Optim SeaCam®

Operator's Manual

DeepSea Power & Light

A division of SeeScan, Inc.

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www.deepsea.com

WARNING!

Read this Operator's Manual carefully before using this product. Failure to understand and follow the contents of this manual may result in electrical shock, fire, and/or serious personal injury.

For support and additional information about using your DeepSea product, go to www.deepsea.com/support or scan this QR code.

DeepSea Power & Light reserves the right to make changes to the design and/or the specifications of this product at any time and without prior notice. Changes made in this way come without obligation to update units already in operation. This Operator's Manual may also be changed without prior notice. The latest documentation for your product can be downloaded from www.deepsea.com/support.

Table of Contents

Read This First!

Users and operators of the Optim SeaCam should read and understand the information in this section of the manual in order to be familiar with important warnings, hazards, and maintenance requirements.

Safety Symbols

In this manual, safety symbols and signal words are used to communicate important safety information. This section is provided to improve understanding of these signal words and symbols.

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE indicates information that relates to the protection of property or proper function of the device.

This symbol means read the operator's manual carefully before using the equipment. The manual contains important information on the safe and proper operation of the equipment

This symbol means always wear safety glasses with side shields or goggles when handling or using this equipment to reduce the risk of eye injury

This symbol indicates the risk of electrical shock.

This symbol indicates the risk of explosion.

General Safety Rules

Read all safety warnings and instructions. Failure to follow the warnings and instructions may result in electrical shock, fire, explosion, and/or serious injury.

DANGER

High Voltage Equipment

Do not operate any high voltage equipment in or around water without using a Ground Fault Circuit Interrupter (GFCI) and an isolation transformer, especially when divers are in the water.

WARNING

Improper Use and Handling

- Whenever possible, subsea electronic systems should be connected to either an active or passive cathodic protection system such as a network of anodes to prevent corrosion of critical components when deployed.
- This product can be configured with a variety of standard pinouts and will be shipped with a pinout label identifying the connector type and the internal connections of power and control signals. Always check the pinout of the unit against the system specifications prior to installation.
- This product operates on low voltage DC power anywhere from 10V DC up to 36V DC. Connecting the unit to a power source outside this range may result in malfunction or damage to the item.
- Never place the pressure housing in a vice or other hard clamping tool unless explicitly instructed to do so in this manual. Should it become necessary to hold onto the unit tighter than can be managed by hand, use a clean and good quality strap wrench.

DANGER

Flooded Housing

A flooded or partially flooded housing presents a significant hazard of both electrical shock and explosion. Water in contact with internal electronics may short to the housing, exposing users to potentially dangerous voltages. It is also possible that water in contact with internal electrical circuits may electrolyze, producing an explosive mixture of hydrogen and oxygen gasses trapped inside the pressure vessel.

For safety reasons, always assume the HD Camera has flooded and take necessary precautions if it stops working underwater. When working with a potentially flooded HD Camera, it is important to use appropriate personal protective equipment (PPE) to include, at a minimum, eye and hand protection and protective clothing.

Follow these steps if the pressure housing becomes flooded or is suspected of flooding:

1. Immediately power off the unit.
2. Put on appropriate PPE, including protective clothing, eye protection, and protective gloves.
3. Relieve any internal pressure by venting the pressure relief valve (PRV) or loosening the bulkhead connector from the unit.
4. Remove the rear endcap retaining ring and then lever the endcap off with a flat blade screwdriver using the groove just forward of the connector mating surface. The endcap should separate in a smooth linear motion. No twisting is necessary.
5. Pour out any water trapped inside the housing.
6. If the unit is completely flooded, rinse the internal components with clean, fresh water in order to minimize contamination and corrosion damage.
7. Allow parts to dry in air or in an oven set to 60°C (140°F).

WARNING

Field Service and Modification

Except when specifically instructed, this product does not require the user to open the pressure volume or break the factory-validated high-pressure seals to operate. Opening the pressure volume invites the risk of contamination of the high-pressure seal surfaces which may result in water intrusion and failure.

