

Projector Specification for Training and Simulation Application

Mechanics

The geometric dimensions of the projector shall be less than 22x14x12 inches at a maximum weight of about 55 lb to ensure installation and maintenance for small screen applications and multiple channel systems.

Customizable mounting condition

The projector chassis shall offer the possibility to mount the device on different frameworks. In order to reduce the overall weight of the system the mounting shape shall be customisable to fit the requirements of the application.

Cooling

The cooling system of the projector has to fit in the application. From low noise fans being adjacent to trainees or technicians to high power fans for thermal loaded environments to a fan less Venturi-Pipe system installed for motion base applications.

Display Technology

Single chip projectors show a very good cost/performance ratio hence are considered in this summary.

The displayed image content must have low motion blur and must not show any perceptible rainbow effects therefore the display panel has to operate every single RGB signal at frequencies higher than 1200 Hz (that means every pure colour image will be displayed about 20 times per frame). These frequencies especially suits DLP chips in combination with an LED light source.

The whole system shall be almost maintenance free especially the illumination system. Its life time shall be above 10.000h and its degrading of brightness shall be less than 10%.

Display Parameter (Brightness, Resolution, Contrast,...)

These parameters only represent the performance of the projector in a flat screen system and can not be easily transformed in another especially curved screen system.

The display resolution shall consist of 1920 x 1200 pixels (WUXGA) or better that is an aspect ratio of 16/10.

A maximum needed brightness depends on the application but a minimum of 600 lm is generally sufficient if the system operates on a big colour gamut as higher saturated colours seem brighter to the human eye.

An example for a good gamut is (Standard CIE 1931)

red colour coordinates: x: 0.71, y: 0.30

green colour coordinates: x: 0.19, y: 0.75

blue colour coordinates: x: 0.14, y: 0.03

Displayable contrast shall be comparable to the following values

Sequential contrast about 50.000:1

Native contrast about 1000:1

ANSI contrast about 300:1

Electronics

Communication and control

The projector shall have multiple different computer inputs among them at least

1x DVI

1x HDMI (1.3a or better)

1x VGA

1x RGBHV, RGBS, RGsB, YUV (5x BNC)

The projector has to be controllable completely via the network that includes the illumination system, DLP and lens adjustments.

Additional communication and control of projector via an

RS232 in/out

TCP/IP (communication with projector electronics directly)

USB

is necessary.

The image processing latency of the projector must not exceed 22 ms.

Optic

Projection Lens

Depending on the position of the projector relative to the screen a certain area is illuminated. In order to be more free in positioning the projector there should be different projection lenses to cover throw ratios from 0.8:1 to 6.5:1.

Avoiding Keystone distortions without losing resolution a lens shift of at least 40% horizontal and 50% vertical is required.

Additional requirements

Retrofit ability

The projector shall be retrofit able both for night vision and motion base compatibility.

Night Vision

Night vision (NV) trainings stimulating night vision goggles generation 1 to 5 shall be feasible. The NV capability shall be integrated inside the projector. The system has to display near infrared light within the spectral band of 740nm to 780nm overlaying or being sequential to the common visible output.

The illumination system needs to be dim able to less than 5% of the maximum intensity level.

Night vision stimulation can be achieved in different ways. One of the following implementations is required.

Similar to stereoscopic systems the projector displays the visible and the night vision image sequentially, hence the electronics has to handle two input signals at 120 Hz frame rate.

Night vision information is encoded in the visible image content using advanced light control management.

Motion Base

The projector system shall withstand acceleration forces up to 10g in motion base applications without any performance loss. Stability of the whole projector chassis, a special lens mounting and cooling systems are required and have to be verified in a test centrifuge. Inside these simulators the projector will be rotated and tilted significantly hence life time, brightness the performance in general must be independent of the orientation of the projector.

Specification Table			
Geometry			
Dimension	< 550x350x300mm	< 22'x14'x12'	
Weight	< 25 kg	< 55 lb	
Mounting			
Base plate	Modified to fit simulator		
Cooling			
Fan	noise / performance		
Venturi Pipe	10 g Application		
Display			
Single DLP			
Light Source			
LED RGB visibel			
LED NIR (near infrared)			
Life time	>30.000 hours		
Parameter			
Resolution	1920 x 1200 (WUXGA)	Aspect Ratio 16:10	
Brightness	600 Lumen		
Calour Gamut (x,y)	Red (0.71,0.30)	Green (0.19,0.75)	Blue (0.14,0.03)
Contrast	Sequ. 50000:1	Native 1000:1	ANSI 300:1
Electronics			
Signal Input	1x DVI		
	1x HDMI (1.3a)		
	1x VGA		
	1x RGBHV, RGBS, RGsB, YUV (5x BNC)		
Control	RS232		
	TCP\IP		
	USB		
Latency	22 ms		
Optic			
Projection Lens	Focus		
	Zoom		
	Iris		
	Lens Shift		
	Throw Ratio 0.8:1 – 6.5:1		
Night Vision			
Stimulation using near infrared LED (740nm – 790nm)			
Stereo Projection			
Motion Base			
Mechanics und cooling designed for acceleration forces up to 10g			
Retrofit Able			
The projector shall be retrofit able both for night vision and motion base compatibility.			