DIGITAL VIDEO ESSENTIALS
PROFESSIONAL EDITION
PAL DISC DESCRIPTIONS

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	2	15% Horizontal Window	15%
	3	20% Horizontal Window	20%
	4	25% Horizontal Window	25%
	5	30% Horizontal Window	30%
	6	35% Horizontal Window	35%
	7	40% Horizontal Window	40%
	8	45% Horizontal Window	45%
	9	50% Horizontal Window	50%
	10	55% Horizontal Window	55%
	11	60% Horizontal Window	60%
	12	65% Horizontal Window	65%
	13	70% Horizontal Window	70%
	14	75% Horizontal Window	70%
	15	80% Horizontal Window	80%
	16	85% Horizontal Window	85%
	17	90% Horizontal Window	90%
	18	95% Horizontal Window	95%
	19	100% Horizontal Window	100%
	20	Black	Black
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2	Level 005	005
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4	Level 012	012
5	Level 014	014
6	Level 016	016
7	Level 017	017
8	Level 018	018
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10	Level 020	020
11	Level 021	021
12	Level 022	022
13	Level 023	023
14	Level 024	024
15	Level 025	025
16	Level 026	026
17	Level 027	027
18	Level 028	028
19	Level 029	029
20	Level 030	030
21	Level 031	031
22	Level 032	032
23	Level 033	033
24	Level 034	034
25	Level 035	035
26	Level 036	036
27	Level 037	037
28	Level 038	038
29	Level 040	040
30	Level 042	042
31	Level 044	044
32	Level 046	046
33	Level 048	048
34	Level 050	050
35	Level 054	054
36	Level 058	058
37	Level 062	062
38	Level 066	066
39	Level 070	070
40	Level 075	075
41	Level 080	080
42	Level 085	085
43	Level 090	090
44	Level 095	095

	45	Level 100	100
	46	Level 110	110
	47	Level 120	120
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	49	Level 130	130
	50	Level 140	140
	51	Level 150	150
	52	Level 160	160
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Audio Test Materials: Titles 1 to 4

Title 1: Levels and Balance

Format: Dolby Digital and DTS 5.1 (NTSC and PAL)

Dolby Digital and DTS 5.1 Audio System Check. During this section of the program there are three audio tracks available, DTS 5.1, Dolby Digital 5.1 and Dolby Digital Lt Rt. The tracks are selectable using the Audio Select button on the DVD player's remote control. The player should provide an on screen indication of which track is being played. The Dolby Lt Rt track may show up as Dolby 2.0. Your receiver should be in the Dolby Pro-Logic decoding mode when this track is selected.

The Dolby Digital Pro-Logic track stays in step with the multi-channel audio indications on screen by repeating the L-R signal for each of the back surrounds.

Pink noise begins at the head of the chapter and lasts for the duration of the chapter. The level is -30 dBSF for individual channels. The levels at half way points between two speakers have been set so that the acoustic level comes out at the same level as the individual channels.

Audio levels should be set among the channels using band limited pick noise. The important point is to set all of the channels so that they are equal in level. Band limited pink noise is used so that possible tambour differences among speakers will not affect the level setting process. The –30 dBSF should produce a + 75 dB acoustic level if the volume control is turned up to reference level.

Step Around the Room in 5.1, Band Limited Pink Noise (500 Hz to 2 KHz), 10 seconds per position.

Chapter 1: Left

Chapter 2: Half Left

Chapter 3: Center

Chapter 4: Half Right

Chapter 5: Right

Chapter 6: Half Right Surround

Chapter 7: Right Surround

Chapter 8: Center Back, Between the Surrounds

Chapter 9: Left Surround

Chapter 10: Half Left Surround

Chapter 11: LFE, 40 to 80 Hz noise at -33 dBfs

Chapter 12: Pan Around the Room

This is done once in 30 seconds with Full Bandwidth Pink Noise (20 Hz to 20 KHz), leaving out the LFE channel. Listen for any tambour differences in the speakers. This or any other chapter can be put in a loop if there is a need to repeat this sequence. Starting at the left we are full on to the next speaker every six seconds.

Title 2: Levels and Balance

Format: Dolby Digital and DTS 6.1 (NTSC and PAL)

Dolby Digital and DTS 6.1 Audio System Check. The Dolby Digital Lt Rt will stay in step with the multi-channel audio by repeating the L-R channel for each of the back surrounds. Pink noise begins at the head of the chapter and lasts for the duration of the chapter. Level is -30 dBSF for individual channels. The levels at half way points between two speakers have been set so that the acoustic level comes out at the same level as the individual channels.

Step Around the Room in 6.1, Band Limited Pink Noise (500 Hz to 2 KHz), 10 seconds per position.

Chapter 1: Left

Chapter 2: Half Left

Chapter 3: Center

Chapter 4: Half Right

Chapter 5: Right

Chapter 6: Half Right Surround

Chapter 7: Right Surround

Chapter 8: Half RS and CB

Chapter 9: Center Back

Chapter 10: Half CB and LS

Chapter 11: Left Surround

Chapter 12: Half Left Surround

Chapter 13: LFE, 40 to 80 Hz noise at -33 dBSF

Chapter 14: Pan Around the Room

This is done once in 30 seconds with Full Bandwidth Pink Noise (20 Hz to 20 KHz), leaving out the LFE channel. The chapter can be put in a loop if the sequence needs to be repeated.

Step Around the Room in 6.1, Full Bandwidth Pink Noise, 20 seconds per position.

Chapter 15: Left

Chapter 16: Half Left

Chapter 17: Center

Chapter 18: Half Right

Chapter 19: Right

Chapter 20: Half Right Surround

Chapter 21: Right Surround

Chapter 22: Half RS and CB

Chapter 23: Center Back

Chapter 24: Half CB and LS

Chapter 25: Left Surround

Chapter 26: Half Left Surround

Chapter 27: LFE, 40 to 80 Hz noise at -33 dBfs

Chapter 28: Low Bass in the Left & Right

Title 3: System Response

Dolby Digital and DTS 6.1 plus Dolby Lt Rt

Chapters 1-4 of this title provide test patterns for the “Buzz & Rattle Test.” These chapters provide a frequency sweep from 15 Hz to 300 Hz in order to help determine if anything in the room will “Buzz” or “Rattle” at a reference listening level and at a certain frequency. This test should be performed after the output levels and speaker placement have been finalized. At this point if anything does “Buzz” or “Rattle” find the cause of the “Buzz” or “Rattle” and try to minimize it. This may mean anchoring furniture or moving trinkets.

Audio formats included in this disc are Dolby Digital and DTS 6.1 plus Dolby Lt Rt. Use the Audio select button on the remote control to switch among the channels. An indication should come up on screen telling you which option has been selected. Dolby Digital Lt Rt will probably show up as Dolby 2.0

Audio Content:

Chapter 1: Buzz & Rattle Test, 15 Hz to 300 Hz – Left

Chapter 2: Buzz & Rattle Test, 15 Hz to 300 Hz – Center

Chapter 3: Buzz & Rattle Test, 15 Hz to 300 Hz – Right

Chapter 4: Buzz & Rattle Test, 15 Hz to 300 Hz – 6 Main Channels

Chapters 5-8 provide test patterns designed to check aural frequency response of the system using frequency sweep from 15 Hz to 22 KHz. Using a sound level meter in the flat frequency response mode look for level changes over the entire range of frequencies presented in the sweep. The sweeps can also be used to monitor the response of audio processing equipment using audio level meters or an oscilloscope. Make sure any measuring devices used are flat in their response capability over the range provided in the test.

The room itself can be at fault for errors, let alone possible problems with the audio equipment driving the space. It is a good idea to check the equipment's capability independent of the room wherever possible and fix it first if it is contributing to the error being measured in the room. Equalizing any errors in response can be accomplished in a number of ways. There are audio equalizers, but they may introduce their own distortion in the processing of balancing the audio spectrum. There is acoustic treatment that can be added to the room itself to help equalize the audio spectrum.

The goal is to have flat frequency response in the area where the listeners will sit. The larger the area of optimal listening, the more people will be able to hear the same thing. Check with people who specialize audio system setup for additional help.

Chapter 5: Frequency Sweep, 15 Hz to 22 KHz – Left

Chapter 6: Frequency Sweep, 15 Hz to 22 KHz – Center

Chapter 7: Frequency Sweep, 15 Hz to 22 KHz – Right

Chapter 8: Frequency Sweep, 15 Hz to 22 KHz – 6 Main Channels

Chapters 9-16 provide audio materials designed to check the bass management of the system. They provide test signals from 15 Hz to 150 Hz through all channels and each individual channel within the system. As with the frequency sweeps the goal is to achieve flat bass response throughout the 15 Hz to 150 Hz frequency range in the biggest listening area as possible. This may be difficult because lower frequencies tend to have bigger null points - as the larger wavelength of the lower frequencies create standing waves. This is illustrated in the tutorial portion of the program on the first two discs of the DVE-Pro set.

In addition to low bass response in the room these signals check the ability of the audio processing system to properly cross over low bass information in each channel to the subwoofer. The point of cross over from subwoofer and main channel is often user selectable and may depend on the capabilities of the main loudspeakers. In any event the cross over frequency should be well below 150 Hz, with 80 Hz being a common choice in high quality systems.

Audio in the LFE channel should not cross over into any of the main channels.

Chapter 9: Bass Management Test 15 Hz to 150 Hz – 6 Main Channels

Chapter 10: Bass Management Test 15 Hz to 150 Hz – Left

Chapter 11: Bass Management Test 15 Hz to 150 Hz – Center

Chapter 12: Bass Management Test 15 Hz to 150 Hz – Right

Chapter 13: Bass Management Test 15 Hz to 150 Hz – Right Surround

Chapter 14: Bass Management Test 15 Hz to 150 Hz – Back Surround

Chapter 15: Bass Management Test 15 Hz to 150 Hz – Left Surround

Chapter 16: Bass Management Test 15 Hz to 150 Hz – LFE

Title 4: Sound and Vision Timing

Dolby Digital and DTS 6.1 plus Dolby Lt Rt

The idea behind this section is a combination of what is accomplished in the film leader count down clock used to check visual and sound sync in movie theaters plus Using video wipe patterns of luminance and color information for video testing. The audio pop occurs at top dead center of the rotation. At the point of the pop the top 5% of the image area turns white. This can be used as a scope trigger to determine if the audio is in step with the picture.

The transitions about the clock are 75 and 100% chroma and luminance wipes. The idea is to determine if there are any problems with such transitions in video.

The sound used is what the film industry calls the two pop.

This title opens with the pink noise clock. Its purpose is to determine how long it takes the audio to start up after the video. The pink noise is always on. Take note of the position of the clock when you first hear the pink noise when starting this chapter from the menu system. You can also start the chapter, hit pause, and then back it up to the first frame of the chapter. Leave it in the still frame mode long enough for the audio decoder to loose sync then hit play. Take note of the position of the clock when the audio starts. This section runs for 5 seconds, which should be long enough for any system to pick up the audio.

The clock pulse or “two pop” is in the center channel during the full band pink noise section. It then moves to the left and right channels when it is on its own.

Either chapter can be put in a loop if more time is required for the use of the signals, although putting the pink noise clock in a loop should not cause a drop in audio decoding sync.

Chapter 1: Pink Noise Clock

Chapter 2: Luminance & Chroma Clock

Video Test Materials: Titles 5 to 16

Our concept of providing test patterns comes from two points of view. The first finds its origins in the history of television, where test patterns have been used to determine the integrity of the video signal path and calibration of equipment. The second comes from the need of creating simulations of problems that occur in images. The need for this type of test materials comes from the amount of video processing currently employed in displaying program material. That processing involves compression and de-compressing as well as conversion to other rates for display.

We also elected to challenge parameters in the interlaced video domain that have been otherwise off limits. Among them is how much horizontal and vertical detail can we get into the digital video channel. Normal standard definition program production standards filter the horizontal resolution to less than 6 MHz, when the digital channel could carry as much as 6.75 MHz in bandwidth. The vertical is also filtered by about 30% in program production to minimize the visibility of interlaced artifacts when the signal is displayed on an interlaced monitor.

So why are we exceeding either program production practice in our test and demonstration materials? The reason is found in high definition program production. A large percentage of program material currently out on DVD comes from progressive high definition masters, as does our presentation. When that image information is down converted to standard definition interlaced video there is a strong possibility that the detail content goes right out to the limits of the digital video channel.

This is certainly anticipated in many DVD players where the analog output allows all of the capability of the digital channel to be reproduced. Manufacturers designing consumer equipment need a clear reference for what can happen in their equipment when such detail is present. We've made sure that extra detail is present in *Digital Video Essentials.*

Providing that detail has consequences in many applications. Interlaced artifacts are going to be far more visible on interlaced displays. Video processors designed to the limitations of program production practices are probably going to exhibit ringing in the image, if not a great deal of flicker.

Knowing this we've provided filtered and unfiltered versions of some test patterns. That will be pointed out in the introduction of the individual titles.

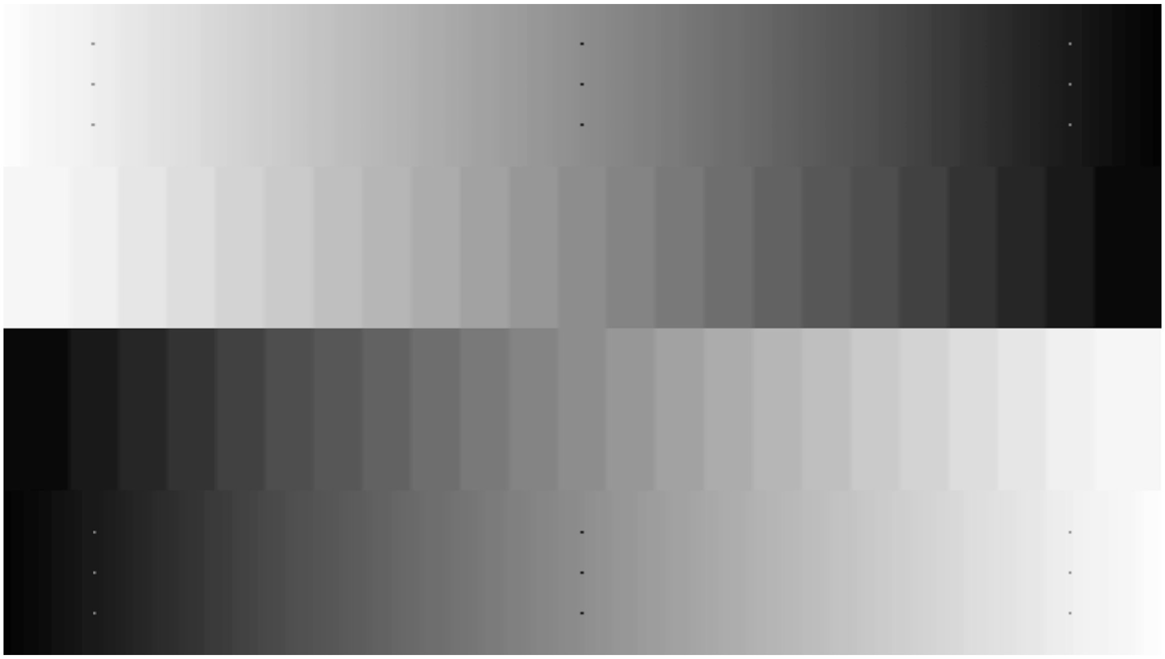
Title 5: Basic Display Setup

Chapter 1: Title Identification: *Basic Display Setup*

Title 5 provides a quick reference for evaluating the condition of a display and to some extent the circuits driving it. Included are gray scale, brightness, contrast, color decoding, chroma and luminance response, and a reference for ambient light behind a monitor, should that light be needed with the display.

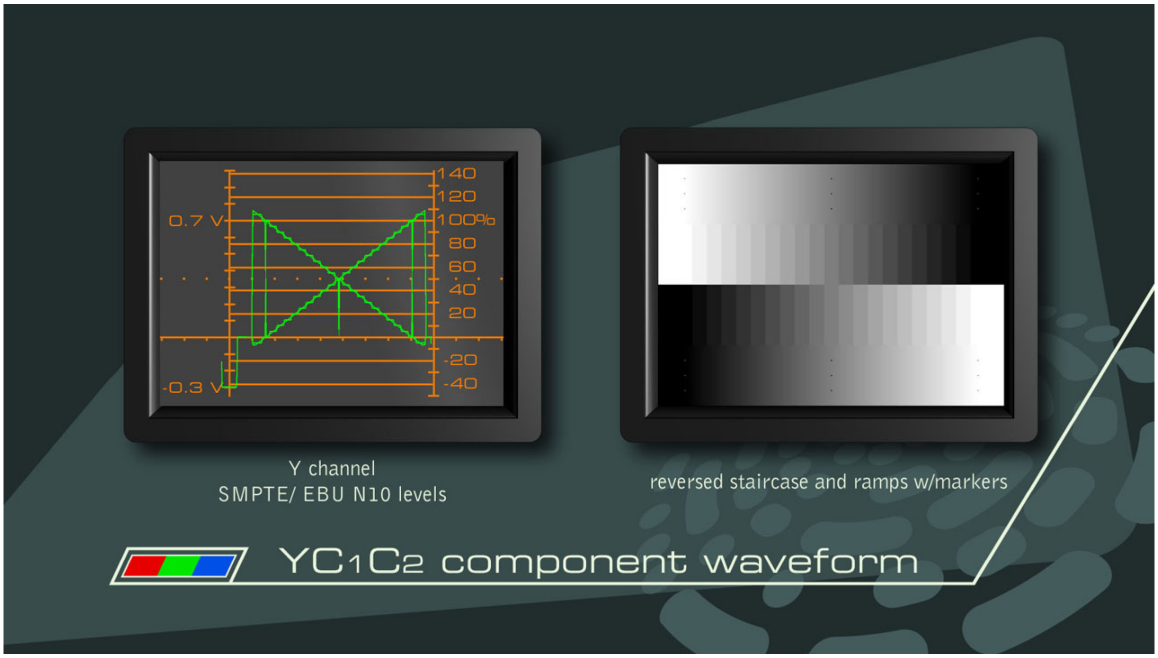
Chapter 2: Reverse Gray Ramps & Steps

Function: To assess/adjust brightness, contrast, gray scale tracking (within the limitations of flat field uniformity), bit depth, and gamma.



Pattern Layout: The top and bottom portion of this pattern consist of a gray ramp. The inner portion of the pattern contains gray steps. The twenty-two steps extend from 5% below black to 5% above white, with the ramps extended out to the limits of the digital video system. Markers, which appear as three vertical dots, are placed at video black, 50% and 100% video.

Descriptions of Uses: This pattern was initially designed to exercise the entire dynamic range of the digital video system. In this application it is useful in determining if video equipment can pass the complete dynamic range of the signal. In a solid-state display it will make it easy to spot any clipping that may take place at the upper end of the dynamic range. It’s the pattern of choice when setting the contrast control on a digital display.



While the Reverse Gray Ramps and steps can be used to set black level as well as white, we still favor the PLUGE pattern for setting black level on any display.

Unlike the analog CRT digital displays do not go into blooming. As the contrast is turned up the brighter portions of the video signal hit a clipping circuit, the maximum capability to pass video. Any video information that is going to get to the display must be below the clip point in level. It's sort of like a speed governor on a car. It's drivable at any speed below the maximum point set in the governor. If the contrast is turned up chances are that part of the video signal will be pushed into this clipping circuit. Whatever detail is in that portion of the video signal will be turned into a flat white with no detail. The contrast control must be turned down until the detail re-appears. Run the contrast control up to see if the steps start to blend together.

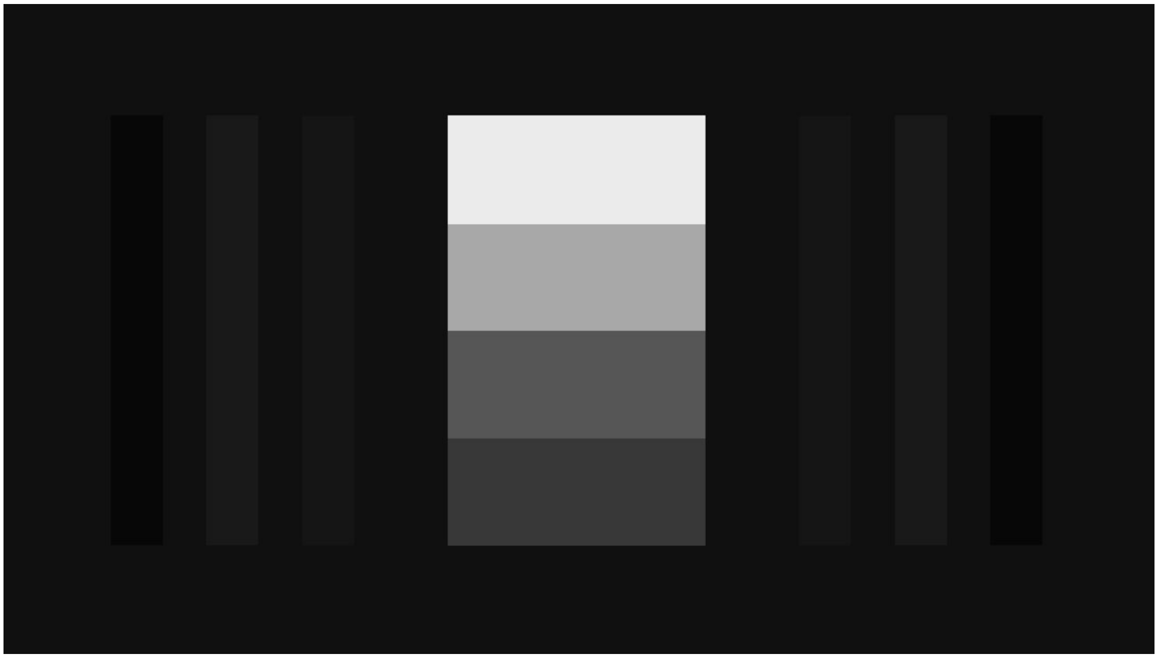
There may be circumstances where turning the contrast control down on the display device will not pull the video out of the clip. This is often an indication that some device ahead of the display is running into its own digital clip.

It is important to have a waveform monitor to check the video at various stages in the video path to determine that it is not being clipped at either end of the dynamic range. The full active video signal extends from about –48 mVolts to +760 mVolts with black at 0 Volts and white at 700 mVolts.

This pattern is also capable of revealing information about the bit depth of video processing. Look at the ramps in the pattern. These should appear smooth from black to above white. If there are vertical lines or noise in any areas of the ramps, the system more than likely does not have enough bit depth to properly handle the video signal.

Chapter 3: DVE PLUGE w/ Gray Scale

Function: To assess/adjust brightness in all types of displays and contrast in a CRT display.



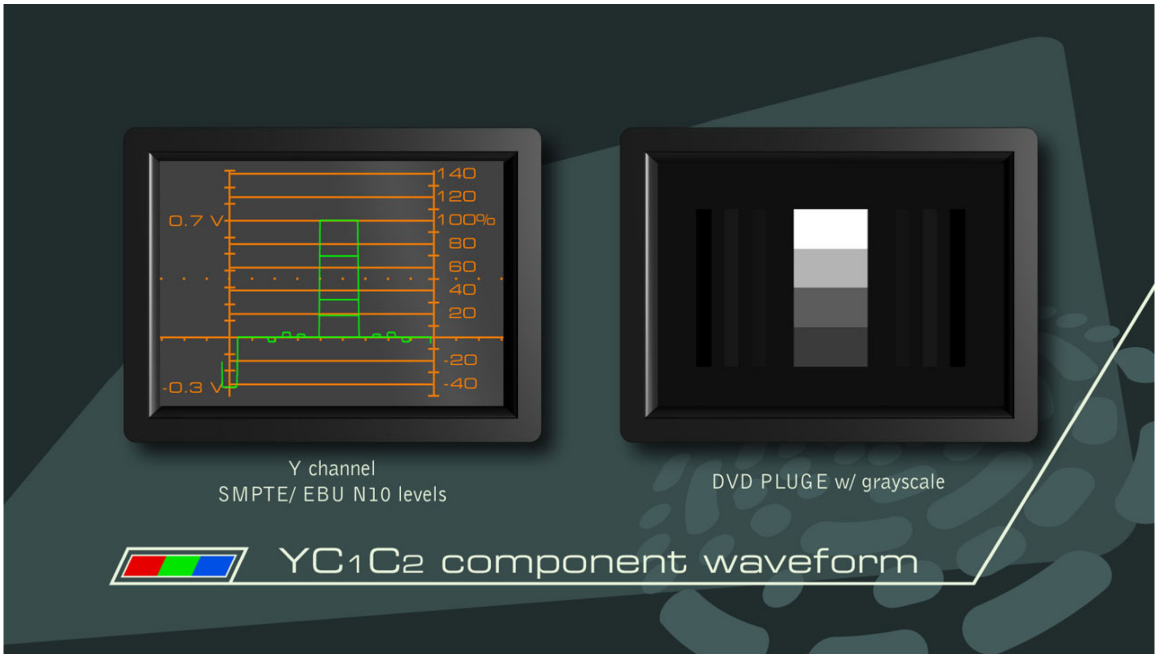
Pattern Layout: The pattern consists of a background at video black, then a symmetrical PLUGE on both the left and right side of the log gray scale in the middle of the pattern. The outer part of the PLUGE contains a -4% black bar on the video black background followed by a +4% bar and +2% bar as you go towards the middle from either side. The gray scale in the middle represents steps of about 18.4%, 32.1%, 69% and 100%. These values were chosen based on the gamma curve of a CRT display and represent a visual progression in light output along that curve.

Descriptions of Use: We've made several changes to the PLUGE patterns from the BBC version that was presented in *Video Essentials*. The original PLUGE was on the left with the gray scale on the right. The PLUGE is now on both sides of the center to provide a greater opportunity to set black, taking image uniformity into a greater account. We've also added a 2% step. Originally it was added to help in setting black level where below black information was being cut off. It later served a function of helping us describe the rate at which a CRT comes out of black. There is almost no difference in level between black and 2% above black.

The DVE PLUGE allows for the brightness control to be set properly on almost any display system. Its general use is illustrated in the tutorial discs of the DVE-Pro package. An important point to make here is that when displayed on a CRT there is almost no difference in level between the 2% above black and black itself. In the description of how to set black we tell you to adjust the Brightness control so that the blacker than black strip and video black background just match in level. You'll note that the resolution of Brightness controls is so poor that if this criteria is met, the 2% above black strip might not be visible. Turn the brightness control up far enough for the 2% strip to be visible and there will be a difference between the blacker than black and video black background. The gamma of a CRT is nearly flat in this area of operation. This is the way all display devices should work. If there is a large difference between the black background and the 2% stripe, at least part of the gamma curve in the display is wrong.

The pattern has a low average picture level (APL) and is used in conjunction with the high APL PLUGE to determine the condition of DC Restoration.

The waveform of the pattern is useful in setting black and white levels in video equipment.



In light bulb driven solid state displays you're not likely to reach the point of absence of light as described in the procedure for setting brightness on a CRT display. What you reach is a digital cut-off, a point where information in the video signal is no longer displayed. Ideally you might think you should put black at cut-off. Where solid-state displays have a gamma curve designed to emulate a CRT we are setting black level one point on the brightness scale above the point of video black being cut off. At this point in the gray scale the gamma curve is nearly flat and there should be little or no light output difference in this extra point of brightness shift. What this provides the viewer is a simulation of the CRT's ability to fully display information in the area of black, making use of some of the dynamic range below black. The light level for this darker part of the picture should be controlled using a combination of screen size and type, and lamp output. Some projectors also have an iris control for even finer control of the ambient level. The tutorial in DVE suggests the ambient level should be below 0.05 ft-L.

The center grayscale allows for a quick determination of the color of gray. Many calibrators use this pattern as a reference for quickly adjusting a grayscale as it allows one to see what is happening to the entire gray scale as adjustments are being made. It can also be used to set the contrast control on a CRT based display. That is also illustrated in DVE. It is not easily used to set the proper upper dynamic range of a solid-state display. With experience you can spot when clipping comes down as far as the 100% of this top rectangle but that doesn't help in knowing how much the contrast has to be backed down to accommodate the entire video dynamic range.

Chapter 4: High APL PLUGE

Function: To assess the quality of DC Restoration in the display.

Pattern Layout: The pattern consists of a peak white area at the top and bottom and center of the image with video black and PLUGE on the left and right sides of the image.

Descriptions of Use: Black level in the image should remain fixed when switching back and forth between the test patterns in Chapters 3 and 4. You may have to look carefully at the area around the PLUGE, factoring out any flair from the bright white or just factoring out the effect it may have on your eyes shutting down, to determine if black is being held at black independent of program content.

Knowing that there are 2 and 4% steps in the PLUGE pattern you can get a rough estimate of how well black is being held at black. Solid-state displays can be designed so there is no shift in black level. A 1 to 2% change is expected in even good CRT displays. In a good viewing environment you wouldn't want anything that changed more than 3 or 4%.

Chapter 5: Needle Pulse

Function: To assess the high voltage regulation and determine the presence of scan velocity modulation.

Pattern Layout: The background of the pattern is split screen with video black on the top and peak white on the bottom. There is a line that travels vertically through the image that is called the needle, it is white at the top section and black at the bottom section. The rise and fall time of the pulse is about 2T or half the maximum rise time the video system will allow.

Descriptions of Use: The pattern was initially developed as a quick look at video bandwidth, which requires its display on a waveform monitor, then became useful in looking at power supply capability and eventually took on the task of helping to spot the presence of scan velocity modulation in CRT displays. It's usefulness as a visual pattern for spotting problems is primarily in CRT displays. Solid-state displays should not have any of the problems for which this pattern will be useful. That's not to say we won't spot something, but it should look good on all of these types of displays.

The needle in the pattern is a vertical line and has the same width from top to bottom. It should be a vertical line in any display. Independent of geometry controls the line may bend on CRT displays as the contrast is increased. This is an indication that the power supply is not able to provide the current being demanded by the position of the contrast control. This is illustrated in the tutorial version of DVE.

The other use of this pattern is to determine the presence of scan velocity modulation.

Scan Velocity Modulation, or SVM, is one of the many tricks manufacturers use to get more light out of a picture tube, at the cost of real picture detail. It changes the speed or velocity of the beam as it is scanned from the left to the right side of the picture. In the process, it distorts real picture detail, causing dark areas of the picture on light backgrounds to be reproduced much larger than normal and light areas on dark backgrounds to be reproduced much smaller than normal. When the beam spends more time "writing" light areas, the phosphors receive more energy and produce more light output. The fact that this will contribute to phosphor blooming, as well as detail distortion seems to be lost on a number of manufacturers calling it a "feature."

Its use for this function is illustrated in the tutorial version of DVE.

Chapter 6: 75% Color Bars & Patch w/ Labels

Function: To assess/adjust color decoding, pointing out the bar and patch combinations to be viewed when making Color and Tint adjustments

Pattern Layout: Split bar, patch combination found in the SMPTE color bar pattern.

Descriptions of Use: This pattern is most useful in display devices where you can individually view the red, green and blue channels. Short of that the red, green and blue filters provided with DVE can provide that function for most displays. Its use is illustrated in the tutorial version of DVE.

We have a word of caution in using the filters to view each color individually. If the display matrixes colors to go from their original primary colors to any other set of primary colors the filters will not be useful. The display will have to have its own red, green and blue capability.