This product is configured for optimal function at the factory. Opening and modifying any of the factory configured hardware, such as the lens assembly, can affect focus and imaging performance. Access to or modification of the internal components should not be attempted without the guidance of a qualified service representative.

NOTICE

Proper Cables and Interconnects

This product transmits data over high-speed serial interfaces using controlled impedance transmission lines such as 75Ω coax and 100Ω differential pairs. Use of controlled impedance connectors and cables designed for subsea applications is critical to the proper operation of the unit.

Changing Factory Settings

This product is configured for optimal function at the factory. Carefully read through the sections of this manual describing the serial control interfaces and online user interface before making changes to the unit and heed warnings about settings that should not be modified.

Pre and Post Dive Inspection

Before deployment, always check to make sure the bulkhead connector assembly is secure.

Prior to and following each deployment, perform a visual inspection of the following areas for damage, wear, or corrosion:

- Bulkhead connector assembly
- Interconnect cable
- Optical port
- Port retainer and pressure housing

Rinse the unit with fresh water after use, especially in saltwater environments.

Customer Service

DeepSea Power & Light provides service to our global customers through our Service and Repair department. Contact DeepSea Support with comments, suggestions, feedback or to request service or support for your product.

To learn more about this product, along with the other products and services provided by DeepSea Power & Light, please visit www.deepsea.com or reach out to us at support@deepsea.com.

Configuration

The Optim SeaCam delivers high quality 4K/UHD video along with a 15x optical zoom range with custom water-corrected optics. This camera is offered in three main configurations. The two SDI models provide an uncompressed 6G-SDI SMPTE compliant broadcast video signal over coax or fiber optic physical interfaces. The IP version includes a high quality onboard encoder capable of streaming low-latency h.265 and h.264 streams over an Ethernet interface. Multiple connector configurations are offered in addition to model-specific options, such as CWDM laser wavelength for SDI models or on-board recording memory size on the IP models.

Integration Options

The Optim SeaCam comes in either a coax, fiber optic, or IP model. The CX/FX models feature low latency 6G-SDI outputs in CWDM fiber optic and coax data links respectively, while the IP model enables streaming live video over an Ethernet network or capturing directly up to 1 TB onboard memory.

NOTICE

Bulkhead Connector Selection

Regardless of the housing configuration, bulkhead connectors should be chosen that meet or exceed the housing's operating depth limits. **If a customer-specified connector does not meet the housing's pressure rating, the connector will limit the camera's factory certified depth rating.**

Power Input Options

The Optim SeaCam provides a wide range, 10-36 VDC discrete voltage input drawing a maximum 10 W of power (coax) or 12 W (fiber optic and IP). The control interface signals are internally referenced to the DC reference voltage of the power supply.

Signal Format Options

The Optim SeaCam is based on a Sony FCB-ER8530 zoom block camera module. In addition to the custom corrector optics, which allow the camera to produce sharp imagery underwater, and Titanium housing enabling reliable operation at any depth, the Optim SeaCam integrates multiple interface options to suit a wide range of applications.

All configurations of the Optim SeaCam feature the latest generation Sony FCB-ER8530 CMOS zoom camera block modules with two types of output video signal options available: 6G-SDI digital video or IP streaming.

Video Format Type	**6G-SDI Digital Video**		**IP Streaming**
Transmission Method	Fiber Optic	75Ω Coax	Ethernet
Video Data Format	SMPTE compliant 6G-SDI		h.264, JPEG
Date Rate	6.0 Gbps		10/100/1000 BaseT
Connector Type	Fiber Optic Bulkhead + Electrical	Subsea Coax Hybrid	Subsea Ethernet
Onboard Memory	None	None	Yes | 256 GB to 1TB
Internal Recording	None	None	Yes | Video
Input Power	10 to 36 VDC, 12W Max	10 to 36 VDC, 10W Max	10 to 36 VDC, 12W Max

Table 1 – Optim SeaCam Video Format Options

Housing Options

The Optim SeaCam is available in a robust Grade 5 titanium housing with a borosilicate glass port and can be configured for a standard 6,000 m or optional 11,000 m operating depth.

