JVC
The Perfect Experience

Multi-format 3D LCD Monitor

DT-3D24G1

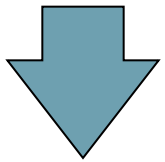
3D Professional

3D

real D 3D

PRODUCT PLANNING OBJECTIVES

- Compact and portable 24-inch screen size.
- A variety of helpful camera-assist functions.
- Convenient 3D setup functions.
- Direct operation via easy-to-press hard buttons.
- 24V DC input.
- Full compatibility with easily acquired and affordable RealD 3D eyeglasses.



A monitor designed for 3D video content that delivers 100% performance in any recording application.

FEATURES

3D Monitor Features

- Xpol® Circular Polarizing System compatible with widely available RealD 3D eyeglasses.
- 3D Cursor and Grid Modes for easy binocular disparity adjustment.
- Camera-assist functions: Mirror/Rotation, Split, R Shift, Anaglyph, LR Sequential, Individual, and LR Swap.
- Dual Time Code, Waveform and Vectorscope displays.
- 3D Mixing function.
- Supports Line-by-Line and Side-by-Side 3D formats.

Basic Monitor Features

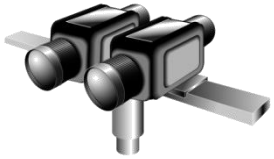
- Supports 3G-SDI, dual HD-SDI, and DVI.
- WUXGA (1920 x 1200p) professional monitor.
- ITU-709 color gamut.
- Gamma 2.2, 2.35, 2.45, and 2.6 presets.
- Supplied with tilt stand.
- DC 24V power supply capability.

Rig Settings

- **Features:** Depending on the rig setting of the stereo camera, images from either camera (left or right) can be rotated 180-degrees and inverted or switched horizontally or vertically.
- **Advantage:** Left and right images are easily reconfigured to synchronize the view in virtually any camera rig setting.
- **Benefit:** Convenient operation is assured when using cameras in a new rig setting as individual settings are saved even after the Camera-assist Menu is closed.

NOTE: Rotation (vertical) and mirror (180-degree rotation) will delay the image by two frames and a frame synchronizer is used to synchronize the delayed image.

Left and right images can be configured to match virtually any rig setting.



Synchronized L /R image

Right image inverted horizontally and vertically

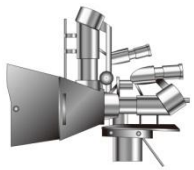


Photo: © Richard Clark, President, Inter Video

Right image inverted horizontally

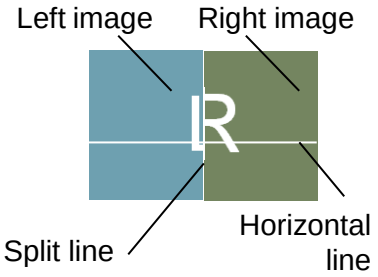
Right image inverted vertically

CAMERA-ASSIST MENU: SPLIT AND L/R SEQUENTIAL

Methods to check the alignment of both cameras vary but the DT-3D24G1 has many convenient features that enable users to answer any requirement.

Split

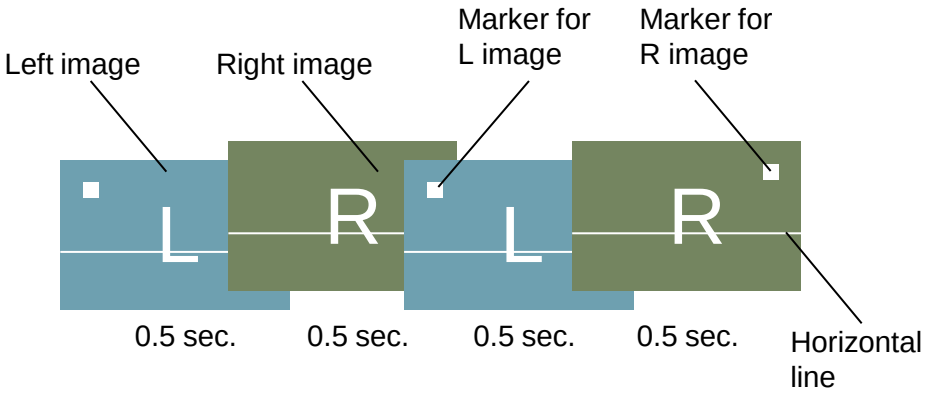
- **Features:** L images are displayed on the left of the Split line, and R images on the right.
- **Advantages:** The vertical line can be shifted freely to the left or right and the horizontal line position can also be adjusted.
- **Benefits:** Quick verification of misalignment while rotating images during rig settings, simplified checking of left/right camera positions, and easy confirmation of hue and white balance of the two images.



The vertical line can be shifted freely to the left or right and the horizontal line position can also be adjusted.

L/R Sequential

- **Features:** Left and right images are displayed alternatively at 0.5-second intervals.
- **Advantage:** A horizontal line and square marker on the upper left or right of the screen are displayed to help in differentiating between L and R images.
- **Benefit:** Experienced creators can use L/R Sequential to better generalize the overall content of a 3D recording without wearing 3D eyeglasses.

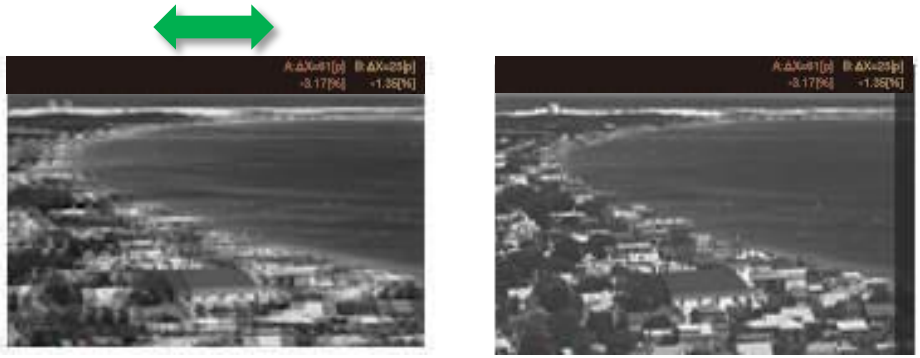


CAMERA-ASSIST MENU: R-SHIFT AND ANAGLYPH

Methods to check the alignment of both cameras vary but the DT-3D24G1 has many convenient features that enable users to answer any requirement.

