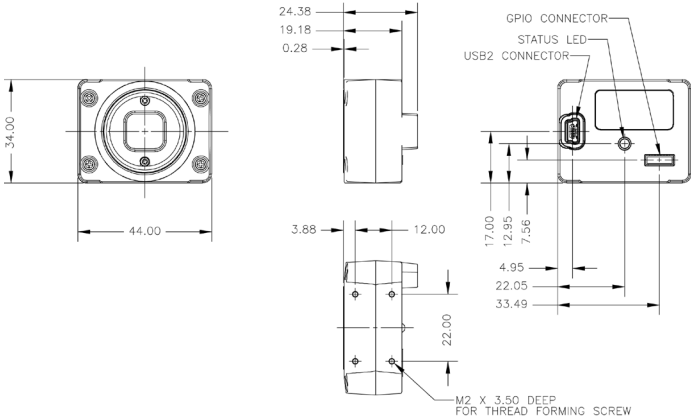


## Development Kit Contents

First time users of the *Firefly*® MV USB 2.0 camera will receive a development kit at no charge upon request (Limit one free kit per customer)

- 2 meter USB 2.0 cable (Type A to Mini-B 5 pin)
- ACC-01-3002: GPIO wiring harness
- Firefly MV Getting Started Manual
- *FlyCapture*® SDK (C/C++ API and device drivers) CD

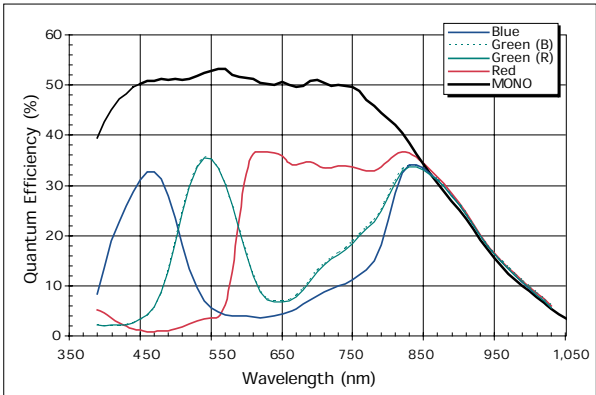
## Physical Dimensions



## Camera Specifications

Specification	Description
Overview	Small format case enclosed USB 2.0 digital camera
Imaging Sensor	Micron MT9V022 1/3" progressive scan CMOS
Active Pixels	Wide-VGA 752x480
Shutter Type	Global shutter using Micron TrueSNAP™ technology
A/D Converter	On-chip 10-bit analog-to-digital converter
Video Data Output	8 and 16-bit digital data (see <i>Supported Data Formats</i> below)
Standard Resolutions	640x480
Frame Rates	60, 30, 15, 7.5 FPS
Partial Image Modes	Pixel binning and region of interest modes available via Format_7
Interfaces	5-pin USB 2.0 for camera control and video data transmission 4 general-purpose digital input/output (GPIO) pins
Voltage Requirements	8-32V
Power Consumption	Less than one (1) Watt
Gain	Automatic/Manual Gain modes 0 to 12 dB
Shutter	Automatic/Manual Shutter modes 0.12 ms to 66.6 ms @15 FPS
Gamma	0 (linear) or 1 (12-bit to 10-bit companding mode)
Trigger Modes	DCAM v1.31 Trigger Modes 0 and 3
Signal To Noise Ratio	Greater than 50dB at minimum gain
Dimensions	44 mm x 34 mm x 19 mm (W x H x D)
Mass	32 g (with housing)
Emissions Compliance	Complies with CE rules and Part 15 Class B of FCC Rules
Operating Temperature	Commercial grade electronics rated from 0° to 45°C
Storage Temperature	-30° to 60°C
Warranty	1 year

## Spectral Response (QE)



## Status LED

LED Status	Description
Steady on	Camera receiving power and initialized
Steady on and very bright	Camera acquiring and transmitting images
Flashing bright, then brighter	Camera registers being accessed
Steady or slow flashing on and off	Firmware updated, or possible camera problem (power cycle)

