PANAVISION HIGH DEFINITION
PRIMO DIGITAL™ IMAGING
In 1997, Panavision and Sony announced their collaboration on the development of a 24 frame, progressive capture digital high definition camera suitable for use by filmmakers to create images for the motion picture screen. We knew from 45 years of experience, that a complete imaging system approach was the only way for traditional film crews to make a seamless transition into digital production.

Panavising the Sony HDW-F900 camera required a disassembly of the stock camera and replacement of the top cover, carrying handle, bottom supports and mounts with more robust and flexible mounts and handles. Also, a complete new faceplate, lens lock and iris rod support system have been installed. A newly designed ULTRAVIEW® Viewfinder with enhanced optical performance and easier to use controls replaces the standard viewfinder. These changes and more were made in order to produce a film friendly system that utilizes many of the standard Panavision accessories, such as the follow focus, matte box, heads, etc.

In addition to the mechanical modifications to the camera, a unique optical pre-filter gives you better color matching with film emulsions and enhanced resolution for blue screen effects cinematography.

In September of 2000, George Lucas completed principal photography of Star Wars: Episode 2 Attack of the Clones, utilizing six Panavised cameras and the first specially designed Primo Digital™ lenses.

Historically, 525 and 625 line video systems were constrained in their performance by almost everything but optics. However, with the introduction of the first progressive output 2/3", 2 million pixel (per color) CCD camera it was immediately apparent that optics were going to be critical to maximizing the performance of a Digital Cinematography System.

The 2/3" CCD imager is actually only 11mm in diagonal (as compared to the 27.5 mm diagonal of a 35mm motion picture film frame). Therefore, for any given screen size, the 2/3" CCD will require 2.5 times more horizontal magnification than a 35mm film frame. This required that our new Primo Digital™ lens series be designed to have 2.5 times the performance of our best cine lenses.

On the right side of the graphic below is a 16x9 format, 35mm film camera aperture. On the left is the image area of a 2/3" CCD drawn to the same scale. In order to have the same performance as a Primo cine lens, Primo Digital™ lenses must achieve 80% contrast at 50 line pairs per millimeter on the 2/3" CCD (2.5 times better frequency response). Another way to visualize the optical demands is to write your full name in each box, making both signatures legible.

Primo Digital™ prime and zoom lenses fully incorporate the optical, mechanical and ergonomic characteristics of their Academy Award® winning cine predecessors. All Primo Digital™ lenses permit selective control of colorimetry and resolution/contrast via insertable lens filters (worldwide patents pending). Additionally, these filters provide a constant effect through focus and zoom unlike conventional filters placed in front of or behind the lens.

To maximize versatility and ensure optimal image quality, Primo Digital™ lenses employ state-of-the-art opto-mechanical components, such as ultra precision linear bearings, exotic glasses, finely ground aspherical surfaces and high efficiency.
anti-reflection coatings (up to 12 layers), in very compact, lightweight packages. Rather than treat each zoom lens design separately, Panavision has developed its Primo Digital™ zoom lenses together so that they properly address customer needs. We began with two slightly overlapping medium ratio 4.5x zooms which cover wide angle to telephoto focal lengths of 6-27mm and 25-112mm with a 20x total focal length range. Then we added a 9x larger ratio 8-72mm zoom to accommodate virtually all shooting scenarios. All Primo Digital™ lenses are optimized for maximum image quality at fast maximum apertures of T1.6-1.9 (F1.45-1.75), thus enabling depths of field similar to 35mm cine formats. For visual effects and CGI work the lenses include integral encoders for real-time sub-pixel accuracy of focus, zoom, and aperture data. Furthermore, the Panavision system philosophy of compatibility and standardization between cameras, lenses, and accessories continues and is expanded in the Primo Digital™ lens series.

In addition to requiring 2.5 times the frequency response of its cine counterpart, the smaller target also has 2.5 times greater depth of field for the same angle of view and f-stop as the equivalent cine lens (f4 on 1.85:1 35mm film format is f1.6 in the 2/3" CCD format). In order to provide creative control over depth of field, the Primo Digital™ lenses have been designed to operate two stops faster than the equivalent cine lenses.

The “film” versus the “video” look is an extremely controversial issue, and is an aesthetic decision based on many factors that include colorimetry, gamma, frame rate, image enhancement, granularity, etc. The Primo Digital™ lenses have a unique internal design which enables interference type spectral modification filters to be incorporated within the lenses. When coupled with other optical pre-filters within the camera beam splitter optics, the “Panavised” camera can achieve a wider color gamut than standard CCD video cameras.

Panavision is committed to continuously developing our Digital Imaging System in close collaboration with our clients, just as we have done with our film systems over the last 45 years. Now your HD project will benefit from the same dedication to customer service and superior image quality that is the hallmark of Panavision.

<table>
<thead>
<tr>
<th>2/3&quot; CCD</th>
<th>1.85:1</th>
<th>2.40:1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-STOP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.8</td>
<td>2</td>
<td>2.8</td>
</tr>
<tr>
<td>1.1</td>
<td>2.8</td>
<td>4</td>
</tr>
<tr>
<td>1.6</td>
<td>4</td>
<td>5.6</td>
</tr>
<tr>
<td>2.2</td>
<td>5.6</td>
<td>8</td>
</tr>
<tr>
<td>3.2</td>
<td>8</td>
<td>11</td>
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<tr>
<td>4.4</td>
<td>11</td>
<td>16</td>
</tr>
<tr>
<td>6.4</td>
<td>16</td>
<td>22</td>
</tr>
</tbody>
</table>
The Panavised HDW-F900 Camera