R-Shift

- **Features:** Images on the right can be shifted horizontally while 3D images (left and right signals) are displayed simultaneously.
- **Advantage:** Images on the right can be freely shifted as desired.
- **Benefits:** 1.) Real-time confirmation of optimally applied 3D effects and proper camera setting alignment is possible.
  2.) 3D effects can be viewed and verified on-screen prior to actually moving the cameras.



Move the right image at will to check the 3D effect

Anaglyph

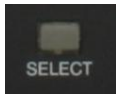
- **Features:** Enables binocular disparity to be checked using traditional red (for L images) and blue (for R images) colors.
- **Advantage:** As with the R-Shift function, images on the right can be freely shifted as desired.
- **Benefits:** 1.) Enables easy verification of vertical alignment/tilt of the cameras without having to wear 3D eyeglasses.
  2.) Clearly divided in sections, the amount of binocular disparity is easily recognizable.

CAMERA-ASSIST MENU: INDIVIDUAL AND L/R SWAP

Methods to check the alignment of both cameras vary but the DT-3D24G1 has many convenient features that enable users to answer any requirement.

Individual

- **Features:** Each left and right image can be displayed individually.
- **Advantage:** Left and right images can be easily switched without noise by pressing on the SELECT button.



- **Benefit:** Enables quick verification of disparity between left and right input signals as switching can be freely performed as desired.

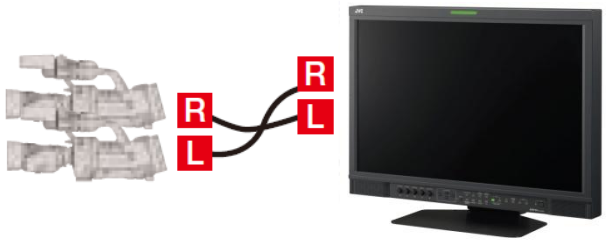
The horizontal line can freely be shifted up and down.

Horizontal line

L/R Swap

- **Features:** Allows left and right images to be easily swapped.
- **Advantage:** The reconnecting or switching of input signals is not required.
- **Benefit:** Helps in checking whether the cables are properly connected.

LR Swap: Off LR Swap: On



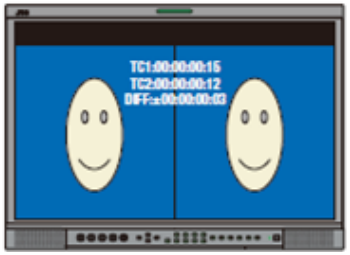
L/R Swap is useful for determining whether the cables are correctly connected to the proper terminals.

CAMERA-ASSIST MENU: DUAL TIME CODE AND SCOPE BUTTON/LAMP

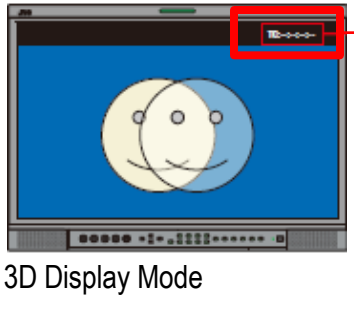
Methods to check the alignment of both cameras vary but the DT-3D24G1 has many convenient features that enable users to answer any requirement.

Dual Time Code

- **Features:** Dual Display Mode and 3D Display Mode are useful for checking the time codes of left and right input signals.
- **Advantages:** Time codes of both left and right signals are shown in Dual Display Mode, whereas only the left signal time code is displayed in 3D Display mode.
- **Benefit:** Dual Display Mode makes it easy to check the time code of both input signals.



Dual Display Mode: Displays time codes for left and right signals as well as the time gap between the two signals.

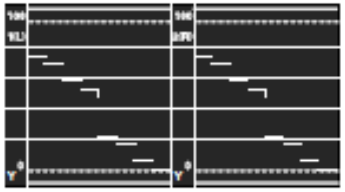


3D Display Mode

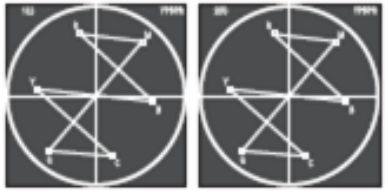
Displays TC1 (left signal time code)

Scope Button/Lamp

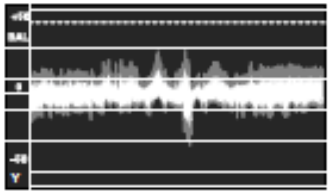
- **Features:** The two built-in oscilloscopic wave signals of Waveform (W.F.M.) and Vectorscope (V.S.) can be displayed.
- **Advantages:** Parallel Wave Form, Parallel Vector Scope, Difference Wave Form, and Difference Vector Scope displays are available. The SCOPE button can also be used to select a monitor mode, which cycles through these modes.
- **Benefit:** A separate scope monitor is not required.



Parallel Wave Form: Displays the two signal forms side by side.



Parallel Vectorscope: Displays the two signal scopes side by side.



Difference Wave Form: Displays the differential between the two signals in wave form.

Difference Vectorscope: Displays the differential between the two signals in vectorscope.

