

Vertex SeaCam®

Operator's Manual



DeepSea

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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 deepsea.com/vertex or scan this QR code.



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DeepSea 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/product-documentation.

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Read This First!

Users and operators of the Vertex 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.

SAVE THESE INSTRUCTIONS!

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 dangerous voltages. Water in contact with energized circuits may also electrolyze, producing an explosive mixture of hydrogen and oxygen gases trapped inside the pressure housing.

A camera can partially flood, reseal underwater, and become internally pressurized on ascent. A resealed housing may show no external sign of flooding. **If the camera stops working underwater, always assume it has flooded.**

On recovery, if flooding is known or suspected:

1. Point the camera away from personnel and equipment
2. Disconnect power immediately. Do not reapply power.
3. Move the camera to a well-ventilated area, away from ignition sources

Then, complete the Flooded Housing Response Procedure below.

Flooded Housing Response Procedure

This procedure is not a repair. Its purpose is to relieve the hazard of a pressurized housing and to drain corrosive seawater before it damages the electronics and the housing itself. Aluminum housings are particularly vulnerable. Complete the procedure as soon as it is safe to do so, then contact DeepSea to arrange repair (see RMA Procedure for Repair section on page 18).

Before beginning, put on appropriate personal protective equipment, including at minimum eye protection, protective gloves, and protective clothing. Keep the camera pointed away from personnel and equipment throughout.

1. Confirm the camera is powered off and disconnected.
2. Relieve internal pressure. If the camera is fitted with a pressure relief valve (PRV), vent it. Some configurations may ship without a PRV; on these, slowly loosen the bulkhead connector until pressure is released
3. Using an O-474 spanner wrench, unscrew the rear endcap retaining ring. The retaining ring and the electronics chassis are attached, so the chassis is removed with the ring.
4. Pour out any water trapped inside the housing.
5. If the camera is completely flooded, rinse the internal components with clean fresh water to minimize contamination and corrosion damage.
6. Allow parts to dry in air or in an oven set to 60 °C (140 °F).
7. Do not attempt further repair. Contact DeepSea's RMA Department (see page 18).

IMPORTANT! DeepSea does not endorse field repair of the Vertex SeaCam. This procedure is a damage-mitigation measure only. DeepSea cannot be responsible for any damage incurred during emergency field repairs, which should be undertaken only as a last resort by qualified personnel.

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.

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

Changing Factory Settings



This product is configured for optimal function at the factory. Changing the device settings through either the On-Screen Display (OSD) menu for the SDI camera configurations or the online user interface for the IP camera configuration can result in loss of functionality. Carefully read through the sections of this manual describing the OSD menu and online user interface before making changes to the unit and heed warnings about settings that should not be modified.

NOTICE



Pre and Post Dive Inspection

Before each deployment...

- Always check to make sure the bulkhead connector assembly is secure and that cable strain is managed appropriately.

After each deployment...

- Inspect the camera for evidence of flooding by looking through the dome viewport for signs of water such as water spots, a liquid line, or fogging.

Before and After Each Deployment...

- Perform a visual inspection of the following external areas for damage, wear, or corrosion:
 - Bulkhead connector assembly
 - Interconnect cable
 - Optical dome port
 - Port retainer and pressure housing

Customer Service

DeepSea provides service to our global customers through our Service and Repair department. Contact DeepSea Support with comments, suggestions, or 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 Vertex SeaCam comes with either serial controls or tristate controls. Units that are factory configured for serial control work with either RS-232 or RS-485 control interfaces primarily through Sony's VISCA protocol. Using the VISCA protocol, focus, zoom, white balance, exposure, and many other common imaging settings can be easily controlled using software or dedicated VISCA-compatible hardware controllers.

DeepSea's SeaSense® Protocol is also supported over serial; please view the **SeaSense Specification Document**, available at www.deepsea.com/seasense, for a list of supported commands. Units that come configured for tristate control use tristate for the zoom, focus, auto focus, and white balance features. White balance and auto focus control will be absent in some tristate models depending on the output method configured at factory.

The Vertex SeaCam comes configured with either an optical fiber, a coax, or a FleXlink® output. Please see the Video Signal Standards section on page 9 for more information on these options.