Composite/S-Video:

Initially observe the blue channel; isolate blue either by turning off red and green, or with the blue filter. Following the explanation in the tutorial version of *Digital Video Essentials*, adjust the amplitude and phase controls in order to achieve proper results.

Next, assess the red channel. Turn off the blue and green channels of video, or use the enclosed filter. If the red intensity in the magenta patches and red patches match when observed through the filter, decoding in the red direction is accurate. If there is a difference in intensity the decoder is not functioning properly.

Finally, assess the green channel by turning off the blue and red channels. If the green intensity in the cyan patches and yellow patches match when observed through the filter, decoding in the green direction is accurate. If there is a difference in intensity the decoder is not functioning properly.

Component Video:

The same observations apply; however, if there is a Hue or Tint control it controls color balance instead of decoder phase. Hue or Tint is not normally available in component video.

Chapter 7: 75% Color Bars w/ Gray Reference

Function: To assess/adjust color decoding.

Pattern Layout: The pattern consists of a gray background with yellow, cyan, green, magenta, red, and blue rectangles on the top and bottom halves of the image.

Description of Use: This pattern was designed to better serve the function of color decoder calibration across all component and composite video systems plus have areas large enough to make it possible to see around many of the on-screen menu systems in display devices. When it originates in the particular system being calibrated this pattern works for NTSC, PAL, interlaced and progressive video, plus all of the component high definition systems. It is particularly useful when trying to evaluate the conditions of the green and red channels after levels have been properly set in the blue channel.

Composite/S-Video:

Initially observe the blue channel; isolate blue either by turning off red and green, or with the blue filter. Following the explanation in the tutorial version of *Digital Video Essentials*, adjust the amplitude and phase controls in order to achieve proper results.

Next, assess the red channel. Turn off the blue and green channels of video, or use the enclosed filter. If the red intensity in the magenta patches and red patches match when observed through the filter, decoding in the red direction is accurate. If there is a difference in intensity the decoder is not functioning properly.

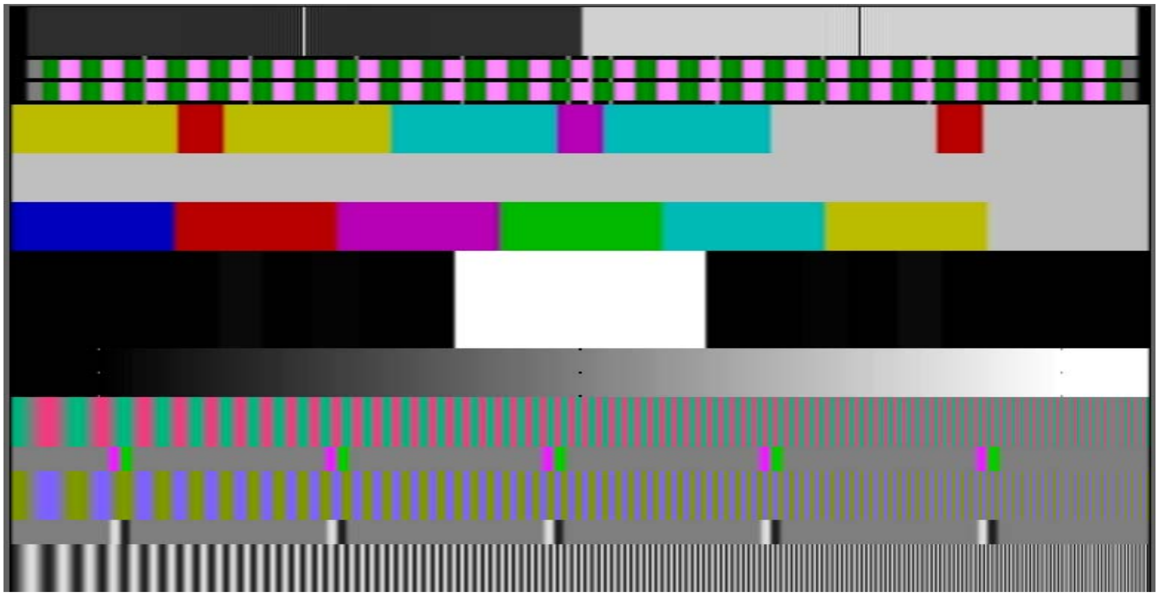
Finally, assess the green channel by turning off the blue and red channels. If the green intensity in the cyan patches and yellow patches match when observed through the filter, decoding in the green direction is accurate. If there is a difference in intensity the decoder is not functioning properly.

Component Video:

The same observations apply; however, if there is a Hue or Tint control it controls color balance instead of decoder phase. Hue or Tint is not normally available in component video.

Chapter 8: Combination Pattern

Function: General visual evaluation pattern for a number of important parameters in conveying and displaying video. Individual, full screen versions of each of the test signals represented in this combination can be found elsewhere in the disc.



Pattern Layout: From top to bottom

Sinx/x This is a video bandwidth test pattern. It requires a spectrum analyzer to make full use of its capability. It exercises the majority of the frequencies in the baseband video. It can be found in Title 12, Chapter 35 as a full field test pattern.

Bowtie test pattern at 5 nsec resolution. The Bowtie is named after its appearance on a waveform monitor. It is designed to provide information about the amplitude and timing relationship of the Y Pb and Pr channels in the component video system. It can be found in Title 12, Chapter 29 at a 5 nsec resolution and in Title 12, Chapter 30 at a 1 nsec resolution.

Chrominance to Luminance Delay. This is a visual indication of positioning of color on color with luminance differences in those colors plus a look at color on gray. The full field version of this pattern can be found at Title 6, Chapter 25.

Gray Reference at 75%. This serves as a decoder reference for both the delay pattern above it and the color bar pattern below it. The function of this is best illustrated in the Color Bar pattern with Gray Reference found earlier in this title.

Color Bars at 75%. This is to be used with the gray reference above it for checking the quality of decoding to RGB. The function of this is best illustrated in the Color Bar pattern with Gray Reference found earlier in this title.

PLUGE with a Reference White. This is a wedge out of the PLUGE with Log Gray Scale at the point of the white rectangle. It serves as a reference for black and white levels.

Full dynamic range gray ramp with markers for black, 50% and video white at 100%.

Reduced Amplitude Pr Sweep with a 50% Flat Field Luminance Background. The amplitude of the sweep is about 75% of full color level. The sweep starts at about 0.25 MHz and runs out to 2.875 MHz. The flat field in the luminance makes it easier to see the excursions of the color signal. Full field and split field versions of these patterns can be found in Title 11.

Pb plus Pr Amplitude and Frequency Markers. The markers are placed at 0.5 MHz intervals in the chroma sweep. The bandwidth of the marker is about 0.5 MHz. The amplitude of the marker represents the amplitude of the chroma signal at 0.5 MHz. In a visual inspection compare the amplitude of the markers with the amplitude of the signal at any point along the sweep.

Reduced Amplitude Pb Sweep with a 50% Flat Field Luminance Background. The amplitude of the sweep is about 75% of full color level. The sweep starts at about 0.25 MHz and runs out to 2.875 MHz. The flat field in the luminance makes it easier to see the excursions of the color signal. Full field and split field versions of these patterns can be found in Title 11.

Luminance Amplitude and Frequency Markers. The markers are placed at 1.0 MHz intervals in the luminance sweep. The bandwidth of the marker is about 1.0 MHz. The amplitude of the marker represents the amplitude of the luminance signal at 0.5 MHz. In a visual inspection compare the amplitude of the markers with the amplitude of the signal at any point along the sweep.

Reduced Amplitude Luminance Sweep. This 75% amplitude sweep starts at 0.5 MHz and extends out to about 5.75 MHz. The sweep is centered around the 50% luminance level to match the chroma sweeps. Full field and split field versions of these patterns can be found in Title 11.

Description of Use: This pattern was assembled because one full field will tell you a lot of what you need to know about a video path. The Sinx/x and Bowtie patterns were designed for use with instrumentation. The others work for both visual inspection and instrumentation. Any of the parameters being tested with this pattern can be individually tested with other patterns in the program.

Chapter 9: Reference for Maximum Ambient Light

Function: To assist in judging the intensity of a D6500 bias light placed behind the TV set.

Pattern Layout: The important part of the pattern for the purpose of judging the maximum ambient light to be behind the monitor is the gray window. There is also a PLUGE pattern as part of the signal.

Description of Use: With the display properly calibrated for black and white levels use this pattern to assess the maximum amount of light that is visible behind the display from the primary viewing position. The level of the window is based on the gamma curve of a CRT display, being placed at a video level that should produce about 10% of the peak white capability of the monitor. In other words if the monitor is set for 30 foot-Lamberts for 100% video, this pattern should fall at about 3 foot-Lamberts. If the gamma of the display being used does not follow the CRT curve then the light output from this pattern will most likely not be 10% of the peak white.

Sit back in the viewing position and look at the level of light coming from this pattern then compare it to the level of light behind the set. If the set and the light are at the right color of gray the color of the two should match.

The amount of light behind the set is part of Human Factors. Many people like the light behind the set to be below the 10% point. There is also a point where the set is dim enough or occupies a large enough portion of your field of view that ambient light is not needed or desirable.

Chapter 10: Video Black

Function: Provide an easily accessed source of video black. Look for vertical or horizontal tilt in the signal.

Pattern Layout: Video Black

Description of Use: Something that can be used on a video screen for a long time without fear of harming any of the display characteristics. This is also just ahead of a Title boundary. Use the Skip Forward or Play button to jump to the next title. Not all DVD players are capable of easily jumping a Title boundary. You may have to try other navigation options or use the Program Menu to move forward to the next title.

Any flat field pattern can be used to look for vertical or horizontal tilt. This is a circumstance where the amplitude of the signal is not the same from one side of the picture to another. Visually spotting tilt can be encumbered by flat field uniformity. It's best to check such thing out on a waveform monitor.

Title 6: Advanced Display Setup

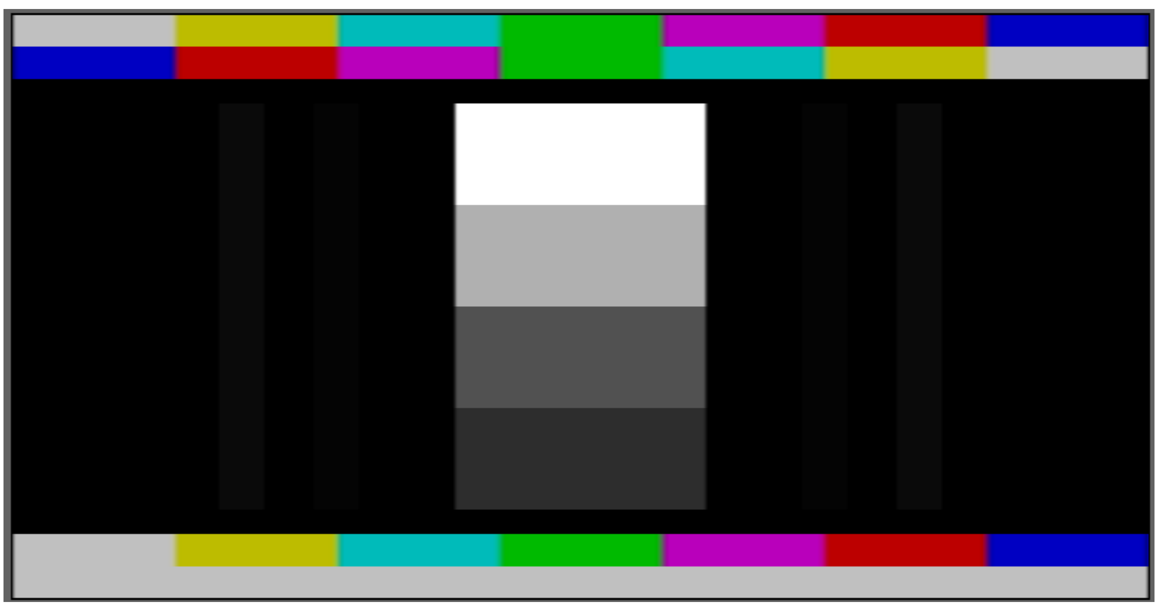
In the introduction to this section we mentioned that test patterns would be provided which were filtered to the limits of standard definition interlaced video production standards instead of exercising the full capability of the digital video channel. Chapters 20 to 23 provide examples.

Chapter 1: Title Identification: *Advanced Display Setup*

Title 6 focuses on some of the details involved in display setup such as color filter wheel phase in single chip displays, gray scale calibrations and image aspect ratios.

Chapter 2: DVE PLUGE w/ Gray Scale

Function: Combination pattern for assessing and or adjusting black level and color decoding with a reference for video white.



PLUGE

The outer part of the PLUGE contains a -4% black bar on the video black background followed by a +4% bar and +2% bar as you go towards the middle from either side. The gray scale in the middle represents steps of about 18.4%, 32.1%, 69% and 100%. These values were chosen based on the gamma curve of a CRT display and represent a visual progression in light output along that curve.

Descriptions of Use: The combination pattern allows you to set black level, make observations about white level, or properly set it on a CRT based display, and asses the decoding of color. At the top of the pattern the patches of 75% saturated color and gray are reversed allowing a comparison of individual colors when observing just the red, green or blue channel. Displaying the decoded signal on a waveform monitor makes it easy to assess or adjust any of the decoder functions. The bottom color and gray combination is also at 75%. This time the color patches are being compared to reference levels for each color.

The DVE PLUGE allows for the brightness control to be set properly on almost any display system. Its' general use is illustrated in the tutorial discs of the DVE-Pro package. An important point to make here is that when displayed on a CRT there is almost no difference in level between the 2% above black and black itself. In the description of how to set black we tell you to adjust the Brightness control so that the blacker than black strip and video black background just match in level. Note that if the resolution of Brightness controls is so poor that if this criteria is met, the 2% above black strip might not be visible. Turn the brightness control up far enough for the 2% strip to be visible and there will be a difference between the blacker than black and video black background. The gamma of a CRT is nearly flat in this area of operation. This is the way all display devices should work. If there is a large difference between the black background and the 2% stripe, at least part of the gamma curve in the display is wrong.

The pattern has a low average picture level (APL) and is used in conjunction with the high APL PLUGE to determine the condition of DC Restoration.

In light bulb driven solid state displays it is not likely to reach the point of absence of light as described in the procedure for setting brightness on a CRT display. What is reached is a digital cut-off, a point where information in the video signal is no longer displayed. Ideally you might think you should put black at cut-off. Where solid-state displays have a gamma curve designed to emulate a CRT we are setting black level one point on the brightness scale above the point of video black being cut off. At this point in the gray scale the gamma curve is nearly flat and there should be little or no light output difference in this extra point of brightness shift. What this provides the viewer is a simulation of the CRT's ability to fully display information in the area of black, making use of some of the dynamic range below black. The light level for this darker part of the picture should be controlled using a combination of screen size and type, and lamp output. Some projectors also have an iris control for even finer control of the ambient level. The tutorial in DVE suggests the ambient level should be below 0.05 ft-L.

The center grayscale allows for a quick determination of the color of gray. Many calibrators use this pattern as a reference for quickly adjusting a grayscale as it allows one to see what is happening to the entire gray scale as adjustments are being made. It can also be used to set the contrast control on a CRT based display. That is also illustrated in DVE. It is not easily used to set the proper upper dynamic range of a solid-state display. With experience you can spot when clipping comes down as far as the

100% of this top rectangle but that doesn't help in knowing how much the contrast has to be backed down to accommodate the entire video dynamic range.

Chapter 3: 75% Color Bars w/ Gray Scale

Function: To assess/adjust color decoding.

Pattern Layout: The pattern has many of the elements of the SMPTE color bar pattern with an additional grayscale in the lower left corner to replace the I, Y and Q in the original pattern. The lower right corner maintains the DVE PLUGE with 4% below black, 2% above black, and 4% above black bars.

Descriptions of Use: When possible adjust this pattern by turning each color, red, green, or blue, on and off in order to see the individual red, green, and blue channels. This is a particular requirement of displays incorporating color gamut correction, due to the method by which the correct color gamut is achieved.

Composite/S-Video:

Initially observe the blue channel; isolate blue either by turning off red and green, or with the blue filter. Following the explanation in the tutorial version of *Digital Video Essentials*, adjust the amplitude and phase controls in order to achieve proper results.

Next, assess the red channel. Turn off the blue and green channels of video, or use the enclosed filter. If the red intensity in the magenta patches and red patches match when observed through the filter, decoding in the red direction is accurate. If there is a difference in intensity the decoder is not functioning properly.

Finally, assess the green channel by turning off the blue and red channels. If the green intensity in the cyan patches and yellow patches match when observed through the filter, decoding in the green direction is accurate. If there is a difference in intensity the decoder is not functioning properly.

Component Video:

The same observations apply; however, if there is a Hue or Tint control it controls color balance instead of decoder phase. Hue or Tint is not normally available in component video.

Chapter 4: Reverse Gray Ramps & Steps

Function: To assess/adjust brightness, contrast, gray scale tracking (within the limitations of flat field uniformity), bit depth, and gamma. This pattern can be found in several titles. It's repeated because of its functionality with patterns around it.

Pattern Layout: The top and bottom portion of this pattern consist of a gray ramp. The inner portion of the pattern contains gray steps. The twenty-two steps extend from 5% below black to 5% above white, with the ramps extended out to the limits of the digital video system. Markers, which appear as three vertical dots, are placed at video black, 50% and 100% video.

Descriptions of Uses: This pattern was initially designed to exercise the entire dynamic range of the digital video system. In this application it is useful in determining if video equipment can pass the complete dynamic range of the signal. In a solid-state display it will make it easy to spot any clipping that may take place at the upper end of the dynamic range. It's our pattern of choice when setting the contrast control on a digital display.

While the Reverse Gray Ramps and steps can be used to set black level as well as white, we still favor the PLUGE pattern for setting black level on any display.

Unlike the analog CRT digital displays do not go into blooming. As the contrast is turned up the brighter portions of the video signal hit a clipping circuit, the maximum capability to pass video. Any video information that is going to get to the display must be below the clip point in level. It's sort of like a speed governor on a car. It's drivable at any speed below the maximum point set in the governor. If the contrast is turned up chances are that part of the video signal will be pushed into this clipping circuit. Whatever detail is in that portion of the video signal will be turned into a flat white with no detail. The contrast control must be turned down until the detail re-appears. Run the contrast control up to see if the steps start to blend together.

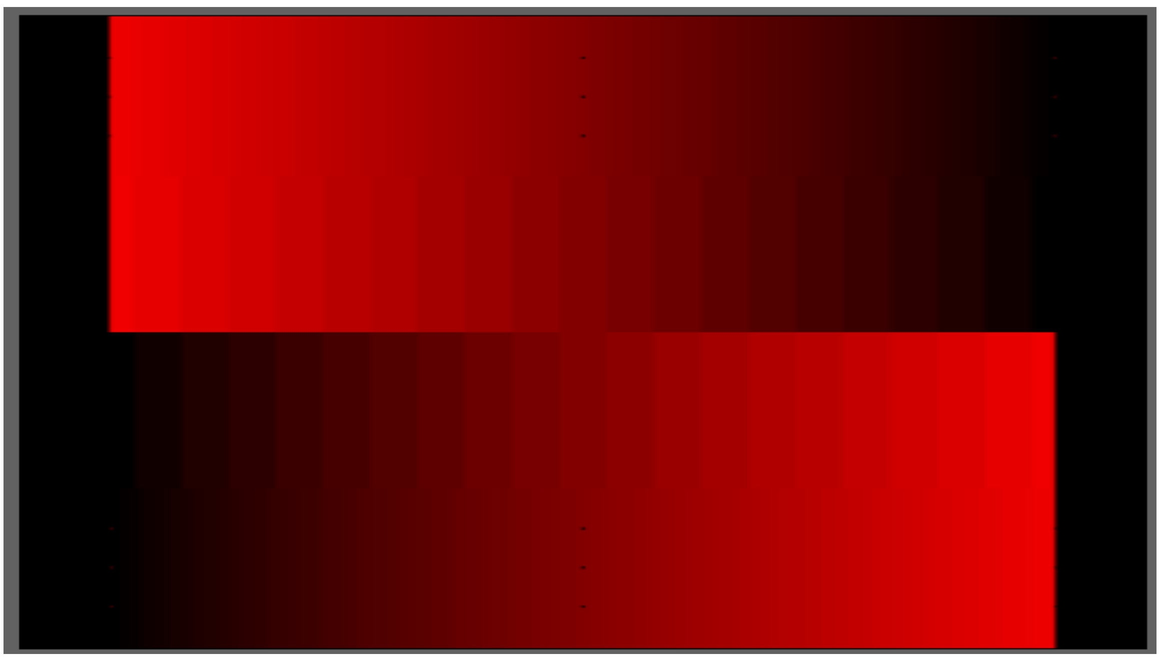
There may be circumstances where turning the contrast control down on the display device will not pull the video out of the clip. This is often an indication that some device ahead of the display is running into its own digital clip.

It is important to have a waveform monitor to check the video at various stages in the video path to determine that it isn't being clipped at either end of the dynamic range. The full active video signal extends from about –48 mVolts to +760 mVolts with black at 0 Volts and white at 700 mVolts.

This pattern is also capable of revealing information about the bit depth of video processing. Look at the ramps in the pattern. These should appear smooth from black to above white. If there are vertical lines or noise in any areas of the ramps, the system more than likely does not have enough bit depth to properly handle the video signal.

Chapter 5: Reverse Ramps, Red

Function: To assess/adjust brightness, contrast, bit depth, color filter wheel position and gamma.



Pattern Layout: This is the red channel version of the Reverse Gray Ramps with steps.

Descriptions of Use: It was initially designed for single chip DLP projectors where the phase of the color filter wheel could be adjusted. In adjusting the phase or position of the color filter wheel you'll see that the purity of the red will change, with something other than pure red coming into one side of the other of the ramp.

Otherwise it serves a similar function in observation of video dynamic range, maximum contrast before clipping and processor bit depth. The three primary colors and three secondary colors are represented in Chapters 5 to 10.

Chapter 6: Reverse Ramps, Green

Function: To assess/adjust brightness, contrast, bit depth, color filter wheel position and gamma.

Pattern Layout: This is the green channel version of the Reverse Gray Ramps with steps.

Descriptions of Use: It is part of the sequence of providing ramps in individual or combinations of the three color channels.

Chapter 7: Reverse Ramps, Blue

Function: To assess/adjust brightness, contrast, bit depth, color filter wheel position and gamma.

Pattern Layout: This is the blue channel version of the Reverse Gray Ramps with steps.

Descriptions of Use: It is part of the sequence of providing ramps in individual or combinations of the three color channels.

Chapter 8: Reverse Ramps, Cyan

Function: To assess/adjust brightness, contrast, bit depth, color filter wheel position and gamma.

Pattern Layout: This is the green plus blue channel version of the Reverse Gray Ramps with steps.

Descriptions of Use: It is part of the sequence of providing ramps in individual or combinations of the three color channels.

Chapter 9: Reverse Ramps, Magenta

Function: To assess/adjust brightness, contrast, bit depth, color filter wheel position and gamma.

Pattern Layout: This is the red plus blue channel version of the Reverse Gray Ramps with steps.

Descriptions of Use: It is part of the sequence of providing ramps in individual or combinations of the three color channels.

Chapter 10: Reverse Ramps, Yellow

Function: To assess/adjust brightness, contrast, bit depth, color filter wheel position and gamma.

Pattern Layout: This is the green plus blue channel version of the Reverse Gray Ramps with steps.

Descriptions of Use: It is part of the sequence of providing ramps in individual or combinations of the three color channels.

Chapter 11: Reverse Gray Ramps & Steps

Function: To assess/adjust brightness, contrast, gray scale tracking (within the limitations of flat field uniformity), bit depth, and gamma. Pattern images and waveforms are presented in the Title 5 test signals description. The text is repeated in Chapter 4 of this title. The pattern is repeated multiple times in the Test Materials section of this program because its use is related to other patterns in the sequence.

Chapter 12: 20% V Window w/ DVE PLUGE

Function: To assess and adjust the lower end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 20% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is to be used with an optical comparator or color analyzer for setting the low end of a gray scale. It is far enough above black so most meters will see its level. This level may be to low for use in setting display devices such as CRT projectors that don't do well in tracking gray. This pattern, in conjunction with the 100% Window are there for setting gray on a set that does a good job of tracking gray. The PLUGE is included as a reference for black level.

Chapter 13: 100% V Window w/ DVE PLUGE

Function: To assess and adjust the upper end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 100% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is to be used with an optical comparator or color analyzer for setting the high end of a gray scale. This level may be above the useful gray scale tracking range of display devices such as CRT projectors. This pattern, in conjunction with the 20% Window are there for setting gray on a set that does a good job of tracking gray. The PLUGE is included as a reference for black level.

Chapter 14: 40% V Window w/ DVE PLUGE

Function: To assess and adjust the lower end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 40% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is intended to be used in setting the lower end of the gray scale when either light output or gray scale tracking do not permit the use of a 20% Window. It is also useful for a quick check on gray scale tracking on sets that are adjusted using the 20 and 100% Windows. The PLUGE is included as a reference for black level.

Chapter 15: 80% V Window w/ DVE PLUGE

Function: To assess and adjust the upper end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of an 80% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is intended to be used in setting the upper end of the gray scale when gray scale tracking does not permit the use of a 100% Window. It is also useful for a quick check on gray scale tracking on sets that are adjusted using the 20 and 100% Windows. The PLUGE is included as a reference for black level.

Chapter 16: 20% V Window w/ DVE PLUGE

This pattern is repeated for ease of access in making gray scale measurements and adjustments.

Chapter 17: Reverse Shallow Gray Ramps

Function: To assess the dynamic range available from a particular system. It is a logical follow-up to the gray scale adjustment while serving a slightly different function than the Reverse Gray Ramps with Steps.

Pattern Layout: The pattern consists of three sets of cross ramps. The top ramps have excursions about video white of ±50 mVolts. The above white level does not extend to the peak capability of the video system. The middle set goes from video black to video white or 0 volts to 700 mVolts, and the bottom set has excursions about video black of about ±50 mVolts. The background is at video black. The center quarter of the line time in the shallow ramps is at either black or white.

Descriptions of Use: The shallow ramps at the top and bottom of the pattern were designed to isolate the areas of video dynamic range where systems usually go wrong. The middle portion of the pattern provides the video black to white range. This pattern was designed for use with a waveform monitor. It may also be useful in setting contrast on digital display.

Chapter 18: Pixel Phase

Function: Assist in the positioning video on a fixed pixel display so that there is a one to one correspondence between the image and the display. In order for this pattern to work properly there has to be a direct correspondence between the test pattern and the display.

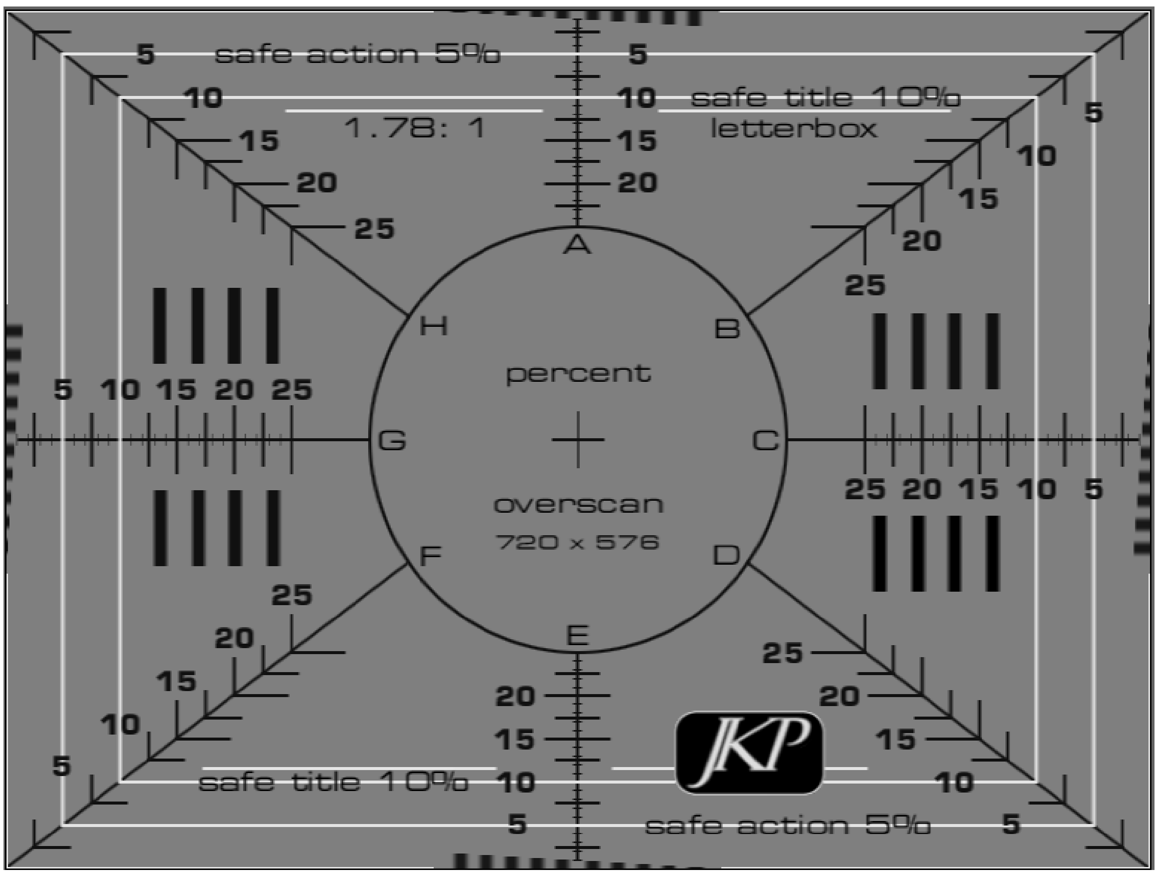
Pattern Layout: The first two groups of information, top left and top right, are 2 pixel rise times. The middle two are single pixel rise times and the last two are 3 pixel rise times. On the left side of the image each group starts out in the positive direction and on the right side they start out in the negative direction. The left and right images are out of phase with each other. The excursion is about 50% of the video amplitude starting at about 5% above black.

Description of Use: This pattern is only useful as a pixel phase test pattern at its native rate. Conversion to another rate will not create the one to one pixel relationship required for this pattern to work in the pixel phase function. While there are few 720 by 486 or 720 by 576 displays these versions of the patterns have been included to be consistent with patterns provided in high definition.

In another application these patterns will provide a look at what is happening at the upper end of frequency response. The single pixel rise time wedges in the middle of the pattern represents a change in state from pixel to pixel or about 6.75 MHz in analog bandwidth.

Chapter 19: 1.33 Overscan Pattern w/ 1% Markers

Function: Reference for the active video area of the picture with markers for pixel count at the four edges and percent markers used to determine the amount of picture information being displayed. The pattern was created as 720 by 486 in NTSC and 720 by 576 in PAL. The geometry is set for the 1.33 aspect ratio option of each system dimension. The rise time of the markers in the pattern, against a gray background make this pattern ideal for spotting artificial image “enhancement” that might be taking place in the video processing.



Pattern Layout: There is a drawing of the HD version of this test pattern that provides general descriptions of transitions. Beyond that all horizontal rise times are filtered to about 3 pixels.