When compared to conventional video recordings, the setting up of 3D recordings can take up to three times longer as lengthy camera installation and the proper adjustment of depth and pop-up effects are required.

Setting Up the DT-3D24G1

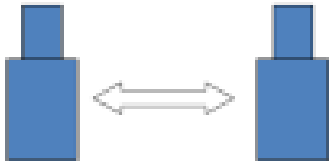
- **Advantages:** In addition to a wide variety of camera- assist functions, a number of features that are specific to 3D recordings such as the 3D Cursor and Grid Modes are also available.
- **Benefits:** The DT-3D24G1 not only speeds up the 3D recording process but also helps to create 3D recordings that are more comfortable to view.

Basics of 3D camera recording

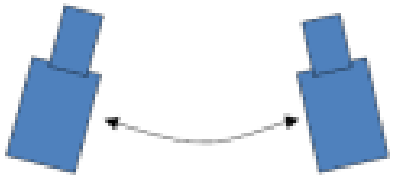
There are two methods of making 3D recordings, either of which can be used to suit specific requirements.

- **Parallel method:** The two cameras are positioned in parallel with wider disparity (two cameras placed further apart) used to increase field depth, while a longer convergence point makes images appear to pop up. When the disparity is widened, however, image deterioration is likely to occur in the background.
- **Convergence method:** When the divergence angle is widened significantly, this will cause the subject matter to shift behind the screen surface and result in image deterioration.

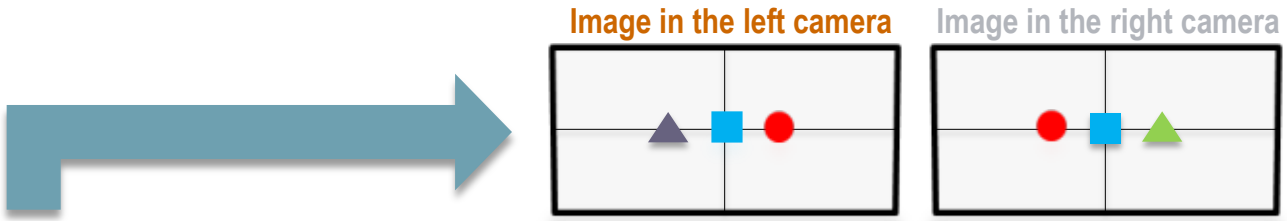
Parallel method: Depth and pop-up effects cannot be mixed into a single scene.



Convergence method: Excessive divergence angle can cause too much disparity, requiring keystone adjustment of the image.

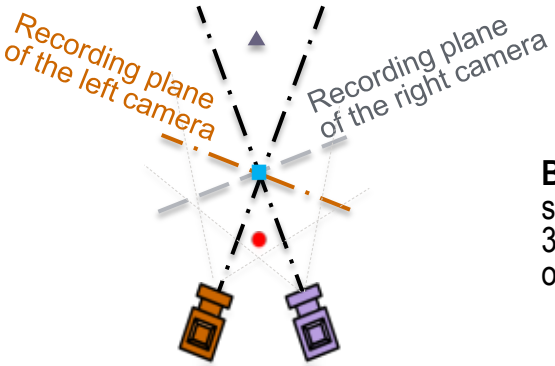


3D Basics: Pop-up and Depth Principles



Convergence recording method

The three objects will appear as shown above in both left and right cameras.

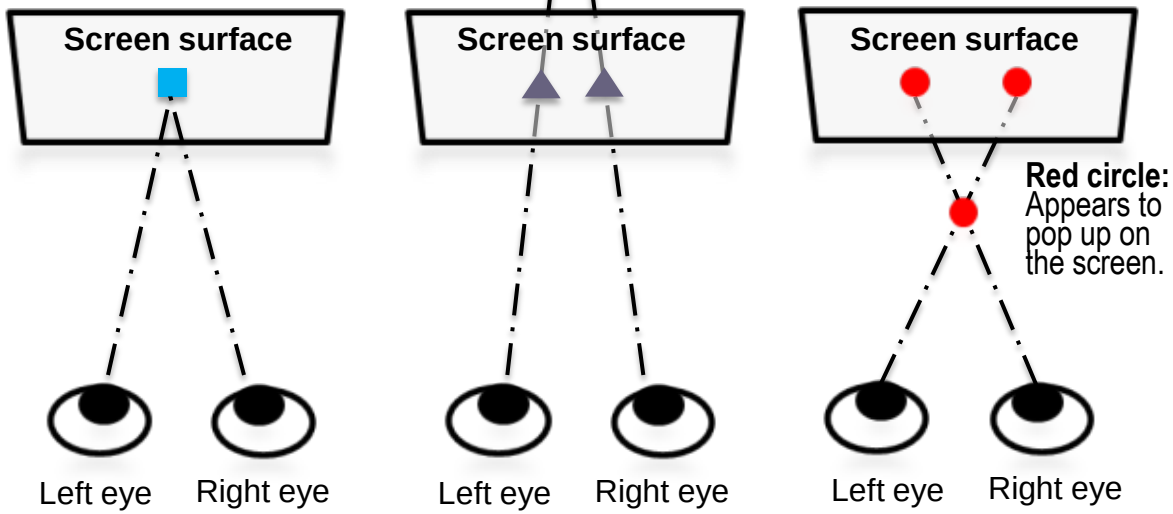


The creator selects the position of an object on the screen and sets the convergence point. In this case, the convergence point is where the blue square is positioned.

Blue square: Appears to be on the surface of the screen without any 3D effect as left and right images overlap perfectly.

Green triangle: Appears to be deep into the screen.

Red circle: Appears to pop up on the screen.



3D Basics: Fusion Deterioration

When a recording is made in 3D with the background at a distance and an object in the near foreground simultaneously, the human eye will perceive only the object in the foreground in 3D and not the background scenery.