Video Signal Standards

IP Video Streaming

The IP video streaming option uses a high quality h.265 video encoder from Z3 Technologies to compress and transmit the 4K video signal via an RTSP connection on an Ethernet network. This video option works much like conventional security and surveillance cameras while providing additional features such as onboard recording, multiple video feeds, and onboard memory up to 1 TB.

For best performance and the highest reliability, subsea cables and connectors rated for CAT5e or better network applications should be used to connect the camera to a network for streaming. In non-streaming applications, the camera can be configured to start recording video and/or timelapse images as soon as power is applied. Stored video files are segmented in configurable fixed size chunks per file.

SDI Video

6G-SDI is the preferred video signal option for uncompressed high-definition digital video. The 6.0Gbps 6G-SDI output signal is compliant with the SMPTE broadcast standards and will work with almost any broadcast video equipment. DeepSea offers both conventional coax and fiber optic transmission method.

Coax

An Optim SeaCam fitted with a coax 6G-SDI output leverages the 75Ω impedance of the coaxial transmission line to send the high-speed digital data over distances extending up to 20-30 m with good subsea hybrid coax connectors. The video signal must be connected through a coax conductor all the way from source to destination for proper operation. For longer distances, a SMPTE compliant fiber optic media converter can be used to extend the signal reach to several kilometers.

Fiber Optic

The SDI version of the Optim SeaCam can also be equipped with an internal fiber optic media converter compatible with ITU-T G.694.2 compliant coarse wave division multiplexer (CWDM) devices at most standard wavelengths from 1271nm through 1611nm with 20nm channel spacings. The Optim can be equipped with both single-mode and multi-mode fiber optics penetrations depending on the application requirements. The fiber optic signals only carry the SDI video transmission and separate wired connections are needed for power and camera controls.

Catalog Configuration Reference

6G-SDI COAX Models

Example Configuration:	OSC	-2080	-CX	-TI	-RS2	-PRV	-M	-SUHF75CXBH6M/S	-06X020
MODEL	OSC = Optim SeaCam								
OPTICAL FORMAT	Dome Port, Glass 2080 = 5.7 mm to 88.4 mm, F/2.0 to F/3.8, 78° HFoV								
VIDEO SIGNAL			CX = 6G-SDI over Coax						
HOUSING				TI = Titanium 11 = 11,000 m Titanium					
CONTROL					TRI = Tristate discrete control RS2 = RS-232, Sony VISCA protocol RS4 = RS-485, Sony VISCA protocol				
PRV						DDS = DDS-T Pressure Relief Valve (standard) NON = No PRV			
BRACKET							I = Imperial 1/4"-20, Saddle		
BULKHEAD								Coax: SUHF75CXBH6M/S SubConn HF75CXBH6M Stainless Steel, 7 km ↓ 6-Pin + Coax ↓	
PINOUT	1: DC- 2: DC+ 3: N/C 4: N/C							06X020 5: ↑RxD/B+ 6: ↓TxD/A- COAX: SDI Video	*Other connector options available. Contact DeepSea Sales with inquiries for connectors and pinouts not listed.*

6G-SDI Fiber Optic Models

Example Configuration:	OSC	-2080	-FO	-TI	-RS4	-DDS	-I	-SUOPTOLINK1FO/S	-31	-SM	-SUMCBH6M/S	-06C002
MODEL	OSC = Optim SeaCam											
OPTICAL FORMAT	2080 = 5.7 mm to 88.4 mm, F/2.0 to F/3.8, 78° HFoV											
VIDEO SIGNAL			FO = 6G-SDI over Fiber									
HOUSING				TI = Titanium 11 = 11,000 m Titanium								
CONTROL					TRI = Tristate discrete control RS2 = RS-232, Sony VISCA protocol RS4 = RS-485, Sony VISCA protocol							
PRV						DDS = DDS-T Pressure Relief Valve (standard) NON = No PRV						
BRACKET							I = Imperial 1/4"-20, Saddle					
FIBER BULKHEAD								SUOPTOLINK1FO/S = SubConn, OptoLink Single Fiber BCR				
WAVELENGTH									31 = CWDM, +1.5 dB 1311 nm 55 = CWDM, +1.5 dB 1551 nm			
FIBER TYPE										SM = Single Mode MM = Multi Mode		
ELECTRICAL BULKHEAD											SUMCBH6M/S SubConn MCBH-6M ↓ 6-Pin	
PINOUT	1: DC- 2: DC+ 3: N/C										06C002 4: N/C 5: ↑RxD/B+ 6: ↓TxD/A-	*Other connector options available. Contact DeepSea Sales with inquiries for connectors and pinouts not listed.*

