



SIM2 HT300 Plus

DLP™ Video Projector

BILL CUSHMAN

All-World Performance —Italian Style

The HT300 Plus is the newest DLP™ front projector manufactured by SIM2 Multimedia. It is an evolutionary step forward from the original HT300 and features the latest DLP (Digital Light Processing™) technology from Texas Instruments. The unit has modern Italian styling, and features high resolution, high contrast, and loads of unique and truly useful features that give it unprecedented flexibility. It produces a beautiful picture to create a stellar home theatre viewing experience.

Description

The HT300 Plus features the new Texas Instruments HD-2 (Mustang) DLP chip in a sealed, dust-proof optical engine. The 1280 x 720 pixel, 16:9 aspect-ratio micro-mirror device incorporates advanced 12-degree tilt mirrors for an improved contrast ratio. The light source is a 120-watt UHP lamp with a rated life of 6,000 hours. The twelve-element zoom lens has motorized focus and shift and a throw ratio of 1.8 to 2.5 screen widths. The optical keystone adjustment of 8 degrees is supplemented by 18 degrees of digital adjustment giving a total adjustment range of up to 26 degrees. The power requirement of 100 to 240 volts, 48 to 62 Hz, 180 watts, allows use in both the United States and throughout the world.

The infrared remote control contains 27 buttons that operate all projector functions. Alternatively, a computer or external controller can control the unit through an RS-232 serial interface. Two 12-volt outputs, each capable of providing 100-ma of current, are available to control external devices such as motorized screens.

The unit is approximately 14 inches wide, 13 inches deep, 7 inches high and weighs 11 pounds. All connections are made to the rear panel, which also contains eight buttons for control of projector functions, plus a master on-off switch.

DLP Technology

DLP technology is unique. It was developed by and is only available from Texas Instruments and is the only true digital imaging device currently available. The single HD-2 chip used in this projector has nearly 1 million separate mirrors, which individually tilt to either direct light through the lens or send it aside where it is discarded. By varying the amount of time the mirror is "on" versus "off" at a fast rate, the viewer perceives different levels of brightness. This produces a black and white picture containing all necessary shades of gray. To achieve color, a spinning color wheel is added in the light path prior to the reflective micro-mirror device. The color wheel has red, green, and blue sections and spins at a rapid rate, synchronized to separate red, green, and blue images that are displayed sequentially. Because all of this happens so fast, we perceive a full color picture. Some observers can occasionally observe the separate color images when they move their eyes quickly, or the image has a bright spot that moves quickly. This appears as a rainbow, or color flash. The SIM2 has a six-segment wheel running at a higher than typical speed. This

almost eliminates the visibility of this artifact. I am very sensitive to color flashes, and only rarely observed them on this projector.

DLP has wonderfully constant brightness from corner to corner, which produces extremely uniform full color fields. This, in turn, produces beautifully even black and white images, free from any color contamination. Because it is a reflective device, it runs cool and is totally free from burn-in or other image latency effects. Video games, stationary logos, and static computer images are no problem with DLP. Because it is digital in nature, it is also free from drift over time, which may occur on monitors using any analog display technology.

In the design of the HD-2 (Mustang) chip, Texas Instruments increased the mirror tilt angle to 12 degrees from the previous 10 degrees. This makes it possible to achieve higher contrast ratios, allowing DLP to produce good blacks that approach the black levels observed in typical movie theatres. Although DLP does not achieve absolute black, which is typical of the best CRT projectors, the HD-2 chip is the first fixed-pixel imaging device that will probably satisfy the vast majority of CRT users.



Samsung HD Tuners
Full page color

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Dirt And Filters

The SIM2 HT300 Plus is unique in that it has a totally sealed optical system and no air filter in its cooling system. Other projectors use various types of air filters, which require cleaning and maintenance, else overheating and other problems may result. In addition, non-sealed optical systems often suffer from dirt ingress, which results in blobs visible on dark images. This projector is totally free from periodic cleaning and maintenance, and the image should always stay free from the dreaded blobs that are all too well known to the owners of many other fixed-pixel front projectors.

Inputs And Signal Compatibility

Inputs are provided for composite video (RCA jack), S-video (mini-DIN jack), component video (four RCA jacks), computer (HD15 VGA jack), and DVI-D. There is also a remote input interface, which can be hooked up using an optional special cable. The component video input can be configured for 480i YPbPr, or 480i RGB with sync on green. The same input can also be configured in a similar manner for 480p, 720p, or 1080i YPbPr or RGB. The computer input accepts RGBHV with either HDTV or computer graphics resolutions.