Description of Use: The Overscan pattern shows how much picture information is being displayed on your set. It has been built to the program production standards as specified in the SMPTE Recommended Practice (RP) document number 187 for the NTSC version of the pattern. The document specifies that the active picture is 720 by 486 in digital video. The specification for DVD is 720 by 480. That suggests that at least six lines in the vertical direction are going to be lost between the production format and the DVD itself. In the horizontal direction DVD players may not show the entire width of the picture. We see as few as 704 pixels from some players. It so happens that 704 by 480 is one of the ATSC rates for DTV.

The SMPTE RP-187 is specific about the location of the center of the image and that's where the center of this Overscan pattern is located. What this means in setting up the TV is that the center of the Overscan pattern should go in the center of the screen. Depending on how much of the horizontal and vertical information is cut off by the DVD player, and which edge of the image is lost you may not see as much information on one edge as the other. Overscanning the image may be necessary to cover up the fact that more is lost on one side rather than the other. In most cases you shouldn't have to push the image out beyond the 2.5% markers.

We are suggesting that not all DVD players will show this signal the same way and this is what we are finding. As an example, six lines in the vertical direction will probably get lost from the 486 of our original pattern to the 480 of the DVD. Six lines might come off the top and none off the bottom or six lines could come off the bottom and none off the top or it could be one and five or two and four or three and three. We've seen all of the combinations in various DVD players. In the horizontal direction the difference between 720 and 704 can come from either side, although it usually comes off each side equally.

The PAL DVD format is better specified than NTSC. In the case of PAL both the program production and DVD format are the same, 720 by 576. That doesn't say that all PAL DVD player manufacturers conform to that number but at least the specifications are consistent.

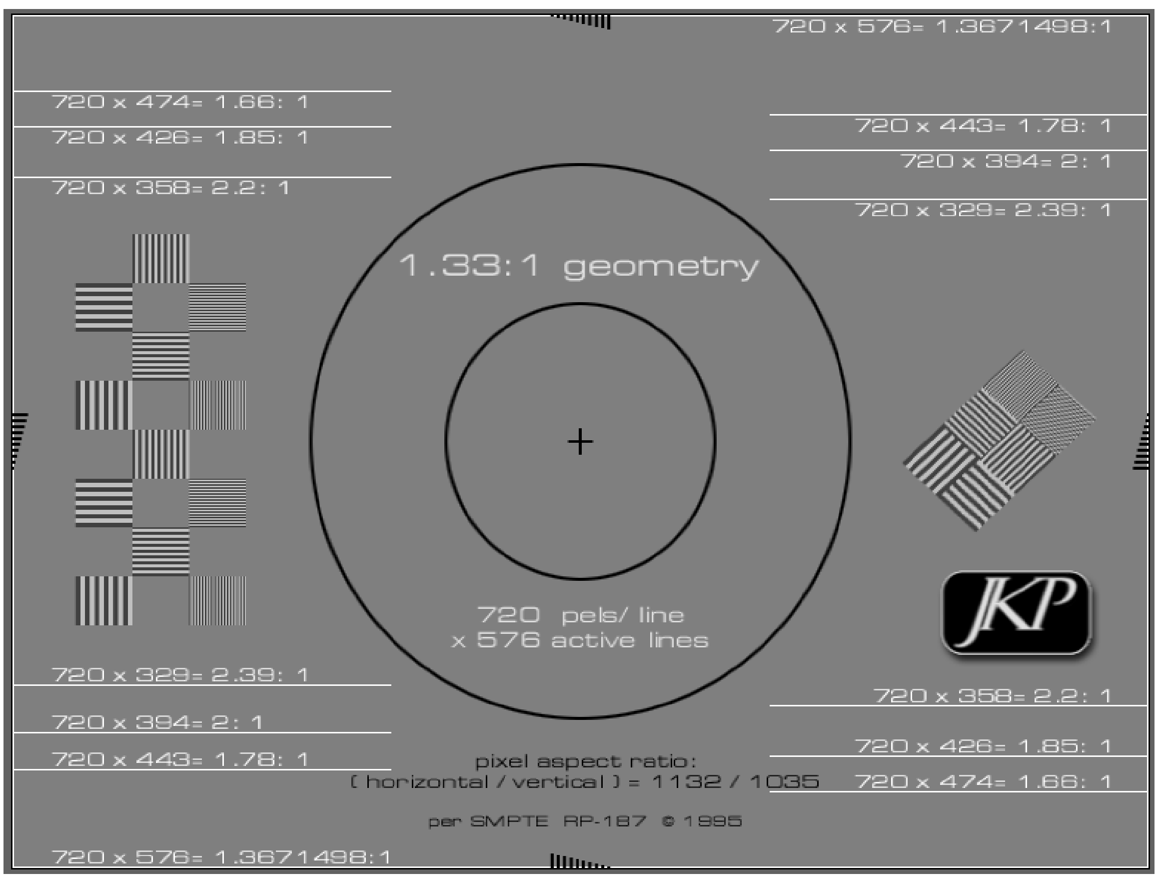
Why is there a difference between the number used for the NTSC production format and the DVD player format, and or the ATSC format of 704 by 480? The reason is that the digital format for production was based on our analog system. In the vertical direction the analog system has 482 and ½ active lines in the picture. Additional lines were added to the digital video count to accommodate closed captioning. When MPEG encoding came along for digital video it worked on even multiples of 16. The number 480 is the closest multiple of 16 to the production format of 486.

In the horizontal direction the number 720 for digital samples includes all of the analog formats. Some of the analog formats only go out to 713 or less. The two numbers that are even multiples of 16 for MPEG are 704 and 720. In the PAL world the number 576 fell right into their production standard. It's an even multiple of 16 as is 720.

The pattern is also designed to assist in determining how accurately image detail is being reproduced in the picture from the point of view of distortion in the image. This distortion comes in the form of extra edges being added to the picture. It's part of the "Sharpness" function. When the Sharpness control is set too high it introduces noise into the overall picture and produces ringing on sharp edges in the picture. The ringing is much easier to spot than the noise so we focused on that parameter in designing a test pattern. In 1988 we came up with the Overscan pattern with sharp edges on a gray background. The pattern served the purpose of setting sharpness and observing the condition of TV set overscan. The gray background in the pattern made it easy to see the ringing in the picture and easier to identify noise in the picture.

Chapter 20: 1.33 Aspect Ratio Pattern w/ 1 Line Vertical Resolution

Function: Provide 1.33 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 1 vertical line.



Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78.

This pattern is frame based and is one of several patterns in the program with full progressive video resolution. It will likely challenge the capability of many processors to up convert it to a true progressive image. If you see flicker in the progressive output of a processor it is most likely not set up to handle this much vertical detail. There should be no flicker in the progressive output if the processor can deal with full vertical resolution in the interlaced image.

Chapter 21 contains the same general pattern but with all horizontal lines being in both field one and field two, or about half the vertical resolution of the image in Chapter 20. This set of circumstances is repeated in Chapters 22 and 23.

Chapter 21: 1.33 Aspect Ratio Pattern w/ 2 Line Vertical Resolution

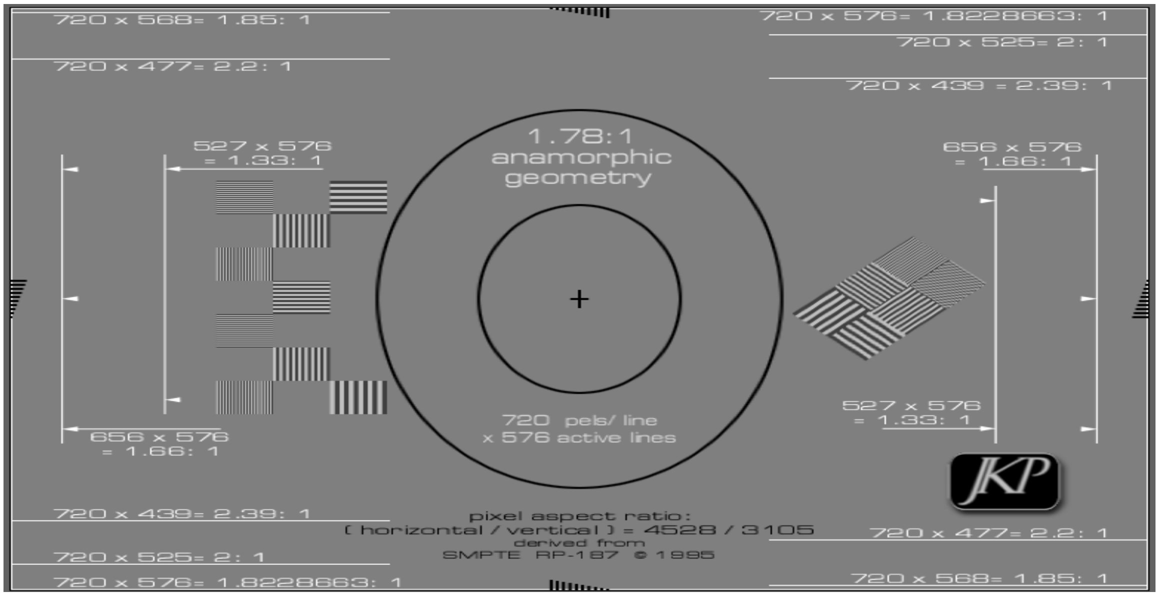
Function: Provide 1.33 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 22: 1.78 Aspect Ratio Pattern w/ 1 Line Vertical Resolution

Function: Provide 1.78 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 1 vertical line.



Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

This is the second pair of test patterns where Chapter 22 goes to the limit of the digital channel in vertical resolution and Chapter 23 doesn't.

Chapter 23: 1.78 Aspect Ratio Pattern w/ 2 Line Vertical Resolution

Function: Provide 1.78 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 24: 1.78:1 Convergence and Geometry

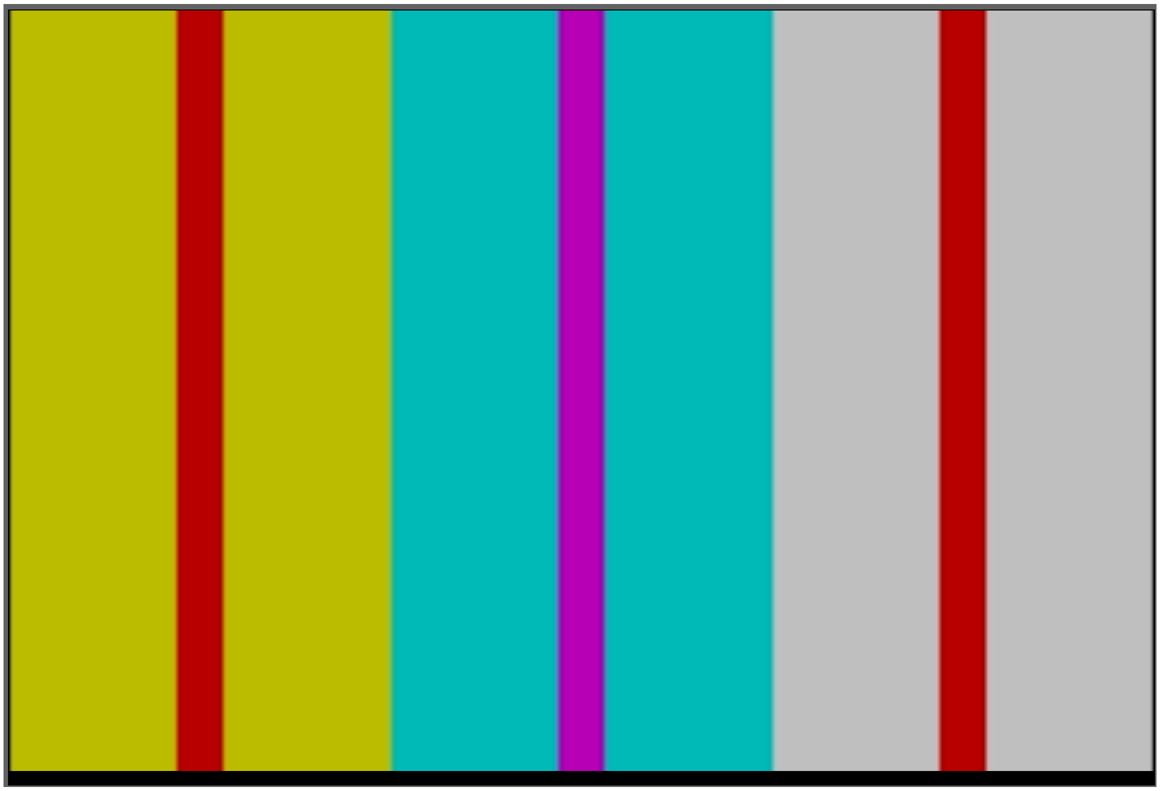
Function: The name of the pattern certainly goes a long ways in describing the purpose of the pattern. The aspect ratio is 1.78:1.

Pattern Layout: Overscan markers are placed at 2.5%. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers fro measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function. Variations on this pattern can be found in Titles 7, 8 and 9.

Chapter 25: Chroma / Luminance Delay

Function: Visual inspection of the position of color signals within the boundary of luminance.



Pattern Layout: Two combinations of color on color and one of color on luminance.

Description of Use: Look for the position of the color within the boarder created by a difference in luminance intensity. If they are anything but symmetric the color signal is out of time with the luminance. This signal also provides a quick inspection of chroma bandwidth. If the color extends out over both luminance edges the chroma bandwidth is low.

Chapter 26: Video Black

Function: Provide an easily accessed source of video black. Look for vertical or horizontal tilt in the signal.

Pattern Layout: Video Black

This is something that can be used on a video screen for a long time without fear of harming any of the display characteristics. This is also just ahead of a Title boundary. Use the Skip Forward or Play button to jump to the next title. Not all DVD players are capable of easily jumping a Title boundary. You may have to try other navigation options or use the Program Menu to move forward to the next title.

Any flat field pattern can be used to look for vertical or horizontal tilt. This is a circumstance where the amplitude of the signal is not the same from one side of the picture to another. Visually spotting tilt can be encumbered by flat field uniformity. It's best to check such a thing out on a waveform monitor.

Title 7: 1.33 Full Convergence

Chapter 1: Title Identification: *1.33 Full Convergence*

Titles 7, 8 and 9 focus on geometry and convergence in various aspect ratios. Each title primarily deals with a single aspect ratio but includes patterns for quick evaluation of other aspects of geometry, convergence and aspect ratios. These three titles were initially built in the days of CRT projectors where convergence patterns had to be presented in half amplitude as well as full amplitude. Individual primary and secondary colors are also presented for displays that made it difficult to shut off individual colors. We've included some information in these patterns at white and gray to make sure there is a recognition that individual colors have not been shut off.

We start out each section with an aspect ratio pattern appropriate to the title followed by full amplitude convergence patterns, then half amplitude patterns. The remainder of the title contains patterns of other aspect ratios or uses.

All horizontal lines are at least two lines high; meaning information for each line is in both field one and field two of the image. Otherwise there is no vertical filtering in the image. It has come from a true progressive source converted to interlaced video without vertical filtering.

Chapter 2: 1.33 Aspect Ratio Pattern w/ 2 Line Vertical Resolution

Function: Provide 1.33 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 3: 1.33:1 Linear, Half Amplitude, w/ Ref for B&W

Function: This pattern serves as a reminder that brightness and contrast must be properly set prior to doing convergence on a CRT display.

Pattern Layout: The PLUGE signal is located to the left and right of center of the image. The center contains a square with the majority of amplitude at 100% of video. There is also a 95% amplitude.

Description of Use: Make sure that brightness and contrast are properly set prior to starting on geometry and convergence.

Full Amplitude Geometry and Convergence

Function, pattern layout and description of use are similar for all of the patterns in the convergence section. They will be listed once for the first pattern. Beyond that the description in the chapter title should provide enough information. The order of colors is partially based on converging a CRT display. If another order is desired it should be easy enough to navigate among chapters to select the individual order required.

These patterns were generated to fill the 720 by 486 digital program production format. At best, the majority of DVD players will only reproduce 720 by 480 so we expect information to be missing from the top and or the bottom of the image. The width of the image may also be less than the full 720 pixels. In many cases trimming the left and right edges of the image at the interlaced output of the DVD player is done on purpose. There are a number of older sets that do not deal well with the wider image available from DVD's.

Chapter 4: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, White

Function: Set geometry and convergence in the 1.33 aspect ratio.

Pattern Layout: Overscan markers are placed at 2.5%. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function.

Chapter 5: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, Green

Chapter 6: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, Green & Red

Chapter 7: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, Red & Blue

Chapter 8: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, Green & Blue

Chapter 9: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, Red

Chapter 10: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, Blue

Chapter 11: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, White

Chapter 12: 1.33:1 Linear, Half Amplitude, w/ Circles & Markers, Gray

Chapter 13: 1.33:1 Linear, Half Amplitude, w/ Circles & Markers, Green

Chapter 14: 1.33:1 Linear, Half Amplitude, w/ Circles & Markers, Green & Red

Chapter 15: 1.33:1 Linear, Half Amplitude, w/ Circles & Markers, Green & Blue

Chapter 16: 1.33:1 Linear, Half Amplitude, w/ Circles & Markers, Red & Blue

Chapter 17: 1.33:1 Linear, Half Amplitude, w/ Circles & Markers, Red

Chapter 18: 1.33:1 Linear, Half Amplitude, w/ Circles & Markers, Blue

Chapter 19: 1.33:1 Linear, Full Amplitude, w/ Circles & Markers, White

Other Related Patterns:

Chapter 20: 1.33:1 Aspect Ration Pattern w/ 2 Line Vertical Resolution

Function: Provide 1.33 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge the up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 21: 1.33:1, w/ Diagonal Lines & Circles, Full Amplitude

Function: Video wall setup.

Pattern Layout: Geometry lines are diagonal for setting up cubes in a video wall. The circles provide a quick reference for geometry.

Description of Use: Other patterns can be used for detail in geometry.

Chapter 22: 1.33:1, w/ Diagonal Lines & Circles, Half Amplitude

Chapter 23: 1.33:1 Aspect Ratio, 1.78 Letterboxed, w/ Circles & Labels Inside the 1.78:1 Area

Function: Set up geometry and convergence for program material that is letterboxed within a 1.33 video source but being displayed on a 1.78 monitor.

Pattern Layout: Circles and markers are placed inside the 1.78 area of the 1.33 raster. The arrows outside of the 1.78 area point at the 1.78 boarders within the 1.33 raster.

Description of Use: Variations on this pattern are found in Title 8.

Chapter 24: 1.78:1 Convergence and Geometry

Function: The name of the pattern certainly goes a long ways in describing the purpose of the pattern. The aspect ratio is 1.78:1.

Pattern Layout: Overscan markers are placed at 2.5%. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function. Variations on this pattern are found in Title 9.

Title 8: 1.33 Letterbox Convergence

Chapter 1: Title Identification: *1.33 Letterbox Convergence*

Titles 7, 8 and 9 focus on geometry and convergence in various aspect ratios. Each title primarily deals with a single aspect ratio but includes patterns for quick evaluation of other aspects of geometry, convergence and aspect ratios. These three titles were initially built in the days of CRT projectors where convergence patterns had to be presented in half amplitude as well as full amplitude. Individual primary and secondary colors are also presented for displays that made it difficult to shunt off individual colors. We’ve included some information in these patterns at white and gray to make sure there is a recognition that individual colors have not been shut off.

We start out each section with an aspect ratio pattern appropriate to the title followed by full amplitude convergence patterns, then half amplitude patterns. The remainder of the title contains patterns of other aspect ratios or uses.

All horizontal lines are at least two lines high; meaning information for each line is in both field one and field two of the image. Otherwise the there is no vertical filtering in the image. It has come from a true progressive source converted to interlaced video without vertical filtering.

Chapter 2: 1.33 Aspect Markers, 2 Line Vertical

Function: Provide 1.33 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge the up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 3: 1.33:1 Linear, 1.78 Ltbx, Half Amplitude w/ Ref for B&W

Function: This pattern serves as a reminder that brightness and contrast must be properly set prior to doing convergence on a CRT display.

Pattern Layout: The PLUGE signal is located to the left and right of center of the image. The center contains a square with the majority of amplitude at 100% of video. There is also a 95% amplitude.

Description of Use: Make sure that brightness and contrast are properly set prior to starting on geometry and convergence.

Full Amplitude Geometry and Convergence

Function, pattern layout and description of use are similar for all of the patterns in the convergence section. They will be listed once for the first pattern. Beyond that the description in the chapter title should provide enough information. The order of colors is partially based on converging a CRT display. If another order is desired it should be easy enough to navigate among chapters to select the individual order required.

These patterns were generated to fill the 720 by 486 digital program production format. At best, the majority of DVD players will only reproduce 720 by 480 so we expect information to be missing from the top and or the bottom of the image. The width of the image may also be less than the full 720 pixels. In many cases trimming the left and right edges of the image at the interlaced output of the DVD player is done on purpose. There are a number of older sets that do not deal well with the wider image available from DVD's.

These patterns were generated to fill the 720 by 486 digital program production format. At best, the majority of DVD players will only reproduce 720 by 480 so we expect information to be missing from the top and or the bottom of the image. The width of the image may also be less than the full 720 pixels. In many cases trimming the left and right edges of the image at the interlaced output of the DVD player is done on purpose. There are a number of older sets that do not deal well with the wider image available from DVD's.

Chapter 4: 1.33:1 Linear, 1.78 Ltbx Markers & Circles, Full Amplitude

Function: Set geometry and convergence in the 1.33 aspect ratio with reference to the 1.78 image area.

Pattern Layout: Overscan markers are placed at 2.5% for both the 1.33 area and the 1.78 area within the pattern. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function.

Chapter 5: 1.33:1 Linear, 1.78 Ltbx, Green

Chapter 6: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Full Amplitude, Green & Red

Chapter 7: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Full Amplitude, Red & Blue

Chapter 8: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Full Amplitude, Green & Blue

Chapter 9: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Full Amplitude, Red

Chapter 10: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Full Amplitude, Blue

Chapter 11: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Full Amplitude, White

Chapter 12: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Half Amplitude, White

Chapter 13: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Half Amplitude, Green

Chapter 14: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Half Amplitude, Green & Red

Chapter 15: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Half Amplitude, Red and Blue

Chapter 16: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Half Amplitude, Green and Blue

Chapter 17: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Half Amplitude, Red

Chapter 18: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Half Amplitude, Blue

Chapter 19: 1.33:1 Linear, 1.78 Ltbx, Markers and Circles, Full Amplitude, White

Chapter 20: 1.33 Aspect Markers, 2 Line Vertical

Function: Provide 1.33 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.33 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 21: 1.33:1, 1.78 Markers, w/ Diagonal Lines & Circles, Full Amplitude

Function: Video wall setup.

Pattern Layout: Geometry lines are diagonal for setting up cubes in a video wall. The circles provide a quick reference for geometry.

Description of Use: Other patterns can be used for detail in geometry.

Chapter 22: 1.33:1, 1.78 Markers, w/ Diagonal Lines & Circles, Half Amplitude

Chapter 23: 1.33:1 Aspect Ratio, w/ Circles & Labels

Function: Set geometry and convergence in the 1.33 aspect ratio.

Pattern Layout: Overscan markers are placed at 2.5%. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function.

Chapter 24: 1.78:1 Convergence and Geometry

Function: The name of the pattern certainly goes a long ways in describing the purpose of the pattern. The aspect ratio is 1.78:1.

Pattern Layout: Overscan markers are placed at 2.5%. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function. Variations on this pattern are found in Title 9.

Title 9: Anamorphic Convergence

Chapter 1: Title Identification: *Anamorphic*

Titles 7, 8 and 9 focus on geometry and convergence in various aspect ratios. Each title primarily deals with a single aspect ratio but includes patterns for quick evaluation of other aspects of geometry, convergence and aspect ratios. These three titles were initially built in the days of CRT projectors where convergence patterns had to be presented in half amplitude as well as full amplitude. Individual primary and secondary colors are also presented for displays that made it difficult to shunt off individual colors. We have included some information in these patterns at white and gray to make sure there is a recognition that individual colors have not been shut off.

We start out each section with an aspect ratio pattern appropriate to the title followed by full amplitude convergence patterns, then half amplitude patterns. The remainder of the title contains patterns of other aspect ratios or uses.

All horizontal lines are at least two lines high; meaning information for each line is in both field one and field two of the image. Otherwise the there is no vertical filtering in the image. It has come from a true progressive source converted to interlaced video without vertical filtering.

Chapter 2: 1.78 Aspect Markers, 2 Line Vertical

Function: Provide 1.78 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.78 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 3: 1.78:1 Linear, Half Amplitude w/ Ref for B&W

Function: This pattern serves as a reminder that brightness and contrast must be properly set prior to doing convergence on a CRT display.

Pattern Layout: The PLUGE signal is located to the left and right of center of the image. The center contains a square with the majority of amplitude at 100% of video. There is also a 95% amplitude.

Description of Use: Make sure that brightness and contrast are properly set prior to starting on geometry and convergence.

Full Amplitude Geometry and Convergence

Function, pattern layout and description of use are similar for all of the patterns in the convergence section. They will be listed once for the first pattern. Beyond that the description in the chapter title should provide enough information. The order of colors is partially based on converging a CRT display. If another order is desired it should be easy enough to navigate among chapters to select the individual order required.

These patterns were generated to fill the 720 by 486 digital program production format. At best, the majority of DVD players will only reproduce 720 by 480 so we expect information to be missing from the top and or the bottom of the image. The width of the image may also be less than the full 720 pixels. In many cases trimming the left and right edges of the image at the interlaced output of the DVD player is done on purpose. There are a number of older sets that do not deal well with the wider image available from DVD's.

Chapter 4: 1.78:1 Linear, w/Markers & Circles, Full Amplitude

Function: Set geometry and convergence in the 1.78 aspect ratio.

Pattern Layout: Overscan markers are placed at 2.5% for the 1.78 image area. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function.

Chapter 5: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, Green

Chapter 6: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, Green & Red

Chapter 7: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, Red & Blue

Chapter 8: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, Green & Blue

Chapter 9: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, Red

Chapter 10: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, Blue

Chapter 11: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, White

Chapter 12: 1.78:1 Linear, w/Markers & Circles, Half Amplitude, White

Chapter 13: 1.78:1 Linear, w/Markers & Circles, Half Amplitude, Green

Chapter 14: 1.78:1 Linear, w/Markers & Circles, Half Amplitude, Green & Red

Chapter 15: 1.78:1 Linear, w/Markers & Circles, Half Amplitude, Red & Blue

Chapter 16: 1.78:1 Linear, w/Markers & Circles, Half Amplitude, Green & Blue

Chapter 17: 1.78:1 Linear, w/Markers & Circles, Half Amplitude, Red

Chapter 18: 1.78:1 Linear, w/Markers & Circles, Half Amplitude, Blue

Chapter 19: 1.78:1 Linear, w/Markers & Circles, Full Amplitude, White

Chapter 20: 1.78 Aspect Markers, 2 Line Vertical

Function: Provide 1.78 image and pixel aspect ratio information following the SMPTE RP-187 document. The horizontal lines in the image that marks the position of various image aspect ratios within the 1.78 frame have a width of 2 vertical lines.

Pattern Layout: There is enough geometry information in each of these sets of patterns to recognize the basic 1.33:1 or 1.78:1 intention. The resolution wedges come from the SMPTE RP-133. There is a 10-pixel count in the center of each edge of the pattern.

Description of Use: The primary use of this pattern is in locating the image positions of other aspect ratios within the two video aspect ratios of 1.33 and 1.78. The set of patterns is frame based and is one of several patterns in the program that will challenge up conversion of interlaced standard definition signals. There should be no flicker in the progressive version of either of these vertical resolutions.

Chapter 21: 1.78:1, w/ Diagonal Lines & Circles, Full Amplitude

Function: Video wall setup.

Pattern Layout: Geometry lines are diagonal for setting up cubes in a video wall. The circles provide a quick reference for geometry.

Description of Use: Other patterns can be used for detail in geometry.

Chapter 22: 1.78:1, w/ Diagonal Lines & Circles, Half Amplitude

Chapter 23: 1.33:1, 1.78:1 Ltbx, w/ Circles & Labels

Function: Set geometry and convergence in the 1.33 aspect ratio.

Pattern Layout: Overscan markers are placed at 2.5%. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function.

Chapter 24: 1.33:1 Convergence and Geometry

Function: Set geometry and convergence in the 1.33 aspect ratio.

Pattern Layout: Overscan markers are placed at 2.5%. There is a white boarder defining the outside edges of the active picture area. There are horizontal and vertical distance markers for measuring linearity. Except at the outside boarders of the pattern the boxes are square.

Description of Use: The original design of this pattern was for CRT based projectors where geometry was set up in the green channel followed by converging the other two colors. Markers were placed on the horizontal and vertical axis to make it easier to measure linearity. White boarders were placed at the outside edge of the active video so you would know the limits of the active video area. In solid-state displays it serves a geometry function.

Title 10: Gray Scale Tracking

Chapter 1: Title Identification: *Gray Scale Tracking*

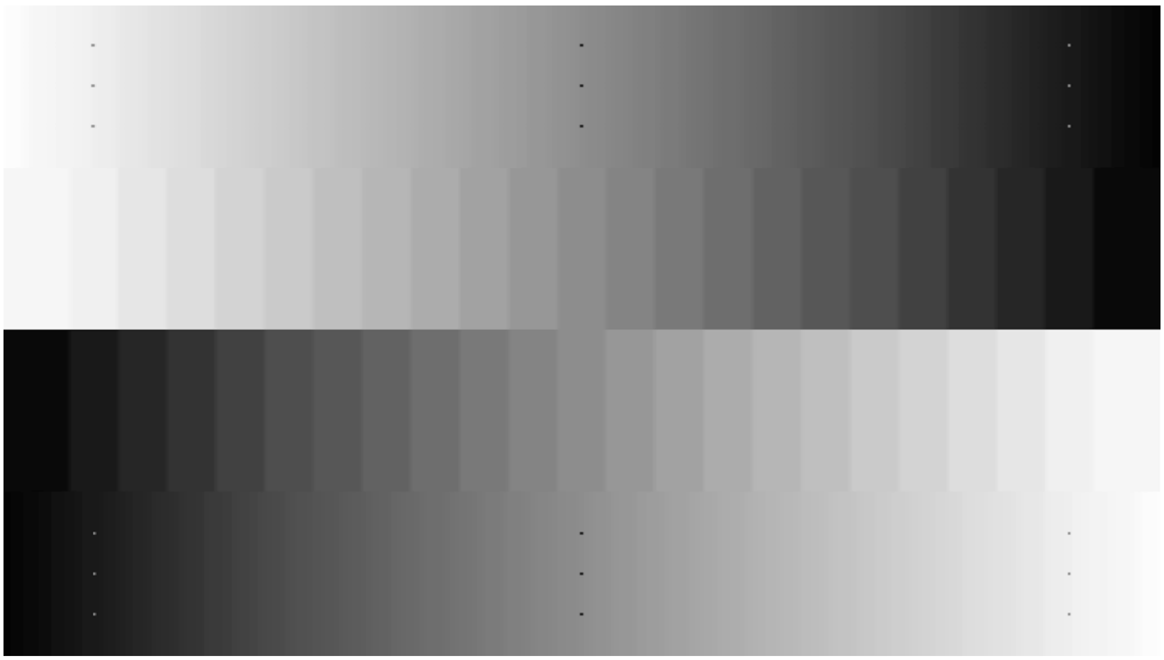
The test patterns in this title are designed for the manual inspection and setup of gray scale. Their order starts with basic inspection followed by setup and finishing with steps in gray for confirming tracking.

