
INSITE PACIFIC Inc.

IMAGING SYSTEMS FOR HARSH ENVIRONMENTS

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TECHNICAL MANUAL

MINI ZEUS MARK II

COMPACT, HIGH DEFINITION,
UNDERWATER COLOR TELEVISION CAMERA

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PROPRIETARY INFORMATION STATEMENT:

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INSITE PACIFIC, hereinafter referred to as the COMPANY, provides the following warranty for its products:

The COMPANY agrees to correct, either by repair or replacement, at the sole discretion of the COMPANY, any defect in material or workmanship that occurs within one year after the delivery of any standard product to the original purchaser of the equipment. This is provided that investigation and inspection by the COMPANY reveals that the equipment was used under normal operating conditions. All shipping and associated costs for sending the cameras to the COMPANY and sending them back to the Customer are to be paid for by the Customer.

Exceptions and conditions of the warranty are as follows:

- a. The warranty shall be void if repairs and/or modifications are made by any persons other than COMPANY employees or duly authorized COMPANY service personnel, unless such repairs are made with the prior written consent of the COMPANY.
- b. In the event of a product failure and the customer fails to take prompt reasonable action to prevent further damage to the product, the COMPANY will not be held responsible for any further damage.
- c. The COMPANY does not accept any liability concerning any consequential or incidental damage of any sort that occurs as the result of the operation, repair, and/or maintenance of its products.
- d. This warranty shall be governed by the laws of the state of California within the United States of America.

CUSTOMER SERVICE

This product has undergone mechanical and electrical testing to insure that all specifications have been adhered to. Should you have any difficulty regarding the operation, maintenance or repair of this camera please contact INSITE PACIFIC customer service department at the below address or one of its authorized service centers.

RETURN OF EQUIPMENT FROM FOREIGN LOCATIONS

In the event equipment is required to be returned to INSITE PACIFIC from foreign locations, the following information must be provided on all invoices and shipping documents.

The original purchase order should be provided on any shipping documents or declarations. The shipment is to be consigned to:

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DECLARATION

I, _____, DECLARE THAT THE ARTICLES SPECIFIED HEREIN ARE TO THE BEST OF MY KNOWLEDGE AND BELIEF, ARE THE PRODUCT OF THE UNITED STATES AND THAT THEY WERE EXPORTED FROM THE PORT OF _____ ON OR ABOUT _____ 20____; THAT THEY ARE BEING RETURNED WITHOUT HAVING BEEN INCREASED IN VALUE OR IMPROVED IN CONDITION BY ANY PROCESS OR OTHER MEANS.

INTRODUCTION:

This manual provides the necessary information for the operation of this camera. The manufacturer assumes no liabilities for repairs or adjustments made to this camera other than by duly authorized personnel.

The information in this manual is believed to be accurate and reliable. The manufacturer assumes no responsibility for its use.

INSITE PACIFIC reserves the right to change or modify designs or specifications as part of its continuing product improvement.

Product Description:

The Mini Zeus Mark II is a compact, high definition, color, zoom, underwater TV Camera. The camera is housed in an aluminum or titanium housing incorporating a quadruplet corrective optics lens system. The quadruplet lens maintains the performance of the zoom lens while taking images underwater.

The Mini Zeus Mark II Camera is capable of outputting HD component video, NTSC & PAL composite video, and HD-SDI video all out of the same camera. The camera can be configured for either an electrical or fiber optic 3G-SDI/HD-SDI video output. The 3G-SDI/HD-SDI fiber optic signal would be at a CWDM compatible wavelength and use single mode fiber optic cable. Transmission of the 3G-SDI/HD-SDI video signal at distances greater than 30km are possible when the camera is configured for a fiber optic output.

The Mini Zeus Mark II Camera can be configured for various video output formats, focus/iris/zoom control voltages, white balance settings, and RS232 or RS485 communication.

Camera Control Using Insite Pacific's Camera Control Unit:

Insite Pacific's Lens Control Unit provides control of focus (near/far & auto/manual), iris (open/close & auto/manual), and zoom (tele/wide) via an RS232 or RS485 output from the control unit. The baud rate for camera communication is 38.4k baud and is not adjustable. Serial communication between the control unit and camera is based on Sony's Visca Protocol. The control unit can be directly replaced by a computer running Sony's GUI for the FCB-EV7100 Camera Module.

The same circuit board is used in the Camera and in the Control Unit. When Insite's Camera Control Unit is used to operate the Camera, the circuit board in the control unit becomes the master board. That means that Camera settings such as the Video Mode, White Balance Settings, Focus Speed, etc. are made in the control unit. The Camera Housing does not need to be opened to make any changes in settings. The output of the control unit will not be DC voltages, but instead will be an RS232 or RS485 signal. When the Camera is operated without Insite's Control Unit and is controlled via DC voltages for focus, zoom, and iris the Camera Housing will have to be opened to make any settings changes.