Various world television standards such as NTSC, PAL, and SECAM are supported, as is ATSC HDTV/SDTV at 1080i, 720p, and 480p. VGA, SVGA, XGA, SXGA, and UXGA computer graphics resolutions are supported.

Using video test generators, I tested every analog input with all acceptable signal formats to assure compatibility, and every signal was displayed properly. This included all of the HDTV and computer resolutions mentioned above. The normal configuration I used for viewing and picture quality observations were composite video, S-video, and component video fed from a DVD player, and SDTV/HDTV fed as RGBHV to the computer input. All sources were fed directly to the projector, not routed through auxiliary equipment.

Setup Adjustments

Adjustments are provided for projector orientation (front projection, rear projection, ceiling, or floor mounting) and keystone in both horizontal and vertical directions. Five test patterns are available to aid in making adjustments. Focus and Zoom are available in this menu, and also with dedicated buttons on the remote. The Menu has both adjustable position and adjustable background. In addition, the time before the

menu automatically disappears is adjustable.

Picture Control Adjustments

The picture control adjustments vary as different modes of operation are selected. Brightness (Black level), Contrast (Picture), and Sharpness are available in all modes. Color and Tint are available only for composite, S-video, or YPbPr component video. The Filter adjustment (affects vertical enhancement), Cinema Mode (deinterlacing), and Video Type (Normal or VCR) are available for all 480i sources. Horizontal and Vertical Position are available in all modes except DVI-D. Frequency and Phase adjustments are available for HDTV and RGB resolutions.

Contrast and Brightness interact noticeably on this projector. Many modern displays exhibit no variation in black level when Contrast is adjusted, provided that Brightness is first set properly. Contrast can then be varied with no interaction. This was not the case on the HT300 Plus. If Contrast is adjusted, be sure to always check Brightness and, if necessary, readjust it for best performance.

Advanced settings allow adjustment of Color Temperature (High, Medium, Low, and User) and Gamma (Film, Video, and Graphics). Even Y/C delay was adjustable in modes where it was applicable. Quick picture adjustments are available without going to the regular menu system. Simply pushing the Up or Down arrows cycles through the available picture adjustments.

Aspect Ratio Adjustments

Aspect ratio adjustments on this projector are unique and extremely flexible. There are eight aspect ratio choices that appear to be available for all sources and all signal formats. In most displays, the aspect ratio choices are limited or not available at all in HDTV or Computer modes. This is probably done to limit viewer confusion, since all HDTV formats are 16:9 (1.78:1) aspect ratio and most computer formats are 4:3 (1.33:1) aspect ratio. By making all aspect ratios available in all modes, SIM2 has greatly increased user flexibility. This allows use of external anamorphic lenses, computer resolutions for widescreen displays, and elimination of black windowbox bars on upconverted simulcast programs from HDTV stations. The eight modes are labeled, Normal, Anamorphic, Letterbox, Panoramic, Pixel to Pixel, and User 1, 2, and 3.

Normal is used for display of 4:3 material. Anamorphic is used for display of 16:9 material. Letterbox is used for display of let-

terboxed 4:3 format material. Panoramic is used for display of 4:3 material at full width with moderate vertical compression and moderate vertical cropping. Pixel to pixel is perfect pixel-to-pixel mapping. User 1, 2, and 3 are adjustable for both height and width, and are easily set up to user preference. The user adjustments even allow automatic selection of screen control to activate automatic masking.

Magnification

One of the truly unique features of this projector is the variable magnification available on all inputs. The normal 480i presentation has a small amount of overscan, but HDTV is normally displayed with zero overscan. Twenty steps of magnification are provided. The first several steps are most useful. The first step is about 3-percent overscan. This allows junk that often appears around the edges of the picture to be eliminated. Such junk consists of the closed caption code that looks like a series of white dashes at the top of the picture, small black bars on the sides of the picture from blanking errors, and videotape head switching garbage that sometimes appears at the bottom center of the picture during newscasts when the original source was a consumer camcorder. Some people hate the black bars on 2:35:1 aspect ratio movies. The magnification can easily eliminate them. This feature can also be used just for fun, magnifying part of the picture to an extreme extent. Using HDTV, the first several steps of magnification were approximately 0, 3, 7.5, and 13 percent overscan.