Gray Scale Inspection:

The beginning of this title is essentially a repeat of material in Title 6 and has been included here as a precursor to the window patterns used to determine gray scale tracking.

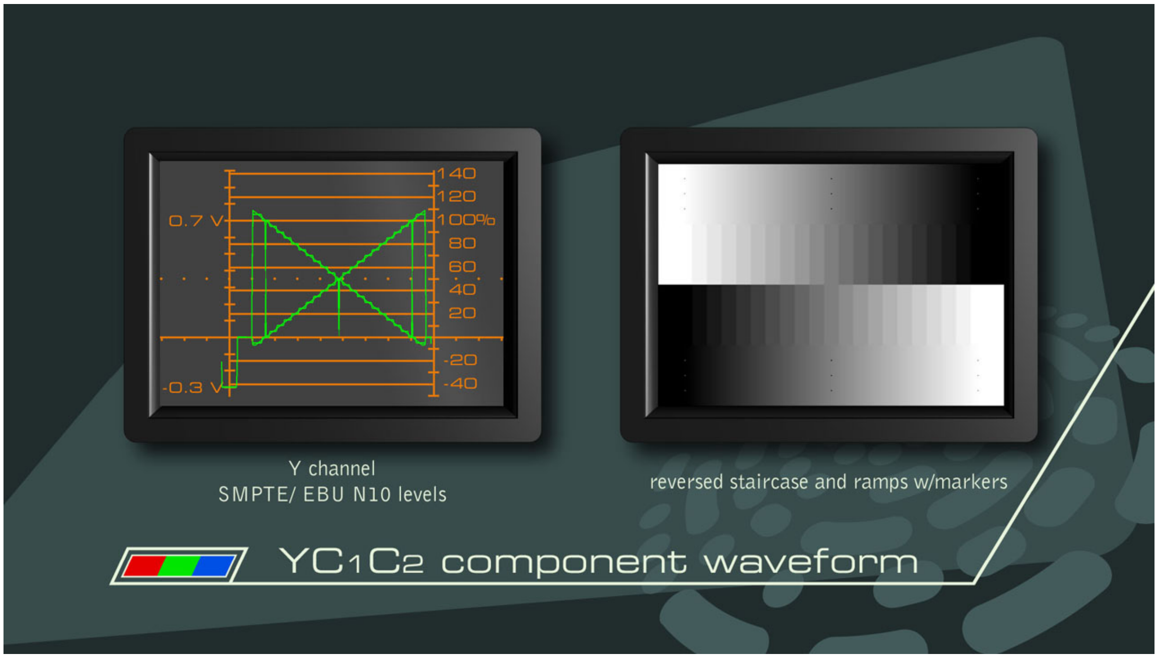
Chapter 2: Reverse Gray Ramp w/Steps

Function: To assess/adjust brightness, contrast, gray scale tracking (within the limitations of flat field uniformity), bit depth, and gamma. This pattern can be found in several titles. It's repeated because of its functionality with patterns around it.



Pattern Layout: The top and bottom portion of this pattern consist of a gray ramp. The inner portion of the pattern contains gray steps. The twenty-two steps extend from 5% below black to 5% above white, with the ramps extended out to the limits of the digital video system. Markers, which appear as three vertical dots, are placed at video black, 50% and 100% video.

Descriptions of Uses: This pattern was initially designed to exercise the entire dynamic range of the digital video system. In this application it is useful in determining if video equipment can pass the complete dynamic range of the signal. In a solid-state display it will make it easy to spot any clipping that may take place at the upper end of the dynamic range. It's the pattern of choice when setting the contrast control on a digital display.



While the Reverse Gray Ramps and step can be used to set black level as well as white, we still favor the PLUGE pattern for setting black level on any display.

Unlike the analog CRT digital displays do not go into blooming. As the contrast is turned up the brighter portions of the video signal hit a clipping circuit, the maximum capability to pass video. Any video information that is going to get to the display must be below the clip point in level. It's sort of like a speed governor on a car. It's drivable at any speed below the maximum point set in the governor. If the contrast is turned up chances are that part of the video signal will be pushed into this clipping circuit. Whatever detail is in that portion of the video signal will be turned into a flat white with no detail. The contrast control must be turned down until the detail re-appears. Run the contrast control up to see if the steps start to blend together.

There may be circumstances where turning the contrast control down on the display device will not pull the video out of the clip. This is often an indication that some device ahead of the display is running into its own digital clip.

It is important to have a waveform monitor to check the video at various stages in the video path to determine that it is not being clipped at either end of the dynamic range. The full active video signal extends from about –48 mVolts to +760 mVolts with black at 0 Volts and white at 700 mVolts.

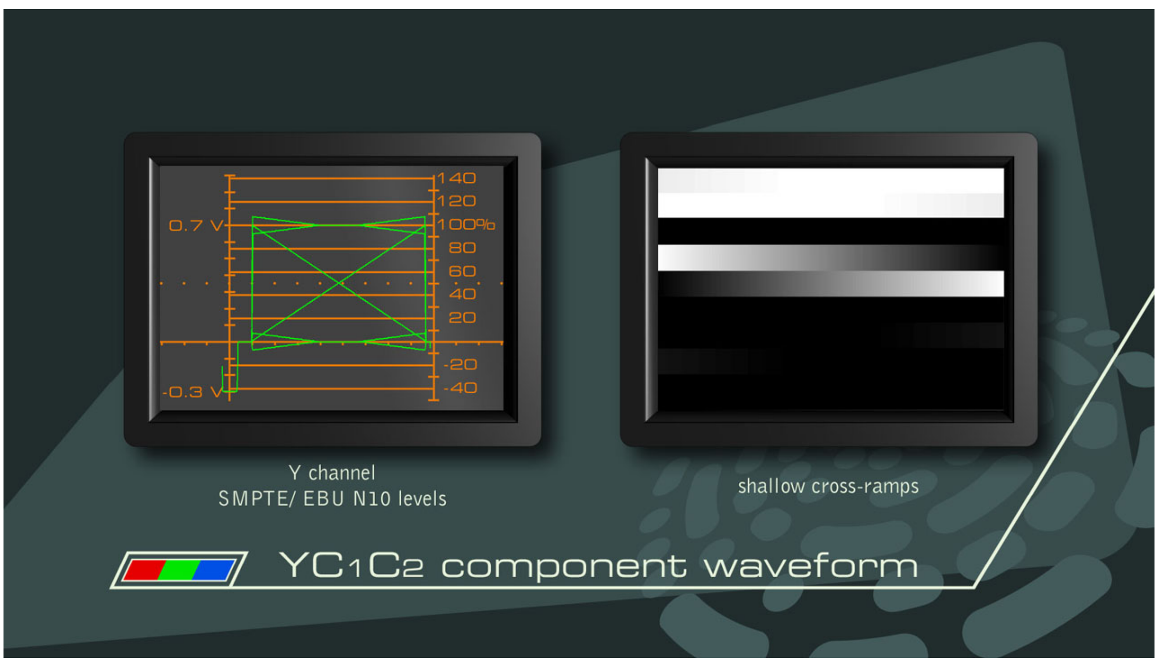
This pattern is also capable of revealing information about the bit depth of video processing. Look at the ramps in the pattern. These should appear smooth from black to above white. If there are vertical lines or noise in any areas of the ramps, the system more than likely does not have enough bit depth to properly handle the video signal.

Chapter 3: Reverse Shallow Gray Ramps

Function: To assess the dynamic range available from a particular system. It is a logical follow-up to the gray scale adjustment while serving a slightly different function than the Reverse Gray Ramps with Steps.

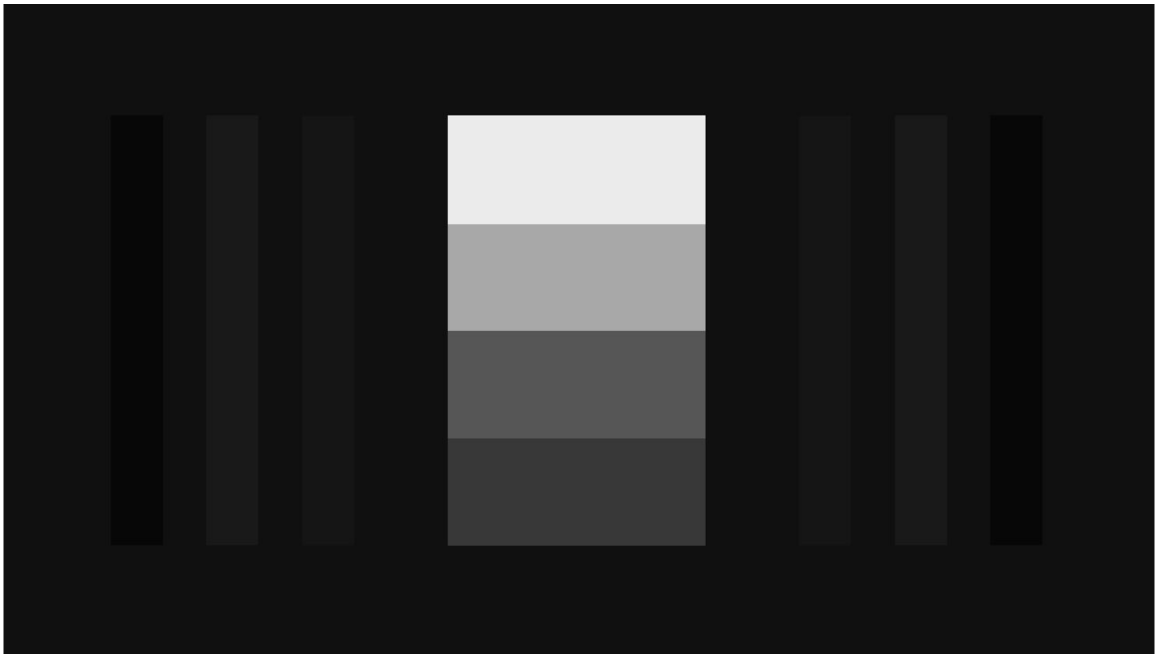
Pattern Layout: The pattern consists of three sets of cross ramps. The top ramps have excursions about video white of ±50 mVolts. The above white level does not extend to the peak capability of the video system. The middle set goes from video black to video white or 0 volts to 700 mVolts, and the bottom set has excursions about video black of about ±50 mVolts. The background is at video black. The center quarter of the line time in the shallow ramps is at either black or white.

Descriptions of Use: The shallow ramps at the top and bottom of the pattern were designed to isolate the areas of video dynamic range where systems usually go wrong. The middle portion of the pattern provides the video black to white range. This pattern was designed for use with a waveform monitor. It may also be useful in setting contrast on digital displays.



Chapter 4: DVE PLUGE on Black Background

Function: To assess/adjust brightness. Its inclusion here is part of the inspection process, to determine what’s happening to the color of gray and DC restoration at the bottom end of the gray scale.



Pattern Layout: The pattern consists of a background at video black, then symmetrical PLUGE on both the left and right side of the pattern. The outer PLUGE contains a -4% black bar on the outside, a +4% bar in the middle, and a +2% bar on the inside.

Description of Use: The PLUGE allows for the brightness control to be set properly on almost any system. In the application of the PLUGE pattern there is no other light on screen, possibly making it easier to set. It will also assist in the evaluation of DC restoration, being nearly zero in its APL.

Gray Scale Calibration

The following set of patterns is used for calibration of a gray scale in displays where the gray scale is set with a balance between upper and lower levels of gray.

Window patterns have been used in setting the color of gray in CRT based display device so that the high voltage regulation would not be challenged and that the gray scale would be set independent of white field uniformity. The Window size was to occupy a minimum of 15% of the picture area. Traditionally Windows have been horizontal in their aspect ratio. This set of windows was designed vertically to make room for the three step PLUGE pattern on either side of the Window. The picture area of each Window is just slightly over 15%.

Below: A waveform of the 100% Vertical Window w/ DVE PLUGE is shown to illustrate the voltage levels of the PLUGE.

Chapter 5: 20% Vertical Window w/ DVE PLUGE

Function: To assess and adjust the lower end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 20% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is to be used with an optical comparator or color analyzer for setting the low end of a gray scale. It is far enough above black so most meters will see its level. This level may be to low for use in setting display devices such as CRT projectors that do not track gray well. This pattern, in conjunction with the 100% Window is designed for setting gray on a set that does a good job of grayscale tracking. The PLUGE is included as a reference for black level.

Chapter 6: 100% Vertical Window w/ DVE PLUGE

Function: To assess and adjust the upper end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 100% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is to be used with an optical comparator or color analyzer for setting the high end of a gray scale. This level may be above the useful gray scale tracking range of display devices such as CRT projectors. This pattern, in conjunction with the 20% Window is designed for setting gray on a set that does a good job of grayscale tracking. The PLUGE is included as a reference for black level.

Chapter 7: 40% Vertical Window w/ DVE PLUGE

Function: To assess and adjust the lower end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 40% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is intended to be used in setting the lower end of the gray scale when either light output or gray scale tracking do not permit the use of a 20% Window. It is also useful for a quick check on gray scale tracking on sets that are adjusted using the 20 and 100% Windows. The PLUGE is included as a reference for black level.

Chapter 8: 80% Vertical Window w/ DVE PLUGE

Function: To assess and adjust the upper end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 80% amplitude vertical window box set against a black background.

Descriptions of Use: This pattern is intended to be used in setting the upper end of the gray scale when gray scale tracking does not permit the use of a 100% Window. It is also useful for a quick check on gray scale tracking on sets that are adjusted using the 20 and 100% Windows. The PLUGE is included as a reference for black level.

Chapter 9: 20% Vertical Window w/ DVE PLUGE

This pattern is repeated for ease of access in making gray scale measurements and adjustments.

Chapter 10: 15% Vertical Window w/ DVE PLUGE

Function: To assess and adjust the lower end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 15% amplitude vertical window box set against a black background.

Descriptions of Use: This is one of two steps below the 20% Window that may be useful in the calibration process.

Chapter 11: 10% Vertical Window w/ DVE PLUGE

Function: To assess and adjust the lower end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 10% amplitude vertical window box set against a black background.

Descriptions of Use: This is one of two steps below the 20% Window that may be useful in the calibration process.

Chapter 12: DVE PLUGE on Black Background

Function: To assess/adjust brightness. Its inclusion here is part of the inspection process, to determine what's happening to the color of gray and DC restoration at the bottom end of the gray scale.

Pattern Layout: The pattern consists of a background at video black, then symmetrical PLUGE on both the left and right side of the pattern. The outer PLUGE contains a -4% black bar on the outside, a +4% bar in the middle, and a +2% bar on the inside.

Description of Use: The PLUGE allows for the brightness control to be set properly on almost any system. In the application of the PLUGE pattern there is no other light on screen, possibly making it easier to set. It will also assist in the evaluation of DC restoration, being nearly zero in its APL.

Chapter 13: 10 Step Vertical Gray Scale, White to Black

Function: Visual inspection of gray scale tracking and check on video path. The word vertical refers to the direction of change in the steps of gray.

Pattern Layout: The 10 steps above black change in intensity in the vertical direction starting with white at the top and black at the bottom of the picture. The steps are 10 % pattern consists of solid gray bars horizontally across the screen increasing in amplitude from black to white at 10% intervals.

Description of Use: The primary function of this pattern and the horizontal gray scale is an inspection of gray with respect to flat field uniformity. Both patterns are also used to spot video amplification circuits that do not have linear gain from black and white or cannot sustain a gain at a particular level. The measurement is made with a waveform monitor.

Chapter 14: 10 Step Horizontal Gray Scale

Function: Visual inspection of gray scale tracking and check on video path. The word horizontal refers to the direction of change in the steps of gray.

Pattern Layout: The pattern consists of set of vertical gray bars starting at black on the left side of the screen and ending at white on the right side. There are ten steps above black.

Description of Use: The primary function of this pattern and the vertical gray scale is an inspection of gray with respect to flat field uniformity. Both patterns are also used to spot video amplification circuits that do not have linear gain from black and white or cannot sustain a gain at a particular level. The measurement is made with a waveform monitor.

Gray Scale Tracking:

The following set of Windows is designed to measure gray scale tracking. These windows are horizontal in aspect ratio and occupy about 18% of the picture area. This is what we were using in *Video Essentials* and wanted something in this program that matched that number. A single description of use applies to all of the Window levels.

Description of Use: Using an optical comparator, a color analyzer, or a spectrum radiometer measure the center of the window box pattern to determine the accuracy of the gray scale. Record the measurements made at each step and then analyze the variations once the complete set of steps is used. Depending on the display device and meter being used you may not be able to obtain accurate readings at the bottom end of the gray scale.

Some display devices do not track well at the top or bottom end of the gray scale. CRT based projectors are well known for this problem. A large number of solid-state display devices have trouble tracking at the bottom end of the gray scale. It may be necessary to pick points away from one end and or the other to get the majority of the gray scale to track.

Chapter 15: 10% Horizontal Window

Function: To assess gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 10% amplitude.

Chapter 16: 15% Horizontal Window

Function: To assess gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 15% amplitude.

Chapter 17: 20% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 20% amplitude.

Chapter 18: 25% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 25% amplitude.

Chapter 19: 30% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 30% amplitude.

Chapter 20: 35% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 35% amplitude.

Chapter 21: 40% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 40% amplitude.

Chapter 22: 45% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 45% amplitude.

Chapter 23: 50% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 50% amplitude.

Chapter 24: 55% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 55% amplitude.

Chapter 25: 60% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 60% amplitude.

Chapter 26: 65% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 65% amplitude.

Chapter 27: 70% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 70% amplitude.

Chapter 28: 75% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 75% amplitude.

Chapter 29: 80% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 80% amplitude.

Chapter 30: 85% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 85% amplitude.

Chapter 31: 90% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 90% amplitude.

Chapter 32: 95% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 95% amplitude.

Chapter 33: 100% Horizontal Window

Function: To assess/adjust gray scale.

Pattern Layout: The pattern consists of a black background with a horizontal window at 100% amplitude.

Repeat of Visual Evaluation Patterns

Chapter 34: DVE PLUGE on Black Background

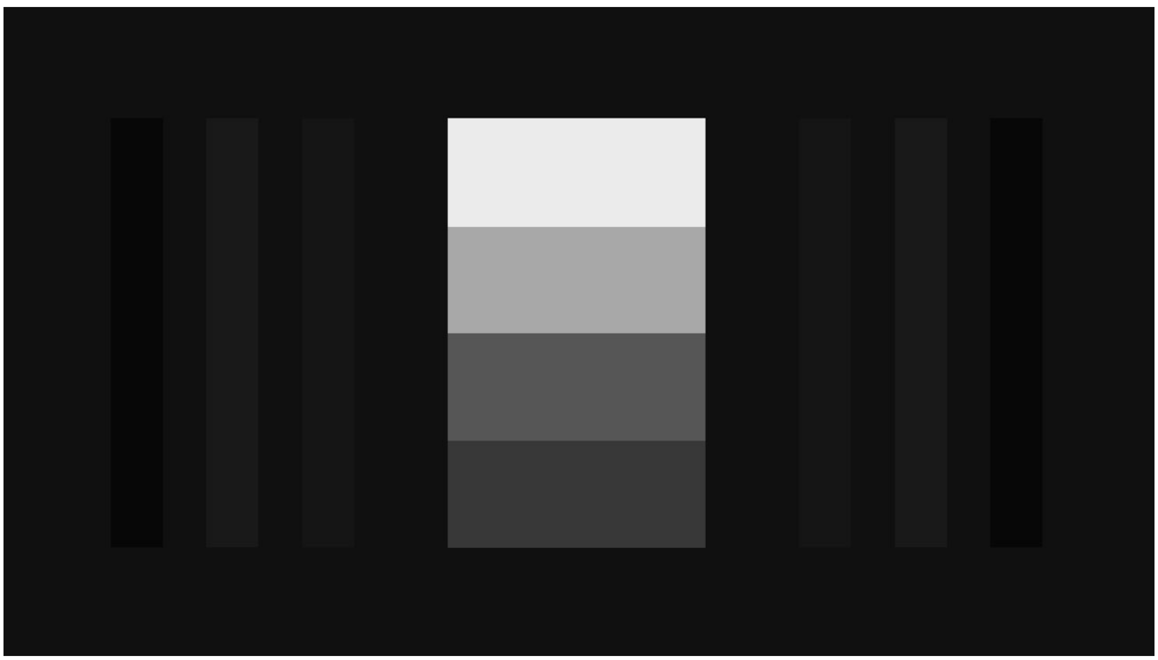
Function: To assess/adjust brightness. Its inclusion here is part of the inspection process, to determine what's happening to the color of gray and DC restoration at the bottom end of the gray scale.

Pattern Layout: The pattern consists of a background at video black, then symmetrical PLUGE on both the left and right side of the pattern. The outer PLUGE contains a -4% black bar on the outside, a +4% bar in the middle, and a +2% bar on the inside.

Description of Use: The PLUGE allows for the brightness control to be set properly on almost any system. In the application of the PLUGE pattern there is no other light on screen, possibly making it easier to set. It will also assist in the evaluation of DC restoration, being nearly zero in its APL.

Chapter 35: DVE PLUGE w/ Gray Scale

Function: To assess/adjust brightness in all types of displays and contrast in a CRT display.



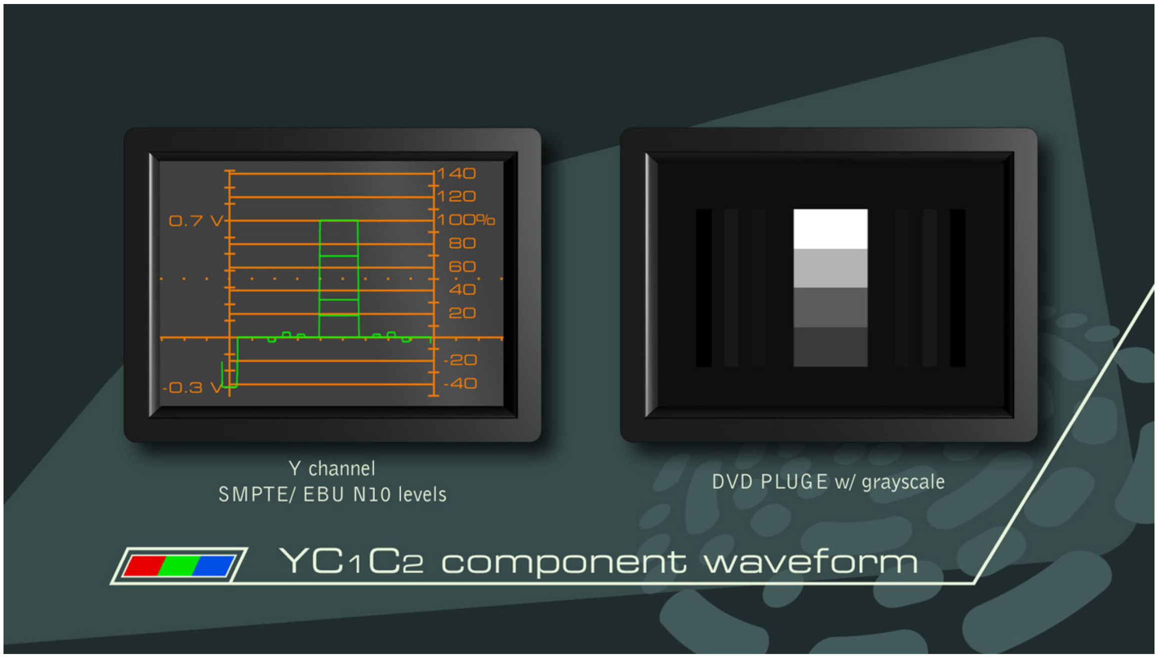
Pattern Layout: The pattern consists of a background at video black, then a symmetrical PLUGE on both the left and right side of the log gray scale in the middle of the pattern. The outer part of the PLUGE contains a -4% black bar on the video black background followed by a +4% bar and +2% bar as you go towards the middle from either side. The gray scale in the middle represents steps of about 18.4%, 32.1%, 69% and 100%. These values were chosen based on the gamma curve of a CRT display and represent a visual progression in light output along that curve.

Descriptions of Use: We have made several changes to the PLUGE patterns from the BBC version that was presented in *Video Essentials*. The original PLUGE was on the left with the gray scale on the right. The PLUGE is now on both sides of the center to provide a greater opportunity to set black, taking image uniformity into a greater account. We have also added a 2% step. Originally it was added to help in setting black level where below black information was being cut off. It later served a function of helping us describe the rate at which a CRT comes out of black. There is almost no difference in level between black and 2% above black.

The DVE PLUGE allows for the brightness control to be set properly on almost any display system. Its general use is illustrated in the tutorial discs of the DVE-Pro package. An important point to make here is that when displayed on a CRT there is almost no difference in level between the 2% above black and black itself. In the description of how to set black we tell you to adjust the Brightness control so that the blacker than black strip and video black background just match in level. note that the resolution of Brightness controls is so poor that if this criteria is met that the 2% above black strip might not be visible. Turn the brightness control up far enough for the 2% strip to be visible and there will be a difference between the blacker than black and video black background. The gamma of a CRT is nearly flat in this area of operation. This is the way all display devices should work. If there is a large difference between the black background and the 2% stripe, at least part of the gamma curve in the display is wrong.

The pattern has a low average picture level (APL) and is used in conjunction with the high APL PLUGE to determine the condition of DC Restoration.

The waveform of the pattern is useful in setting black and white levels in video equipment.



In light bulb driven solid state displays it is unlikely that the point of black, or the absence of light, will appear as described in the procedure for setting brightness on a CRT display. Instead a digital cut-off, or a point where information in the video signal is no longer displayed is reached. Ideally one may think that black should be set at cut-off. Where solid-state displays have a gamma curve designed to emulate a CRT it is recommended to set black level one point on the brightness scale above the point of video black being cut off. At this point in the gray scale the gamma curve is nearly flat and there should be little or no light output difference in this extra point of brightness shift. What this provides the viewer is a simulation of the CRT's ability to fully display information in the area of black, making use of some of the dynamic range below black. The light level for this darker part of the picture should be controlled using a combination of screen size and type, and lamp output. Some projectors also have an iris control for even finer control of the ambient level. The tutorial in DVE suggests the ambient level should be below 0.05 ft-L.

The center grayscale allows for a quick determination of the color of gray. Many calibrators use this pattern as a reference for quickly adjusting a grayscale as it allows one to see what is happening to the entire gray scale as adjustments are being made. It can also be used to set the contrast control on a CRT based display. That is also illustrated in DVE. It is not easily used to set the proper upper dynamic range of a solid-state display. With experience one can spot when clipping comes down as far as the 100% of this top rectangle but that does not help in knowing how much the contrast has to be backed down to accommodate the entire video dynamic range.

Chapter 36: Adjacent Contrast

Function: To accurately measure a realistic contrast ratio during normal viewing conditions.

Pattern Layout: The pattern consists of 16 rectangles starting with black in the upper left corner and alternating between 0% amplitude black and 100% amplitude white with four boxes per horizontal and vertical axis.

Description of Use: This pattern should be utilized after the display has been properly calibrated. Using your light meter, color analyzer, or spectrum radiometer measure the amount of light in all of the dark portions of the picture. You should have eight measurements total. Add these up and divide by eight – this will give you the "Dark Level" measurement. Now measure all of the light portions of the picture with the circle reference points; once again, you should arrive with eight individual measurements. Now, add them and divide by eight to attain the "Light Level" measurement.

Contrast Ratio = Light Level/Dark Level.

Chapter 37: Video Black

Function: Provide an easily accessed source of video black. Using a waveform monitor you can also look for vertical or horizontal tilt in the signal.

Pattern Layout: Video Black

Description of Use: This is something that can be used on a video screen for a long time without fear of harming any of the display characteristics. This is also just ahead of a Title boundary. Use the Skip Forward or Play button to jump to the next title. Not all DVD players are capable of easily jumping a Title boundary. You may have to try other navigation options such as pressing Play or use the Program Menu to move forward to the next title.

Any flat field pattern can be used to look for vertical or horizontal tilt. This is a circumstance where the amplitude of the signal is not the same from one side of the picture to another. Visually spotting tilt can be encumbered by flat field uniformity. It is best to check such thing out on a waveform monitor.

Title 11: Picture Resolution

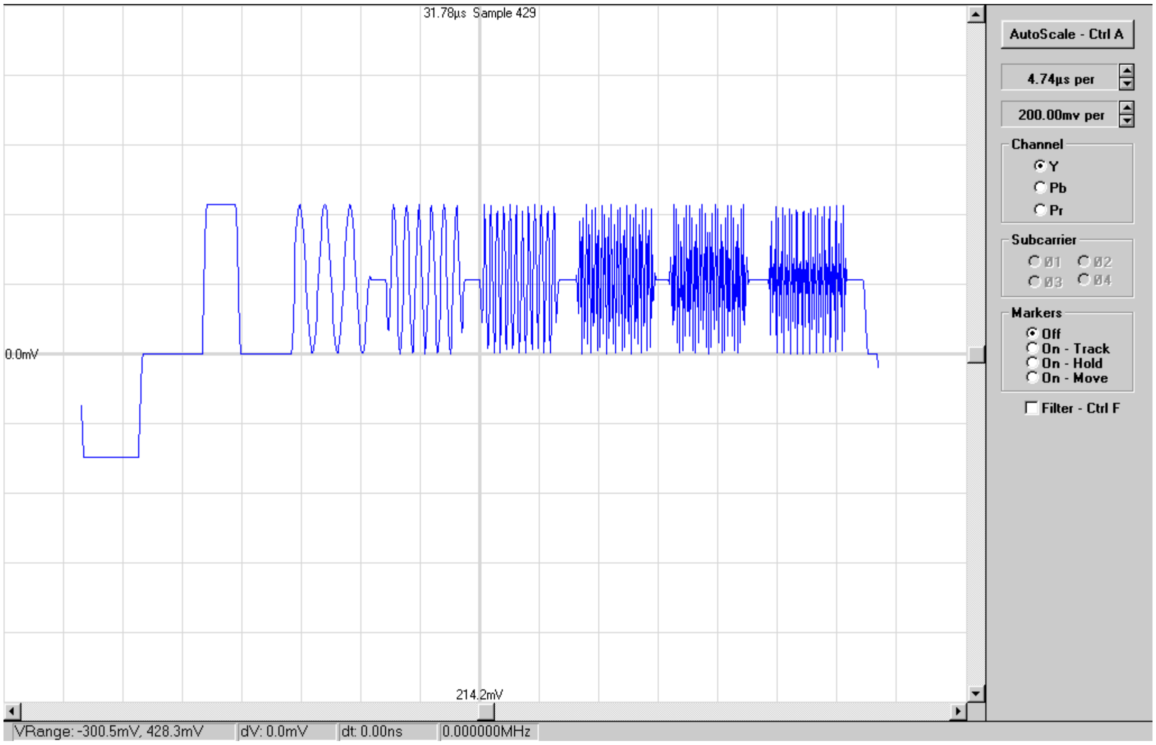
Introduction

There have been many discussions regarding the capability of the DVD format. Specifically, these discussions focused on image resolution and display capability. Back in the days of over the air, analog television; the 6 MHz channel bandwidth limited the video bandwidth to 4.18 MHz. Using the rule of 80 horizontal lines of resolution per picture height for each MHz of bandwidth, analog video being transmitted is limited to about 330 horizontal lines of resolution per picture height.