IP Models

	Example Configuration:	OSC	-2080	-IP	-TI	-1TB	-DDS	-I	-SUDBH8M/S	-08E021
MODEL	**OSC** = Optim SeaCam									
OPTICAL FORMAT	**Dome Port, Glass** **2080** = 5.7 mm to 88.4 mm, F/2.0 to F/3.8, 78° HFoV									
VIDEO SIGNAL	**IP** = TPC/IP Network Video Streaming									
HOUSING	**TI** = Titanium **11** = 11,000 m Titanium									
MEMORY	**NON** = No Onboard Memory **256** = 256 GB Flash Memory **512** = 512 GB Flash Memory **1TB** = 1 TB Flash Memory									
PRV	**DDS** = DDS-T Pressure Relief Valve (standard) **NON** = No PRV									
BRACKET	**I** = Imperial 1/4"-20, Saddle									
BULKHEAD	**SUDBH8M/S** SubConn DBH8M Stainless Steel, 6,000 m ↓ 8-Pin, Ethernet ↓									
PINOUT	**08E021** 1: DC- 5: TD- 2: DC- 6: TD+ 3: DC+ 7: RD- 4: DC+ 8: RD+									

Other connector options available. Contact DeepSea Sales with inquiries for connectors and pinouts not listed.

Specifications

Optical Specifications			
OSC-	**2080-CX**	**2080-FO**	**2080-IP**
Lens	5.7 mm to 88.4 mm f/2.0 to f/3.8		
Optical Zoom	15.5x		
Minimum Focus	Wide: 50 mm, Tele: 350 mm		
Field of View (Water)	Wide: 86° D x 78° H x 48° V		
Sensor and Video Format Specifications			
OSC-	**2080-CX**	**2080-FO**	**2080-IP**
Image Sensor	1/2.5” CMOS Progressive Scan		
Video Formats	**4K UHD:** 2160p/29.97, 2160p/25 **HD:** 1080p/59.94, 1080p/50, 1080p/29.97/25, 1080i/59.94/50, 720p/59.94/50/29.97/25		
Video Transmission	**4K UHD:** 6G-SDI (SMPTE ST 2081), **HD:** 3G-SDI (SMPTE 424M), HD-SDI (SMPTE 292)		**Ethernet** HEVC (h.265), AVC (h.264)
Environmental Specifications			
OSC-	**2080-CX**	**2080-FO**	**2080-IP**
Max Depth Rating	6,000 m 11,000 m (Option)		
Operating Temp	-5 °C to 40 °C [23 °F to 104 °F]		
Storage Temp	-20 °C to 60 °C [-4 °F to 140 °F]		
Mechanical Specifications			
OSC-	**2080-CX**	**2080-FO**	**2080-IP**
Housing	6Al-4V Titanium		
Optical Port	Glass Dome		
Mounting Bracket	Rugged injection molded bracket with Stainless Steel 1/4-20 threaded inserts		
Weight in Air	6.85 kg [15.1 lbs.]		
Weight in Water	2.73 kg [6.02 lbs.]		
Electrical Specifications			
OSC-	**2080-CX**	**2080-FO**	**2080-IP**
Power	10 to 36 VDC		10 to 36 VDC
Voltage	10 W Max	12 W Max	
Control	**Serial:** RS-232, RS-485 using VISCA protocol **Tristate:** Zoom, Focus, AF on-off, AWB		**Ethernet:** Virtual COM port, VISCA protocol
Standard Connector	Coax: SubConn HFCX75BH6M FleXlink: SubConn DBH8M	Electrical: SubConn DBH8M Fiber: SubConn OptoLink 1FO	SubConn DBH8M