Color Separation And Decoding

The composite video input uses a 3-D comb filter to separate the black and white (luma) information from the color (chroma) information. The filter on this projector has very good performance. On static images, no color moiré was observed on fine detail. Occasionally, slight hanging dots or dot crawl was observed. The color decoding was accurate. Combined with the standard D65 white (6500K), this results in the proper color rendition of the complementary colors, cyan, magenta, and yellow. Accurate color decoding also totally eliminates the "Red Push" so common in many consumer displays. The bandwidth of color information on composite and S-video is excellent and no chroma delay is present.

The S-video input bypasses the comb filter, therefore the image is free from color contamination even on moving images. Color decoding and chroma delay is essen-

Transparent Audio
Full page color

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tially perfect.

The component video input has much wider color bandwidth (as expected) than composite or S-video. This is the preferred connection for DVD. It allows almost three times the color resolution possible compared to using composite or S-video. Color decoding and delay is essentially perfect.

Deinterlacing And Scaling

The SIM2 HT300 Plus uses a Faroudja chip for deinterlacing and a Pixelworks chip for scaling according to information provided by the manufacturer. The film-mode deinterlacing is essentially perfect, and the video-mode deinterlacing is very good. The film-mode Snell and Wilcox pattern on *Video Essentials* contains noise, which causes most deinterlacers to drop out of, or never go into film-mode (inverse-telecine). The Faroudja chip properly recognizes the 3:2 cadence and selects the correct mode of operation. This made the moving zone plate of the Snell and Wilcox pattern look virtually perfect. Performance analysis using the Microsoft WHQL disc also verified excellent performance on film-based material and very good performance on video-source content.

The scaling performance of the Pixelworks chip is excellent. Even when using small amounts of variable magnification, scaling artifacts were essentially non-existent. The excellent deinterlacing and scaling performance of this projector makes using many of the unique features such as variable aspect ratio and variable magnification truly useful. Had the performance of the scaler been deficient, these features would have created undesirable artifacts, which would have spoiled the viewing experience.

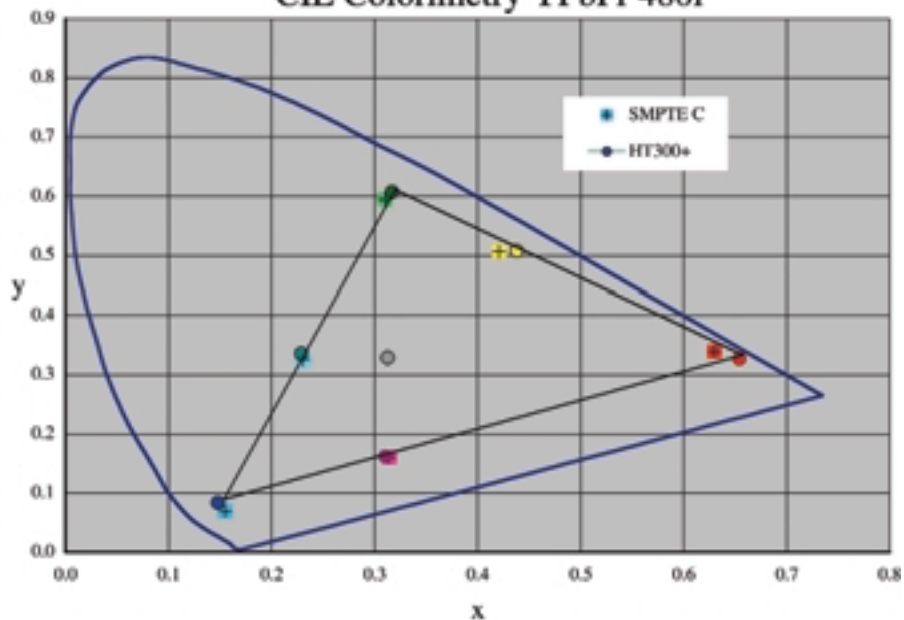
Technical Performance

Because this projector performed well, I enjoyed running numerous additional tests on it as well as watching a large number of DVDs and HD programs. The color primaries are quite close to the HDTV and SMPTE-C standard values. The complements are essentially perfect. The red primary is exceptional, not the typical orange red, but a deeply saturated red that does justice to the United States flag and traffic lights. The beautiful red makes the viewing experience much more enjoyable.

This is the only DLP projector that I have observed that reproduces high-resolution video signals without aliasing. This was a nice surprise that I will discuss later as it relates to the viewing experience.