It is very important that the control unit is powered up either at the same time as the camera or after the camera has been powered up. The microcontroller in the control unit sends initial camera settings only once, when the control unit is powered up.

The focus near/far control is referred to as positional control. The dc voltage fed by the focus slider control corresponds to a particular focus setting on the camera's lens.

The focus auto/manual switch is an illuminated, locking, pushbutton type switch. When the switch is in the up position the focus is set to auto-focus and the led on the switch will be off. When the switch is in the down position the focus is set to manual-focus and the led on the switch will be illuminated.

The zoom control is referred to as rate control. The further that the joystick is pressed in either the tele or wide direction, the faster the lens will zoom in or out.

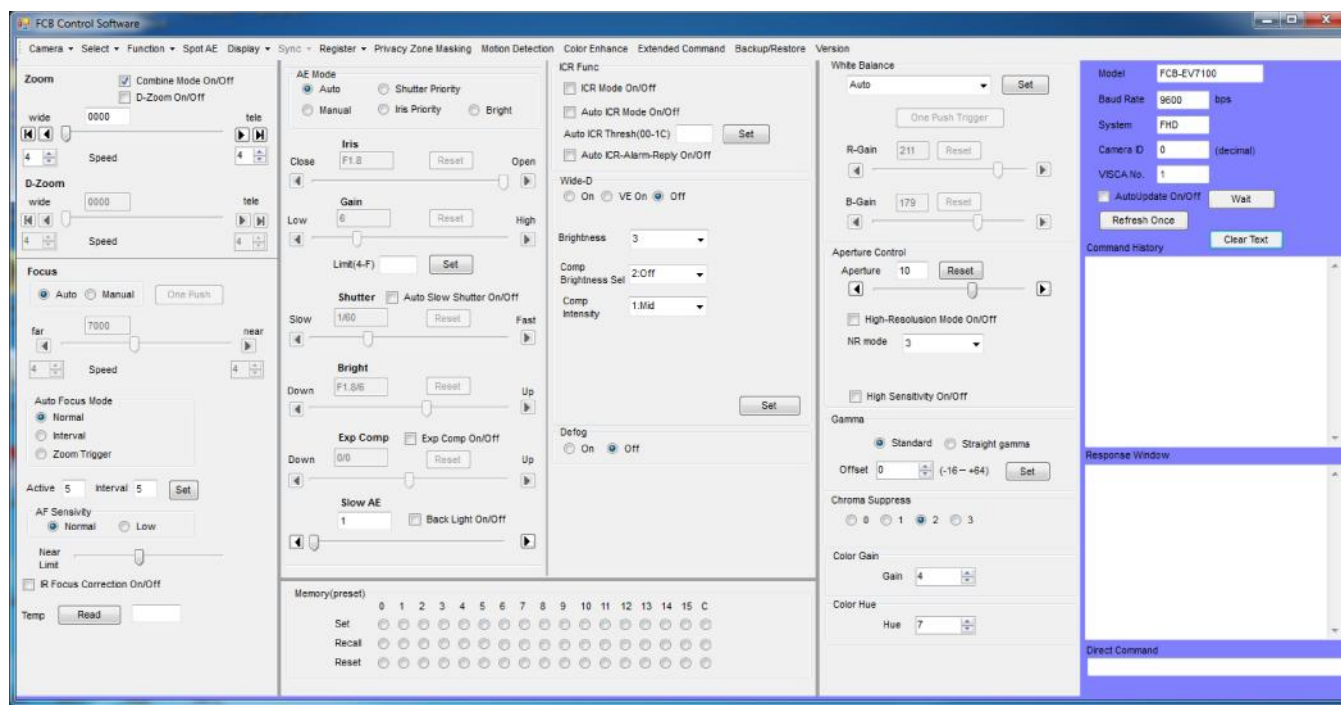
The iris open/close control is referred to as positional control. The dc voltage fed by the iris rotary control corresponds to a particular iris setting on the camera lens.

The iris open/close switch is an illuminated, locking, pushbutton type switch. When the switch is in the up position the iris is set to auto-iris and the led on the switch will be off. When the switch is in the down position the iris is set to manual-iris and the led on the switch will be illuminated.

DC voltages representing actual Zoom, Focus, and Iris lens positions (supplied by the camera) are output from the control unit. Focus position has a voltage range of 0VDC (= far) to 5VDC (= near). Zoom position has a voltage range of 0VDC (= wide) to 5VDC (= tele). Finally, Iris position has a voltage range of 0VDC (= close) to 5VDC (= open).

