ViSiON RESEARCH

ADEPT TURNKEY

SMARTER IMAGING FOR BETTER LIVES

Perth: +61 (08) 9242 5411   **Sydney**: +61 (02) 9905 5551
Melbourne: +61 (03) 9384 1775

Email: sales@adeptturnkey.com.au
Web site: www.adept.net.au

PHANTOM®

when it's too fast to see, and too important not to.®

DATA SHEET

For the most current version visit www.**vision**research.com
Subject to change   Rev August 2014

Phantom® v2511
Phantom® v2011
Phantom® v1611
Phantom® v1211

The world's fastest 1 Mpx ultrahigh-speed digital camera line is also the most light sensitive.

Key Features:

1 Megapixel sensor (1280 x 800)

25Gpx/s throughput (v2511)

22Gpx/s throughput (v2011)

16Gpx/s throughput (v1611)

12Gpx/s throughput (v1211)

1µs minimum exposure

500ns minimum exposure with FAST option*
   * Export controlled feature

ISO (ISO 12232 SAT method):
   Mono: 100,000 T and 32,000 D
   Color: 10,000 T and 6,400 D

Up to 96GB memory

Phantom CineMag® compatible

Weight (without lens): 16 lbs, 14 oz. (7.7 Kg)

Key Benefits:

The Phantom ultrahigh-speed digital camera line offers ultra high throughputs with improved sensitivity.

- The Phantom line's new member, the **Phantom v2511**, achieves over 25 Gpx/s and more than 25,000 frames-per-second (fps) at its full megapixel resolution of 1280 x 800.

- The **Phantom v2011** performs at over 22 Gpx/s and greater than 22,000 fps at full resolution

- The **Phantom v1611** offers 16 Gpx/s throughput and 16,000 fps at full resolution

- The **Phantom v1211** can capture 12,000 fps at full resolution

The entire line has improved sensitivity, providing better picture quality and more lighting flexibility. Using the ISO 12232 SAT method, these cameras are measured at:

v2511 - v2011 - v1611 - v1211 ISO		
	T (Tungsten)	D (Daylight)
Monochrome	100,000	32,000
Color	10,000	6,400

And, these cameras are **built on the proven Phantom v2010/v1610/v1210 Ultrahigh-speed Camera Platform**, with the full array of **unique features** that let you take full advantage of their speed and flexibility. The cameras are supported by Vision Research's **Global service and support network**, offering a full menu of professional support services so that you can maximize your Phantom camera experience.

AMETEK®
MATERIALS ANALYSIS DIVISION

PHANTOM

when it's too fast to see, and too important not to.®

v2511, v2011, v1611 & v1211

The standard Capture Cable, which attaches to the Capture Port, provides the following signals:

- Ready (is high when camera is in capture mode, can be combined with other cameras to provide a "system ready" signal)
- Strobe (is low during frame exposure time)
- Auto-Trigger (a hardware trigger signal supplied by Image-Based Auto-Trigger)
- Pre-trigger/Memgate (a falling edge causes the camera to start acquiring pre-trigger frames and wait for a trigger – the camera goes into "capture" mode; or, if used in Memgate mode, frames acquired while low are discarded and not saved to memory allowing for selective recording)
- Video Out (NTSC or PAL composite video signal)

Or, use the optional Break-out-Box (BoB) connected to the Capture Port and have access to the following signals on the BoB.

- IRIG-In
- IRIG-Out
- Video Out
- Trigger
- Event (if low when Strobe goes high, the frame is marked with an event marker)
- Strobe
- Auto-Trigger (goes low when this camera is triggered by Image-Based Auto-Trigger allowing one camera to trigger other cameras based on an event detected in the live image)
- Pre-trigger/Memgate
- Ready

Phantom v1211- Right Side View

Image Storage:

At ultrahigh-speeds, memory can become a limitation to recording duration. The **cameras can be equipped with 24GB, 48GB or 96GB** of high-speed memory. A camera with 96GB of memory, recording at 10,000 fps at 1280 x 800 can record a single high-speed shot (called a *cine*) for up to 6.2 seconds. Or, **segment memory** into up to 63 segments and record shorter cines into each segment.