Horizontal resolution on the HDNet test

SIM2 HT300 PLUS CIE Colorimetry YPbPr 480i



pattern, which runs every morning at about 9:00 AM, was about 640 lines per picture height (16:9). This converts to about 1140 total lines of horizontal resolution (lines per picture width).

As received, the color temperature (at 80 IRE) on Low was 7,394K; Med was about 8,000K; and High was about 11,000K. These values drifted slightly as the lamp aged during the first 100 hours.

Film Gamma provided a gamma value of about 2.1 to 2.2, a little less than the 2.4 to 2.5 typical of most CRT displays. It was very uniform at all IRE levels. Video Gamma was similar at low IRE levels but decreased to 1.6 at 90 IRE. Overall light output at the same picture settings was about 20 percent higher when using Video Gamma. This resulted in the image getting increasingly blue above 90 IRE, as the projector was running out of red.

Using the factory Low color temperature, gray scale tracking was good down to 30 IRE, but became significantly poorer at 10 and 20 IRE. The x-y coordinates in color space showed that the grays were tinted green, and this is how they looked. Before running any of these measurements, black level was carefully adjusted on a PLUGE pattern, and Contrast was set as high as possible without getting large white balance deviations. At factory Low, output was 252 lumens and the contrast ratio was 1303:1 when Film Gamma was used. When Video Gamma was selected, but contrast was not lowered, output increased to 303 lumens, and the contrast ratio increased to 1567:1. The maximum output with Contrast set to

maximum was about 315 lumens. Color tracking was significantly poorer than when using Film Gamma with the more conservative light output. Setting the User color temperature for D65 at 80 IRE gave an output of 196 lumens and a contrast ratio of 761:1. Gray scale tracking was similar to the factory Low, becoming poorer at 10 through 30 IRE.

I ran some experiments using a CC40R red filter and setting the color temperature to high. Time did not permit as much experimentation as I would have liked, but it appears that this technique will result in a contrast ratio of about 1300:1 but decrease the light output about 10 percent. Because the contrast and black level are so good, but the light output is marginal for large screens, further pursuit of this approach is probably not warranted.

SIM2 HT300 Plus Gray Scale Tracking (480i)

Factory IRE Low Color Temp	WSR Calibrated Low Color Temp
20 6744	6547
30 7155	6670
40 7222	6539
50 7315	6477
60 7356	6485
70 7545	6636
80 7394	6492
90 7356	6424
100 7368	6424

Balanced Audio Technology
Full page color

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After calibrating the projector in the service menu (see your dealer for this), the color tracking was outstanding. Output at 100 IRE was 171 lumens and the contrast ratio was 883:1. Delta E is defined as the perceived color difference. One delta E is just a barely noticeable color difference. Anything better than 5 delta E is excellent tracking. After calibration, from 10 to 100 IRE the HT300 Plus deviated less than 2 delta E, except at 70 IRE where it was 3, and 30 IRE where it was 7. This is exceptional performance—essentially perfect. The output and contrast ratio were less after calibration because of the removal of excess green and blue, but the picture was gorgeous with beautiful natural color and excellent contrast, similar to that observed in conventional movie theatres.

After calibration, the light falling on my 91-inch x 51-inch screen was 5.30 foot-candles at 100 IRE and 0.006 foot-candles at 0 IRE. Note: Light falling on the screen is measured in foot-candles, whereas light leaving the screen (including the screen gain) is measured in foot-Lamberts (fL). Light at the screen plane equal to 1 foot-candle produces 1 foot-Lambert of luminance when the screen gain is 1.0. With a Stewart Filmscreen FireHawk screen (gain of 1.35) the overall brightness would be 7.2 fL. An 80-inch wide FireHawk would deliver nearly 10 fL.

The Viewing Experience

I had the projector table-mounted and used a Da-Lite High Power screen. This retro-reflective screen has absolutely no hot-spotting or sparkles. It has a gain of 2.8, which allowed me to view the projector with about 15 fL of brightness. This value is

essentially the same as the SMPTE standard for theatres (16 fL).

The Da-Lite High Power screen loses gain if the projector is ceiling mounted. SIM2 has a beautiful pedestal mount stand available. Because of the relatively low output of this projector, I strongly recommend the combination of the pedestal mount and the Da-Lite High Power screen if it is desired to have a screen wider than 80-inch maximum (72-inch wide would be better). Set up in a manner similar to the way I used the projector, a screen width up to 104-inch is perfectly acceptable.

The projector was quiet, but not as silent as I would have liked. Both the color wheel and the fans were audible. But during most viewing, the noise level was not a problem.