In 1978 the laserdisc format was introduced. Initially horizontal resolution was still limited to 330 lines because production standards were not going much beyond what could be transmitted. By the early 1980's we were capable of recording video with about a 6 MHz bandwidth or about 480 lines of resolution. By the mid-1980's laserdisc mastering had caught up to this capability and using the video input to home monitors an image from laserdisc could look much sharper than anything being transmitted.

At about the same time the world of program production was shifting to digital. Part of the requirements of the digital video system was to preserve the current quality that could be obtained in the analog world. In doing so a video sampling rate of about 13.5 MHz was established for both PAL and NTSC. According to a mathematician by the name of Nyquist in order to recover the Fourier components of a periodic waveform it is necessary to sample that waveform more than twice as fast as the highest frequency you wanted to recover.

In short, if we have a sampling frequency of 13.5 MHz, the highest frequency we can have in the video is 6.75 MHz. It turns out that video is made up of waveforms that are not periodic or predictable. The designers of our digital video system therefore limited the practical, usable bandwidth to less than 6 MHz. Most video sweep patterns do not go above 5.75 MHz for this reason. Chroma sweeps are limited to half that bandwidth or about 2.875 MHz. That does not mean you cannot go higher in frequency, but you will get into trouble when you do. The image information above 6 MHz range will not be accurate.

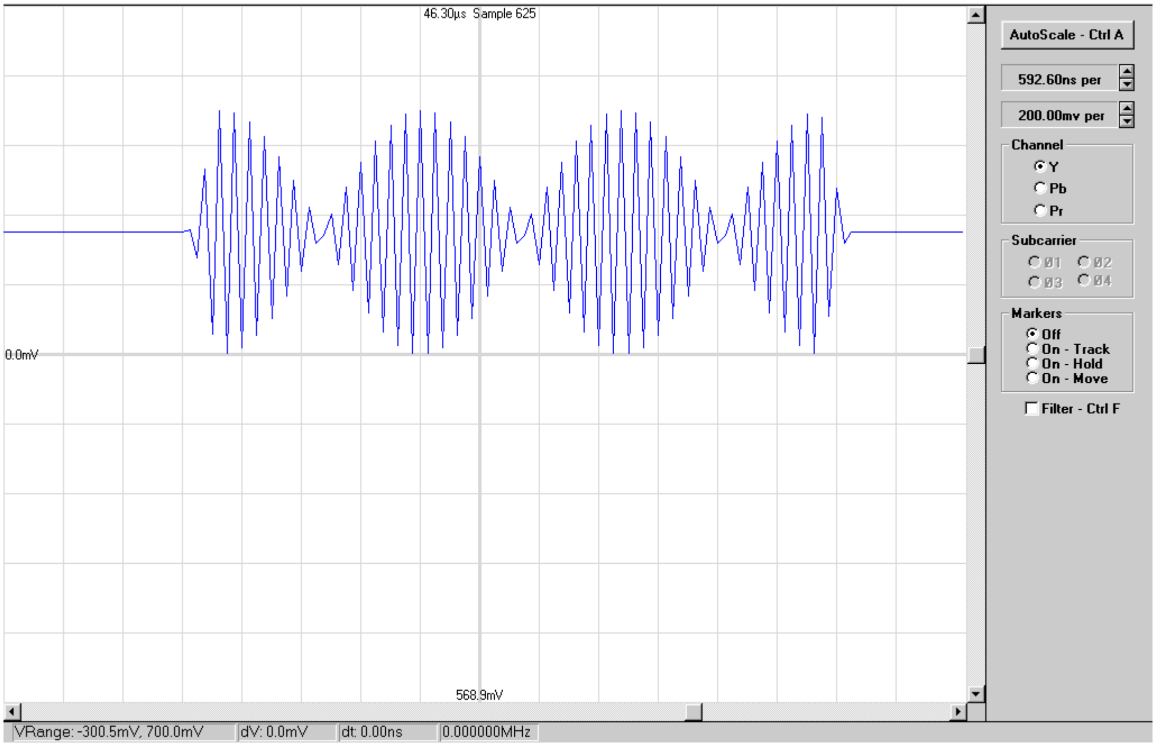


Above: High frequency Multiburst, 5.75 MHz to 6.75 MHz

Let us discuss what occurs when approaching Nyquist, meaning going out to the limit allowed by the sampling frequency. Again, the limit is 6.75 MHz for a sampling frequency of 13.5 MHz in standard definition and 37.5 MHz for a 75 MHz sampling frequency in HD. Since the source video is 4:2:2, the two chroma channels have half the bandwidth of the luminance channel.

The term 4:2:2 reveals that the sampling frequency for the Y channel is about 4 times the standard definition color subcarrier and that the sampling frequency for the two color difference channels is about twice the color subcarrier.

In standard definition analog theory, digital video produced in PAL and NTSC should not have much information above 6 MHz. If it does, it should be filtered out in the conversion to analog. It is filtered out because it might not be accurate. We have provided examples in this disc.



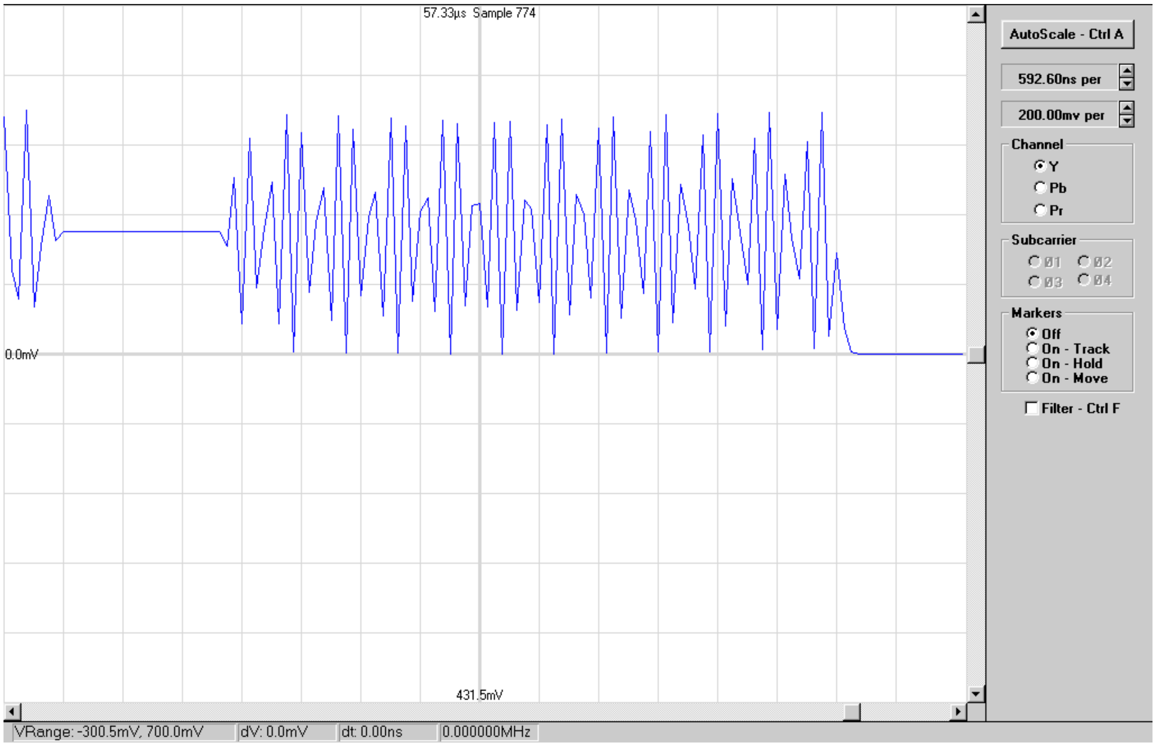
Above: Waveform distortion that occurs at 6.5 MHz

That said it is the digital signal that goes down on the DVD. If there is frequency information between 6 MHz, the analog limit imposed by program production, and 6.75 MHz, the theoretical upper limit according to Nyquist, then that information could be on the disc and therefore used as picture information. This is where DVD player manufacturers come up with the claim of 540 lines of resolution where the post-production community will tell you that the maximum resolution is 480 lines.

Many DVDs are mastered from video that has been down converted from an HD source and these conversions usually accept any and all information out to 6.75 MHz. Some DVD players make all of this information available at the analog output. Manufacturers of DVD players evaluated by Joe Kane Productions have claimed that they have designed their video amplifiers to reach the 3 dB point at 8.5 MHz. This would then yield a flat frequency response at 6.75 MHz. Thorough testing has concluded that these players are down by no more than .1 dB at 6.75 MHz. This can go either way but the upper end of the frequency range is more likely to be included when the digital information from the disc is up converted to 480p, 720p or 1080i inside the player. We certainly know of DVD players where the interlaced output is much better than the progressive output and other players where the digital output is much better than any of the analog outputs. If a DVI or HDMI output is provided this information should be included at full amplitude.

In designing test patterns we are aware of the potential of the player, and are therefore testing frequency space that standard definition production people might consider unusable.

In generating signals in the digital domain some information below 6 MHz may also contain distortion. Wherever possible we will demonstrate this from a digital waveform monitor.



Above: Waveform distortion that occurs at 5.75 MHz

We refer to patterns being vertical or horizontal. These names indicate the direction in which the transitions take place. A vertical Multiburst has a lot of horizontal lines in it. The transitions are in the vertical direction.

Chapter 1: Title Identification: *Picture Resolution*

Some of the patterns in this title have single line resolution in the vertical direction, which may cause problems for processors converting the interlaced signals to progressive. Chapters two and three are examples.

Chapter 2: SMPTE RP 133

Function: The pattern describes image dimensions, resolution and black and white image limits. It was initially designed for medical diagnostic imaging tests but has been adapted in any number of high-resolution applications.

Pattern Layout: Horizontal and vertical resolution wedges in the center and outside corners of the image with gray steps and sub steps at black and white. There are square boxes for geometry and printing for focus and detail. The bright horizontal and vertical wedges are 100% modulation, meaning that they go from black to white. They are one two and three pixels or lines in size. The dim wedges are all one pixel or line in size followed by a one-element transition into the next step. They represent 1%, 2% and 3% modulation levels. The transition in the center of the black square goes to 5% above black and the transition in the white square goes to 95% white. The pattern does not have any image content above white or below black. In the horizontal line of one on then one off the lines that are on exist in only one field of the video signal.

Description of Use: The name SMPTE RP 133 comes from the SMPTE Recommended Practice document number 133. It describes a general pattern layout that can be adapted to any video rate and aspect ratio. The one-line transitions in the resolution wedges are good for spotting the ability of an upconverter to spot a true progressive source signal. This area will either flicker or be all white or all black in a processor that will not recognize a true progressive source. The black on white bar and the white on black bar are used to look for image streaking. The crosshatch will provide a quick look at image geometry. The letters and numbers will provide a reference for image focus at the outside parts of the picture.

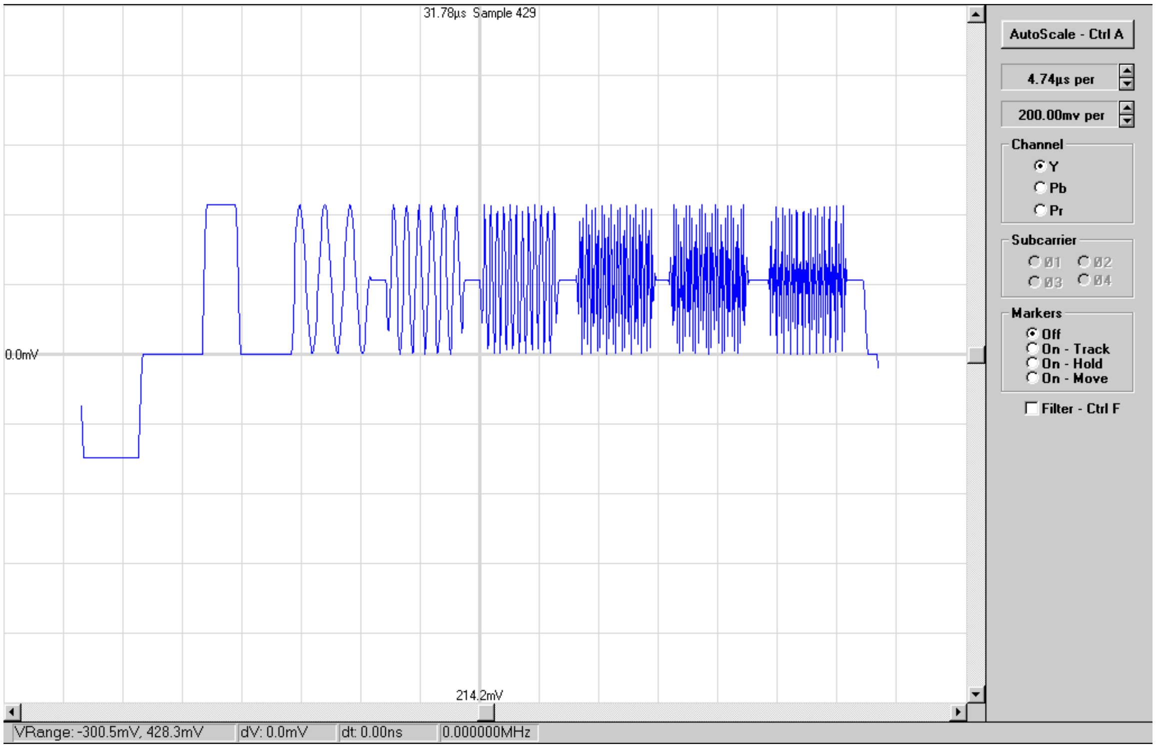
Chapter 3: Vertical Multiburst in a Split Field

Function: A look at vertical image resolution from a progressive test pattern.

Pattern Layout: Vertical image resolution is provided in a progressive pattern that is not filtered in the vertical direction when converted to interlace. Full resolution means one line on and one line off. In the top right the lines that are on fall into field one of the interlaced signal. The lines that are on, in the bottom left, fall into field two of the interlaced signal. In the half resolution wedges two lines are on and two lines are off. The one-third resolution is three lines on and three lines off. The same extends up to five lines on and five lines off. The left and right wedges are out of phase with each other and reversed in position in the pattern.

Description of Use: The pattern is here to help look at vertical resolution of interlaced video and the consequences of converting it to a progressive image. As the pattern went down on the disc the amplitude of all of the bars is 700 mVolts. The interlaced output of many DVD players will exhibit a fall off in amplitude in just displaying an interlaced signal. It is also likely that image processing, where the interlaced signal is converted to progressive, will also roll off vertical response. The full resolution wedges may also be fully on or fully off or flicker if the processor cannot recognize a frame based still image.

Chapter 4: Multiburst, Horizontal, 0.5 to 5.8 MHz, Reduced Amplitude w/ Amplitude Markers

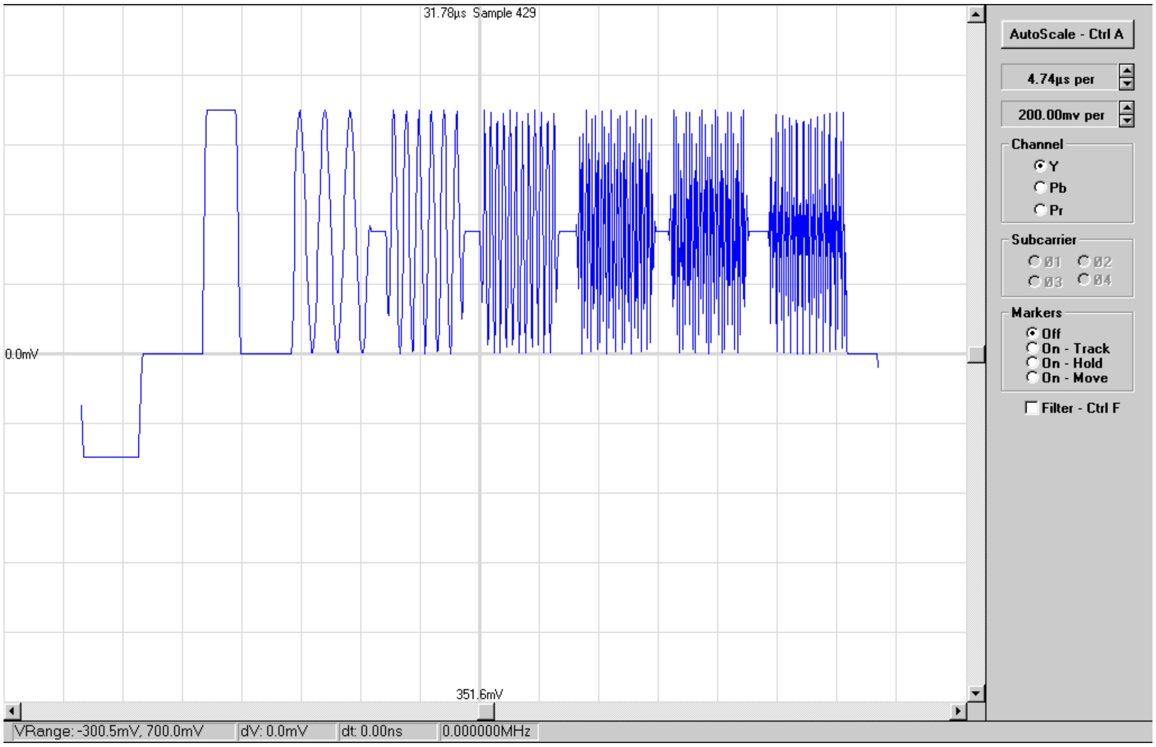


Function: Check frequency response of the analog video bandwidth with reduced amplitude frequency bursts.

Pattern Layout: From left to right there is a low frequency amplitude marker followed by six frequency bursts. They are 0.5 MHz, 1.0 MHz, 2.0 MHz, 4.0 MHz, 4.8 MHz, and 5.8 MHz. The amplitude is 60% or 420 mVolts, with a gray reference of 30% or about 210 mVolts.

Description of Use: In the discussion opening this title we talk about the analog bandwidth of the video channel versus the digital video bandwidth, based on Nyquist theory. Here we are checking the analog bandwidth at reduced amplitude. It is possible that frequency response will change depending on amplitude so we need to look at both sets of circumstances. Observations of amplitude can be made on a display by looking at the luminance intensity of the transitions. Where possible the signal should be checked on a waveform monitor prior to being connected to the display.

Chapter 5: Multiburst, Horizontal, 0.5 to 5.8 MHz, Full Amplitude w/Amplitude Markers

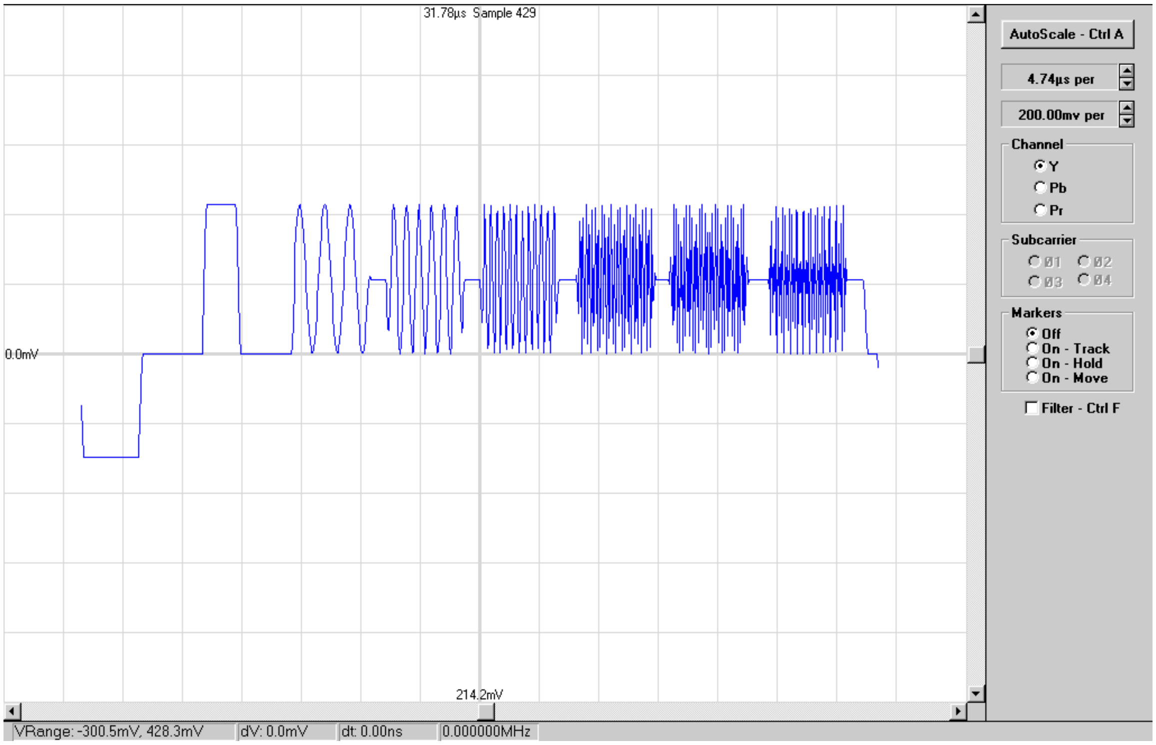


Function: Check frequency response of the analog video bandwidth with full amplitude frequency bursts.

Pattern Layout: From left to right there is a low frequency amplitude marker followed by six frequency bursts. They are 0.5 MHz, 1.0 MHz, 2.0 MHz, 4.0 MHz, 4.8 MHz, and 5.8 MHz. The amplitude is 100% or 700 mVolts, with a gray reference of 50% or about 350 mVolts.

Description of Use: Here we are checking the analog bandwidth at full amplitude. It is possible that frequency response will change depending on amplitude so we need to look at both sets of circumstances. Observations of amplitude can be made on a display by looking at the luminance intensity of the transitions. Where possible the signal should be checked on a waveform monitor prior to being connected to the display. This will help isolate video signal path and display problems.

Chapter 6: Multiburst, Horizontal, 5.75 to 6.75 MHz, Reduced Amplitude w/ Amplitude Markers



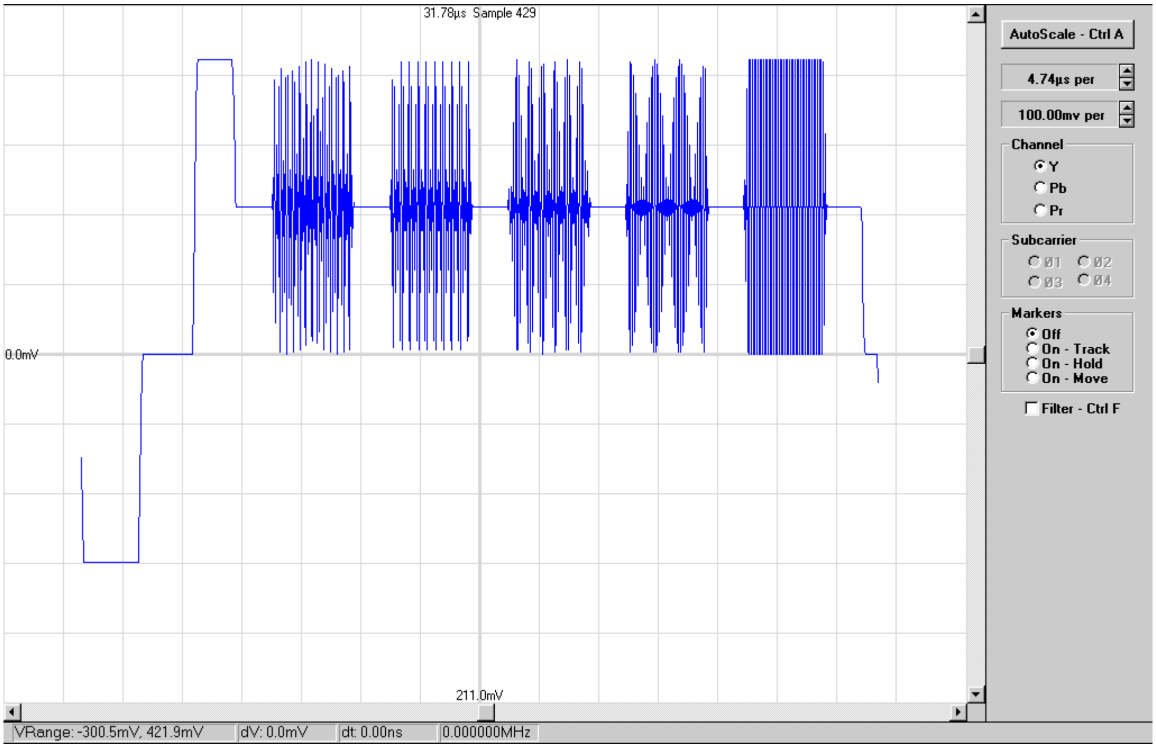
Note that the amplitude in this waveform is 100 mVolts per vertical division.

Function: Check frequency response of the upper portion of the digital video bandwidth with reduced amplitude frequency bursts.

Pattern Layout: From left to right there is a low frequency amplitude marker followed by five frequency bursts. They are 5.75 MHz, 6.0 MHz, 6.25 MHz, 6.5 MHz, and 6.75 MHz. The amplitude is 60% or 420 mVolts, with a gray reference of 30% or about 210 mVolts. We've changed the amplitude per vertical division on the waveform show for this signal so you can better see some of the distortions in the upper frequency range. Keep in mind that this distortion will appear on the display. It is in the source signal and is a problem of approaching the Nyquist frequency of the system.

Description of Use: In the discussion opening this title we talk about the upper portion of the digital video bandwidth of the video channel versus the digital video bandwidth, based on Nyquist theory. This is done to check the digital bandwidth, which should be present at the component analog outputs of a high quality DVD player. They would otherwise be filtered out of the analog signal in post-production applications because of the distortions seen in the waveforms.

Chapter 7: Multiburst, Horizontal, 5.75 to 6.75 MHz, Full Amplitude w/ Amplitude Markers

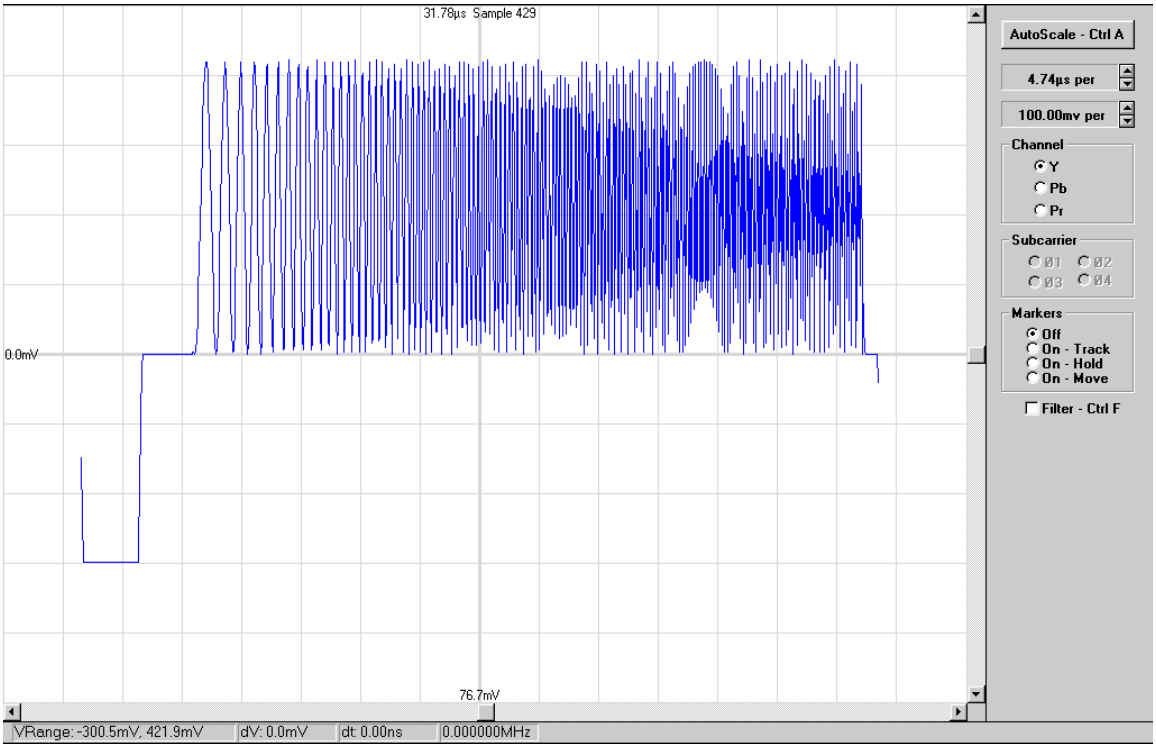


Function: Check frequency response of upper portion of the digital video bandwidth with full amplitude frequency bursts.

Pattern Layout: From left to right there is a low frequency amplitude marker followed by five frequency bursts. They are 5.75 MHz, 6.0 MHz, 6.25 MHz, 6.5 MHz, and 6.75 MHz. The amplitude is 100% or 700 mVolts, with a gray reference of 50% or about 350 mVolts.

Description of Use: Here we are checking the upper portion of the digital video bandwidth at full amplitude. It is possible that frequency response will change depending on amplitude so we need to look at both sets of circumstances. Observations of amplitude can be made on a display by looking at the luminance intensity of the transitions. Keep in mind the phase distortion that is in the original signal.

Chapter 8: Luminance Sweep, 0.5 to 5.75 MHz, Reduced Amplitude, w/ Frequency and Amplitude Markers



Above: Note that the amplitude in this waveform is 100 mVolts per vertical division. This is a representation of a single line of the video and does not show the frequency and amplitude markers.

Function: Check the luminance frequency response of the component analog video bandwidth with a reduced amplitude continuous frequency sweep from 0.5 MHz to 5.75 MHz.

Pattern Layout: The markers at the top and bottom of the pattern are 420 mVolts in amplitude and are positioned at 1 MHz intervals. There are five markers, indicating MHz values from 1 to 5. The amplitude of these markers is 420 mVolts, centered about a 210 mVolt background. Each marker is the same width so that its' amplitude will remain fixed as the frequency of the sweep in the center of the pattern increases. The sweep signal does contain phase errors as shown in the waveform.

Description of Use: The amplitude of the sweep signal should remain fixed or flat across the band. A waveform monitor should be used to check the video path and observations can be made on the display for an idea of how well it is responding to changes in frequency.

Chapter 9: Luminance Sweep, 0.5 to 5.75 MHz, Full Amplitude, w/ Frequency and Amplitude Markers

Function: Check luminance frequency response of the component analog video bandwidth with a full amplitude continuous frequency sweep from 0.5 MHz to 5.75 MHz.

Pattern Layout: The markers at the top and bottom of the pattern are 700 mVolts in amplitude and are positioned at 1 MHz intervals. There are five markers, indicating MHz values from 1 to 5. The amplitude of these markers is 700 mVolts, centered about a 350 mVolt background. Each marker is the same width so that its' amplitude will remain fixed as the frequency of the sweep in the center of the pattern increases. The sweep signal does contain phase errors as shown in the reduced amplitude waveform.

Description of Use: The amplitude of the sweep signal should remain fixed or flat across the band. A waveform monitor should be used to check the video path and observations can be made on the display for an idea of how well it is responding to changes in frequency.

Chapter 10: Luminance Sweep, 0.5 to 5.75 MHz, and Chroma Sweeps for Pb & Pr 0.25 to 2.875 MHz, Reduced Amplitude, w/ Amplitude and Frequency Markers

Function: Check luminance and chroma frequency response of the component analog video bandwidth with a reduced amplitude continuous frequency sweep from 0.5 MHz to 5.75 MHz for the luminance and 0.25 MHz to 2.875 MHz for the chroma.