Minimize cine save times with the Phantom CineMag feature that is standard on all ultrahigh-speed models. With the ability to save 1GB/s of data to an attached CineMag, a 96GB shot can be saved in about 1.5 minutes. The resulting **cine is securely stored in non-volatile memory.**

The contents of a CineMag can later be viewed on a PC, trimmed, played to video, and saved either by placing the CineMag back on the camera, or using our offline Phantom CineStation® – a simple CineMag reader that connects to your PC with Gb or 10Gb Ethernet.

Sensor Characteristics:

Phantom UltraHigh-Speed Cameras are based on a Vision Research designed **custom CMOS sensor**. The **28 micron pixel size means high light sensitivity** and Vision Research's innovative design increases the sensitivity even more. Each pixel has a **bit depth of 12 bits** yielding 4,096 gray levels with high dynamic range. Each camera comes in monochrome and color versions.

Sensor resolution is 1280 x 800 "widescreen" format. The rectangular shape of the 1 Mpx sensor allows the user to keep moving objects in the frame longer and is compatible in aspect ratio with modern display technology. The physical size of the sensor is 35.8mm x 22.4mm.

These cameras have a **global electronic shutter** capable of exposures as fast as 1 µs on a standard camera, or, 500 ns with the export controlled FAST option, to truly **"freeze motion" and eliminate motion blur** in the most demanding of applications.

Connectivity:

The Phantom v2511, v2011, v1611 & v1211 are **our most "connected" cameras ever!**

On the back panel of the camera you will find:

1 Trigger BNC
(trigger the camera on either a rising or falling TTL signal)

2 F-SYNC BNC
(as an output, this provides a frame sync signal to slave cameras, as an input, the camera is slaved to an external frame sync signal)

www.adept.net.au

3 **Timecode In BNC (IRIG, SMPTE)**

4 **Timecode Out BNC (IRIG, SMPTE)**

5 **Power Switch**

6 **HD-SDI 1 BNC**

7 **HD-SDI 2 BNC**

8 **10Gb Ethernet** (UTP copper interface, RJ45 connector)

9 **1Gb Ethernet**

10 **Primary DC Power** (20 - 28VDC)

11 **Backup DC Power**

12 **GPS** (input GPS time, location from an external GPS receiver)

13 **Range Data** (input azimuth and elevation data from a tracker)

14 **Remote Control Port**

15 **Capture Port**

The two HD-SDI ports can be configured in several ways. The two ports can act as identical 4:2:2 HD-SDI ports where one port can be set up to provide an (optional) on-screen display for monitoring the on-camera controls and camera operation. Or, they can be configured as a "single" 4:4:4 Dual-Link HD-SDI port.

Command & Control:

You can set up and control your Phantom camera using several different tools.

A convenient way to use your Phantom ultrahigh-speed camera is with the standard **on-camera controls**. Simply connect a video monitor to the camera and use the intuitive user interface to control most common camera settings.

Our **Phantom Camera Control (PCC) software** is full-featured and easy to use. Set up and control one or many cameras from a single interface with easy access to even the most complex camera features. PCC even has a basic motion analysis and measurements package built-in.

PCC also connects to our Phantom CineStation for offline work with our popular CineMag storage devices. View, trim, and save slow-motion movies based on Phantom cine raw files into a variety of formats.

The **Phantom Remote Control Unit** (RCU) is a small full-featured camera controller that connects to the Remote port on the camera (or connects via Bluetooth to using a Bluetooth adapter on the camera for wireless control). The bright LCD touchscreen gives you access to all popular camera features with the tap of a finger. Connect the RCU to one of the HD-SDI video ports and use it as a monitor, too!

LabView and Matlab development environments are also available.