Camera Control Using Sony's GUI or VISCA Serial Protocol:

See the Sony Operation Manual for the FCB-EV7100 Camera Module for detailed information on various camera settings/controls and for VISCA Serial Protocol information. Below is a screen capture of Sony's GUI. The default baud rate when using Sony's GUI is 9600 baud.



Circuit Board Settings:

Many of the circuit board settings are made with Solder Jumpers. See the drawings “Top Side Jumper & Switch Locations” and “Bottom Side Jumper & Switch Locations” for more information. The Video Mode, White Balance, and one Push White Balance settings are made with switches.

1) Focus, Iris, and Zoom Routing (Jumpers SB1, SB3, SB4, SB5, SB7, SB8, & SB12)

These jumper settings route the focus, iris, and zoom control voltages based on whether the control voltages are 1Vdc – 4Vdc linear voltages (used in the Control Unit) or bipolar / tri-state control voltages. These jumpers are not necessary when the camera is controlled through either an RS232 or RS485 serial link.

Solder Jumper	SB1	SB3	SB4	SB5	SB7	SB8	SB12
Linear Control Voltages	1 - 2	1 - 2	1 - 2	1 - 2	1 - 2	1 - 2	1-2
Bipolar / Tri-State Control Voltages	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3	2 - 3	OPEN

2) Focus, Iris, and Zoom Command Voltages (Jumpers SB2, SB6, SB9, SB13, & SB16)

These jumper settings are used when single wire focus, iris, and zoom control voltages of 0VDC/12VDC, 0VDC/24VDC, +6VDC/-6VDC, and +12VDC/-12VDC are applied. They apply a reference voltage to the optoisolator input when two wire control isn't used. Do not install any of these jumpers when linear control voltages or two wires are used for focus, iris, and zoom control. These jumpers are not necessary when the camera is controlled through either an RS232 or RS485 serial link.

Solder Jumper	SB2	SB6	SB9	SB13	SB16
0V & +12V	1 - 3	1 - 3	1 - 3	1 - 3	1 - 3
0V & +24V	1 - 2	1 - 2	1 - 2	1 - 2	1 - 2
+6V / -6V	1 - 4	1 - 4	1 - 4	1 - 4	1 - 4
+12V / -12V	1 - 4	1 - 4	1 - 4	1 - 4	1 - 4

3) RS232, RS485, and DC Voltage Signal Routing (Jumpers SB10, SB11, SB14, SB15, SB17, SB18, SB19, SB20, SB21, SB22)

These jumper settings are to configure the input and output path of the microcontroller depending on whether RS232 or RS485 comm's are used or if DC voltages are used for focus, zoom, and iris control.

NOTE: The camera can't be configured for both DC voltage and RS232/RS485 camera control at the same time. The camera must be configured for either one mode or the other.

Solder Jumper	Camera Board RS232 Comm's	Camera Board RS485 Comm's	Camera Board DC Voltage Control	Control Unit Board RS232 Comm's	Control Unit Board RS485 Comm's
SB10	OPEN	OPEN	OPEN	1 - 2	2 - 3
SB11	OPEN	OPEN	OPEN	1 - 2	2 - 3
SB14	OPEN	2 - 3	1 - 2	OPEN	OPEN
SB15	OPEN	2 - 3	1 - 2	OPEN	OPEN
SB17	OPEN	OPEN	OPEN	1 - 2	OPEN
SB18	1 - 2	2 - 3	OPEN	1 - 2	2 - 3
SB19	1 - 2	2 - 3	2 - 3	OPEN	OPEN
SB20	OPEN	OPEN	OPEN	1 - 2	OPEN
SB21	1 - 2	2 - 3	2 - 3	OPEN	OPEN
SB22	1 - 2	2 - 3	OPEN	1 - 2	2 - 3

4) Focus and Zoom Speed (Jumper SB23)

This jumper will set the Focus and Zoom Speeds to either the factory default settings or to Slow Focus & Zoom Speeds. These jumper settings have no affect when the camera is controlled through either an RS232 or RS485 serial link.

Solder Jumper	SB23
Factory Default Speed	OPEN
Slow Focus & Zoom Speed	1 - 2

5) Video Mode Switch (Switch SW1)

Switch SW1 selects the video output format of the camera module. High Definition formats of 1080p/59.94, 1080p/50, 1080p/29.97, 1080p/25, 1080i/59.94, 1080i/50, 720p/59.94, 720p/50, 720p/29.97, and 720p/25 as well as Standard Definition formats of NTSC and PAL are selected via this switch. When the camera is set to one of the High Definition formats, the Standard Definition formats are not output from the camera. Also, when the camera is set to one of the Standard Definition formats, the High Definition formats are not output from the camera. Standard Definition Video is output in the Composite Video, 4:3 format. Please note that the Standard Definition video is only output as an analog signal. These switch settings have no affect when the camera is controlled through either an RS232 or RS485 serial link.