After calibration, the image quality of the SIM2 HT300 Plus was magnificent. Movies had wonderful reds, accurate subtle and saturated colors, gorgeous black and white rendition, and superb contrast that should satisfy anyone who isn't a black level fanatic. The contrast ratio and black level were similar to that observed in the best movie theatres. Resolution and image clarity were superb. The image was totally free from the creepy crawlies that are characteristic of some DLP projectors, and which I suspect are caused by aliasing.

The space scenes near the beginning of *Lilo And Stitch* are rendered with a dark sky, high contrast, and beautiful color. Both *Goldmember* and the original *Austin Powers* looked terrific. On *The Fifth Element*, it was easy to see the rosy cheeks of the General, while seeing a slight green cast on the Scientist wearing a green smock. The Diva scene was beautifully rendered.

On the *Video Essentials* Montage of Images the white vest of the thief running in

front of the police car (dark scene) and the links of the chain link fence are clearly visible. The continual switching from video to film and back again was handled flawlessly. The slow zooms were handled well with only a minimum of artifacts.

As beautiful as DVDs looked, they were nothing like the image when watching HDTV. The news reports on HDNet were so clear the screen looked like a window on reality. On the PBS demo loop, the Battleship New Jersey going through the Panama Canal looked almost real. The autumn colors during the fall season in New Jersey were beautiful. The Las Vegas skyline in CSI on CBS looked like you were there. Video-source HDTV always had clarity and sharpness that was lacking on film-source HDTV, although film-source material looked extremely good.

Summary

This is a beautiful and flexible projector. It delivers superb performance and has many exclusive and truly useful features. It has excellent contrast, but relatively low light output. The image on HDTV is stunning. Colors are vivid and realistic, with exceptional rendition of red. DVD images are beautiful, but pale in comparison to HDTV. High performance combined with long lamp life and no filter maintenance makes this an excellent projector for the discriminating home theatre enthusiast. ■

SIM2 HT300 Plus DLP™ Projector

Light Engine

- DLP Type: Proprietary Sealed Optical Engine Based On Single-Chip DMD™ With HD2 Chipset
- Resolution: True 16:9 (1280 x 720 Pixels)
- Lens: High-Quality Resolution With Motorized Zoom And Focus Adjustments
- Throw Ratio: 1.8-2.4:1
- Lamp Power Consumption: 120 Watts UHP

Installation

- Optical Keystone Adjustment: 16° (±8°) Lens Shift
- Digital Keystone Adjustment: 26° (±13°) Vertical, 20° (±10°) Horizontal
- Picture Size: 50-300 Inches Diagonal
- Aspect Ratio: 4:3, 16:9, Anamorphic, Letterbox (Pan-And-Scan), Plus 3 Custom User (Horizontal And Vertical) Adjustments

Electronics

- Horizontal And Vertical Scan Frequency: 15-80 kHz/48-100 Hz (Maximum Horizontal

- Frequency Corresponding To UXGA, 60 Hz)
- Video Standards And Graphic Resolutions: PAL B, G, H, I, M, N, 60; SECAM; NTSC 3.58 & 4.43; ATSC (480p, 720p, 1080i); PC Graphic Standard Up To UXGA (1600 x 1200 pixels)
- Deinterlacer And Processing: Faroudja DCDi™
- Contrast Ratio (Full On/Full Off): Greater Than 1800:1
- Color Temperature: Three Preset Color Temperature, Selectable By Remote Control
- Special Video Adjustments: Luma-Chroma Delay, Adjustment By Remote Control

Inputs/Outputs

- Composite Video (RCA)
- S-Video (Mini 4-Pin DIN)
- RGBHV (15-Pin D-Sub)
- RGBS/YCrCbS
- Remote Input Interface, EVC-Type, Standard VESA
- RS-232 Connector (9-Pin D-Sub)
- DVI-D Connector
- 12-Volt Power Output, Active When Projector Is On

- 12-Volt Power Output, Active When 16:9 Format Is Selected

Upgradable Control Software Via RS-232 Serial Interface

Power Consumption: 235 Watts

AC Voltage Range: 100-240 VAC, ±10% (48/62 Hz)

Weight (In Pounds): 12.8

Dimensions (WHD In Inches): 13.8 x 6.8 x 12.5 (350 x 173 x 318 mm)

Standard Color: Gun Metal

Optional Colors: Shiny Silver, Cherry Red

Price: \$13,995

Manufactured In Italy For:

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