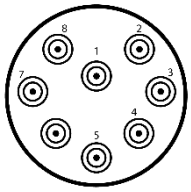
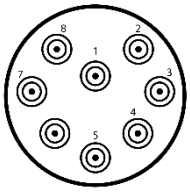
Standard Pinout Information

WARNING

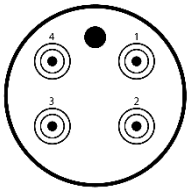
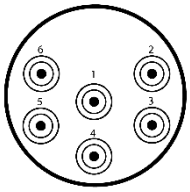
Always verify the pinout of your product against the printed pinout label or documentation supplied with your product before connecting with other systems or powering the device. If you are unsure of how your item is pinned out, contact us at support@deepsea.com and provide the model number, purchase order, and serial number of your item and we will provide a pinout drawing for your product.

The following pinouts are considered “standard” conventions by DeepSea. We strongly urge all of our customers to adhere to these conventions to avoid accident and potential injury. DeepSea is not responsible for damage caused by improper wiring, incorrect power applied to the product, or by using a non-standard pinout.

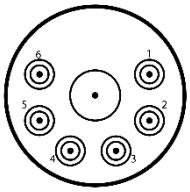
Ethernet IP Pinouts

	SubConn DBH8	**SEA-CON MCBH8M-NET**	**Schilling Robotics SEANET**
	 *MALE PIN VIEW*	 *MALE PIN VIEW*	
PIN	**Ethernet Camera Discrete Power 10/100Mbps**	**Ethernet Camera Discrete Power 10/100Mbps**	**IP Camera NIM**
1	DC-	TD-	DC+
2	DC-	TD+	DC-
3	DC+	RD-	CHASSIS
4	DC+	RD+	RD-
5	TD-	DC-	RD+
6	TD+	DC-	TD-
7	RD-	DC+	TD+
8	RD+	DC+	
ID	**08E021**	**08E022**	**07E004**

Power Only and Power with Control Pinouts

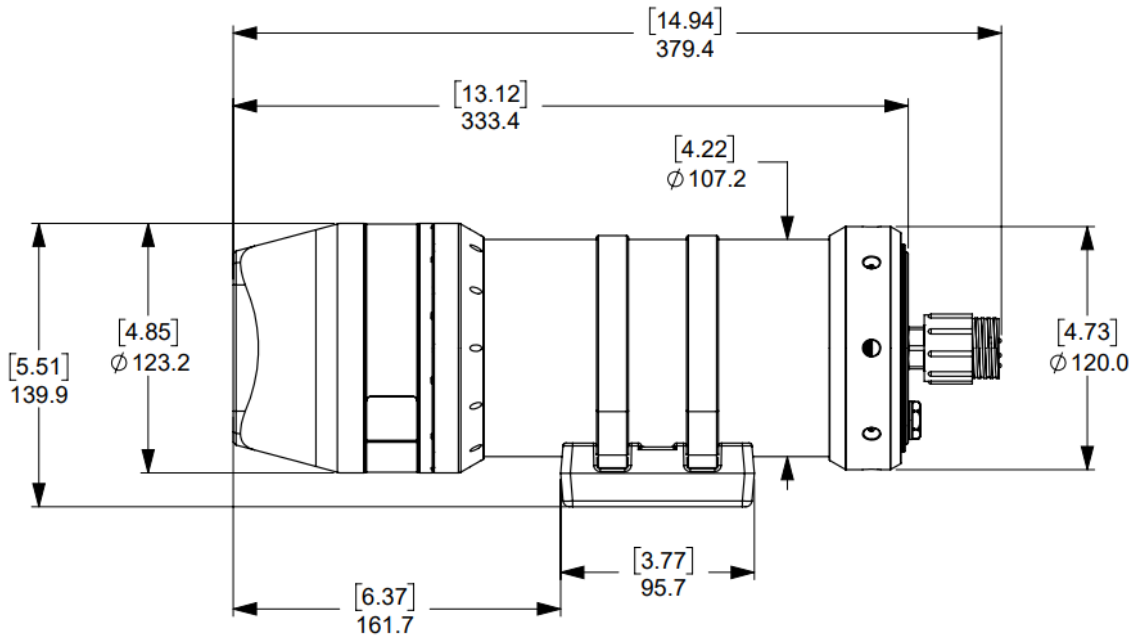
	BH4M, MCBH4M	MCBH6	
	 *MALE PIN VIEW*	 *MALE PIN VIEW*	
PIN	**Power Only -IP Recording-**	**Power with Tristate**	**Power with Serial**
1	DC-	DC-	DC-
2	DC+	DC+	DC+
3	N/C	Zoom±	N/C
4	N/C	Focus±	N/C
5		Focus Mode	↑RxD/B+
6		White Balance Set	↓TxD/A-
ID	**04P007**	**TBD**	**06C002**

