# 6 VIT MANUAL DIAGNOSTICS, PARTS, AND MAINTENANCE

IODP VIT Assembly Part Number OV7000

IODP JRSO

Version 2

9/25/22

| Revision | Date | Originator | Approval |
|---|---|---|---|
| 0 | 3/5/19 | Mike Meiring | Mike Meiring |
| 1 | 11/5/19 | Mike Meiring | Mike Meiring |
| 1A | 9/4/20 | Eric Schulte | |
| 2 | 9/25/22 | Andrew Howard | Andrew Howard |
| | | | |

# TABLE OF CONTENTS

# CHAPTER 1.0 REDUNDANCY STRATEGY

Redundancy strategy is to have one LED light and one camera functional when any one component/device in the system fails.

1. 3-phase 480 VAC Power Conductors: One power conductor can fail or one phase can be lost without affecting operation. High loading in the future may require some load shedding.
2. 24 VDC Power Supply: One of two 24 VDC supplies could fail without affecting the system.
3. 5 VDC Power Supply: If any one of the two 5V supplies fail, redundancy strategy will still be satisfied.
4. Optical fibers: Only one fiber is required, design has three for redundancy.
5. Multiplexers: Two S-109 multiplexers run in parallel, only one required.
6. HD Cameras: Survey and reentry cameras provide redundancy for one another.
7. SVS 309 HD Card: Failure of this card will affect both HD cameras. NTSC Search camera will then provide redundancy, or commanding either HD camera to switch to NTSC will establish video via S109 Multiplexers.

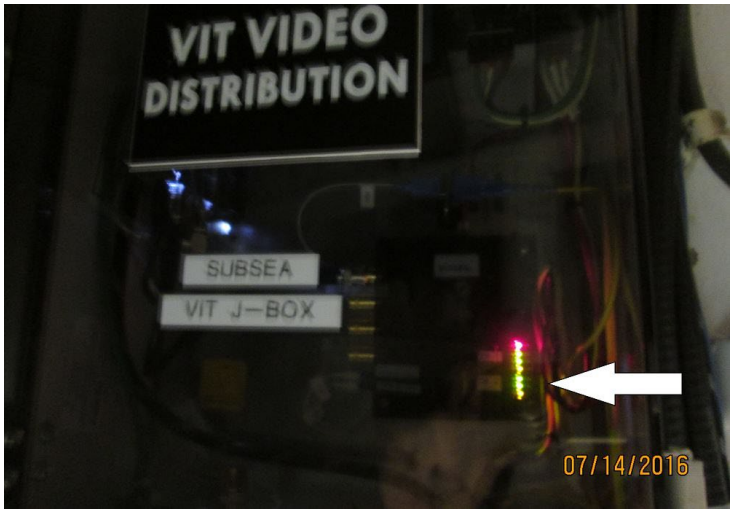
# CHAPTER 2.0 FAULT TRACING

## 2.1 FAULT TRACING SEQUENCE

Switch on the Surface Multiplexer Box in DP. Both 5 VDC A and B and the 12 VDC LED indicators should be on.

1. In Subsea, switch on the power to the Pod. An indicator light (GRN) for 480 VAC supply on the panel should be on. Confirm power to the *VIT J-Box* in Subsea is switched on.
2. In Subsea, in the *VIT J-Box* (**Fig. 1**), confirm that "LOCK" and "CD" LEDs for both CH1 and CH2, on the S309 board are on (see **Section 2.4 LED Diagnostic Indicators**).

**Figure 1. VIT J-Box in Subsea.**



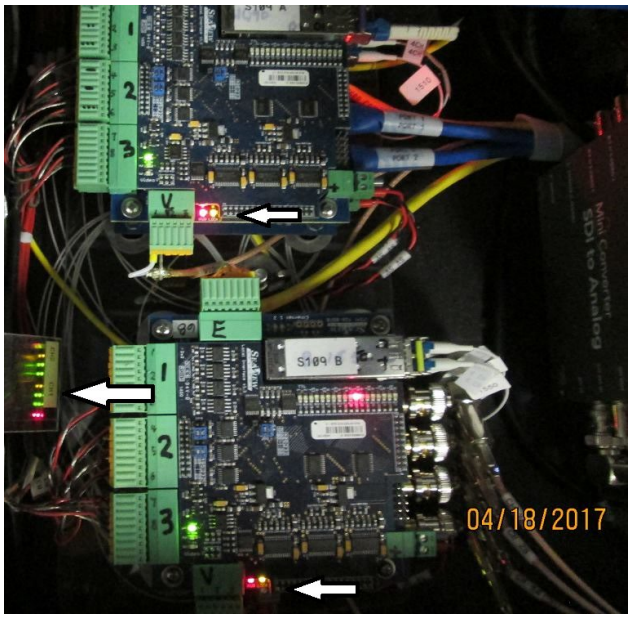

a). Should the "Lock" LED (YEL) be off, it is an indication that no video was received from the Pod. Probably a faulty camera or cable to camera (see schematic *2. Video Distribution*, Confluence > Engineering and Tools > VIT > Schematic Diagrams).

b). If a "CD" LED on either CH1 or CH2 is off, it is most probably a failed SFP on the S309 board in the Pod. Only one video channel will be available (see *7. Optical Link*, Confluence > Engineering and Tools > VIT > Schematic Diagrams).

c). If both CH1 and CH2 "CD" LEDs are off, it is an indication of a failed optical link from Pod or a failed S309 card. No HD video channels will be available. Switch the reentry camera to NTSC and video will be available via the S109 Multiplexer cards. With OTDR, measure optical link from DP to Pod (see *7. Optical Link*, Confluence > Engineering and Tools > VIT > Schematic Diagrams).