## Camera Features

### Image Acquisition

Feature	Description
Global Shutter	Photodiode pixels with simultaneous integration and readout
Near-IR Performance	Enhanced performance provides NIR QE greater than 35%
Auto Exposure Control	Ensures optimal auto settings of shutter and gain for each image
Fast Frame Rates	Faster standard frame rates up to 60 FPS
Partial Image Modes	Format_7 modes for fast frame rates and higher signal-to-noise
Multiple Trigger Modes	Standard external trigger mode, skip frames mode
Gain and Brightness	Adjust gain and black clamp via a 10-bit A/D converter

### Image Processing

Feature	Description
ADC On-Chip	10-bit linear or 12-bit to 10-bit companding mode via Gamma
Image Flip	Horizontal image flipping (mirror image)

### Camera and Device Control

Feature	Description
Memory Channels	Non-volatile storage of camera default power-up settings
Strobe Output	Strobe output with configurable delay and duration
Absolute Value Controls	Shutter and gain reported in real-world units (seconds and dB)
Camera Upgrades	Firmware upgradeable in field via USB 2.0 interface.

## Image Formats

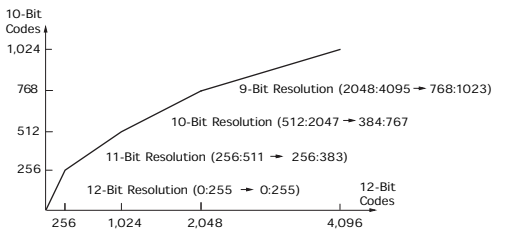
Standard Modes	Frames Per Second					
	1.875	3.75	7.5	15	30	60
640x480Y8 (8bpp)			•	•	•	•
640x480Y16 (16bpp)			•	•	•	

(Format\_7 Partial Image Modes)

Mode	Pixel Format	Size	FPS	Description
0	Mono8 (8bpp)	752x480	63	Region of interest (ROI)
0	Mono8 (8bpp)	320x240	125	Region of interest (ROI)
0	Mono8 (8bpp)	160x120	210	Region of interest (ROI)
1	Mono8 (8bpp)	320x240	135	2x2 pixel binning
2	Mono8 (8bpp)	640x240	135	1x2 pixel binning

## 12-bit to 10-bit Companding

A gamma value of 0 yields a linear response; a value of 1 puts the camera into 12-bit to 10-bit mode. This mode allows higher ADC resolution (12 bits) for low-level signals (shadow details) and lower ADC resolution (9 bits) for high-level signals (highlight details).



## Camera Interface

### USB 2.0 Connector

The *Firefly*® MV has a standard USB 2.0 connector that is used for data transmission, camera control and powering the camera.

### Cables

The maximum USB 2.0 cable length between any USB node (e.g. camera to PCI card, card to hub, etc.) is 5.0 m, as specified by the USB 2.0 standard. Use standard, shielded twisted pair copper cables.

### General Purpose I/O Connector

The *Firefly* MV has a 7-pin GPIO connector on the back of the board. The connector is made by JST (Mfg P/N: BM07B-SRSS-TB). The Development Kit contents include a pre-wired female connector; refer to the diagram below for wire color-coding. Additional female connectors (Mfg P/N: SHR-07V-S-B) can be purchased from Digikey (P/N: 455-1382-ND).

Diagram	Pin	Function	Description
	1	Vext	Allows the camera to be powered externally. Voltage limit: 8 to 30V . Current limit: 1A
	2	+3.3V	Power external circuitry up to a total of 150mA
	3	IO0	Input / Output (Default Trigger_Src)
	4	IO1	Input / Output
	5	IO2	Input / Output
	6	IO3	Input / Output
	7	GND	Input / Output
To configure the GPIO pins, consult the "General Purpose Input / Output" section of the PGR IEEE-1394 Digital Camera Register Reference.			

The *Firefly* MV GPIO pins are TTL 3.3V pins. **Inputs** can be configured to accept external trigger signals. When configured as inputs, the pins are internally pulled high using weak pull-up resistors to allow easy triggering of the camera by simply shorting the pin to ground (GND). Inputs can also be directly driven from a 3.3V or 5V logic output. The inputs are protected from both over and under voltage. It is recommended, however, that they only be connected to 5V or 3.3V digital logic signals. **Outputs** can be configured to send an output signal or strobe pulse. When configured as outputs, each line can sink 10mA of current.