Pattern Layout: The pattern is split between top and bottom, chroma on top with Pb and Pr active and luminance on the bottom portion of the signal. The chroma and its markers are half the bandwidth of the luminance markers but the same amplitude. The chroma markers also represent 0.5 MHz points in the sweeps where the luminance markers in the same vertical positions are 1.0 MHz markers. Chroma and luminance amplitude are equal at 420 mVolts. The luminance background is at 210 mVolts.

Description of Use: Independently look at chroma and luminance response at reduced amplitude, in the same picture.

Chapter 11: Luminance Sweep, 0.5 to 5.75 MHz, and Chroma Sweeps for Pb & Pr 0.25 to 2.875 MHz, Full Amplitude, w/ Amplitude and Frequency Markers

Function: Check luminance and chroma frequency response of the component analog video bandwidth with a full amplitude continuous frequency sweep from 0.5 MHz to 5.75 MHz for the luminance and 0.25 MHz to 2.875 MHz for the chroma.

Pattern Layout: The pattern is split between top and bottom, chroma on top with Pb and Pr active and luminance on the bottom portion of the signal. The chroma and its markers are half the bandwidth of the luminance markers but the same amplitude. The chroma markers also represent 0.5 MHz points in the sweeps where the luminance markers in the same vertical positions are 1.0 MHz markers. Chroma and luminance amplitude are equal at 700 mVolts. The luminance background is at 350 mVolts.

Description of Use: Independently look at chroma and luminance response at full amplitude, in the same picture.

Chapter 12: Chroma Sweep for Pb 0.25 to 2.875 MHz, Reduced Amplitude, w/ Amplitude and Frequency Markers

Function: Check reduced amplitude frequency response in the Pb channel with a flat field in the other channels.

Pattern Layout: Amplitude and frequency markers are at the top and bottom of the picture. The position of the markers is at 0.5 MHz intervals in the sweep signal. The amplitude is 420 mVolts.

Description of Use: Inspect the Pb channel independent of the Pr and Y channels. Look for crosstalk into the other channels, especially after video processing.

Chapter 13: Chroma Sweep for Pb 0.25 to 2.875 MHz, Full Amplitude, w/ Amplitude and Frequency Markers

Function: Check full amplitude frequency response in the Pb channel with a flat field in the other channels.

Pattern Layout: Amplitude and frequency markers are at the top and bottom of the picture. The position of the markers is at 0.5 MHz intervals in the sweep signal. The amplitude is 700 mVolts.

Description of Use: Inspect the Pb channel independent of the Pr and Y channels. Look for crosstalk into the other channels, especially after video processing.

Chapter 14: Chroma Sweep for Pb & Pr 0.25 to 2.875 MHz, Reduced Amplitude, w/ Amplitude and Frequency Markers

Function: Check reduced amplitude frequency response in the Pb and Pr channels with a flat field in the Y channel.

Pattern Layout: Amplitude and frequency markers are at the top and bottom of the picture. The position of the markers is at 0.5 MHz intervals in the sweep signal. The amplitude is 420 mVolts.

Description of Use: Inspect the Pb and Pr channels independent of the Y channel at reduced amplitude. Look for crosstalk of chroma into the Y channel, especially after video processing.

Chapter 15: Chroma Sweep for Pb & Pr 0.25 to 2.875 MHz, Full Amplitude, w/ Amplitude and Frequency Markers

Function: Check full amplitude frequency response in the Pb and Pr channels with a flat field in the Y channel.

Pattern Layout: Amplitude and frequency markers are at the top and bottom of the picture. The position of the markers is at 0.5 MHz intervals in the sweep signal. The amplitude is 700 mVolts.

Description of Use: Inspect the Pb and Pr channels independent of the Y channel at full amplitude. Look for crosstalk of chroma into the Y channel, especially after video processing.

Chapter 16: Chroma Sweep for Pr 0.25 to 2.875 MHz, Reduced Amplitude, w/ Amplitude and Frequency Markers

Function: Check reduced amplitude frequency response in the Pr channel with a flat field in the other channels.

Pattern Layout: Amplitude and frequency markers are at the top and bottom of the picture. The position of the markers is at 0.5 MHz intervals in the sweep signal. The amplitude is 420 mVolts.

Description of Use: Inspect the Pr channel independent of the Pb and Y channels. Look for crosstalk into the other channels, especially after video processing.

Chapter 17: Chroma Sweep for Pr 0.25 to 2.875 MHz, Full Amplitude, w/ Amplitude and Frequency Markers

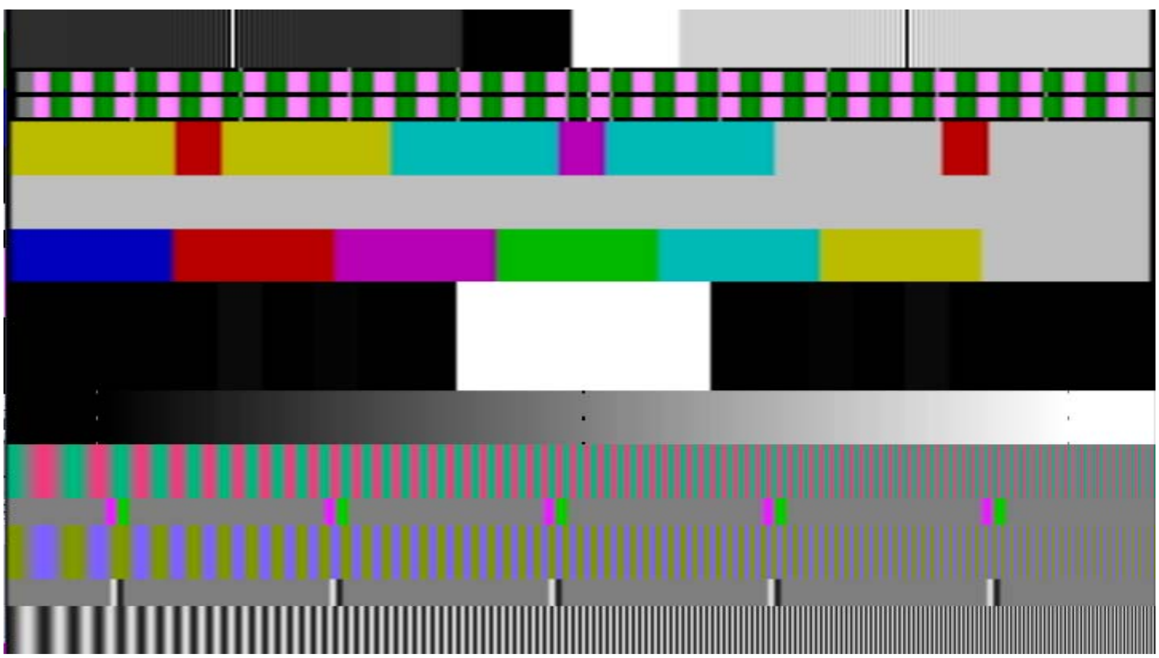
Function: Check full amplitude frequency response in the Pr channel with a flat field in the other channels.

Pattern Layout: Amplitude and frequency markers are at the top and bottom of the picture. The position of the markers is at 0.5 MHz intervals in the sweep signal. The amplitude is 700 mVolts.

Description of Use: Inspect the Pr channel independent of the Pb and Y channels. Look for crosstalk into the other channels, especially after video processing.

Chapter 18: Combination Pattern

Function: General visual evaluation pattern for a number of important parameters in conveying and displaying video. Individual, full screen versions of each of the test signals represented in this combination can be found elsewhere in the disc.



Pattern Layout: From top to bottom

Sinx/x This is a video bandwidth test pattern. It requires a spectrum analyzer to make full use of its capability. It exercises the majority of the frequencies in the baseband video. It can be found in Title 12, Chapter 35 as a full field test pattern.

Bowtie test pattern at 5 nsec resolution. The Bowtie is named after its appearance on a waveform monitor. It is designed to provide information about the amplitude and timing relationship of the Y, Pb, and Pr channels in the component video system. It can be found in Title 12, Chapter 29 at a 5 nsec resolution and in Title 12, Chapter 30 at a 1 nsec resolution.

Chrominance to Luminance Delay. This is a visual indication of positioning of color on color with luminance differences in those colors plus a look at color on gray. The full field version of this pattern can be found at Title 6, Chapter 25.

Gray Reference at 75%. This serves as a decoder reference for both the delay pattern above it and the color bar pattern below it. The function of this is best illustrated in the Color Bar pattern with Gray Reference found earlier in this title.

Color Bars at 75%. This is to be used with the gray reference above it for checking the quality of decoding to RGB. The function of this is best illustrated in the Color Bar pattern with Gray Reference found earlier in this title.

PLUGE with a Reference White. This is a wedge out of the PLUGE with Log Gray Scale at the point of the white rectangle. It serves as a reference for black and white levels.

Full dynamic range gray ramp with markers for black, 50% and video white at 100%.

Reduced Amplitude Pr Sweep with a 50% Flat Field Luminance Background. The amplitude of the sweep is about 75% of full color level. The sweep starts at about 0.25 MHz and runs out to 2.875 MHz. The flat field in the luminance makes it easier to see the excursions of the color signal. Full field and split field versions of these patterns can be found in Title 11.

Pb plus Pr Amplitude and Frequency Markers. The markers are placed at 0.5 MHz intervals in the chroma sweep. The bandwidth of the marker is about 0.5 MHz. The amplitude of the marker represents the amplitude of the chroma signal at 0.5 MHz. In a visual inspection compare the amplitude of the markers with the amplitude of the signal at any point along the sweep.

Reduced Amplitude Pb Sweep with a 50% Flat Field Luminance Background. The amplitude of the sweep is about 75% of full color level. The sweep starts at about 0.25 MHz and runs out to 2.875 MHz. The flat field in the luminance makes it easier to see the excursions of the color signal. Full field and split field versions of these patterns can be found in Title 11.

Luminance Amplitude and Frequency Markers. The markers are placed at 1.0 MHz intervals in the luminance sweep. The bandwidth of the marker is about 1.0 MHz. The amplitude of the marker represents the amplitude of the luminance signal at 0.5 MHz. In a visual inspection compare the amplitude of the markers with the amplitude of the signal at any point along the sweep.

Reduced Amplitude Luminance Sweep. This 75% amplitude sweep starts at 0.5 MHz and extends out to about 5.75 MHz. The sweep is centered near the 50% luminance level to match the chroma sweeps. Full field and split field versions of these patterns can be found in Title 11.

Description of Use: This pattern was assembled because one full field will tell you a lot of what you need to know about a video path. The Sinx/x and Bowtie patterns were designed for use with instrumentation. The others work for both visual inspection and instrumentation. Any of the parameters being tested with this pattern can be individually tested with other patterns in the program.

Chapter 19: Pixel Phase

Function: Assist in the positioning video on a fixed pixel display so that there is a one to one correspondence between the image and the display. In order for this pattern to work properly there has to be a direct correspondence between the test pattern and the display.

Pattern Layout: The first two groups of information, top left and top right, are 2 pixel rise times. The middle two are single pixel rise times and the last two are 3 pixel rise times. One the left side of the image each group starts out in the positive direction and on the right side they start out in the negative direction. The left and right images are out of phase with each other. The excursion is about 50% of the video amplitude starting at about 5% above black.

Description of Use: This pattern is only useful as a pixel phase test pattern at its native rate. Conversion to another rate will not create the one to one pixel relationship required for this pattern to work in the pixel phase function. While there are few 720 by 486 or 720 by 576 displays these versions of the patterns have been included to be consistent with patterns provided in high definition.

In another application these patterns will provide a look at what is happening at the upper end of frequency response. The single pixel rise time wedges in the middle of the pattern represents a change in state from pixel to pixel or about 6.75 MHz in analog bandwidth.

Chapter 20: Phillips, PTV 1.78 Test Pattern

Function: This is a general-purpose test pattern developed by the PTV division of Philips for general use in the PAL world.

Pattern Layout: There are references for image center, geometry, black and white levels and color decoding.

Description of Use: Back in the early days of European color television the 1.33 version of this pattern was on screen during the many hours of the day when there wasn't programming. It provided many of the functions found in the SMPTE RP133 test pattern plus a reference for color. The 1.78 version of the pattern was put together when the Europeans started using the 1.78 format. The pattern is included in this disc set in both PAL and NTSC.

Chapter 21: Video Black

Function: Provide an easily accessed source of video black. Look for vertical or horizontal tilt in the signal.

Pattern Layout: Video Black

This is something that can be used on a video screen for a long time without fear of harming any of the display characteristics. This is also just ahead of a Title boundary. Use the Skip Forward or Play button to jump to the next title. Not all DVD players are capable of easily jumping a Title boundary. You may have to try other navigation options or use the Program Menu to move forward to the next title.

Any flat field pattern can be used to look for vertical or horizontal tilt. This is a circumstance where the amplitude of the signal is not the same from one side of the picture to another. Visually spotting tilt can be encumbered by flat field uniformity. It is best to check such thing out on a waveform monitor.

Title 12: System Evaluation

The system evaluation category ended up being a catch-all title for test materials that did not fit in other places. It is a combination of flat field tests, low frequency tests with some high frequency combinations in low frequency tests.

Chapter 1: Title Identification: *System Evaluation*

Look at system evaluation in terms of determining the capability of the entire system. Of course parts of that will require a waveform monitor to be connected to various point in the signal path.

The beginning of this title provides test patterns designed for evaluating full fields of single colors, either at a fixed level or going from dark to light. The remaining patterns deal with system timing and response.

Chapter 2: Modulated Ramp

Function: The original purpose of this pattern was to test differential phase in the color signal of composite video.

Pattern Layout: A luminance ramp with a fixed amount of color.

Description of Use: Display this signal on a vectorscope and look for changes in chroma amplitude and phase. The chroma amplitude might change at either end of the luminance scale. There might also be changes in phase at various points in the luminance ramp. Good composite video circuits would not have more than a degree of phase error or more than 1% amplitude change.

Chapter 3: Modulated 5 Step

Function: The original purpose of this pattern was to test differential phase in the color signal of composite video. The five steps also made it possible to look at differential gain in the luminance portion of the signal.

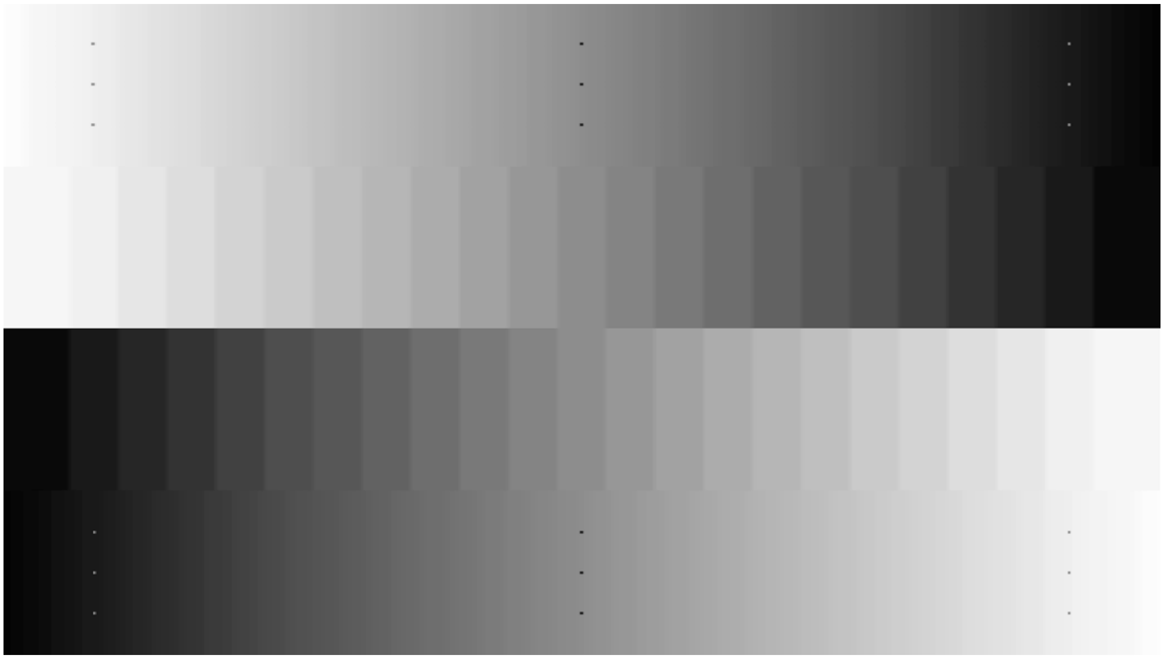
Pattern Layout: Luminance steps with chroma going from dark to light in five steps.

Description of Use: Display this signal on a vectorscope and look for changes in chroma amplitude and phase. The chroma amplitude might change at either end of the luminance scale. There might also be changes in phase at various points in the luminance ramp. Good composite video circuits would not have more than a degree of phase error or more than 1% amplitude change.

A waveform monitor with a differential gain function is required to easily look at this parameter. It will differentiate the boarders of the steps and create a spike for each transition. If there is any difference in the amplitude of the spike then there is a differential in the gain of the video path at some of the steps. If the waveform monitor does not have a differential gain capability the amplitude of each of the steps can be carefully measured and compared with the other steps.

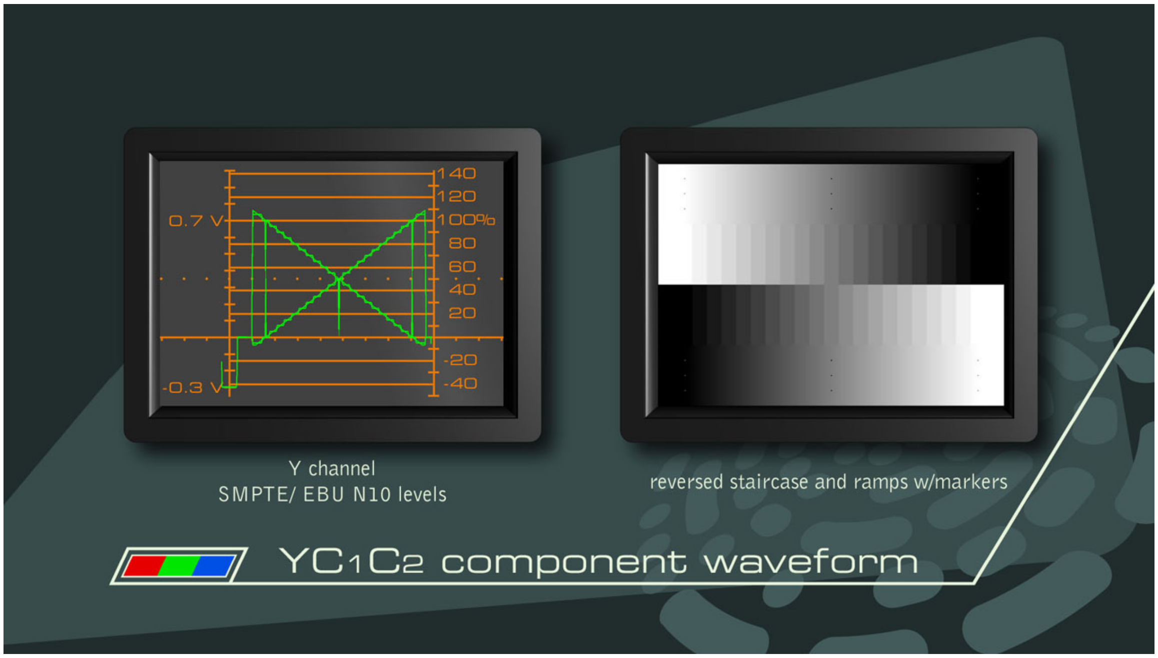
Chapter 4: Reverse Gray Ramp w/Steps

Function: To assess/adjust brightness, contrast, gray scale tracking (within the limitations of flat field uniformity), bit depth, and gamma.



Pattern Layout: The top and bottom portion of this pattern consist of a gray ramp. The inner portion of the pattern contains gray steps. The twenty-two steps extend from 5% below black to 5% above white, with the ramps extended out to the limits of the digital video system. Markers, which appear as three vertical dots, are placed at video black, 50% and 100% video.

Descriptions of Uses: This pattern was initially designed to exercise the entire dynamic range of the digital video system. In this application it is useful in determining if video equipment can pass the complete dynamic range of the signal. In a solid-state display it will make it easy to spot any clipping that may take place at the upper end of the dynamic range. It is the pattern of choice when setting the contrast control on a digital display.



While the Reverse Gray Ramps and steps can be used to set black level as well as white, we still favor the PLUGE pattern for setting black level on any display.

Unlike the analog CRT digital displays do not go into blooming. As the contrast is turned up the brighter portions of the video signal hit a clipping circuit, the maximum capability to pass video. Any video information that is going to get to the display must be below the clip point in level. It's sort of like a speed governor on a car. It's drivable at any speed below the maximum point set in the governor. If the contrast is turned up chances are that part of the video signal will be pushed into this clipping circuit. Whatever detail is in that portion of the video signal will be turned into a flat white with no detail. The contrast control must be turned down until the detail re-appears. Run the contrast control up to see if the steps start to blend together.

There may be circumstances where turning the contrast control down on the display device will not pull the video out of the clip. This is often an indication that some device ahead of the display is running into its own digital clip.

It is important to have a waveform monitor to check the video at various stages in the video path to determine that it is not being clipped at either end of the dynamic range. The full active video signal extends from about –48 mVolts to +760 mVolts with black at 0 Volts and white at 700 mVolts.

This pattern is also capable of revealing information about the bit depth of video processing. Look at the ramps in the pattern. These should appear smooth from black to above white. If there are vertical lines or noise in any areas of the ramps, the system more than likely does not have enough bit depth to properly handle the video signal.

Flat Fields

Chapters 5 to 20 are all about evaluating image uniformity or an ability to deal with particular levels. All of these patterns are useful with a waveform monitor and or vectorscope.

The transition from a 100% flat field to a 100% Window is aimed at CRT displays as a look at their ability to maintain a consistent light output level between the two. In this case a light meter is also necessary.

Chapter 5: Full Field Black

Chapter 6: 20% Flat Field

Chapter 7: 40% Flat Field

Chapter 8: 60% Flat Field

Chapter 9: 80% Flat Field

Chapter 10: 100% Flat Field

Chapter 11: 100% Vertical Window

Function: To assess and adjust the upper end of the grayscale while observing brightness levels.

Pattern Layout: The pattern consists of the DVE PLUGE on the left and right side of a 100% amplitude vertical window box set against a black background.

Description of Use: Use this pattern with the 100% Flat Filed to determine how well the light output of the display remains fixed between the two patterns. A light meter that measures a small area within the 100% Vertical Window is required.

Chapter 12: Full Field 100% Red

Chapter 13: Full Field 100% Green

Chapter 14: Full Field 100% Blue

Chapter 15: Full Field 75% Red

Chapter 16: Full Field 75% Green

Chapter 17: Full Field 75% Blue

Chapter 18: Full Field 75% Cyan

Chapter 19: Full Field 75% Magenta

Chapter 20: Full Field 75% Yellow

Reverse Ramps & Steps in Color

A complete set of six colors can be found in Title 6. The three primary colors are repeated here for their similarity in function to the flat fields.

Chapter 21: Reverse Ramps and Steps, Red

Chapter 22: Reverse Ramps and Steps, Green

Chapter 23: Reverse Ramps and Steps, Blue

Full Field Color Bar Patterns

The color bar patterns in the following four chapters can help make it easier to inspect color decoding capability from Y Pb Pr to RGB. They are intended for use with a waveform monitor. The 100% bars provide a 700 mVolt excursion, making them easy to inspect. Some circuits may have trouble with 100% bars so the 75% bars are also available.

Chapter 24: Field rate color bars 100% saturation

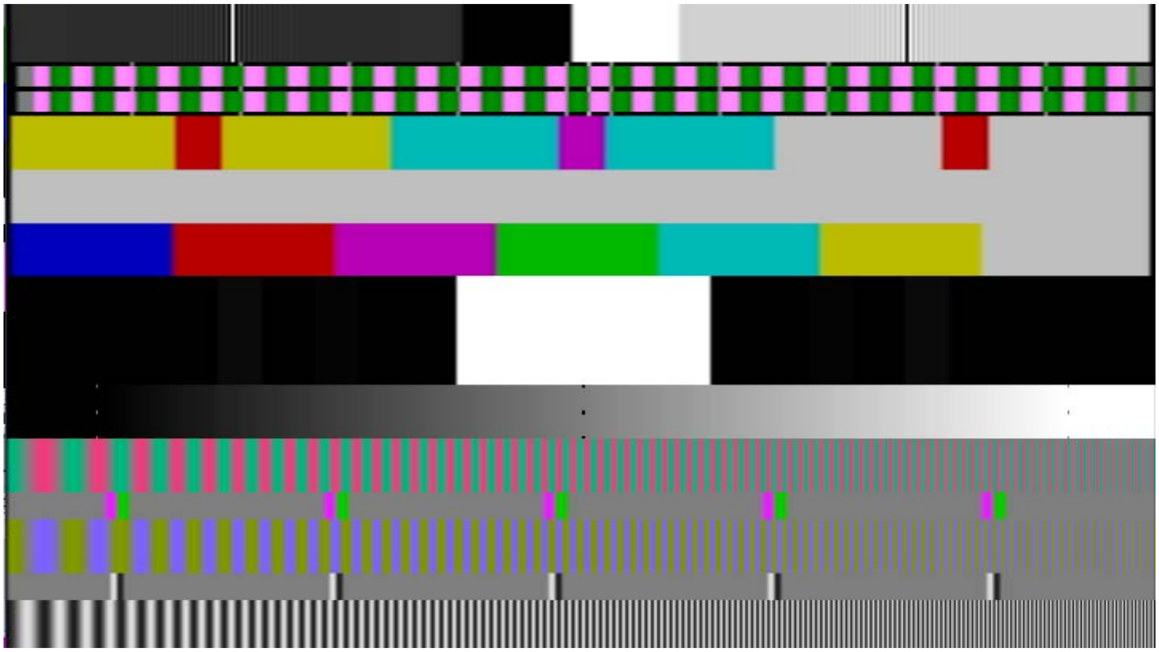
Chapter 25: Field rate color bars 75% saturation

Chapter 26: Line rate color bars 100% saturation

Chapter 27: Line rate color bars 75% saturation

Chapter 28: DVE Combination Pattern

Function: General visual evaluation pattern for a number of important parameters in conveying and displaying video. Individual, full screen versions of each of the test signals represented in this combination can be found elsewhere in the disc.



Pattern Layout: From top to bottom

Sinx/x This is a video bandwidth test pattern. It requires a spectrum analyzer to make full use of its capability. It exercises the majority of the frequencies in the baseband video. It can be found in Title 12, Chapter 35 as a full field test pattern.

Bowtie test pattern at 5 nsec resolution. The Bowtie is named after its appearance on a waveform monitor. It is designed to provide information about the amplitude and timing relationship of the Y Pb and Pr channels in the component video system. It can be found in Title 12, Chapter 29 at a 5 nsec resolution and in Title 12, Chapter 30 at a 1 nsec resolution.

Chrominance to Luminance Delay. This is a visual indication of positioning of color on color with luminance differences in those colors plus a look at color on gray. The full field version of this pattern can be found at Title 6, Chapter 25.

Gray Reference at 75%. This serves as a decoder reference for both the delay pattern above it and the color bar pattern below it. The function of this is best illustrated in the Color Bar pattern with Gray Reference found earlier in this title.

Color Bars at 75%. This is to be used with the gray reference above it for checking the quality of decoding to RGB. The function of this is best illustrated in the Color Bar pattern with Gray Reference found earlier in this title.

PLUGE with a Reference White. This is a wedge out of the PLUGE with Log Gray Scale at the point of the white rectangle. It serves as a reference for black and white levels.

Full dynamic range gray ramp with markers for black, 50% and video white at 100%.

Reduced Amplitude Pr Sweep with a 50% Flat Field Luminance Background. The amplitude of the sweep is about 75% of full color level. The sweep starts at about 0.25 MHz and runs out to 2.875 MHz. The flat field in the luminance makes it easier to see the excursions of the color signal. Full field and split field versions of these patterns can be found in Title 11.

Pb plus Pr Amplitude and Frequency Markers. The markers are placed at 0.5 MHz intervals in the chroma sweep. The bandwidth of the marker is about 0.5 MHz. The amplitude of the marker represents the amplitude of the chroma signal at 0.5 MHz. In a visual inspection compare the amplitude of the markers with the amplitude of the signal at any point along the sweep.

Reduced Amplitude Pb Sweep with a 50% Flat Field Luminance Background. The amplitude of the sweep is about 75% of full color level. The sweep starts at about 0.25 MHz and runs out to 2.875 MHz. The flat field in the luminance makes it easier to see the excursions of the color signal. Full field and split field versions of these patterns can be found in Title 11.

Luminance Amplitude and Frequency Markers. The markers are placed at 1.0 MHz intervals in the luminance sweep. The bandwidth of the marker is about 1.0 MHz. The amplitude of the marker represents the amplitude of the luminance signal at 0.5 MHz. In a visual inspection compare the amplitude of the markers with the amplitude of the signal at any point along the sweep.

Reduced Amplitude Luminance Sweep. This 75% amplitude sweep starts at 0.5 MHz and extends out to about 5.75 MHz. The sweep is centered around the 50% luminance level to match the chroma sweeps. Full field and split field versions of these patterns can be found in Title 11.

Description of Use: This pattern was assembled because one full field will tell you a lot of what you need to know about a video path. The Sinx/x and Bowtie patterns were designed for use with instrumentation. The others work for both visual inspection and instrumentation. Any of the parameters being tested with this pattern can be individually tested with other patterns in the program.

Chapter 29: Bowtie test pattern, 5 nsec. Resolution

Function: Test the amplitude and timing relationship among the three channels, Y Pb and Pr of a component video signal. The resolution of the pattern is determined by signals in the chroma channel.

Pattern Layout: A component test signal with bursts of frequency put in Y, Pb, and Pr channels. The frequencies are slightly different so that the addition of either of the two chroma signals with the luminance signal produces a beat waveform called 'bowtie'. The luminance frequency is about 500KHz, with the frequencies in the two chroma channels being just far enough off so that when the chroma and luminance are added they will be in phase at the outside edges of the picture and out of phase in the center. There are markers in the luminance channel for displaying the resolution of the resulting display.

Description of Use: This pattern is designed for use with a waveform monitor that has a Bowtie function. The display looks like a bowtie and therefore the name of the pattern.

In displaying the signal for evaluation the waveform monitor will combine each of the chroma channels with the luminance channel, displaying the results of the Pb combination on the left side of the screen and the Pr combination on the right side of the screen.

Each combination produces a null somewhere in its waveform. If the null is centered then there is a correspondence between the timing of the chroma channel and the luminance. If the null is before the center the chroma channel is leading the luminance. If the null occurs after the center then the chroma channel is delayed with respect to the luminance. If the null fails to go to zero there is an amplitude error between the chroma and luminance channel(s).

The amplitude shift from the null point to the edge will be much larger in the 5 nsec pattern than in the 1 nsec pattern.

Chapter 30: Bow Tie test pattern, 1 nsec. Resolution

Function: Test the amplitude and timing relationship among the three channels, Y Pb and Pr of a component video signal. The resolution of the pattern is determined by signals in the chroma channel.