Housing Options

The Vertex SeaCam comes with a borosilicate glass dome on a metallic housing. At full wide zoom, the dome and custom corrector optics offer a field of view (FoV) of 86° diagonal x 79° horizontal x 49° vertical.

Available housing materials come as either aluminum or titanium. The aluminum housing option has a depth rating of 6,000 m. The titanium housing option comes with either a 6,000 m or an optional 11,000 m depth rating.

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. The factory certified depth rating will be printed on a label attached to the housing or in the documentation supplied with your unit.**

Power Input Options

The Vertex SeaCam provides a wide range, 10~36 VDC discrete voltage input drawing a maximum 7 W of power (coax and FleXlink) or 10 W (fiber optic). The control interface signals are internally referenced to the DC reference voltage of the power supply.

Video Transmission Options

All configurations of the Vertex SeaCam feature a 1/3" 4.08MP CMOS Progressive Scan sensors with 6G-SDI, 3G-SDI, and CVBS video output options.

Transmission Method	FleXlink® UTP	75Ω Coax	Fiber Optic
Video Data Format	SMPTE 292M/424M compliant HD-SDI/3G-SDI		
Data Rate	1.485 Gbps (HD-SDI) / 2.97 Gbps (3G-SDI)		
Auxiliary Video Output	CVBS (NTSC, PAL)		
Connector Type	SubConn DBH8M/S ¹	SubConn HF75CXBH6M/S	SEACON MINF-1FO + MCBH6
Input Voltage Range	10 to 36 VDC		
Max Power Draw	7 Watts	7 Watts	10 Watts

¹ See our website for a comprehensive list of FleXlink compatible subsea connectors: www.deepsea.com/flexlink

Video Signal Standards

Coax

A Vertex SeaCam fitted with a coax HD-SDI/3G-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, an SMPTE-compliant fiber optic media converter can be used to extend the signal reach to several kilometers.

FleXlink®

DeepSea's exclusive FleXlink technology offers an alternative connectivity option for SDI video signal transmission through subsea interconnects. FleXlink uses a proprietary cable driver and media converter to transmit the uncompressed HD-SDI or 3G-SDI video signal over a balanced 100Ω unshielded twisted pair (UTP), such as those typically found in subsea Ethernet cables. A FleXlink media converter is required to convert the SDI video into coax or fiber optic signals using a compatible Small Form-factor Pluggable (SFP).

Fiber Optic

The Fiber Optic version of the Vertex SeaCam is equipped with an internal fiber optic media converter, allowing the SDI video signal to be carried over single-mode or multi-mode fiber optic cable for extended cable runs where coax or FleXlink distances are insufficient. The fiber optic signal only carries the SDI video transmission; a separate electrical connector provides power and camera control.

Catalog Configuration

SDI COAX and FleXlink Models

Example Configuration:									
MODEL	VSC = Vertex SeaCam								
PORT	Dome Port, Glass 1080 = 79° HFoV								
VIDEO SIGNAL	FX = 6G or 3G-SDI over FleXlink CX = 6G or 3G-SDI over Coax								
HOUSING	AL = Aluminum TI = Titanium 11 = 11 km ² Titanium								
CONTROL	TRI = Dual Tristate On-Screen Display (OSD) control RS2 = RS-232, OSD via SeaSense protocol RS4 = RS-485, OSD via SeaSense protocol								
PRV	DDS = DDS-T Pressure Relief Valve (standard) NON = No PRV								
BULKHEAD	I = Imperial 1/4-20, Saddle								
BULKHEAD	SUDBH8M/S		SUHF75CXBH6M/S						
	SubConn DBH8M ↓ 8-Pin↓		SubConn HF75CXBH6M ↓ 6-Pin + Coax ↓						
PINOUT	08C018 (example)		06X020 (example)						
	1: SDI+	5: DC+	1: DC-	5: ↑Rx/D/B+	Other connector and pinout options are available. Contact DeepSea Sales for information.				
	2: SDI-	6: DC-	2: DC+	6: ↓Tx/D/A-					
	3: VID REF	7: ↓Tx/D/A-	3: N/C	Coax: SDI					
	4: ALG VID	8: ↑Rx/D/B+	4: N/C	Video					

² 11km depth rating only available in dome port Optical Format options. Requires suitable connector selection.