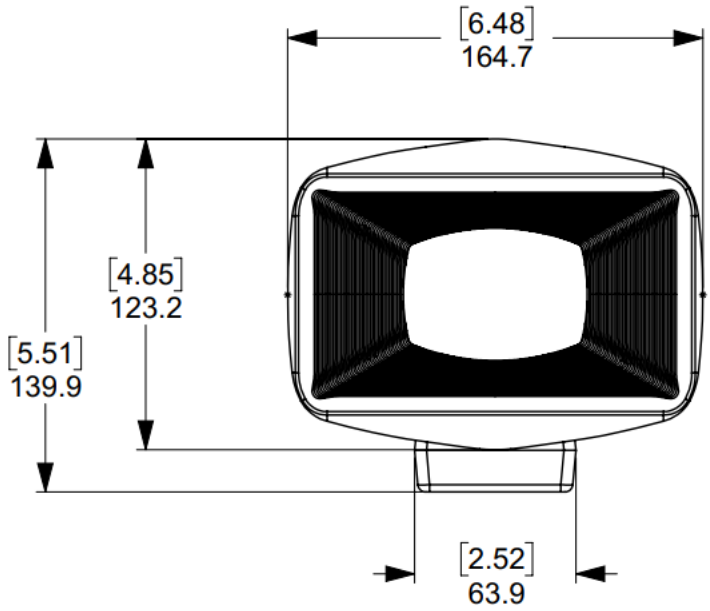
6G-SDI COAX Pinouts

	SubConn HF75CX6BHM	
	 *MALE PIN VIEW*	
PIN	**4K Camera Hybrid Coax Tristate**	**HD Camera Hybrid Coax Serial**
1	DC-	DC-
2	DC+	DC+
3	Zoom ±	N/C
4	Focus ±	N/C
5	Focus Mode	↑RxD/B+
6	White Balance Set	↓TxD/A-
COAX	SDI	SDI
SHIELD	SDI REF	SDI REF
PINOUT	**06X024**	**06X020**