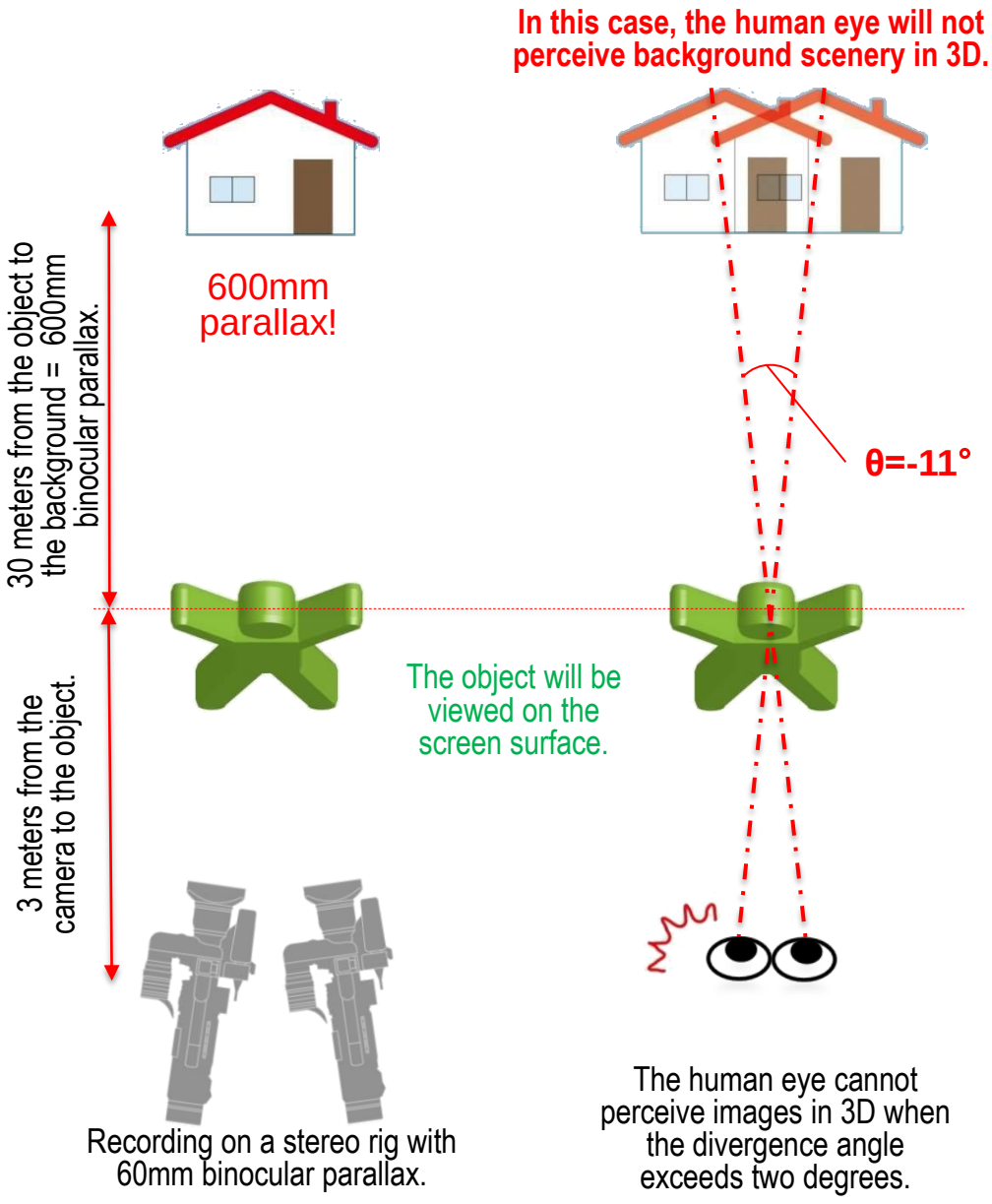
This is because as the distance between the subject in the foreground and background increases, binocular parallax widens significantly.

TIPS:

1) Guidelines for background percentage gaps of two images:

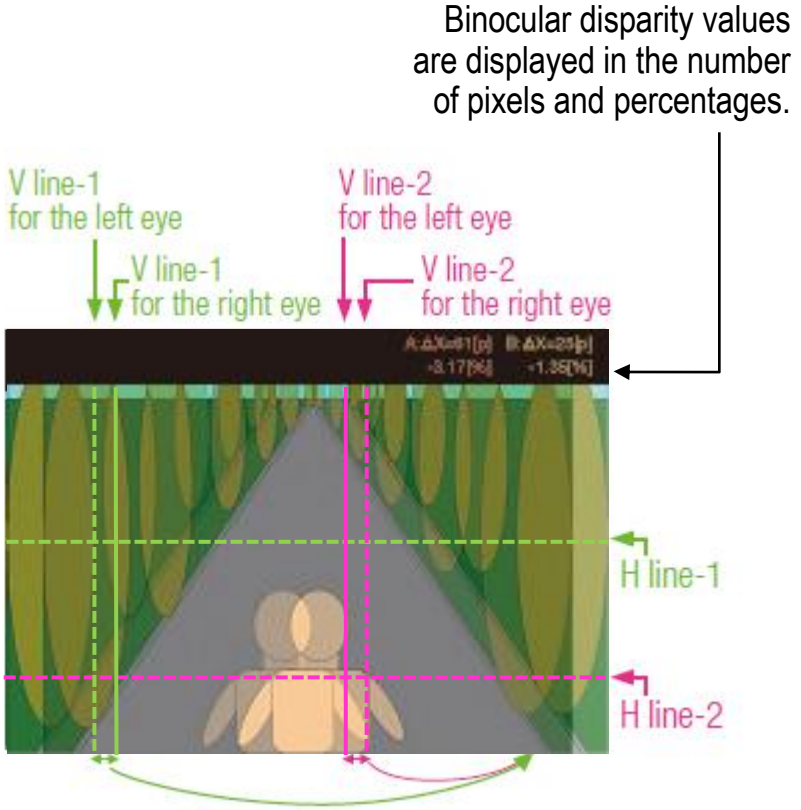
- Hollywood production concerns recommend a display ratio of less than 1.7%.
- Japanese production concerns recommend a display ratio of less than 2.0%.

