 IRE white field test pattern and associated waveform

5.8.3 Measurement method

For NTSC composite video and S-video:

Using the waveform monitor in the test setup illustrated in section 5.8.1, measure and record the maximum luminance level (the "signal" in the S/N ratio).

Using the noise meter in the test setup illustrated in section 5.8.1, measure and record the luminance noise. The ratio of the signal measured above to the noise measured here is the luminance S/N, though it is customary to report this value as a negative number (*i.e.*, a N/S ratio). Note: No quotation of the luminance S/N is complete without stating the HPF (high pass filter) and LPF (low pass filter) settings. Comparison of signal-to-noise ratios measured with different HPF and LPF settings can lead to incorrect