Robust, flexible carrying handle and mount
New faceplate, lens lock that allows for optical recentering of the prism block CCD assembly
Bottom iris rod system
Steadicam® plates
Standard accessories: follow focus, matte box, etc.
Dual voltage 12/24 distribution
Optical prefilter provides enhanced color gamut

ULTRAVIEW® VIEWFINDER:
2 times larger image
Increased diopter range
Operator side controls for contrast, brightness and peaking
More robust mount
More fore/aft and side-to-side adjustment
More robust pivot and lock
Modular hand held and extension finders

HDW-F900 Camera Specifications

GENERAL
Power requirement....................DC 12 V (+5.0 V/-1.0 V)
Power consumption ..................42 W (with 12 V power supply, REC mode, with HDVF-20A)
Operating temperature...............0º C to +40º C (+32º F to +104º F)
Storage temperature .................-20º C to +60º C (-4º F to +140º F)
Operating humidity ....................25% to 80% (relative humidity)

INPUTS/OUTPUTS
Genlock video input ..................BNC, 1.0 Vp-75Ω
Time code input........................BNC, 0.5 V to 18 Vp-p, 10 kHz
Audio CH1/CH2 input ...............XLR-3-pin type (female), -60dBu/+4dBu selectable, high impedance, balanced
Mic input..................................XLR-3-pin type (female), -60 dBu
Monitor output ..........................BNC (x3, Y/PB/PR), 1.0 Vp-p, 75Ω, unbalanced
Audio output.............................XLR-5-pin type (male) 0 dBm
Time code output......................BNC, 1.0 Vp-p, 75Ω
Earphone .................................Mini-jack, 8 Ω, -∞ to -18 dBs variable
DC input ..................................XLR-4-pin type (male), 11 to 17 V DC
DC output ................................11 to 17 V DC, Max. 100 mA
Lens ........................................12-pin
Remote ..............................8-pin

VTR SECTION
Recording format ......................HDCAM
Tape speed ............................Approximately 77.4 mm/s (24P mode)
Playback/recording time ..........Maximum 50 minutes with BCT-40HD (24P mode)
Fast forward/rewind time ............Approximately 6 minutes with BCT-40HD

AUDIO PERFORMANCE (playback with standard HDW-F500)
Frequency response .................20 Hz to 20 kHz, +0.5 dB/-1.0 dB
Dynamic range .........................More than 85 dB (emphasized on)
Distortion ..............................0.08% maximum
Cross talk ................................-70 dB
Wow & flutter ..........................Below measurable limit

CAMERA SECTION
Pickup device..........................3-chip 2/3-type F1.45 prism system
Optical system..........................3-chip 2/3-type FIT type CCD, 1920 x 1080
Clear scan ............................(ECS) 24 to 4300 HZ (minimum setting depends on frame rate selected)
Sensitivity............................f10.0 at 2000 lux, 89.9% reflective, at 24 fps, with a 1/48-second shutter speed (equivalent to a 180° film camera shutter setting), the exposure index is approximately equivalent to 320 ISO

VIEWFINDER
CRT.........................................2" monochrome
Controls ..........................Brightness control, Contrast control, Peaking control, Tally switch, Zebra Pattern switch, Display/Aspect switch
Horizontal resolution ..............500 TV Line (at center)
### PRIME AND ZOOM LENS FOCAL LENGTHS, RATIOS AND FEATURES

<table>
<thead>
<tr>
<th>Focal Lengths</th>
<th>Ratios</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5 - 180</td>
<td>5-160</td>
<td>Field of View dependent on picture extraction</td>
</tr>
<tr>
<td>25 - 262</td>
<td>16-35</td>
<td>- 70-320 T5.3</td>
</tr>
<tr>
<td>35 - 560</td>
<td>70-100</td>
<td>- 50-225 T3.8</td>
</tr>
</tbody>
</table>

#### PRIMES
- **6-27 T1.8 4.5X**
- **8-72 T1.9 9X**
- **9.5-105 T1.6 11X**

#### ZOOMS
- **25-112 T1.9 4.5X**

### OPTICAL
- High contrast at full aperture
- Very low veiling glare
- Low lateral color
- Low ghosting
- Low distortion
- Flat field
- Color balanced
- Colorimetry filter (drop-in)
- Resolution/contrast filter (drop-in)
- Consistent image quality through focus & zoom

### MECHANICAL
- Precision linear bearings
- Direct drive systems (no gears)
- Low static & dynamic friction
- Minimal backlash & slop
- Ultra smooth movements
- Stable boresight
- High reliability
- High durability
- Ease of service

### ERGONOMIC
- Dual focus, zoom, iris scales
- Individually calibrated scales
- Expanded focus scales
- Linear iris scales
- Optimal zoom scale markings
- Compatible with Panavision accessories
- One matte box, prime or zoom
THE ONLY LENS SERIES
OF ZOOMS
AND PRIMES
SPECIFICALLY DESIGNED
FOR
24P HIGH-DEFINITION
CINEMATOGRAPHY

Woodland Hills 818.316.1000
Hollywood 323.464.3800 Orlando 407.363.0990
Wilmington 910.343.8796 Dallas 972.929.8585 New York 212.606.0700
Toronto 416.444.7000 Vancouver 604.291.7262
Melbourne 011.613.9646.3044 Sydney 011.612.9436.1844
Brisbane 011.617.5588.6543 Wellington 011.644.384.4191
Auckland 011.649.378.9492 London 011.44.208.839.7333
Manchester 011.44.161.872.4766 Shepperton 011.44.1932.572400
Glasgow 011.44.141.221.5175 Dublin 011.353.12.860811
Paris 011.331.4813.2550 Marseille 011.334.91.21.43.14
Hong Kong 011.85.2.2338.6311 Tokyo 011.81.3.3280.2101