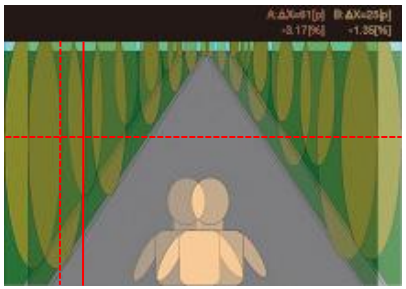
2) Binocular parallax for pop-up or background effects should be maintained at a maximum between 50 - 60mm to prevent eye fatigue and other adverse effects when viewing 3D video content.



3D Cursor Mode

- **Features:** Enables the easy checking and adjustment of binocular disparity during recording or editing.
- **Advantages:** In addition to facilitating binocular disparity adjustment on-screen, more efficient 3D scaling is assured via disparity values displayed in the number of pixels and percentages for negative and positive depth. This means that the counting, measuring, and/or calculating of pixels are no longer necessary.
- **Benefits:** Warnings are provided when values exceed established tolerance levels, helping to drastically reduce the time required for 3D content production.
- **NOTE:** When binocular disparity values surpass 2.0%, normal viewing without adverse health effects may become difficult for certain viewers.



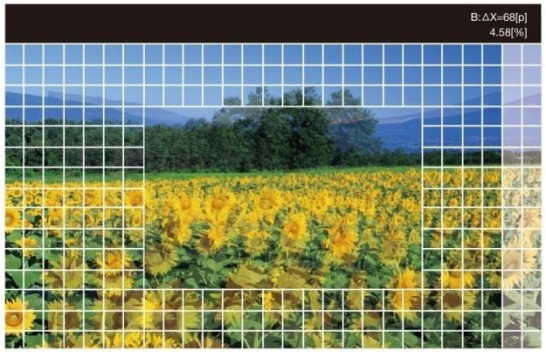


How it works: On the screen, 3D Cursors or the line markers of V for left (dash dot), V for right (solid line) and H (dashes) are shown. There are two sets of Cursors, Group A in green and Group B in purple, either of which can be used to finely adjust levels of depth or pop-up; the H line is used as a horizontal guide.

3D Creation Modes: Grid Mode

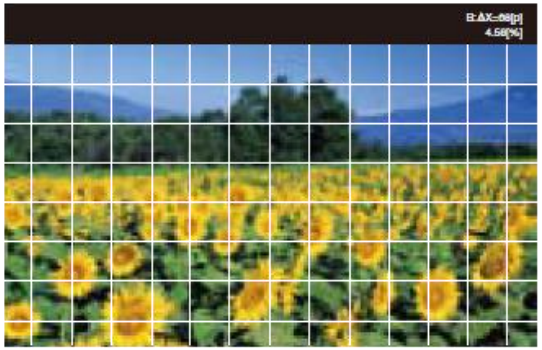
Grid Mode

- **Features:** Grids are used to facilitate the checking of gaps in depth and pop up.
- **Advantage:** By displaying grid lines over the screen with pixel values shown on the top right corner of the screen, variable scaling helps in determining the ideal positions of left and right images instantaneously.
- **Benefit:** As the size of the grids is variable, gap values can be easily checked by selecting the optimum grid size. And this makes counting the number of pixels or calculating percentages unnecessary.



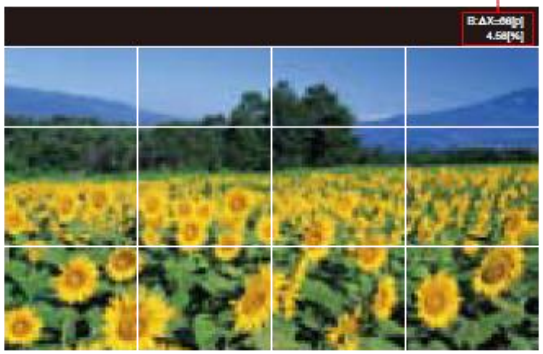
There are two grid displays, Normal and Center Window, which can be selected by pressing the SELECT button.

The variable grid lines can be adjusted by turning the POSITION knob on the front panel to stretch or squeeze grids into desired sizes.



Squeezed grid

Pixel/grid values are displayed.



Stretched grid

Tips: Both the 3D Cursor and Grid Modes can be used to measure the binocular disparity of 3D effects.

3D Cursor Mode is useful for obtaining the correct value of binocular disparity of a specific position, whereas the Grid Mode is helpful for checking the overall picture as it is especially suited for measuring more than three different 3D effects on a screen.

3D RECORDING CHALLENGES AND SOLUTIONS

3D recording challenges	DT-3D24G1 solutions
● Precise adjustment of vertical position gaps between the left and right cameras to prevent eye fatigue and other adverse effects. ● Preventing vertical and horizontal rotation or inversion of one or both images caused by different camera rig settings. ● Creating top-quality 3D content that will not cause eye fatigue and other adverse effects.	● Convenient camera-assist functions help in adjusting vertical position gaps and correcting left and right images regardless of the camera rig setting selected in advance. ● The approximate counting, measuring, and/or calculating of pixels are no longer necessary thanks to handy functions such as Cursor Mode and Grid Mode. The value of pixels and percentages are clearly displayed to help in determining the correct amount of binocular disparity.