SDI Fiber Optic Models

Example Configuration:		VSC	-1080	-FO	-TI	-RS4	-DDS	-I	-SUOPTOLINK1FO/S	-31	-SM	-SUMCBH6M/S	-	06C002
MODEL	VSC = Vertex SeaCam													
OPTICAL FORMAT	Dome Port, Glass 1080 = 79° HFoV													
VIDEO SIGNAL	FO = 6G or 3G-SDI over Fiber													
HOUSING	AL = Aluminum TI = Titanium 11 = 11,000 m Titanium													
CONTROL	TRI = Tristate discrete control RS2 = RS-232, VISCA or SeaSense protocol RS4 = RS-485, VISCA or SeaSense 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	06C002 1: DC- 4: N/C 2: DC+ 5: ↑Rx/D/B+ 3: N/C 6: ↓Tx/D/A- Other connector options available. Contact DeepSea Sales with inquiries for connectors and pinouts not listed.													

Specifications

Optical Specifications	
Lens	3.2 mm to 32 mm F/1.8 to F/3.4
Optical Zoom	10x
Focus	Wide: 10 mm Tele: 250 mm
FOV in Water	Wide: 86° D x 79° H x 49° V Tele: 10.6° D x 9.2° H x 5.3° V
Video Specifications	
Image Sensor	1/3" 4.08MP CMOS Progressive Scan
Faceplate Illumination	0.51 Lux
Scene Illumination	0.65 Lux
Resolution	1920x1080
Measured Resolution	850 TVL at Full Wide
Signal to Noise	< 50 dB
Video Output	HD-SDI 1.485 Gb/s: 1080p/30, 1080p/29.97, 1080p/25, 1080i/60, 1080i/59.94, 1080i/50, 720p/60, 720p/59.94, 720p/50, 720p/30, 720p/29.94, 720p/25 3G-SDI 2.97 Gb/s: 1080p/60, 1080p/59.94, 1080p/50 CVBS: NTSC, PAL
Serial Protocol	SeaSense® Serial Protocol, VISCA
Control Interface	RS-232, RS-485, Tristate (zoom, focus, auto focus, white balance)
Environmental Specifications	
Depth Rating	Aluminum: 6,000 m Titanium: 11,000 m
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	
Housing	6000 Series Aluminum 6Al-4V Titanium
Port	Optical glass dome
Weight in Air	Aluminum: 3.84 kg [8.47 lbs]
Weight in Water	Aluminum: 1.81 kg [3.99 lbs]
Electrical Specifications	
Voltage	10~36 VDC
Power	Fiber Optic: 10 W Max FleXlink and Coax: 7 W Max
Connectors	
Fiber	Electric: SubConn MCBH6M SS Fiber Optic: SubConn OptoLink 1-FO
Coax	SubConn HF75CXBH6M/S
FleXlink	SubConn DBH8M/S

Standard Pinout

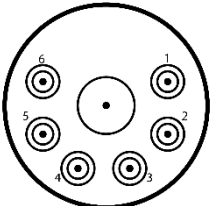
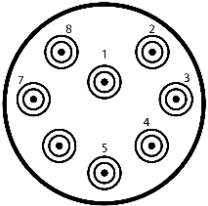
WARNING



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 accidents and potential injury.

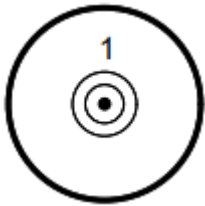
SDI COAX and FleXlink Pinouts

BULKHEAD	SUHF75CXBH6M/S			SUDBH8M/S	
	SUBCONN HF75CXBH6M			SUBCONN DBH8M SS	
COAX	 MALE PIN VIEW		FLEXLINK	 MALE PIN VIEW	
PIN	SDI Camera Coax Serial	SDI Camera Coax Tristate	PIN	SDI Camera FleXlink Serial	SDI Camera FleXlink Tristate
1	DC-	DC-	1	SDI+	SDI+
2	DC+	DC+	2	SDI-	SDI-
3	N/C	ZOOM±	3	VID REF	VID REF
4	N/C	FOCUS±	4	ALG VID	ALG VID
5	↑RxD/B+	FOCUS MODE	5	DC+	DC+
6	↓TxD/A-	WHITE BALANCE SET	6	DC-	DC-
COAX	SDI VID	SDI VID	7	↓TxD/A-	ZOOM±
Shield	SDI RTN	SDI RTN	8	↑RxD/B+	FOCUS±
PINOUT ID	06X020	06X024		08C018	C08022

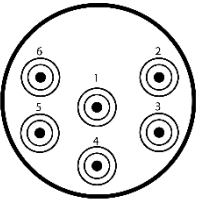
Fiber Optic Pinouts

The Fiber Optic Vertex SeaCam uses a separate electrical connector for power and control, and a dedicated fiber optic connector for the video signal.