Pattern Layout: A component test signal with bursts of frequency put in Y, Pb, and Pr channels. The frequencies are slightly different so that the addition of either of the two chroma signals with the luminance signal produces a beat waveform called 'bowtie'. The luminance frequency is about 500KHz, with the frequencies in the two chroma channels being just far enough off so that when the chroma and luminance are added they will be in phase at the outside edges of the picture and out of phase in the center. There are markers in the luminance channel for displaying the resolution of the resulting display.

Description of Use: This pattern is designed for use with a waveform monitor that has a Bowtie function. The display looks like a bowtie and therefore the name of the pattern.

In displaying the signal for evaluation the waveform monitor will combine each of the chroma channels with the luminance channel, displaying the results of the Pb combination on the left side of the screen and the Pr combination on the right side of the screen.

Each combination produces a null somewhere in its waveform. If the null is centered then there is a correspondence between the timing of the chroma channel and the luminance. If the null is before the center the chroma channel is leading the luminance. If the null occurs after the center then the chroma channel is delayed with respect to the luminance. If the null fails to go to zero there is an amplitude error between the chroma and luminance channel(s).

The amplitude shift from the null point to the edge will be much larger in the 5 nsec pattern than in the 1 nsec pattern.

Chapter 31: NTC-7 Test Pattern in Component

Function: The original purpose of the composite versions of these test signals was multifunctional. It was used to test for chroma and luminance gain, differential luminance gain, relative chroma levels within the luminance channel, otherwise known as differential chroma gain, chroma timing relative to luminance, and some basic information about luminance and chroma response.

It is a component video signal on the disc and can therefore be used to look at the conversion from component to composite, once the quality of the analog component path has been pre-qualified.

Pattern Layout: The pattern starts out with a square wave of a length of slightly less than half the horizontal line time, followed by a 2T pulse, then a modulated 12.5T pulse and finally a 5 step modulated stair step from black to white.

Description of Use: This and the FCC Composite Test Signal, the reverse of the NTC-7 signal, were originally designed for the composite video domain. They were often found as single line test patterns in the vertical interval of the video signal.

The square wave can be used to evaluate rise time, looking for undershoot or overshoot, and line tilt, consistent level from one part of the picture to the next.

The 2T pulse is used for a quick judgment of luminance frequency response for composite video. Its amplitude should reach 100%. The specifications for luminance response in the component domain should be far better than better than required for this pulse to reach 100%, but check that before looking at how well the signals come together in the composite output of the player.

The 12.5T modulated pulse gets its full amplitude from a combination of the chroma and luminance signals being added together in the composite domain. The luminance signal in the component domain will not reach 100% on its own. Looking at the base of the 12.5T pulse on a composite waveform monitor allows for assessment of the chroma to luminance amplitude and delay characteristics. If the chroma level is high there will be a bump in the chroma that goes below black. If it is low the hump will not go down to black. If there is a sine wave hump in the base of the 12.5T pulse the chroma is out of phase with the luminance. If the sine wave is going below black on the leading edge, the chroma is ahead of the luminance. The chroma is behind the luminance if the leading edge of the sine wave is shallow, or goes above the black level.

The modulated stair step can be used for differential gain measurements in the luminance channel and differential gain and phase measurements in the chroma channel. A standard waveform monitor vectorscope combination will be needed for these measurements.

Chapter 32: Reverse NTC-7 test pattern

Function: The original purpose of the composite versions of these test signals was multifunctional. It was used to test for chroma and luminance gain, differential luminance gain, relative chroma levels within the luminance channel, otherwise known as differential chroma gain, chroma timing relative to luminance, and some basic information about luminance and chroma response.

It is a component video signal on the disc and can therefore be used to look at the conversion from component to composite, once the quality of the analog component path has been pre-qualified.

Pattern Layout: The pattern starts out with the modulated 5-stair step followed by the 2T pulse, then a modulated 12.5T pulse and finally the square wave.

Description of Use: It is sometimes known as the FCC Composite Test Signal.   This and the NTC-7 signal were originally designed for the composite video domain. They were often found as single line test patterns in the vertical interval of the video signal.

The modulated stair step can be used for differential gain measurements in the luminance channel and differential gain and phase measurements in the chroma channel. A standard waveform monitor vectorscope combination will be needed for these measurements.

The 2T pulse is used for a quick judgment of luminance frequency response for composite video. Its amplitude should reach 100%. The specifications for luminance response in the component domain should be far better than better than required for this pulse to reach 100%, but check that before looking at how well the signals come together in the composite output of the player.

The 12.5T modulated pulse gets its full amplitude from a combination of the chroma and luminance signals being added together in the composite domain. The luminance signal in the component domain will not reach 100% on its own. Looking at the base of the 12.5T pulse on a composite waveform monitor will allow assessment of chroma to luminance amplitude and delay characteristics. If the chroma level is high there will be a bump in the chroma that goes below black. If it is low the hump will not go down to black. If there is a sine wave hump in the base of the 12.5T pulse it is an indication that the chroma is out of phase with the luminance. If the sine wave is going below black on the leading edge the chroma is ahead of the luminance. The chroma is behind the luminance if the leading edge of the sine wave is shallow, or goes above the black level.

The square wave can be used to evaluate rise time, looking for undershoot or overshoot, and line tilt, consistent level from one part of the picture to the next.

Chapter 33: Pulse and Bar 2T

Function: This is a component test pattern designed to test the three channels, Y Pb and Pr, for rise time and flatness of image over a long period of line time.

Pattern Layout: The 2T is out of the black on the left side of the image and out of the white on the right side of the image in the luminance channel.

The two chroma channels start with a square wave followed by a 2T pulse from the negative excursion of the otherwise symmetrical signal. The T in the chroma channel is twice the width of the T in the luminance channel and chroma is symmetrical about a center point where luminance exists from black to white.

Description of Use: The signal is used to look at the rise time capability of the three channels within the analog specifications for component video.

Chapter 34: Pulse and Bar 2T, 4T, 10T

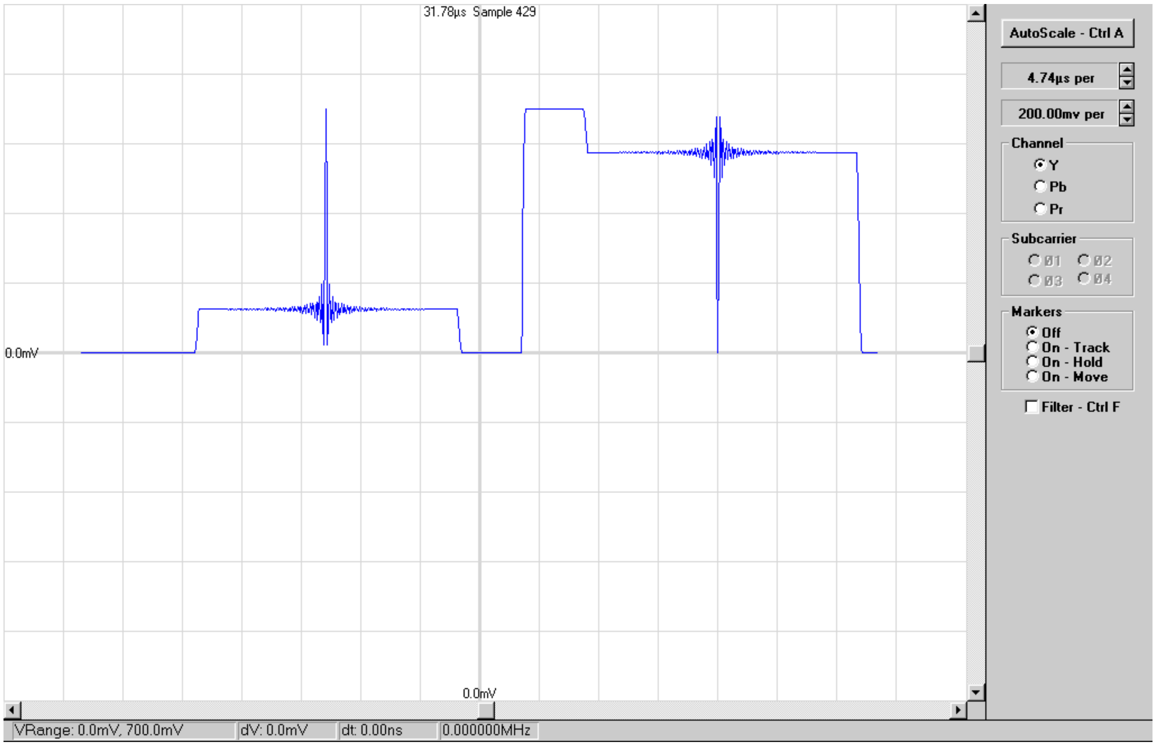
Function: This is a variation of the Pulse and Bar 2T where various rise time are explored.

Pattern Layout: The 2T, 4T and 10T pulses are out of the black on the left side of the image and out of the white on the right side of the image in the luminance channel.

The two wider pulses are in the chroma channel and are symmetrical about the zero axis of the chroma channel.

Description of Use: The signal is used to look at the rise time capability of the three channels within the analog specifications for component video.

Chapter 35: (Sin x)/x



Function: (Sin x)/x is a signal that represents all harmonics of the horizontal frequency up to about 4.75 MHz. It should produce a flat spectral display on a spectrum analyzer when it is set up to look at the analog video channel.

Pattern Layout: It has a pulse with lots of what appears to be ringing coming out of a dark area of the picture on the left side of the image followed by a dark pulse with lots of what appears to be ringing coming out of a brighter area of the picture on the right side of the image. There is a square wave in the middle of the image that goes from black to white.

Description of Use: A spectrum analyzer is required to make any real use out of this pattern. The test pattern provides a look at video channel bandwidth in terms of older analog specifications.

Chapter 36: Luminance Multipulse

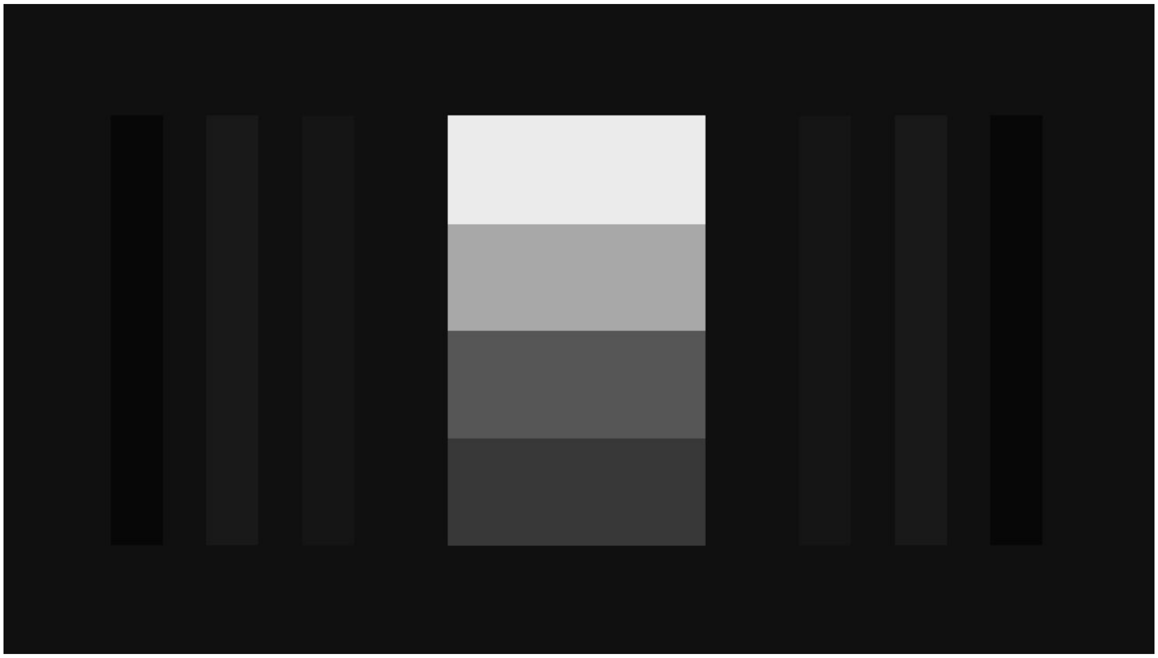
Function: This pattern is used to evaluate rise time characteristics of an analog video channel. It goes out to about 4.2 MHz.

Pattern Layout: The signal starts out with a reference square wave, followed by an un-modulated 2T pulse, a 20T pulse modulated by 1.0 MHz, a 20T pulse modulated by 3.0 MHz, a 10T pulse modulated by 3.0 MHz, a 10T pulse modulated by 3.5 MHz, and finally a 10T pulse modulated by 4.2 MHz. The two chroma channels have their own corresponding pulses at about half of the bandwidth of the luminance channel.

Description of Use: Determine the rise time capability of the component video channels within the limitations of an analog channel.

Chapter 37: DVE PLUGE w/Gray Scale

Function: To assess/adjust brightness in all types of displays and contrast in a CRT display.



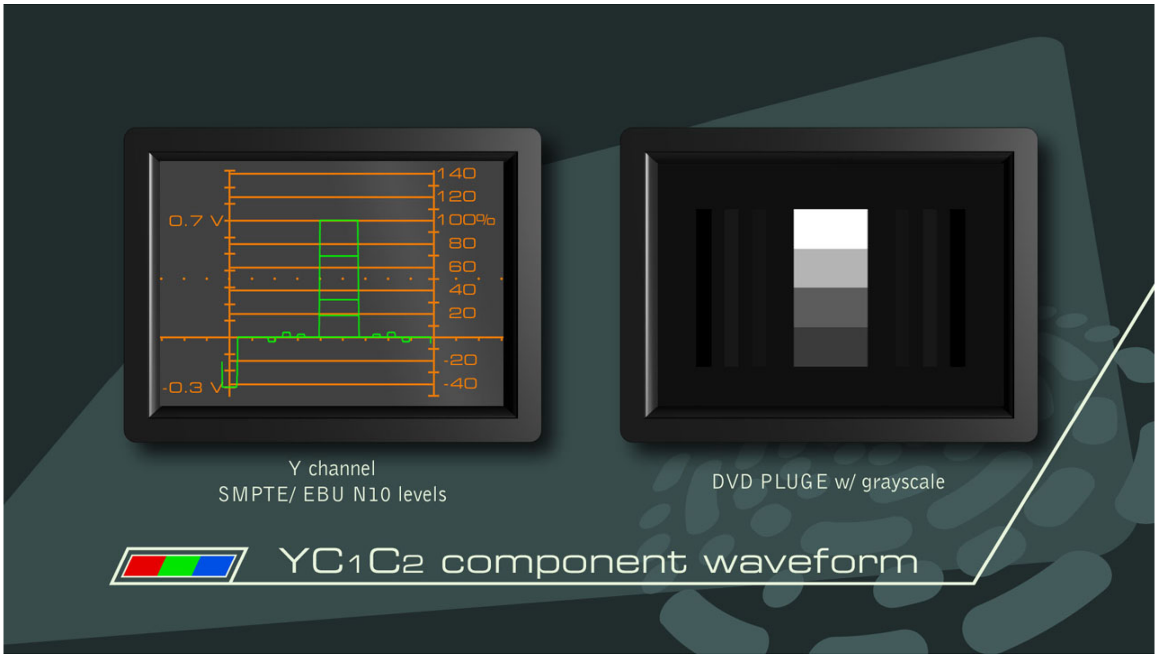
Pattern Layout: The pattern consists of a background at video black, then a symmetrical PLUGE on both the left and right side of the log gray scale in the middle of the pattern. The outer part of the PLUGE contains a -4% black bar on the video black background followed by a +4% bar and +2% bar as you go towards the middle from either side. The gray scale in the middle represents steps of about 18.4%, 32.1%, 69% and 100%. These values were chosen based on the gamma curve of a CRT display and represent a visual progression in light output along that curve.

Descriptions of Use: We've made several changes to the PLUGE patterns from the BBC version that was presented in *Video Essentials*. The original PLUGE was on the left with the gray scale on the right. The PLUGE is now on both sides of the center to provide a greater opportunity to set black, taking image uniformity into a greater account. We've also added a 2% step. Originally it was added to help in setting black level where below black information was being cut off. It later served a function of helping us describe the rate at which a CRT comes out of black. There is almost no difference in level between black and 2% above black.

The DVE PLUGE allows for the brightness control to be set properly on almost any display system. Its general use is illustrated in the tutorial discs of the DVE-Pro package. An important point to make here is that when displayed on a CRT there is almost no difference in level between the 2% above black and black itself. In the description of how to set black we tell you to adjust the Brightness control so that the blacker than black strip and video black background just match in level. You'll note that the resolution of Brightness controls is so poor that if this criteria is met that the 2% above black strip might not be visible. Turn the brightness control up far enough for the 2% strip to be visible and there will be a difference between the blacker than black and video black background. The gamma of a CRT is nearly flat in this area of operation. This is the way all display devices should work. If there is a large difference between the black background and the 2% stripe, at least part of the gamma curve in the display is wrong.

The pattern has a low average picture level (APL) and is used in conjunction with the high APL PLUGE to determine the condition of DC Restoration.

The waveform of the pattern is useful in setting black and white levels in video equipment.



In light bulb driven solid state displays you're not likely to reach the point of absence of light as described in the procedure for setting brightness on a CRT display. What you reach is a digital cut-off, a point where information in the video signal is no longer displayed. Ideally you might think you should put black at cut-off. Where solid-state displays have a gamma curve designed to emulate a CRT we are setting black level one point on the brightness scale above the point of video black being cut off. At this point in the gray scale the gamma curve is nearly flat and there should be little or no light output difference in this extra point of brightness shift. What this provides the viewer is a simulation of the CRT's ability to fully display information in the area of black, making use of some of the dynamic range below black. The light level for this darker part of the picture should be controlled using a combination of screen size and type, and lamp output. Some projectors also have an iris control for even finer control of the ambient level. The tutorial in DVE suggests the ambient level should be below 0.05 ft-L.

The center grayscale allows for a quick determination of the color of gray. Many calibrators use this pattern as a reference for quickly adjusting a grayscale as it allows one to see what is happening to the entire gray scale as adjustments are being made. It can also be used to set the contrast control on a CRT based display. That is also illustrated in DVE. It is not easily used to set the proper upper dynamic range of a solid-state display. With experience you can spot when clipping comes down as far as the 100% of this top rectangle but that doesn't help in knowing how much the contrast has to be backed down to accommodate the entire video dynamic range.

Chapter 40: Flat Field with SDI Test

Function: This test signal is included for testing standard definition serial digital links.

Motion Test Patterns:

The following two titles are different in the PAL and NTSC discs. The difference comes in the way 24-frame source material, such as motion picture film, is translated to the video system. In the 60 Hz video world there is a 2 then 3-film frame repetition of the film frames that allows it to fit nicely into the 60 field (or frame) television system. This 2 – 3 sequence is used in interlaced and progressive 60 Hz video. It doesn't matter if it is standard definition or high definition, although these two discs are standard definition and the signals came from an interlaced generator.

The 2 – 3 sequence is illustrated in the program notes of DVE-Pro. From the *Program Menu*, the first page of the top-level menu system, select *Program Notes*, then *Video Basics*, followed by *Film to Video Conversion*. Step through the sequence by using the Play or Skip Forward buttons on the remote control.

In the 50 Hz television system the film is sped up from 24 to 25 frames per second. There is no 2 – 3 sequence.

As a result there are fewer chapters in the PAL disc in Titles 13 and 14. These are therefore listed separately.

There are also difference in the demonstration materials titles between PAL and NTSC, which will be covered when we get to that section.

Title 13: 1.33 Aspect Ratio Motion Test Patterns

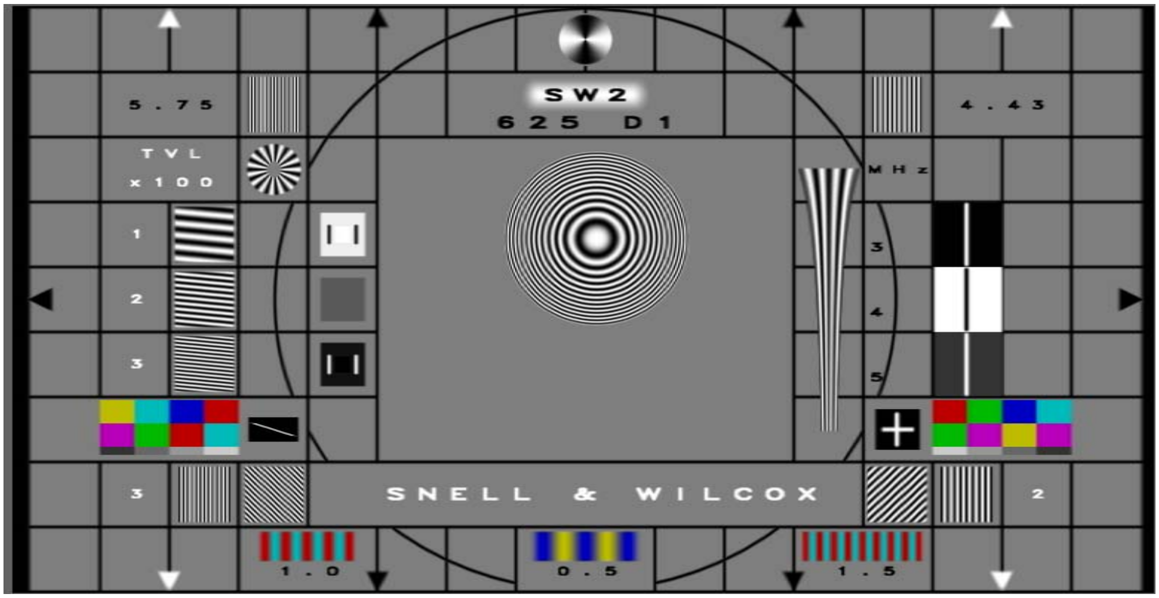
The general purpose of this title is to provide motion pattern in the 1.33:1 aspect ratio. The title is flagged as 1.33 and players capable of automatically switching between 1.33 and 1.78 should go to 1.33 during this title.

Once you skip forward beyond Chapter 1 the title will play in its entirety, ending on the opening still for Title 14. Any of the chapters in this title can be put in a loop to prevent it from going into the next chapter.

Chapter 1: Title Identification: *1.33 Motion Patterns*

This is the only still pattern in the title. You will need to press Skip Forward or Play to continue.

Snell and Wilcox Zone Plate Test Patterns



Chapters 2 to 7 use the Snell & Wilcox Zone Plate test pattern as the base pattern. The type of motion is changed in each. We will present a basic description of the general information in the pattern prior to describing the motion in each of the chapter descriptions.

Function: The Zone Plate Test Pattern is designed to show image motion at various rates within a static background. The background provides basic information about video path performance.

Pattern Layout & Description of Use: The pattern is based on the digital video production format of 720 by 576 with a pixel aspect ratio described in the SMPTE RP187 document for a 1.33 aspect ratio picture. Details in the pattern are designed to conform production standards of a video bandwidth for composite PAL video.

The pattern is named 625 D1 indicating that it is generated in the 4:2:2 digital component format used by the D1 tape recording format.

References are included for black and white levels, horizontal and diagonal resolution, geometry and horizontal rise and fall times.

There are three chroma with luminance bursts at the bottom of the pattern. The center pattern, labeled 0.5 is primarily in the Pb channel. The two outside bursts, labeled 1.0 and 1.5 are primarily in the Pr domain. Their bandwidths are in the order of chroma bandwidth specifications for a transmitted composite video signal. Even at that, they can often be useful at looking at the chroma bandwidth of a video path.

As for motion, the patterns in the PAL version are grouped into three sets, each of which has frame and field rate of motion. The motion types include diagonal, horizontal, and vertical.

There is a programmed 10-frame pause in all of the motion as it hits one of the boundaries of the area of motion. During that pause the test pattern is presenting progressive frames of information.

In any motion detection processing it is important to see what happens to the fixed information in the image when motion is detected. It is not unusual to see motion being added to the still material as the quality of the motion material improves.

Chapter 2: Snell & Wilcox Zone Plate, Diagonal Motion, Frame Rate

Pattern Layout: The motion rate on the generator was set to 2 – 2 or complete frames in two fields when this pattern was generated. There is a 10-frame pause at each stop. The pause should be seen as a 2 – 2 still or a frame still. The chapter is 15 seconds long.

Description of Use: We have included the diagonal motion in this disc, at a frame rate, to be consistent with material that has been presented in the past. We are not convinced that the diagonal motion in the frame rate position of the generator is actually frame related, although processors do often treat it differently than field rate diagonal. In any event we have never seen it detected as 2 – 2 by any processor, where we have seen lots of processors that can find the 2 – 2 in either horizontal or vertical movement.

Chapter 3: Snell & Wilcox Zone Plate, Diagonal Motion, Field Rate

Pattern Layout: The motion in this section is updated in each field.

Description of Use: Interlaced video is difficult for any processor in converting the image to progressive video. Look for the types of artifacts being introduced. This certainly makes a case for doing away with interlaced video.

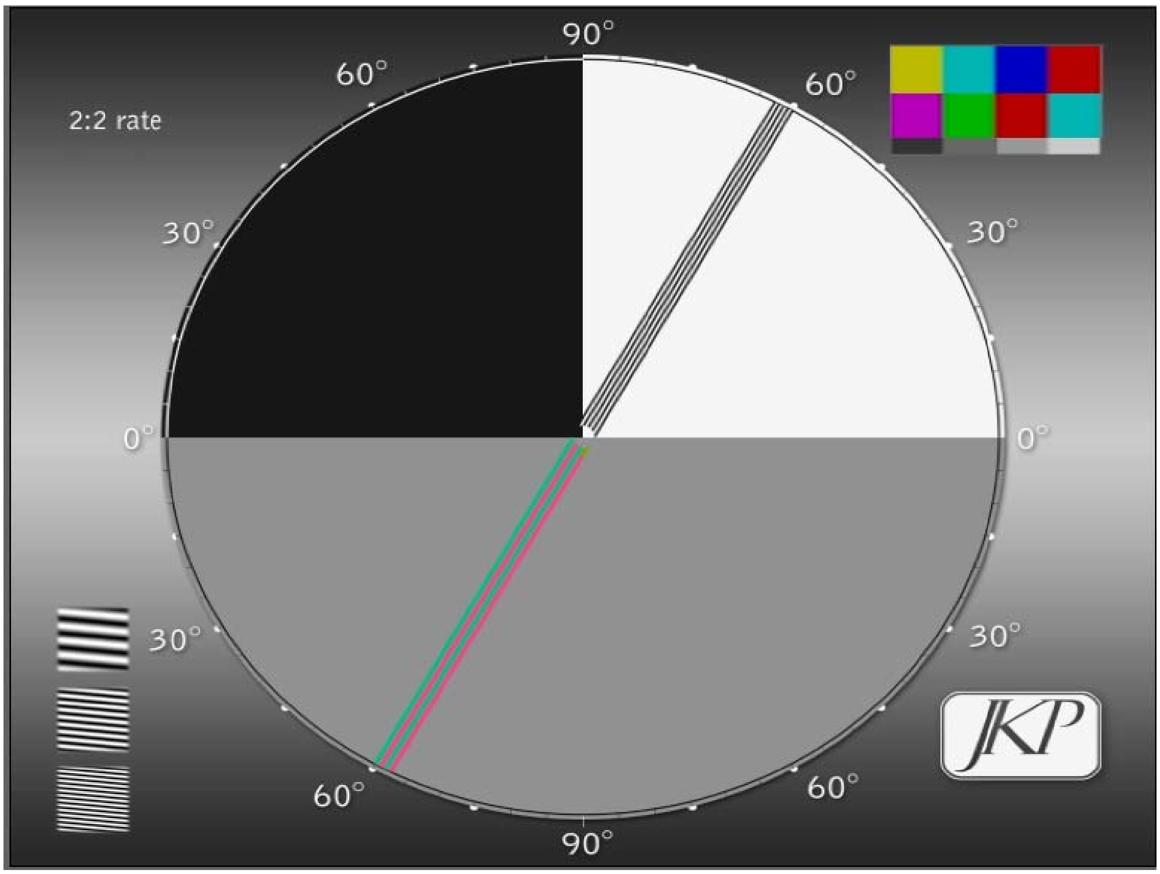
Chapter 4: Snell & Wilcox Zone Plate, Horizontal Motion, Frame Rate

Chapter 5: Snell & Wilcox Zone Plate, Horizontal Motion, Field Rate

Chapter 6: Snell & Wilcox Zone Plate, Vertical Motion, Frame Rate

Chapter 7: Snell & Wilcox Zone Plate, Vertical Motion, Field Rate

Compass Test Pattern



A general description is being provided here followed by the order of the rates in the individual chapters.

Function: This pattern was designed to help look at how diagonal motion is being processed in luminance and color. There is fixed information in the image so that you can tell what the image processing is doing to that part of the picture.

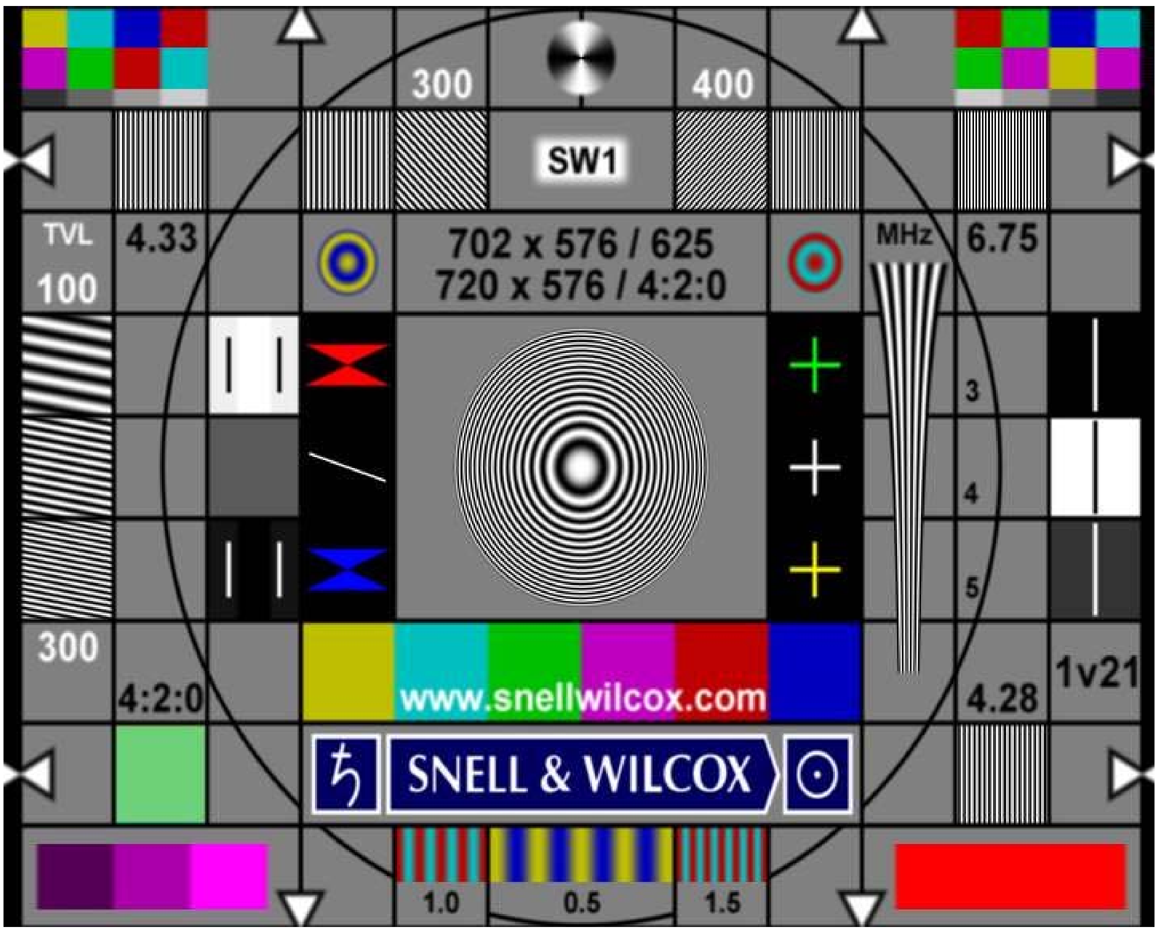
Pattern Layout: The compass rotates through luminance, Pb and Pr at the rate designated for each pattern. The rate in indicated in the upper left corner of the image.

