

## Technical Specifications

### Phantom 65 Gold Camera

- 4K (4096x2440) full resolution
- Dual 1920x1080 resolution in 3D mode
- Up to 300 frames-per-second in 3D mode
- Adjustable frame rates in 1fps increments
- Shutter speeds as fast as two microseconds (1/500,000 second)
- 14-bit sensor depth (42-bit color)
- 11-stop dynamic range
- Approximately ISO 320
- 35mm depth-of-field in 3D mode
- HD Video out: 4:2:2 HD-SDI (720p, 1080psf, 1080i, all standard formats)
- 32G in-camera memory
- Hand held user interface to control camera settings
- Weight: 12.125lbs (5.5kg) without lenses
- Compatible with 35mm accessories

### Zepar Control System

- Wired or Wireless control
- Focus control
- T-stop
- Lens separation distance control and calculator for Zero Parallax plane and 'safe' 3D distances
- Auto calibration for each lens pair

### Zepar Stereo 3D Prime Lenses



Focal Length	Aperture	Close Focus	Min Distance From Front Stereo Effect	Length	Front Diameter	Weight	Horizontal Angle of View
20mm	T4.0	27.6"	13.0"	4.3"	3.2"	2.1lbs	33.2°
24mm	T4.0	27.6"	18.9"	4.4"	3.2"	2.3lbs	28.4°
28mm	T4.0	27.6"	22.0"	4.0"	3.2"	2.1lbs	25.1°
35mm	T2.8	27.6"	16.5"	4.3"	3.2"	2.1lbs	20.6°
50mm*	T2.8	31.5"	25.6"	4.3"	3.2"	2.1lbs	14.7°
75mm*	T3.6	31.5"	29.5"	4.4"	3.2"	2.1lbs	9.2°
100mm*	T5.6	39.4"	42.5"	5.5"	3.2"	2.3lbs	4.8°

\*Additional optical adapter available with the capacity to change the interocular distance of the 50mm, 75mm and 100mm lenses.  
 Interocular distance without adapter is from 24.15mm-26.4mm; with adapter from 62mm-102mm.  
 Adapter size (L,H,W): 170mm x 88mm x 96mm  
 Weight: 0.55kg

### Phantom 65-Z3D Partners



#### New York

609 Greenwich Street  
 New York, NY 10014

t 888.223.1599  
 t 212.462.0100  
 f 212.462.0199

#### Los Angeles

801 South Main Street  
 Burbank CA, 91506

t 888.700.4416  
 t 818.972.9078  
 f 818.972.2673

#### Chicago

17 W662 Butterfield Rd #302  
 Oakbrook Terrace, IL 60181

t 877.880.4267  
 t 630.359.5778  
 f 630.359.5793

AbelCine

[www.abelcine.com](http://www.abelcine.com)

## Phantom 65-Z3D System

Single camera, single lens, single recorder 3D system with adjustable zero parallax for producing uncompromised, high quality, user-comfortable 3D content

- **Two 35mm Film-sized Images**  
side by side within single 65mm sensor
- **Ultra Lightweight**  
for hand held, Steadicam and B camera companion
- **Compact Size**  
for jib, remote operation and tight spaces
- **Quick Set-Up**  
No genlock, no camera alignment, saves time, reduces error
- **Straightforward Image Capture**  
no image distortion, eliminates possibility of excessive parallax
- **Simplified Workflow**  
safe and efficient process from capture through post



Phantom 65-Z3D is a unique collaborative 3D system using Vision Research's Phantom 65 Gold camera in conjunction with MKBK's Zepar Stereo 3D optics.

AbelCine

[www.abelcine.com](http://www.abelcine.com)



## The Approach



**35 Full Aperture**  
24.92mm x 18.67mm  
31.1mm diagonal



**Phantom 65 Full Frame**  
4096 x 2440 pixels  
51.20mm x 30.50mm  
59.60mm diagonal

Two full aperture 35mm film frames fit side by side within the Phantom 65mm sensor  
Typical output: dual 1920 x 1080 (as shown)

Phantom 65-Z3D is a single camera 3D production system that uses two lenses inside a single housing to capture stereo images on a single sensor.

The Phantom 65 Gold sensor is the largest digital cinema sensor in the industry, equivalent in size to 65mm format film. The system takes full advantage of the Phantom 65 Gold's large real estate and marries the camera to Zepar Stereo 3D lenses, the optics component of the Academy Award-winning side-by-side Stereo-70 system. The Zepar optics divide the frame into two side by side images, each as large as a full aperture 35mm motion picture film frame with 2K resolution.

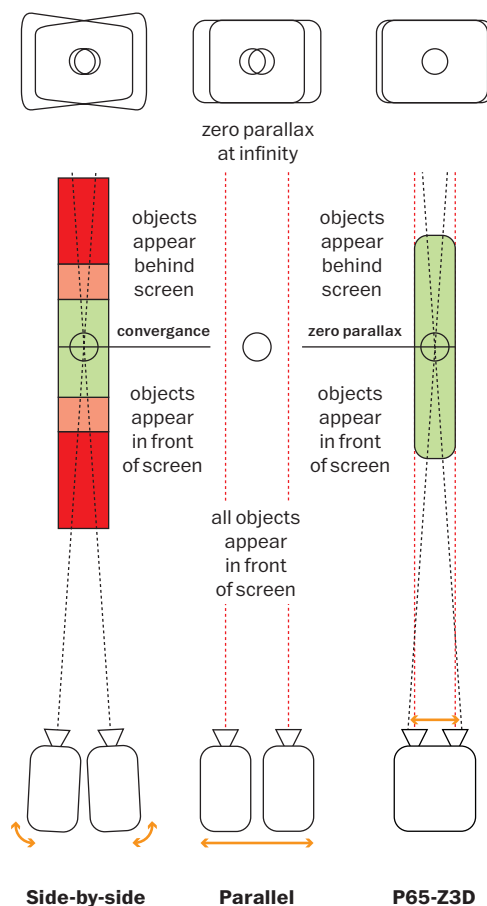
P65-Z3D is the industry's only single camera digital 3D solution to record such a large image with the equivalent resolution and depth of field as a pair of Super 35 film or digital cameras.