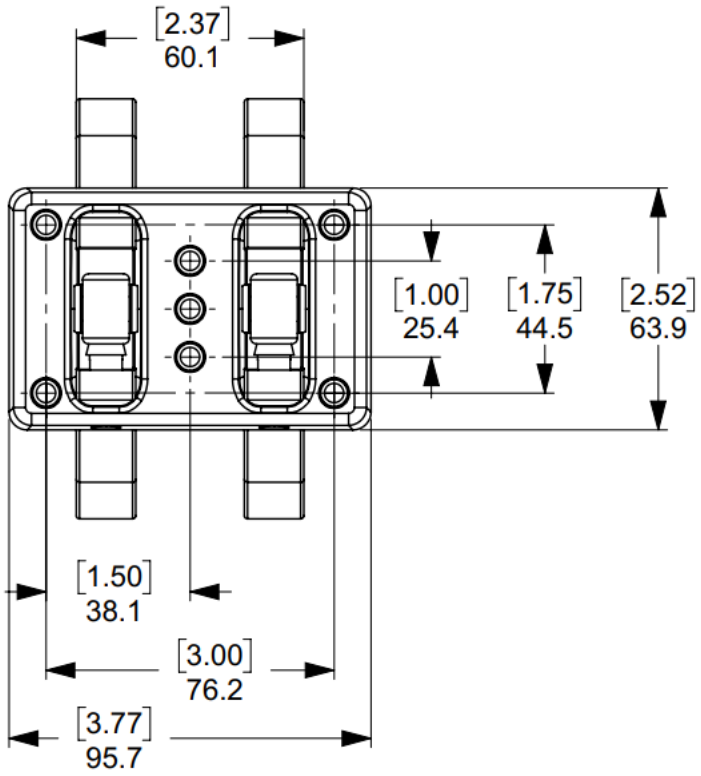
Dimensions

OSC-2080-XX





Bracket Dimensions



Introduction

Ideal for real-time viewing in 4K, Optim SeaCam models feature low latency 6G-SDI outputs in CWDM fiber optic and coax data links as well as IP streaming configurations in high quality HEVC (h.265). All feature a 15.5x optical zoom range and a 350mm minimum object distance at full telephoto that makes for stunning close-up images thanks to proprietary corrector optics.

The Optim SeaCam is built on a Sony FCB-ER8530 zoom block camera module capable of 4K-UHD resolution at a maximum of 30 frames per second. This is paired with a media converter for coax and fiber optic SDI outputs or a Linux-based IP encoder module for real-time streaming and onboard encoding.

Power is provided by a discrete DC input via an electrical bulkhead on the camera housing which also provides access to serial, tristate, and Ethernet interfaces for command, control, and in the case of the IP Optim SeaCam, real-time video feeds. In Fiber Optic configurations, a separate optical penetration carries the 6G-SDI video signal either through a hybrid contact bulkhead or, in most cases, a separate dedicated fiber optic bulkhead.

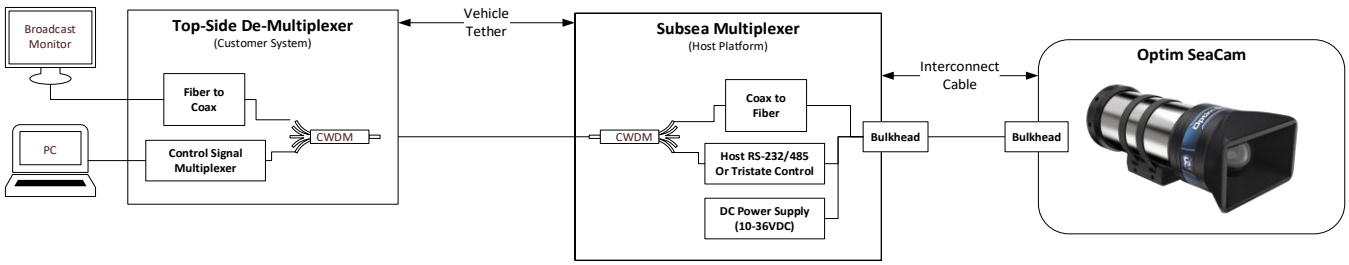


Figure 1 - Block diagram for a typical coax Optim SeaCam integration

Controlling the Camera

Command and control of the optical elements is done through a serial interface to the camera using the standard VISCA protocol. For Coax and Fiber Optic 6G-SDI VISCA commands are sent over a dedicated RS-232 or RS-485 serial interface. Additionally, these VISCA control commands can be emulated by the internal control hardware based on the state of up to four discrete tristate input signals which can be mapped to control zoom, focus, auto focus, and auto white balance functions. In the IP version of the Optim SeaCam, basic camera control functions are available in a web-based interface but full control of the camera can be achieved through a virtual COM port mapped to a specific TCP/IP or UDP port.

Additional Documentation

Online support and documentation is available through our online product support site accessible at https://q.dspl.com/optim-help.