Environmental Specs:

Operating Temperature:	-10 to +50 C
Storage temperature:	-20 to + 70 C
Humidity:	95% non-condensing
Altitude:	
Operational	0 to 10 k feet above sea level
Non-Operational	-500 to 50 k feet above sea level
Magnetic Field Immunity:	500 amp-meter
Regulatory:	EMI/RFI
Emissions	EN 55022, FCC part 15
Conducted	EN 55022
Immunity	EN 55024
ESD	IEC 61000-4-2
Random Vibration:	
Operational	0.25G, 5 −500 − 5Hz,
	1.0 Octave/min 10 Sweeps
	(5 Cycles).
Non-Operational	1.2G, 5 – 500Hz,
	1.0 Octave/min 10 Sweeps
Shock:	
Operational	5.5G, 11mSec half-sine with
	10 shocks in all axis.
Non-Operational	33G, 11mSec half-sine with
	10 shocks in all axis
Natural Frequency:	Operational 5-200 Hz
Safety:	IEC 60950

www.adept.net.au

Advanced Features:

- **Image-Based Auto-Trigger:** trigger the camera (or even a number of connected cameras) from motion detected within the live image. This makes it easier to catch events that are not predictable and may occur infrequently.

- **Internal Mechanical Shutter:** all digital high-speed cameras require an occasional black reference if they are to provide the highest quality images. A black reference is obtained by sampling a perfectly black image. With an internal mechanical shutter, the black frame can be obtained by simply closing the shutter. No physical access to the camera is needed.

- **Multi-Cine:** partition internal memory into segments and make shorter recordings back-to-back without missing any action.

- **Continuous Recording:** Do you need to record many occurrences of an event, especially an event that happens rarely or is unpredictable? Continuous recording is a mode that automatically saves a recorded cine to a disk drive on a connected PC immediately after it is recorded then re-arms the camera and waits for the next cine to be recorded. A recording can be triggered manually, electronically from an event detection system, or even by our Image-Based Auto-Trigger. The number of recordings is limited only by the amount of disk storage you have available.

- **PIV features:** Particle Image Velocimetry and similar measurement techniques like Particle Tracking Velocimetry (PTV), Laser Induced Florescence (LIF), and Digital Image Correlation (DIC) require extremely accurate timing and the ability to take images is a very stable and predictable way. The straddle time on the v2511 and v2011 is 500 ns, on the v1611 is 525ns, and on the v1211 is 725ns.

- **Burst Mode:** Many experiments require taking images at precisely the same time during the experiment. For example, combustion studies may require images at each 1° turn in a crankshaft. Our unique burst mode allows you to trigger the camera at 0° and then take a burst of images at precise time delays.

- **Quiet Fans:** During recording, turns the fans off to eliminate vibration which might interfere with some applications, especially when image magnification is required.

Vision Research Global Support - for wherever you are

Our ultrahigh-speed camera line is supported by Vision Research's Global Service and Support network offering AMECare Performance Services from multiple sites around the globe. Maximize the value of your Phantom camera by learning more about our service and support options at www.visionresearch.com/PhantomZone

Phantom v2511, v2011, v1611 & v1211

RESOLUTION					
		v2511*	v2011*	v1611*	v1211*
H	V	Max FPS	Max FPS	Max FPS	Max FPS
1280	800	25,600	22,500	16,600	12,600
1280	720	28,500	25,100	18,400	14,000
1024	800	30,500	26,900	19,700	15,000
1024	512	47,300	41,800	30,700	23,400
896	800	33,600	29,800	21,800	16,600
768	768	39,100	34,700	25,300	19,300
640	480	69,900	62,400	45,500	34,700
512	512	75,400	67,700	49,100	37,500
512	384	99,500	89,000	65,000	49,600
384	256	170,600	154,200	112,300	85,700
256	256	205,000	187,200	135,400	103,600
256	128	375,700	343,500	253,000	193,900
128	64	764,700	708,800	538,400	415,500
128	32	1,000,000	1,000,000	840,000	653,000
128	16	1,000,000	1,000,000	1,000,000	820,000

*Assumes FAST option is installed

Maximum v2511 standard: 677,000 fps
Maximum v2011 standard: 666,000 fps
Maximum v1611 standard: 646,000 fps
Maximum v1211 standard: 570,000 fps

v2511 - v2011 - v1611 - v1211 ISO		
	T (Tungsten)	D (Daylight)
Monochrome	100,000	32,000
Color	10,000	6,400

Focused

Since 1950, Vision Research has been shooting, designing, and manufacturing high-speed cameras. Our single focus is to invent, build, and support the most advanced cameras possible.

VISION
RESEARCH

AMETEK®
MATERIALS ANALYSIS DIVISION