There are several techniques currently employed for shooting 3D with control over what appears in front of the screen and what appears behind the screen.

In traditional side-by-side and beamsplitter 3D rigs, by toeing-in both cameras, the two images 'converge' at a distance where objects in front of the convergence appear in front of the screen, objects in back are behind. While this technique provides flexibility in positioning the convergence point, the images can exhibit keystone or distortion, due to the fact that the cameras are at slight angles to the image plane.

Furthermore, there is a sweet spot that extends a certain distance in front of the convergence point and behind it. Objects outside of this sweet spot can be uncomfortable to view because they are either too converged (cross eyed in front of screen) or too diverged (opposite of cross eyed behind the screen).

Another current technique for creating 3D involves parallel cameras. Two parallel cameras with fixed lenses and fixed imagers produce images that never converge. In this case, all objects appear in front of the screen, in front of infinity; also known as the 'zero parallax' distance.



## The Benefits

By utilizing a single sensor, the P65-Z3D is like a pair of parallel cameras, in such that, there is no toeing-in. By adding the capability to adjust the lenses horizontally in front of the sensor, thus changing the distance between the lenses, it is possible to affect the zero parallax distance and therefore determine the point where objects appear in front of the screen and behind the screen.

This unique approach allows the P65-Z3D to offer some significant system benefits.

The images produced by the system's parallel capture are clean and free of optical distortion, from either beamsplitter artifacts or image keystone.

Yet the system is not limited like traditional parallel systems. With P65-Z3D, it is possible to adjust the distance where objects appear in front or behind the screen, the zero parallax distance. There is still a sweet spot, but the danger of 'overconverging' is eliminated because the sensor and lenses are parallel and this makes for more comfortable 3D viewing.

The small footprint of a single camera design makes it ideal on feature and commercial productions, as a 'B' camera alongside traditional rigs, as the Steadicam, handheld or jib unit.

What's more, the Phantom 65 used in this configuration can offer frame rates over 300fps at 1920x1080 resolution.

Because both images are married to the same frame, all workflow processes are simplified from off-load to conversion to editing to archiving. While it is possible to separate the images for viewing or simplified 2D editing, there is never an issue of synchronizing or losing separate media.

## The Technology



### Camera Phantom 65 Gold Camera

The Phantom 65 Gold is a 4K digital cinema camera that delivers nearly 10 megapixels at full resolution. It has a 4096 x 2440 sensor that is the same size as a 65mm film negative, so it achieves 65mm depth-of-field and field-of-view. When used in 3D mode (1080 pixel height) the camera can run at speeds up to 300 frames per second, and provides shutter speed control down to 2 microseconds (1/500,000 second), giving you precise control over the amount of blur or clarity in each scene. Exposure time can also be set in increments of one microsecond. The excellent sensitivity of the CMOS sensor (ISO 320) and wide dynamic range combine to give you an image quality that rivals film.

The camera records to an internal RAM memory (loop mode) or to an on-board CineMag flash memory cartridge (run-stop mode). Playback from the camera is instant over single (4:2:2) HD-SDI at a reduced HD resolution. Data from the CineMag can be offloaded to more permanent storage using the CineStation transfer device.



### Optics Zepar Stereo 3D Prime Lenses

Zepar stereo lens pairs consist of two Shift Lenses with parallel optical axes. The range of fixed focal length lenses are 20mm, 24mm, 28mm, 35mm, 50mm, 75mm and 100mm.

The distance between each lens in a pair is adjustable between 24.15mm to 26.4mm.

The ability to change lenses in the field has never been faster or easier for 3D production. Each Zepar stereo lens pair is packaged in a single housing which attaches to the Zepar face plate in a matter of seconds. It is like changing a lens on a 2D camera.

The Zepar face plate has focus, t-stop and 'ramp' motors built in. The motors are easily attached to the gears on each individual lens housing. By pushing the calibration button on the handheld remote control, the lens motors run through the calibration procedure for each lens pair.



### Control Zepar RCU and Control System

The Zepar Remote Control (RCU) is a smart controller that handles numerous functions and communicates information about 'safe 3D' to the operator. Focus is adjusted by controlling both lenses simultaneously in relation to the image plane and in this way, the two images are always in focus 'sync' with one another.

The space between the lenses is adjustable using the RCU and moves both lenses synchronously in the opposite direction from one another, either towards the system center or away from the center. This adjustment gives the operator control of the zero parallax plane.

Similar in concept to the convergence plane, the zero parallax plane is the distance where objects in front of the plane will appear in front of the screen; objects in back of this plane appear behind the screen. The operator can set the desired distance of the zero parallax plane and the controller will automatically adjust the proper space between lenses.

Each focal length lens pair has a range of acceptable zero parallax distances. If a distance is entered beyond the range of the lens, the calculator will warn the operator. In this way, safe and comfortable 3D is consistently achievable and one of the strengths of the system.