SWITCH POSITION	1080p /59.94	1080p /50	1080p /29.97	1080p /25	1080i /59.94	1080i /50	720p /59.94	720p /50	720p /29.97	720p /25	NTSC	PAL
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
5	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
6	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
7	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
9	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
10	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
11	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
12	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Following is the procedure to make changes is the video output signal.

- A) With the Camera and Control Unit turned off, set Switch SW1 to the desired video output.
- B) Power up the Camera and Control Unit and wait for approximately 5 seconds. This loads the desired video output mode into the register of the Camera Module.
- C) Turn off power to the Camera and the Control Unit.
- D) Finally, power up the Camera and the Control Unit and the video output will now match the desired setting on Switch SW1.

6) White Balance Setting (Switch SW3)

There are five different White Balance Settings that are selectable by Switch SW3. These switch settings have no affect when the camera is controlled through either an RS232 or RS485 serial link.

Auto (AWB): This mode computes the white balance value output using color information from the entire screen. It outputs the proper value using the color temperature radiating from a black subject based on a range of values from 2500K to 7500K. This mode is the factory default setting.

One Push WB: The One Push White Balance mode is a fixed white balance mode that may be automatically readjusted only at the request of the user by momentarily pressing pushbutton switch SW2, assuming that a white subject, in correct lighting conditions, and occupying more than 1/2 of the image, is submitted to the camera. One Push White Balance data is lost when the power is turned off. If the power is turned off, reset One Push White Balance.

5800K: This setting is for lighting that is the color temperature of bright sunlight.

3200K: This setting is for Tungsten Halogen lighting.

Auto Tracing (ATW): Will automatically adjust the white balance using the brightest object in the scene as white. It has a range of 2000K to 10000K. Incorrect white balance settings can occur, especially if looking at scene with a single color in it such as green. The white balance will shift more towards the red.

SWITCH POSITION	AUTO (AWB)	ONE PUSH WB	5800K	3200K	AUTO TRACING (ATW)
1	OFF	ON	OFF	OFF	OFF
2	OFF	OFF	ON	OFF	OFF
3	OFF	OFF	OFF	ON	OFF
4	OFF	OFF	OFF	OFF	ON

7) One Push (WB) White Balance (Switch SW2)

To use the One Push White Balance function, Switch SW3 must be set to the "ONE PUSH WB" setting (SW3 switch position 2 turned on, all other switches turned off). The One Push White Balance mode is a fixed white balance mode that may be automatically readjusted only at the request of the user by momentarily pressing pushbutton switch SW2, assuming that a white subject, in correct lighting conditions, and occupying more than 1/2 of the image, is submitted to the camera. One Push White Balance data is lost when the power is turned off. If the power is turned off, reset One Push White Balance. This switch will have no affect when the camera is controlled through either an RS232 or RS485 serial link.

Comprehensive Specifications:

Electrical:

Image Sensor:	1/2.8 Type "Exmor" CMOS Sensor
Picture Elements	2,380,000 effective pixels
HD Video Formats:	1080p/59.94, 1080p/50, 1080p/29.97, 1080p/25, 1080i/59.94, 1080i/50, 720p/59.94, 720p/50, 720p/29.97, and 720p/25
SD Video Formats:	NTSC & PAL (Composite; 4:3 aspect ratio)
Minimum Illumination:	0.35 lx (1/30 sec, 50%,High Sensitivity mode ON) 1.4 lx (1/30 sec, 50%, High Sensitivity mode OFF) 0.05 lx (1/4 sec, 1/3 sec, 50%, High Sensitivity mode ON) 0.19 lx (1/4 sec, 1/3 sec, 50%, High Sensitivity mode OFF)
Recommended Illumination:	100 lx to 100,000 lx
Signal to Noise	50db minimum
Camera Power:	15 - 30 VDC at nominal 300mA
White Balance:	Auto, 3200K, 5800K, ATW, One Push WB

Mechanical:

Depth:	Refer to installation drawing.
Size:	Refer to installation drawing.
Housing Material:	Refer to installation drawing.
Pressure Window:	Optically Polished Hemispherical Precision Glass.
Connector:	Customer specified.

Environmental:

Operating Temp:	-5°C (23°F) to 60°C (140°F)
Storage Temp:	-20°C (-4°F) to 60°C (140°F)