Care and Maintenance

The Optim SeaCam is designed to require minimal maintenance for proper operation and a long service life. Maintaining the Optim SeaCam according to the below timeline will help prolong the life of your equipment.

After every dive…

- Rinse the camera with fresh water to prevent buildup of salt and mineral deposits outside seals.

Every year…

- Disconnect the inline connector from the unit and visually inspect for any signs of corrosion, water intrusion, wear, or damage to the pins and shell of the mating connector and bulkhead.
- Clean all pin and bulkhead seals and apply fresh lubrication to O-rings and rubber molded pins as necessary.
- Look over the housing for any indications of mechanical damage sustained during subsea operations.
- Visually inspect the optical port for any signs of moisture, cracks, or water intrusion.

Every five years…

- In addition to the normal annual maintenance, remove the unit from operation and return to DeepSea for a high-pressure seal replacement service. You may also contact our support team for instructions on performing this maintenance in the field (support@deepsea.com).

Troubleshooting

1. If the HD Camera stops working while underwater, always assume that it has been flooded. See Flooding Repair procedure on **page 5**.
2. If it has been determined that the unit is not flooded, or if it does not turn on during pre-deployment checks, troubleshoot the HD Camera in the following sequence:
    a. Check the cable/inline connector to make sure that correct voltage and current are being supplied, and that the pin-out matches the HD Camera being used. See **pages 9 and 9** of this manual for electrical specifications and standard connector pin-outs.
    b. Remove the endcap to access the bulkhead connector. Inspect the assembly for visual signs of wear. Use a multimeter check for continuity or shorts in the connector. Try a spare connector, if available.
    c. If the HD Camera still does not work, return it to DeepSea Power & Light using the RMA Procedure on page 19.

Resources

Additional information and troubleshooting guides for your product may be available on our Customer Help site at https://help.deepsea.com/support/home. Create an account there to access the broadest range of content on our products.

RMA Procedure for Repair

Should it be necessary to return your Optim SeaCam to the factory, follow the procedure for a Flooded Housing on **page 5**. Leave the connector partially unscrewed before shipping the HD Camera to DeepSea Power & Light.

For warranty and non-warranty repairs, please contact DeepSea Power & Light for an RMA number prior to returning your item. Provide your product's model number, serial number, and any other pertinent information along with a description of the problem when you request the RMA. You may request an RMA via:

- **Phone**: + 1 (858) 576-1261
- **Email**: RMA@deepsea.com
- **RMA form on our website**: www.deepsea.com/rma

When shipping your item, be sure that the freight is pre-paid (CODs will not be accepted) and that the RMA number is clearly printed on the outside of the box. All shipments should be sent to the address below:

DeepSea Power & Light
Attn: RMA ####
4033 Ruffin Road
San Diego, CA 92123-1817
U.S.A
Tel: (858) 576-1261
Fax: 858-576-0219
Email: RMA@deepsea.com

Warranty Information

Limited Warranty

Seller warrants that the goods (except internal electronic components) sold under this contract will be free from defect in material and workmanship for a period of one year from the date of shipment from the factory, if they have been properly used. Internal electronic components are warranted for 90 days from the date of shipment from the factory, if they have been properly used. This warranty will be limited to the repair or replacement of parts and the necessary labor and services required to repair the goods. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY. This warranty is the exclusive and only warranty to pass with the goods under this contract. No agent, employee, or representative of the Seller has any authority to bind Seller to any information, representation, or warranty concerning the goods sold under this contract, and unless an affirmation, representation, or warranty made by an agent, employee, or representative is specifically included within this contract, it will not be enforceable by Buyer. If notice of defect is given to DeepSea Power & Light within such 90 day or one-year warranty period, the sole obligation of DeepSea Power & Light shall be to furnish new or repaired parts free of charge in exchange for parts which have been proved defective and does not include any other costs such as the cost of removal of the defective part, installation, labor, or consequential damages of any kind, the exclusive remedy being to require DeepSea Power & Light to furnish such new parts. Under no circumstances shall the Buyer be entitled to recover any incidental damages as that term is defined in Commercial Code §2715.