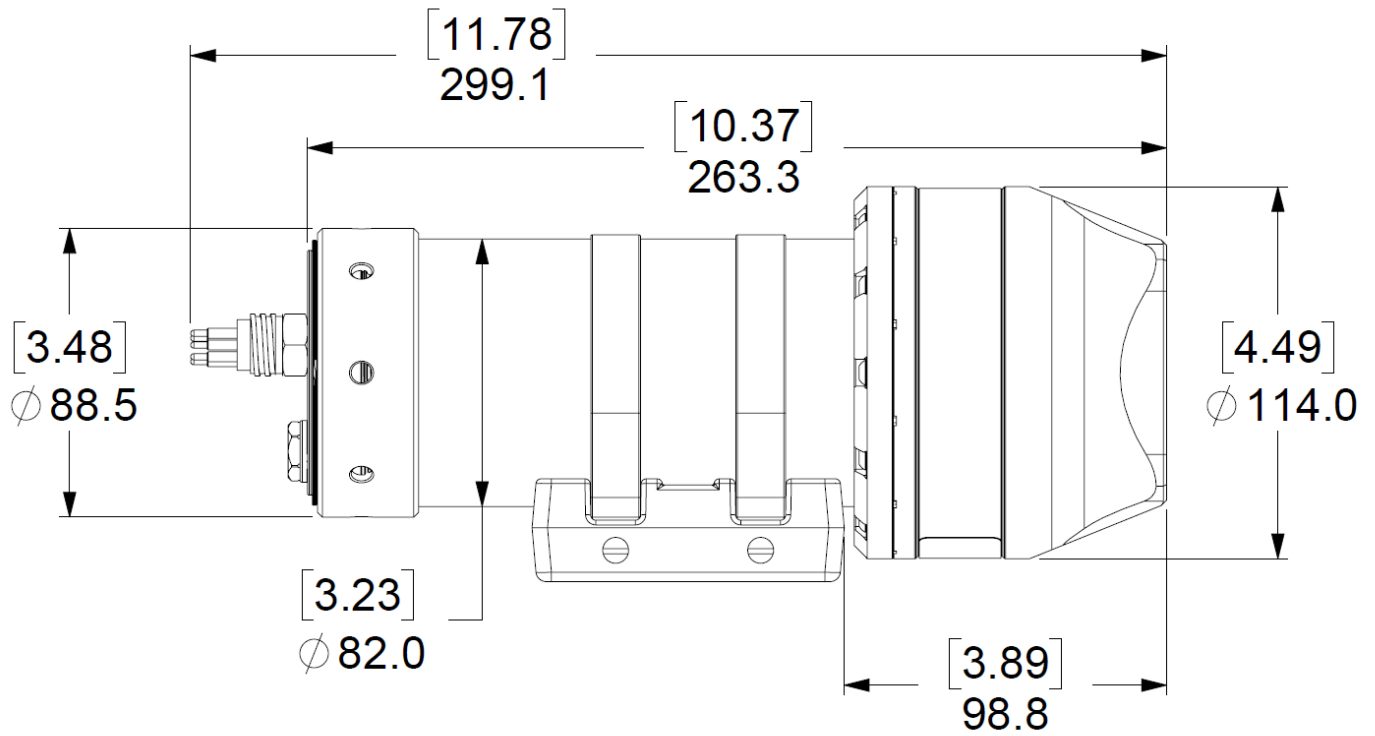
Fiber Optic Connector

SUOPTOLINK1FO/S SubConn OptoLink 1-FO	
	
BCR Face View	
Fiber	SDI Camera Fiber Optic Video
1	OPT1, SM
PINOUT ID	FO1005

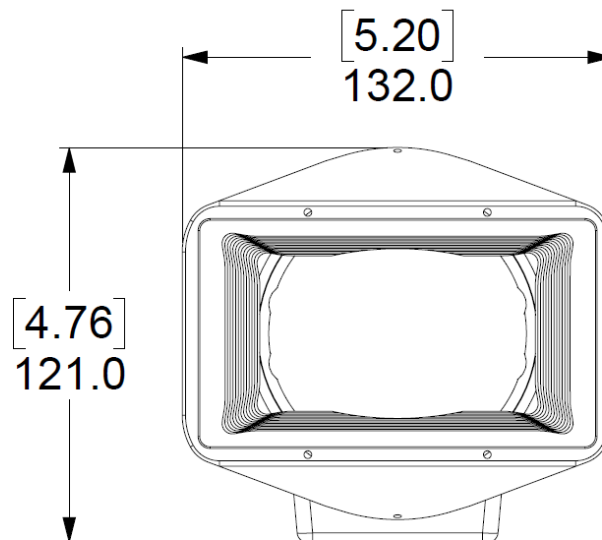
Electrical Connector

SUMCBH6M/S SUBCONN MCBH6M SS		
		
MALE PIN VIEW		
PIN	SDI Camera Power With Serial	SDI Camera Power with Tristate
1	DC-	DC-
2	DC+	DC+
3	N/C	ZOOM±
4	N/C	FOCUS±
5	↑RxD/B+	FOCUS MODE
6	↓TxD/A-	WHITE BALANCE SET
PINOUT ID	06C002	06C030

Dimensions



[inch]
mm



Introduction

The compact Vertex SeaCam includes full HD resolution with 10x optical zoom and low-distortion 79° HFOV at full-wide. A minimum faceplate illumination of 0.5 lux provides impressive low light capability.

This subsea camera works with RS-232 and RS-485 control interfaces through VISCA or SeaSense Protocol. Tristate control is available for zoom, focus, and auto focus features. The Vertex SeaCam is easy to integrate with fiber, coax, and FlexLink output method options. Configuration options include aluminum housing with 6,000 m depth rating and titanium housing with 6,000 m or 11,000 m depth ratings. The Vertex SeaCam includes a mounting bracket with stainless steel inserts.

Integration

Connecting to Your Vertex SeaCam for the First Time

SDI Video Interface

1. Prepare a power supply with 10~36 VDC output and verify that it can supply the amount of power required for your unit (7W or 10W).
2. Connect the camera power, SDI video, analog video, and control signals to their respective interfaces per the pin-out specified for the camera.
3. Prepare the camera bulkhead connector(s) as required by the connector manufacturer.
4. Mate the female underwater connector to the male bulkhead using a smooth linear motion, making sure the connectors are fully seated and seals are engaged.
5. Screw the locking sleeves together firmly by hand. **Do not use tools.**
6. The camera is now ready for operation. Switch the power supply ON to power the camera.
7. Verify proper operation of the camera by viewing the SDI video feed on an appropriate monitor.

Controlling the Camera

For units configured for serial communications, command and control of the optical elements is done through a serial interface to the camera using the standard VISCA protocol. VISCA commands are sent over a dedicated RS-232 or RS-485 serial interface. For units configured for tristate control, these VISCA control commands are 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.

Additional Documentation

Online support and documentation is available through our online product support site accessible at q.dspl.com/vertex-help. Please make an account and log in to view any guides or support materials.

Care and Maintenance

The Vertex SeaCam is designed to require minimal maintenance for proper operation and a long service life. Maintaining the Vertex 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.
- Apply the cowl cover when between dives or doing work on neighboring equipment to reduce the chances of accidentally scratching the dome.
- If storing, apply the cowl cover, install any dust caps on the connectors, and place the unit in its designated case. For long storage periods, store in a climate-controlled environment.

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 external 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 Response 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 11 - 13** 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 using the RMA Procedure on page 18.

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 Vertex SeaCam to the factory, follow the procedure for a Flooded Housing on **pages 5 & 6**. Leave the connector partially unscrewed before shipping the camera to DeepSea.

For warranty and non-warranty repairs, please contact DeepSea 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/return-material-authorization/

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 two years 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 within such two-year warranty period, the sole obligation of DeepSea 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 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.