Optimum results assured:

Usually with conventional 3D recording methods, only a few scenes can be recorded in one day and these must be checked after returning to the studio. But the DT-3D24G1 is capable of delivering up to three times the recording volume thanks to user-friendly and intuitive functions as well as the superb mobility provided by its lightweight and compact design.

What's more:

One of the most important topics in the field of 3D content creation today is how to prevent adverse health effects that some viewers can experience when watching 3D videos. And the DT-3D24G1 helps to alleviate this phenomenon by making it easier for creators to determine whether 3D effects are too extreme for a given production.

Therefore, 3D creators will be pleased to know that:

When properly used, the user-friendly and intuitive features of the DT-3D24G1 ensure the creation of high-quality 3D video content, faster and more precisely.

SPECIFICATIONS

General

Model name	**DT-3D24G1**
Type	Multi-format 3D LCD Monitor
Screen size	Type 24 wide format
Aspect ratio	16:10
Format	3G SDI: SMPTE424M/SMPTE425M DUAL LINK HD SDI: SMPTE372M HD SDI: BTA S-004C, SMPTE292M SD SDI: ITU-R BT.656: 525/625 SMPTE259M: 525 EMBEDDED AUDIO: SMPTE299M, SMPTE272M
Audio output	Internal speaker: 1.0 W + 1.0 W
Operation environment	Operating temperature: 5˚C – 35˚C (41˚F – 95˚F) Operating humidity: 20% – 80% (non-condensing) (Slightly variable depending on ambient conditions for installation.)
Power requirements	AC 120 V/AC 220 – 240 V, 50 Hz/60 Hz, or DC 24 V (Voltage range: DC 23.3 V − DC 25.5 V)
Rated current	1.15 A (AC 120 V) 0.67 A (AC 220 – 240 V) 4.8 A (DC 24 V)
External dimensions: W x H x D (excluding protrusions) **With stand / Without stand**	564 x 448.6 x 243 mm (22-1/4″ x 17-3/4″ x 9-5/8″) / 564 x 408 x 99 mm (22 1/4″ x 16 1/8″ x 4″)
Mass **With stand / Without stand**	12.0 kg (26.4 lbs) / 9.1 kg (20.0 lbs)
Accessories	AC power cord, Power cord holder × 1, Screw × 2 (for power cord holder), Circular polarizing glasses × 2 (for 3D viewing, not under warranty)

SPECIFICATIONS (CONTINUED)

LCD Panel

Type	24″ wide, active matrix TFT
Effective screen size: W x H x Diagonal	518.4 x 324 x 611.3 mm (20-1/2″ x 12-7/8″ x 24-1/4″)
Number of pixels displayed	1920 x 1200
Number of colors displayed	16.77 million
Contrast ratio (TYP.)	1000:1

Input / Output Terminals

Video	**DVI-D**	DVI-D signal input (compatible with HDCP): DVI-D connector x 1 (compatible with DDC2B)
	E. AUDIO 3G SDI/HD SDI/SD SDI (IN 1/L)	Digital signal input (compatible with EMBEDDED AUDIO/DUAL LINK signals): Auto detection, 2 line, BNC connector x 2
	E. AUDIO 3G SDI/HD SDI/SD SDI (IN 2/R)	
	E. AUDIO 3G SDI/HD SDI/SD SDI (ACTIVE OUT)	Digital signal output (compatible with EMBEDDED AUDIO signals): 2 line reclocked out, BNC connector x 2
Audio	**AUDIO (IN)**	Analog audio signal input: 1 line, RCA connector x 2, 500 mV (rms), high impedance
	AUDIO (MONITOR OUT)	Analog audio signal input: 1 line, RCA connector x 2, 500 mV (rms)
External controls	**REMOTE (MAKE/TRIGGER: 8 pins)**	Female: PIN1, 2, 3, 4, 5, Tally on/off, External control valid/invalid, and GND
	REMOTE (RS-485: 8 pins for IN/OUT)	Female: TXD+, TXD-, RXD+, NC, NC, RXD-, NC, and GND
	REMOTE (RS-232C: 9 pins)	Female: NC, RXD, TXD, NC, GND, NC, RTS, CTS, and NC (Note: the 7th and 8th terminals are connected

Video Signal Compatibility

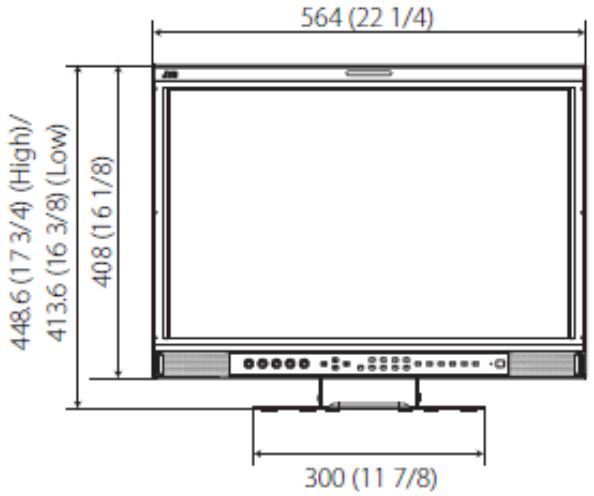
No.	Signal name	Signal format shown in the status display	Input terminals				
			E. AUDIO SDI (IN 1, IN 2)*1				DVI-D (HDCP) (Digital component/ Digital RGB)
			SD/HD (1.5G)	3G SDI	DUAL LINK	MIX	
1	480/60i	480/60i	—	—	—	—	√
2	480/59.94i	480/59.94i	√	—	—	—	√
3	576/50i	576/50i	√	—	—	—	√
4	480/60p	480/60p	—	—	—	—	√
5	480/59.94p	480/59.94p	—	—	—	—	√
6	576/50p	576/50p	—	—	—	—	√
7	640*480/60p	640*480/60p	—	—	—	—	√
8	640*480/59.94p	640*480/59.94p	—	—	—	—	√
9	720/60p	720/60p	√	√	—	√	√
10	720/59.94p	720/59.94p	√	√	—	√	√
11	720/50p	720/50p	√	√	—	√	√
12	720/30p	720/30p	√	√	—	√	—
13	720/29.97p	720/29.97p	√	√	—	√	—
14	720/25p	720/25p	√	√	—	√	—
15	720/24p	720/24p	√	√	—	√	—
16	720/23.98p	720/23.98p	√	√	—	√	—
17	1080/60i	1080/60i	√	√	√	√	√