# 1 Installation

## 1. Recommended System Configuration

- Windows XP Service Pack 1
- 512MB of RAM
- Intel Pentium 4 2.0GHz or compatible processor
- AGP video card with 128MB video memory
- Microsoft Visual C++ 6.0 (to compile and run example code)
- FlyCapture SDK v1.8 or later



## 2. Electrostatic Precautions and Camera Care

- Users who have purchased a bare board camera should:
  - Either handle bare handed or use non-chargeable gloves, clothes or material. Also use conductive shoes.
  - Install a conductive mat on the floor or working table to prevent the generation of static electricity.
- When handling the camera unit, avoid touching the lenses. To clean the lenses, use a standard camera lens cleaning kit or a clean dry cotton cloth. Do not apply excessive force.
- To clean the imaging surface of your CCD, follow the steps outlined in [www.ptgrey.com/support/kb/index.asp?a=4&q=66](http://www.ptgrey.com/support/kb/index.asp?a=4&q=66).
- Extended exposure to bright sunlight, rain, dusty environments, etc. may cause problems with the electronics and the optics of the system.
- Avoid excessive shaking, dropping or mishandling of the device.

# 2 Installation

## 3. Install the FlyCapture® Software and Drivers

- Insert the software CD-ROM. If the Installation Wizard does not automatically run, browse to your CD-ROM directory and run *setup.exe*.
- Follow the installation instructions to install the software.

## 4. Installing the Tripod Mounting Bracket (optional)

- The mounting bracket for the *Firefly® MV* attaches to the camera using the included M2 screws.

## 5. Connect the USB 2.0 Cable to the Camera

- Plug the 2 meter, 5-pin, USB 2.0 cable into the *Firefly MV* USB 2.0 connector.
- If the Microsoft Windows “Found New Hardware Wizard” appears, proceed to Step 6. Otherwise, proceed to Step 7

# 3 Installation

## 6. Install the PGRUSB Driver

- Click “Install from a list or specific location” and click “Next”.
- Select “Don’t search. I will choose the driver to install” and “Next”.
- Click “Have Disk” and browse to C:\Program Files\Point Grey Research\PGR FlyCapture\driver, click “Open”, then “OK”.
- Select the camera model and click “Next”.
- You will be prompted to continue installation - click “Continue Anyway” then “Finish” to complete installation.

## 7. Confirm Successful Installation

- Check the Device Manager to confirm that installation was successful. Go to the *Start* menu, select *Run* and enter “devmgmt.msc”. Verify the camera is listed under “Point Grey Research Devices”.
- To test the camera’s image acquisition capabilities, run the FlyCap demo program. From the *Start* menu, select *All Programs > Point Grey Research > PGR FlyCapture > FlyCap.exe*.

# 4 Troubleshooting

The FlyCapture® User Guide and other technical references can be found in the *Programs > Point Grey Research > PGR FlyCapture > Documentation* directory. Our on-line [Knowledge Base \(www.ptgrey.com/support/kb/\)](http://www.ptgrey.com/support/kb/) also addresses the following problems:

- Article 21: Troublesome hardware configurations
- Article 88: Vertical bleeding or smearing from a saturated portion of an image
- Article 91: PGR camera not recognized by system and not listed in Device Manager
- Article 145: Image discontinuities or horizontal tearing of images when displayed on monitor
- Article 188: Image data acquired by my camera is corrupt and displayed images are broken
- Article 189: Image capture freezes after a period of successful image capture.
- Article 197: Extending the distance between a PGR camera and the controlling host system.
- Article 309: Use USB 2.0 PCI host adapter cards with USB cameras

## Contacting Point Grey Research

- Email:** For all general questions about Point Grey Research please contact us at [info@ptgrey.com](mailto:info@ptgrey.com).
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+1 (866) 765-0827  
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**Email:** [sales@ptgrey.com](mailto:sales@ptgrey.com)
- Knowledge Base:** Find answers to commonly asked questions in our knowledge base at <http://www.ptgrey.com/support/kb/>.
- Downloads:** Users can download the latest manuals and software from <http://www.ptgrey.com/support/downloads/>.



POINT GREY  
RESEARCH

## Firefly® MV

USB 2.0 Digital Camera System



Getting Started  
Manual

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