Description of Use: The pattern was created so we could take a look at how processors handle image information at various angles on the diagonal. The rate of rotation is changed from 2 – 2 to 2 – 1. Chroma is treated independent of luminance just in case there is a difference in how the two types of signals are processed.

Chapter 8: Compass, Frame Rate

Chapter 9: Compass, Field Rate

Chapter 10: Snell & Wilcox MPEG Test Pattern



Function: The primary reason this pattern is included in this program is for inspection of MPEG decoding, in particular the conversion from 4:2:0 to 4:2:2, otherwise known as the "chroma bug".

Pattern Layout: The pattern has been modeled after the S&W Zone Plate test pattern, with some updates reflecting the bandwidth capability of the digital video system. Specifically that includes the 6.75 MHz burst. The pattern has been generated in the MPEG domain and is therefore "MPEG Perfect" or at least void of any encoding errors.

The box labeled 4:2:0 alternates between yellow and cyan in each successive field. The S&W symbol on the right side rotates. The pattern is specifically formatted for the DVD format of 720 by 480, rather than 720 by 486. The size of the three color bursts has been increased from the S&W Zone Plate pattern but the frequencies remain the same.

Description of Use: The chroma wedges to the left of the concentric circles and the color concentric circles to the left and right of the image size labels are used to inspect for the chroma bug. In proper decoding they should be smooth. When decoding is not right there will be dark horizontal areas in that part of the image.

A number of video processors smear the vertical color information in order to cover up this error. If that is happening you should be able to see it in the color wedges at the top and bottom of the pattern.

We have noticed that the chroma in the upper left and right edges of the image can cause problems with some of the early analog component TV sets that anticipate a wide horizontal blanking interval. It shows up as in color streaking in the image. Many DVD players will widen the horizontal blanking in their analog output to avoid this problem.

Title 14: Anamorphic Motion Test Patterns

The general purpose of this title is to provide motion pattern in the 1.78:1 aspect ratio. The title is flagged as 1.78 and players capable of automatically switching between 1.33 and 1.78 should go to 1.78 during this title.

Once you skip forward beyond Chapter 1 the title will play in its entirety, ending on the opening still for Title 15. Any of the chapters in this title can be put in a loop to prevent it from going into the next chapter.

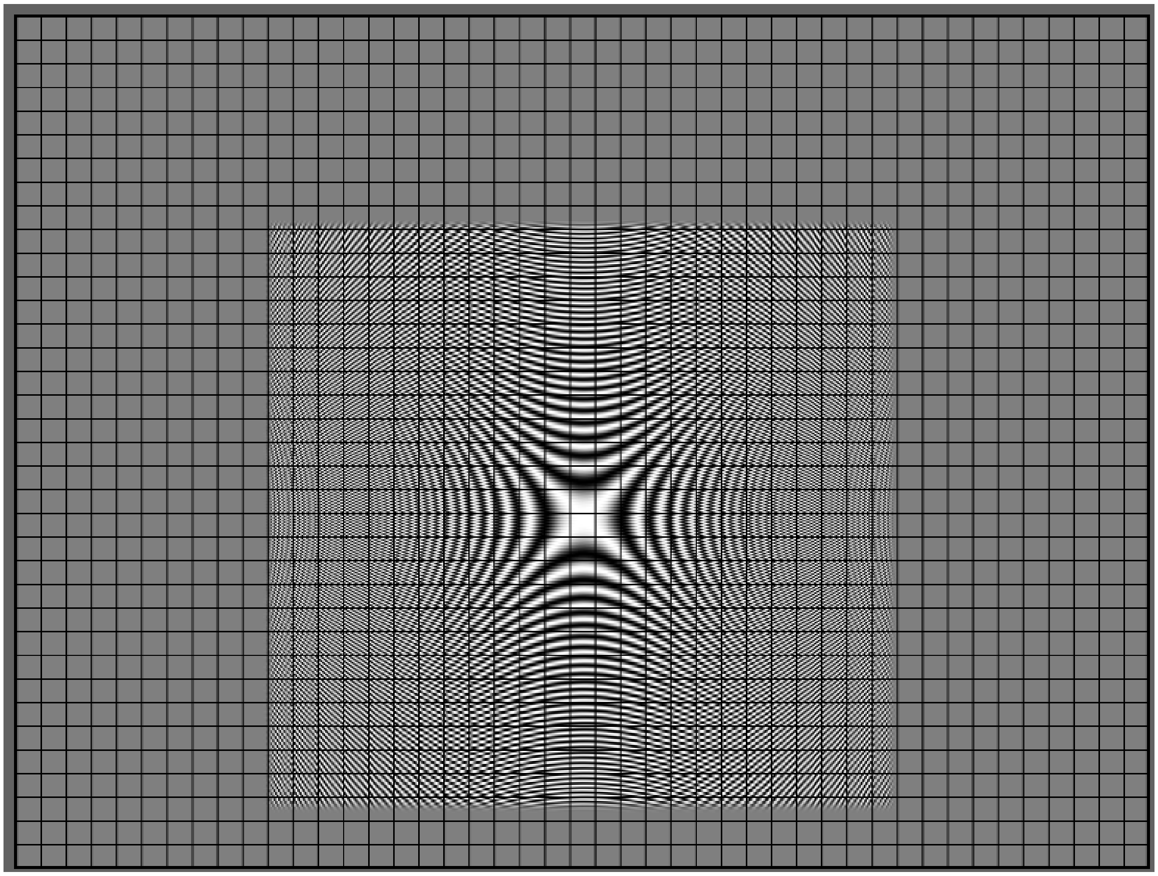
Chapter 1: Title Identification: *Anamorphic Motion Patterns*

This is the only still pattern in the title. Press Skip Forward or Play to continue.

Luminance Codec

The original idea behind this set of test patterns was to look at MPEG encode capability. What we discovered in the encoding process for this disc is that we had hit a soft spot in MPEG's capability with the 16 by 16 grid. There are MPEG artifacts in all of the images in Chapters 2 and 3 that we could not fix no matter what encoder we used. We decided to keep the test patterns in the program as examples of MPEG artifacts. If we ever find an MPEG encoder that can properly encode this signal we will post the files on the DVE-Pro Registered users site.

The picture of the pattern show here is as it was built, prior to encoding. You should be able to see the difference between it and what is being reproduced.



Function: Look at some of the properties of the video signal compression that take place in DVD.

Pattern Layout: There is a 16 by 16 pixel grid, based on a 720 by 576 image size with a moving hyperbolic zone plate behind it. The grid will not appear to be square as the pixel aspect ratio in standard definition video is not square.

Description of Use: The original idea behind this pattern was to create all sorts of interference patterns as the zone plate crossed the 16 by 16 grid. As much as the reproduction of the pattern on the disc has lots of MPEG artifacts in each grid there should still be value in these patters in looking at upconverters.

Chapter 2: Luminance Codec, Frame Rate

Chapter 3: Luminance Codec, Field Rate

Chapter 4: Y Continuous Sweep, Horizontal

Function: Help evaluate luminance frequency response in the horizontal domain.

Pattern Layout: The sweeps start out at a flat field over the entire picture area followed by a gradually increase in frequency to the Nyquist point of 6.75 MHz. It then reverses and goes back to the flat field.

Description of Use: These sweeps fully illustrate the problems of approaching the Nyquist point. Phase errors in the signals are noticeable.

Chapter 5: Y Continuous Sweeps, Vertical

Function: Help evaluate luminance frequency response in the vertical domain.

Pattern Layout: The sweeps start out at a flat field over the entire picture area followed by a gradually increase in frequency to the Nyquist point of 480 active lines. It then reverses and goes back to the flat field.

Description of Use: These sweeps fully illustrate the problems of approaching the Nyquist point. Phase errors in the signals are noticeable.

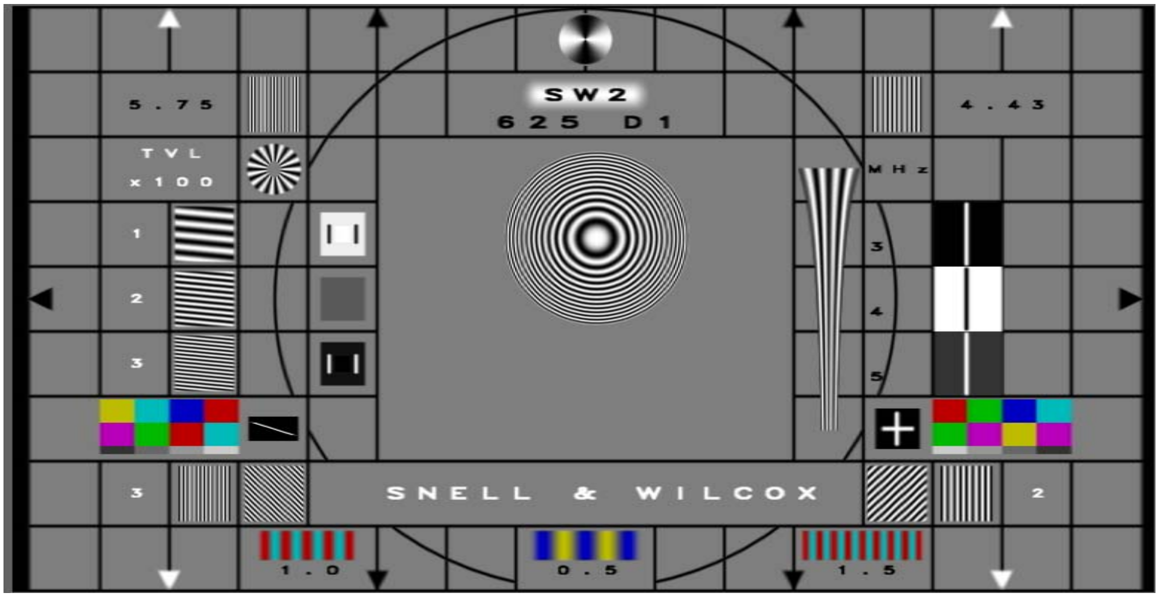
Chapter 6: Pb and Pr Continuous Sweeps, Horizontal

Function: Help evaluate chroma frequency response in the horizontal domain.

Pattern Layout: The sweeps start out at a flat field over the entire picture area followed by a gradually increase in frequency to the 2.875 MHz. It then reverses and goes back to the flat field.

Description of Use: These sweeps fully illustrate the problems of approaching the Nyquist point. Phase errors in the signals are noticeable. The chroma zone plate patterns provide the vertical detail information. This was not done for chroma sweeps because of the conversion from 4:2:2 to 4:2:0

Snell and Wilcox Zone Plate Test Patterns



Chapters 7 and 8 provide motion options for the widescreen version of the Snell & Wilcox Zone Plate test pattern. The rate of motion is changed in each. We will present a basic description of the general information in the pattern prior to describing the motion in each of the chapter descriptions.

Function: The Zone Plate Test Pattern is designed to show image motion at various rates within a static background. The background provides basic information about video path performance.

Pattern Layout & Description of Use: The pattern is based on the digital video production format of 720 by 576 with a pixel aspect ratio described in the SMPTE RP187 document for a 1.78 aspect ratio picture. Details in the pattern are designed to conform production standards of a video bandwidth for composite PAL video, containing a 4.43 MHz burst.

The pattern is named SW2+, 625 D1, indicating that it is generated in the 4:2:2 digital component format used by the D1 tape recording format. The pixel aspect ratio conforms the SMPTE RP187 for the 1.78 aspect ratio.

References are included for black and white levels, horizontal and diagonal resolution, geometry and horizontal rise and fall times.

There are three chroma with luminance bursts at the bottom of the pattern. The center pattern, labeled 0.5 is primarily in the Pb channel. The two outside bursts, labeled 1.0 and 1.5 are primarily in the Pr domain. Their bandwidths are in the order of chroma bandwidth specifications for a transmitted composite video signal. Even at that, they can often be useful at looking at the chroma bandwidth of a video path.

As for motion, the patterns in the NTSC version are grouped into three sets of three. The larger groups are type of motion such as diagonal, horizontal, and vertical. There are only two rates of motion for the PAL test patterns, frame and field.

There is a programmed 10-frame pause in all of the motion as it hits one of the boundaries of the area of motion. During that pause the test pattern is presenting progressive frames of information.

In any motion detection processing it is important to see what happens to the fixed information in the image when motion is detected. It is not unusual to see motion being added to the still material as the quality of the motion material improves.

Chapter 7: Snell & Wilcox Zone Plate, Diagonal Motion, Frame Rate

Pattern Layout: The motion rate on the generator was set to 2 – 2 or complete frames in two fields when this pattern was generated. There is a 10-frame pause at each stop. The pause should be seen as a 2 – 2 still or a frame still. The chapter is 15 seconds long.

Description of Use: Diagonal motion in this disc is included, at a frame rate, to be consistent with material that has been presented in the past. We are not convinced that the diagonal motion in the frame rate position of the generator is actually frame related, although processors do often treat it differently than field rate diagonal. In any event we have never seen it detected as 2 – 2 by any processor, where we have seen lots of processors that can find the 2 – 2 in either horizontal or vertical movement.

Chapter 8: Snell & Wilcox Zone Plate, Diagonal Motion, Field Rate

Pattern Layout: The motion in this section is updated in each field.

Description of Use: Interlaced video is difficult for any processor in converting the image to progressive video. Look for the types of artifacts being introduced. This certainly makes a case for doing away with interlaced video.

Clock Pattern: Chapters 9, 10 and 11

General Description of Use:

The audio is in Dolby Digital 6.1 plus Dolby Lt Rt

The idea behind this section is a combination of what is accomplished in the film leader count down clock used to check visual and sound sync in movie theaters plus Using video wipe patterns of luminance and color information for video testing. The audio pop occurs at top dead center of the rotation. At the point of the pop the top 5% of the image area turns white. This can be used as a scope trigger to determine if the audio is in step with the picture.

The transitions about the clock are 75 and 100% chroma and luminance wipes. The idea is to determine if there are any problems with such transitions in video.

The sound used is what the film industry calls the two pop.

This title opens with the pink noise clock. Its purpose is to determine how long it takes the audio to start up after the video. The pink noise is always on. Take note of the position of the clock when you first hear the pink noise when starting this chapter from the menu system. You can also start the chapter, hit pause, and then back it up to the first frame of the chapter. Leave it in the still frame mode long enough for the audio decoder to loose sync then hit play. Take note of the position of the clock when the audio starts. This section runs for 5 seconds, which should be long enough for any system to pick up the audio.

The clock pulse or “two pop” is in the center channel during the full band pink noise section. It then moves to the left and right channels when it is on its own.

Either chapter can be put in a loop if more time is required for the use of the signals, although putting the pink noise clock in a loop should not cause a drop in audio decoding sync.

Chapter 9: Clock Pattern, Decoder Start Timing, Video Noise Background, Pink Noise Audio w/ Two Pop, Frame Rate w/ Counter, 5 Seconds

Chapter 10: Clock Pattern, Frame Rate, Chroma and Luminance Wedges, Frame Rate w/ Counter, Audio is a Two Pop Every Second, 30 Seconds

Chapter 11: Clock Pattern, Frame Rate, Chroma and Luminance Wedges, Field Rate w/ Counter, Audio is a Two Pop Every Second, 30 Seconds

Moving Bars: Chapters 12 and 13

In our quest to look at motion interpolation in video processors we have developed moving bar patterns. They are presented in horizontal and vertical motion at the frame rate.

Each of the following six chapters is 30 seconds long.

Chapter 12: Horizontal White Bars on a Black Background Moving Up, Frame Rate w/ Counter

Chapter 13: Vertical White Bars on a Black Background Moving Right, Frame Rate w/ Counter

Chapter 14: Black Stretch

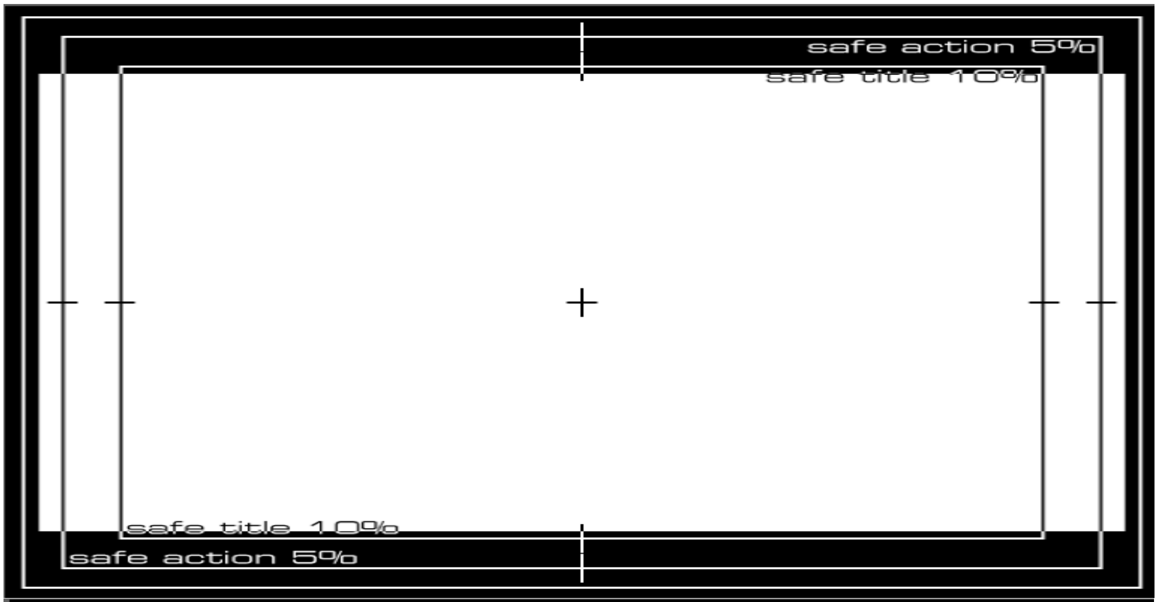
Function: Evaluate a display's capability of properly reproducing areas of the image that are just above black independent of the levels of image content around black.

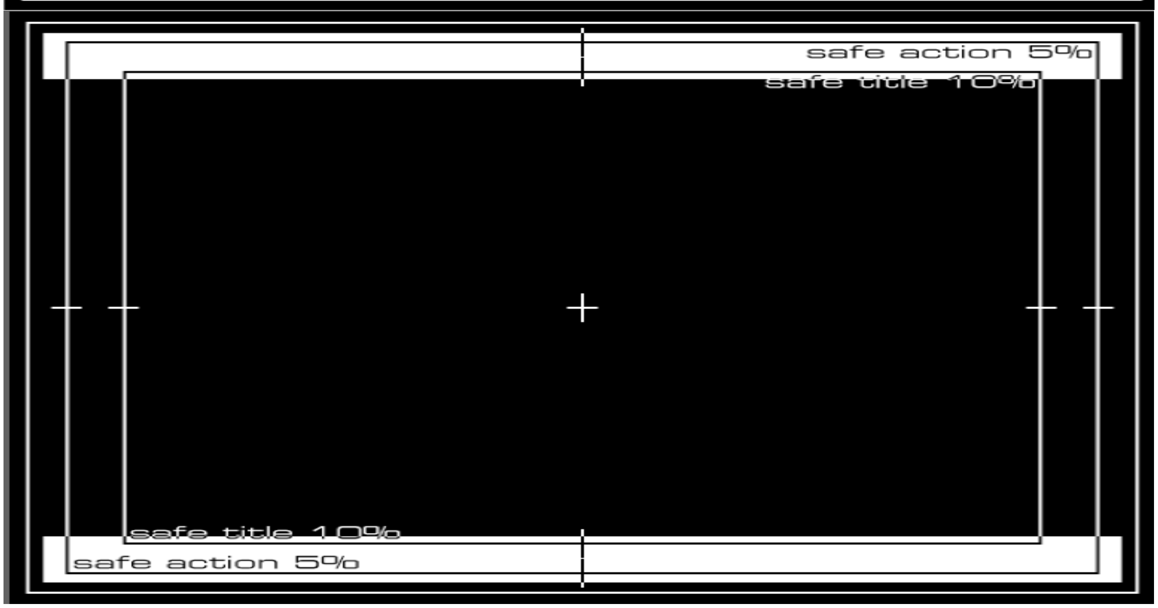
Pattern Layout: In the left half of the picture there is a fixed area where we placed a PLUGE. We then change the other areas of the picture in steps, bringing the background up gradually as the right side of the image is taken from black to white. Once the background reaches 100% it is taken back down again to black. The sequence is repeated within the chapter.

Description of Use: Black stretch is independent of DC Restoration. It is something that happens in certain displays just above black, where that area of the picture is sometimes stretched to make it more visible, depending on the average picture level. It should not be happening.

The signal has also been known to completely disrupt the imaging capability of a number of solid-state display devices.

Chapter 15: High Voltage Regulation



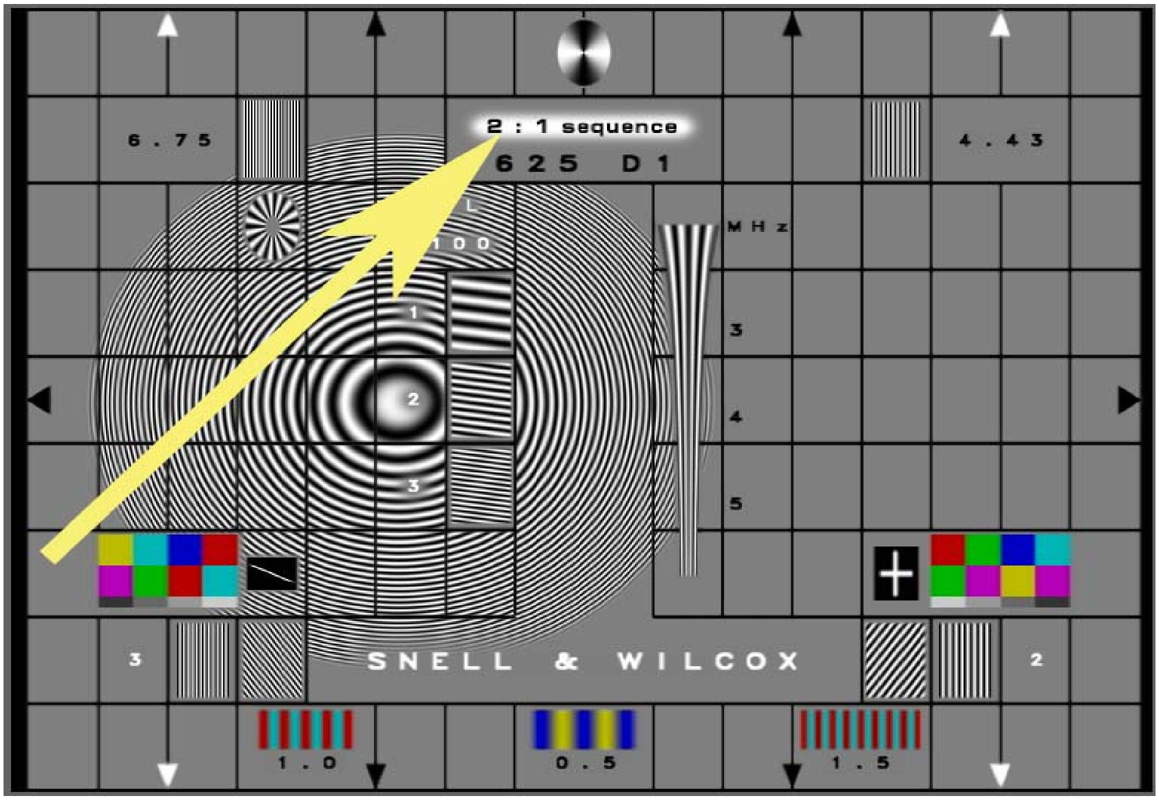


Function: In CRT sets this pattern is used to check the high voltage regulation. The flash in the pattern has also been known to upset the general display capability of some solid-state imagers.

Pattern Layout: There is a black background with white Safe Title and Safe Action Markers. Light is alternately flashed between the majority of the image and the top ad bottom edges of the image. The pattern bounces between a high average picture level and a moderate average picture level.

Description of Use: In looking at high voltage regulation the lines of the Safe Action and Safe Title should remain unaltered by the change in position of the flashed light. If the high voltage regulation is less than ideal things like the image size changing or the lines bending will be noticeable.

Chapter 16: Image Rate Transition



Function: Evaluate video processors for their ability to deal with changes in image rates as well as find specific rates that might improve the quality of the image at the output of the processor.

Pattern Layout: The foreground of the image is a revised grid from the Snell and Wilcox widescreen Zone Plate pattern. The moving zone plate is much larger in this pattern and moves over a large area of the image. There are the static parts of the foreground to be observed when the processor finds the 2 – 2 movement in the image.

Description of Use: Changes in the rate of motion are at the top center of the image, in the same block describing the image format. We have made sure the position of the zone plate changes dramatically at the transition of motion so that it is obvious where that transition is taking place. Motion in 2 – 2 or 2 – 1 is circular.

Chapter 17: Video Black

Title 15: Steps In Windows For Automated Gray Scale Calibration

This is a series of horizontal window patterns that is set out in its own title so that it might accommodate an automated gray scale tracking system. These windows are horizontal in aspect ratio, occupy about 18% of the picture area and go from 10% above video black to video white. This set of patterns can also be used for a more detailed look at gray scale tracking using manual methods of measure. The amplitude of each pattern is provided in the chapter identification.

Chapter 1: 10% Horizontal Window

Chapter 2: 15% Horizontal Window

Chapter 3: 20% Horizontal Window

Chapter 4: 25% Horizontal Window

Chapter 5: 30% Horizontal Window

Chapter 6: 35% Horizontal Window

Chapter 7: 40% Horizontal Window

Chapter 8: 45% Horizontal Window

Chapter 9: 50% Horizontal Window

Chapter 10: 55% Horizontal Window

Chapter 11: 60% Horizontal Window

Chapter 12: 65% Horizontal Window

Chapter 13: 70% Horizontal Window

Chapter 14: 75% Horizontal Window

Chapter 15: 80% Horizontal Window

Chapter 16: 85% Horizontal Window

Chapter 17: 90% Horizontal Window

Chapter 18: 95% Horizontal Window

Chapter 19: 100% Horizontal Window

Chapter 20: Video Black

Title 16: Windows For Measuring Gamma

Chapters 1-63: Level 001- Level 254

Group Function: To assess the gamma of a display.

Pattern Layout: These patterns consist of a sub-black field with an 18% area window at specific levels ranging from below black to above white. The background of the pattern consists of 8 bit video equal to level 001, which corresponds to a percent amplitude of -6.849315068%, or -47.94520548 mV. The level of the background assures that the background around the window itself will not influence measurements made by capping the lens of a projector.

Usage: After brightness and contrast have been set properly, use a light meter to measure the amount of light coming from the display device from the first measurable window pattern. Take your measurements and plot them on a gamma (log-log) chart placing signal input levels on the "x" axis and light output on the "y" axis.

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Chapter 63: Level 254

Audio / Visual Demonstration Materials, Titles 17 & 18 for NTSC, Title 17 for PAL

Title 17: Anamorphic Audio / Visual Demonstration Materials

The contents of this title, in both NTSC and PAL versions, came from down conversions from the 1080p/24 program master. Some of the materials used in the program edit originated at 720p/24 and were upconverted for editing.

Our original goal for *Digital Video Essentials*, in all of its versions, was to provide "True Progressive Mastering". In part this means that the image on the disc would have much more vertical detail than is available from an interlaced image. In doing the down conversion from the 1080p/24 master to both NTSC and PAL we decided to use a minimum amount of vertical filtering, which would normally be in place to compensate for the fact that the image is in the interlaced domain.

Vertical filtering is normally employed, even if the signal originates in the interlaced domain, to reduce the visibility of interlaced artifacts when the signal is displayed on an interlaced monitor.

As much as there is about 30% more vertical detail in our images than might otherwise be available in a true interlaced image, many video processors, up converters in particular, are designed with the idea that the extra detail will not be there. As a result, their output will display a significant amount of vertical ringing on our images.

The source materials for this title all originated in the HD domain and were converted to 1080p/24 for editing. They were then down converted to interlaced NTSC, adding the 2 – 3 sequence to set them up to 60-field video. The PAL conversion was done by slowing the PAL recorder down to 24 frames and doing a frame for frame transfer of the 1080p/24 master. Once recorded the PAL player was sped back up to its normal 25 frame per second speed. The video runs faster in PAL than in NTSC because of the speeding up from 24 to 25 frames. The audio has been pitch shifted so that the pitch sounds the same as in the NTSC. The information is just presented faster.

Chapter 1: Title Identification: Audio and Video Demonstrations

Chapter 2: NASA Materials

The majority of the NASA sequence originated in 720p/24 and came on D5 from Panasonic. Their variable shutter rate high definition camera was used to shoot it. The material from outer space was shot at 1080i/60 and is the only material in the original version of *Digital Video Essentials* that originated in the in the interlaced domain. The segments we picked were so slow in motion that we were able to convert them to 1080p without a lot of interlaced artifacts. The motion was so slow that we had to speed it up by a factor of three in order to use it this sequence.

Chapter 3: Video & Graphics Montage, Interlaced

The video used in this sequence was shot with the Panasonic variable shutter rate high definition camera. We picked material that had been done at 24p to make it easy to convert to our 1080p/24 frame edit. The graphics were delivered in 1080p/24. We had made specific requests for full amplitude detail right out to Nyquist. At the time of the production it was the only we knew how to challenge the capability of 1080p.

This is one of the areas of the program where people are reporting a lot of vertical edge enhancement. We have found that most of this is being introduced by the video processing not being capable of dealing with some much information in that domain.

Chapter 4: Restaurant Sequence 1.33

This film sequence was shot by Allen Daviau in early July 2001 on the best 35 mm film stock available at the time from Eastman Kodak. The transfer was done on a Spirit DataCine. It was conformed for 1.78:1 but protected to the full image aspect ratio of 1.33. The 1.33 transfer was done within a 1.78 raster so we could illustrate the importance of the aspect ratio.

Chapter 5: Restaurant Sequence 1.78

This is the image in the correct aspect ratio.

Title 18: NTSC 1.33 Aspect Ratio Audio / Visual Demonstration Materials

Chapter 1: Title Identification: Audio and Video Demonstrations

Chapter 2: Montage of Images from *Video Essentials*

In the NTSC version of the test disc we included the 1.33 demonstration material from *Video Essentials*. It is still important to those building video processors as it has transition from interlaced to progressive video. This material never existed in PAL and we were never satisfied with any conversion from NTSC to PAL so it is not in the PAL disc.

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Acknowledgements

Program Credits