No.	Signal name	Signal format shown in the status display	Input terminals				
			E. AUDIO SDI (IN 1, IN 2)*1				DVI-D (HDCP) (Digital component/ Digital RGB)
			SD/HD (1.5G)	3G SDI	DUAL LINK	MIX	
18	1080/59.94i	1080/59.94i	√	√	√	√	√
19	1035/60i	1035/60i	√	—	—	—	—
20	1035/59.94i	1035/59.94i	√	—	—	—	—
21	1080/50i	1080/50i	√	√	√	√	√
22	1080/60p	1080/60p	—	√	√	√	√
23	1080/59.94p	1080/59.94p	—	√	√	√	√
24	1080/50p	1080/50p	—	√	√	√	√
25	1080/30p	1080/30p	√	√	√	√	√
26	1080/29.97p	1080/29.97p	√	√	√	√	√
27	1080/25p	1080/25p	√	√	√	√	√
28	1080/24p	1080/24p	√	√	√	√	√
29	1080/23.98p	1080/23.98p	√	√	√	√	√
30	1080/30psf	1080/30psf	√*2	√*2	√*2	√*2	—
31	1080/29.97psf	1080/29.97psf	√*3	√*3	√*3	√*3	—
32	1080/24psf	1080/24psf	√	√	√	√	—
33	1080/23.98psf	1080/23.98psf	√	√	√	√	—
34	1080/25psf	1080/25psf	√*4	√*4	√*4	√*4	—

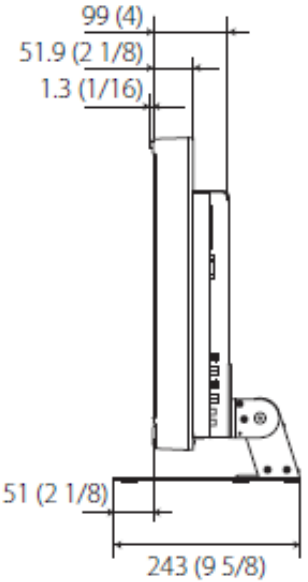
*1 Compatible with EMBEDDED AUDIO signals. *2 If there is no payload ID, signal is regarded as 1080/60i.
*3 If there is no payload ID, signal is regarded as 1080/59.94i. *4 If there is no payload ID, signal is regarded as 1080/50i.

External Dimensions

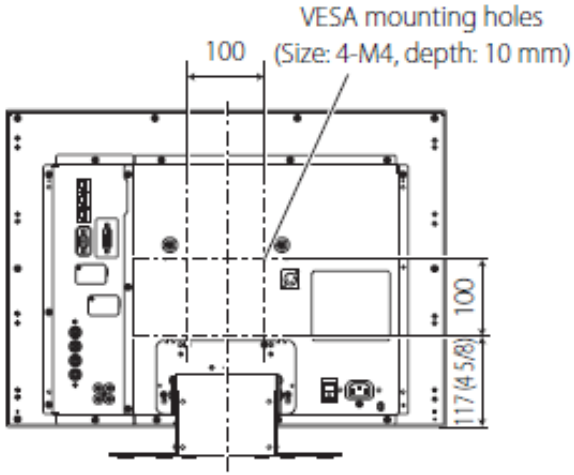
<Front view>



<Side view>



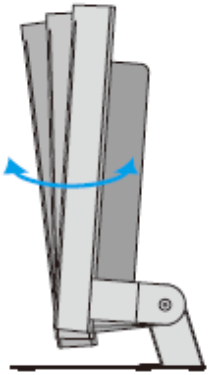
<Rear view>



Unit: mm (inch)

Tilt stand

- **Advantage: ±**6 degrees tilt adjustment.
- **Benefit:** Facilitates the viewing of 3D recordings at a proper angle, which helps to ensure a more comfortable and fatigue-free working environment.



3G-SDI and Dual Link

- **Features:** 3G SDI connection enables the transfer of digital video/audio signals up to 3G/bps and allows the transfer of uncompressed 4:4:4:4 RGBA format video signals.
- **Advantage:** Compliant with the SMPTE 424M standard and compatible with dual link HD-SDI. Transfer speed is double that of normal HD-SDI.
- **Benefit:** The monitor is compatible with 3G-SDI in six formats for serial transmission of 1080p video signals.

Resolution	Frame rate	Color range	Rate	Level	3G-SDI mapping structure
1080	60P/50p	YCbCr=4:2:2	10-bit	A	1
				B	
	30p/25p 24p 30psF 25psF 24pSF 60i 50i	YCbCr=4:2:2	10-bit	B	Dual stream
			12-bit	A	4
				B	
		YCbCr=4:4:4	10-bit	A	2
				B	
			12-bit	A	3
				B	
		RGB	10-bit	A	2
				B	
			12-bit	A	3
				B	
720p	60p/50p 30p/25p 24p	YCbCr=4:2:2	10-bit	B	Dual stream
		YCbCr=4:4:4	10-bit	A	2
		RGB	10-bit	A	2

Benefits of the 3G-SDI Terminal

- Uncompressed 1080p: Ideal for higher quality (progressive) full HD video production.
- Signal loss is eliminated.
- Over 100m of wiring is enabled.

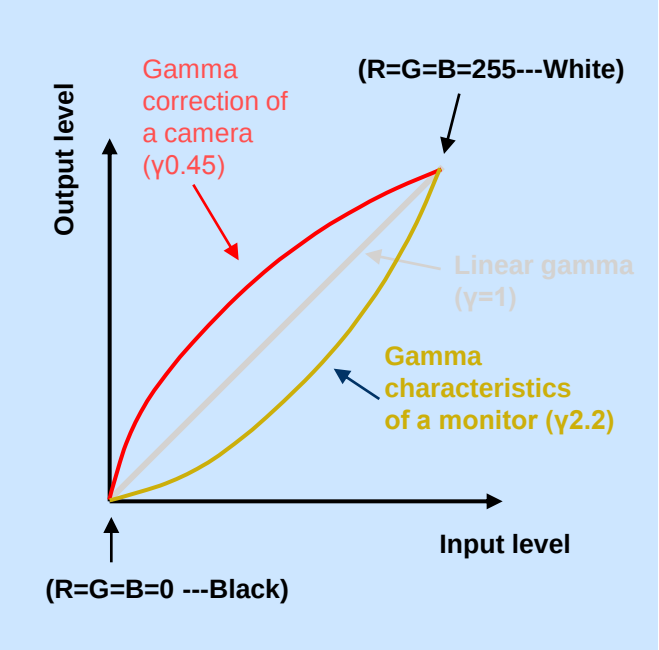
Target Users of the 3G Terminal

- Production companies involved with digital cinema or high-end HD video content.
- Studios using PCs for editing workflow because the progressive signal is used for PC data.
- 1080p uncompressed signal users.
- Although demand from broadcasting stations is low as they can only transmit up to 1080i signals currently, the terminal is attractive as a future investment.

Gamma Preset Mode: Basics

What is Gamma?

- The correlation between input and output signal levels for a camera or monitor is known as gamma. In the case of display monitors, for example, the relationship between the input luminance signal and display brightness is referred to as gamma characteristics.
- Generally speaking, when the gamma curve is linear (γ=1), reproduced images become closer to what humans perceive with their eyes. Therefore, as gamma characteristics of display monitors tend to be darker with halftones it becomes necessary to alter the gamma curve closer to linear by sending an image signal with brighter halftones. This helps to convert colors more precisely, a process that is referred to as gamma correction.
- In light of the fact that many studios are gradually replacing CRT master monitors with next-generation master monitors, a number of organizations (e.g. EBU, ITU-R, ARIB, and others) are announcing guidelines for next-generation master (reference) monitors with varying specifications.



- **Gamma Benefits of the DT-3D24G1:** Compatible with γ2.2, γ2.35 and γ2.45 as well as γ2.6 gamma preset modes for digital cinema environments, the DT-3D24G1 enables users to calibrate optimal gamma settings according to specific operating conditions and applications (refer to the following page for applications of each mode).

Gamma Preset Mode: Preset Values and Applications

Preset Value	APPLICATION
Gamma 2.2	Equivalent to CRT gamma characteristics (also the standard gamma value for NTSC CRT monitors), this gamma value is commonly used as current TV broadcasting is based on this setting.
Gamma 2.35	Recommended by EBU-TECH 3320 (the guideline of reference monitors), this is the gamma value for next-generation (non-CRT), high-definition reference monitors.
Gamma 2.45	Recommended by ARIB, this is the gamma value for next-generation, (non-CRT) high-definition reference monitors.
Gamma 2.6	The standard gamma value for digital cinema environments as the gamma 2.6 mode is required for checking gradation in these applications.

Glossary

- **High-Definition Serial Digital Interface or HD-SDI (SMPTE 292M):** A video signal interface that is commonly used for HD professional digital video systems to transfer uncompressed (up to 1.485Gbps in 1080/60i) HD digital video streams and 16-channel PCM digital audio signals along with other data such as time codes.
- **3G-SDI (SMPTE 424M):** Also known as 3rd generation SDI with 3Gbps data transmission capability, it transmits up to 1080/60p signals or 4:4:4 sampling via a single BNC cable at 2.97Gbps. As the need for enhanced quality HD video production (for Cinema or Blu-ray) increases, the importance of a higher speed video signal interface has grown exponentially.
- **Dual Link SDI (HD-SDI Dual Link, SMPTE 372M):** A serial digital interface standard capable of transferring HD-SDI (SMPTE 292M)1920 x 1080 / 50P, 60P / 4:2:2 / 10-bit or 1920 x 1080 / 24P, 30P, 50I, 60I / 4:4:4 / 10-bit, 12-bit parallel signals as HD-SDI 2-ch video signals via two coaxial cable at 2.970Gbps.
- **LTC (Longitudinal Time Code) and VITC (Vertical Interval Time Code):** Generally speaking, both LTC and VITC are used simultaneously for time code signals recorded onto recording media. LTC is used as the address signal recorded onto longitudinal audio tracks. However, for slow-speed playback, the LTC signal is switched to the VITC signal, as LTC cannot be read at certain playback speeds.
- **ITU-709 (ITU-R BT.709):** ITU-R Recommendation BT.709, a.k.a. Rec. 709 or BT.709 is the specification for the high-definition television format proposed by ITU (International Telecommunications Union-Radio Communications Sector).
- **EBU-TECH 3320:** The guideline issued by the EBU (Europe Broadcast Union) that defines the specifications for reference monitors.
- **ARIB (Association of Radio Industries and Businesses):** An organization concerned with Japanese integration of telecommunications and broadcasting, as well as the promotion of businesses using radio waves in general. ARIB specifies technical specifications related to communications, transmission and reception equipment.