3. In DP, slide out the Surface Multiplexer Box (**Fig. 2**) and confirm that LINK established LEDs are on for all four Seaview cards. YEL on S109 and S209 cards. GRN (CD) on S309 card. These diagnostic LEDs are all visible through the plexiglass box top.
   a). Should one or more be off, with the help of the AFL Power meter and OTDR, determine reason for signal/link loss (see *7. Optical Link* and *8. Link Levels*, Confluence > Engineering and Tools > VIT > Schematic Diagrams).

**Figure 2. Multiplexer Box in DP.**




   b). Should all be off, check power to pod in Subsea, if OK, check optical links to Pod with OTDR.
   c). The AFL Optical Power Meter/Optical Source and/or the visual optical source on the OTDR are handy for locating faulty connectors or patch cords.
4. On the DP VIT Monitor, confirm that you are receiving: reentry cam video on HDMI-3, Survey cam on HDMI-1, reentry cam on TV CH-8 and Survey cam on TV CH-9
   a. If not, see schematic *3. Video Distribution* and trace (Confluence > Engineering and Tools > VIT > Schematic Diagrams).
   b. If no video on TV, confirm that Video Outputs have been initialized on the DVR.

5. On the VIT-PC in DP, launch the LabVIEW control program IRIS VIT:
   a). Switch each Legacy LED light, front left, front right and center rear, to 100%. After confirming they are on, switch them off.
   b). Confirm Reentry camera control by clicking zoom and focus.
   c). On the S109 cards, Data LEDs indicate RS-232 control activity on both TX and RX channels.

   Individual RS-232 control signals can be sent and received via serial emulator PUTTY. A proprietary application for Sony camera control is available on the desktop of VIT-PC. IRIS VIT LabVIEW program should be closed to release COM-ports. See schematic *3. Data Distribution* (Confluence > Engineering and Tools > VIT > Schematic Diagrams).
6. Using the Imenco GUI software, confirm PTZ control by moving the camera up/down, left/right.
7. If no deviations from above checks, system should be serviceable.

## 2.2 RS-485/232 SERIAL COMMUNICATION

See schematic *3. Data Distribution* (Confluence > Engineering and Tools > VIT > Schematic Diagrams) for detail. The VIT-PC is equipped with a NI Serial extender card supporting 8x RS-232 Com ports. Virtual Com ports (such as is needed for the Imenco GUI software) are not allocated to actual Com ports on the NI card.

Commands can be sent to devices on the VIT frame by launching PUTTY on the VIT-PC, selecting the appropriate Com-port and setting communication parameters. All ports are RS-232. Conversion to RS-485 is done in the S109 Multiplexer cards, if needed. Consult device specific manuals for commands.

| **Device** | **PC Comport** | **NI Comport** | **Baudrate** |
|---|---|---|---|
| LED 1& 2 | Com 7 | P4 | 9600 |
| LED 3 | Com 8 | P3 | 9600 |
| Reentry Cam cntrl | Com 4 | P2 | 9600 |
| Gyro | Com 5 | P6 | 38400 |
| Sonar | Com 6 | P8 | 115200 |
| Altimeter | Com 3 | P1 | 9600 |

## 2.3 SWITCHING THE SONY REENTRY CAMERA VIDEO FEED

In the event of a failure in the Video link, the reentry camera can be commanded to switch to/from NTSC/HD video. NTSC video is available via the S109 Multiplexers whereas the HD video is available via the S309 Multiplexers. See schematic *2. Video Distribution* (Confluence > Engineering and Tools > VIT > Schematic Diagrams).

## PROCEDURE: SWITCHING REENTRY CAMERA TO/FROM NTSC/HD

On VIT-PC in the DP, run the IRIS VIT Control LabVIEW program (**Fig. 3**).

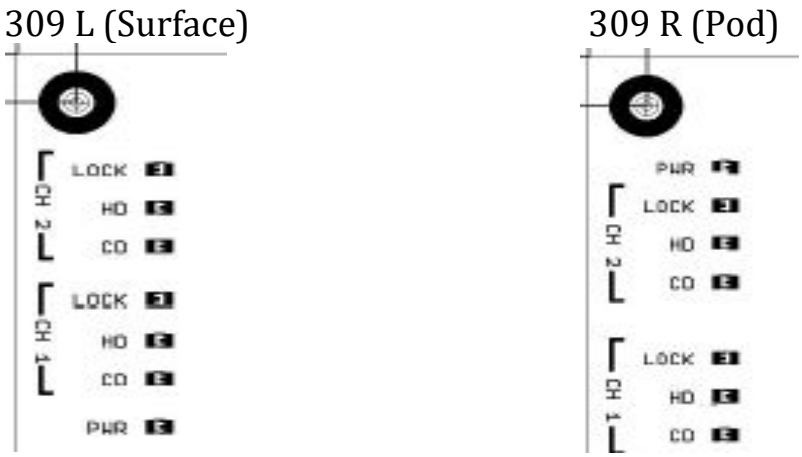
1. On IRIS VIT, open the "RE-ENTRY CAM" tab.
2. At the "RE_ENTRY CMDS", select the desired command.
    a. For switching to NTSC select: *CAM_Set_NTSC(Crop)*
    b. For switching to HD1080i select: *CAM_Set_HD1080i/59.94*
3. Click the "SEND CMD" button to send the command to the camera.
4. The camera requires a power cycling to activate the video set commands. At Subsea, cycle power to the Pod. NTSC video should be available at Surface Multiplexer Box output V2, which is sent to DVR PC input 1A. HD 1080i video should be available at Surface Multiplexer Box HD-SDI (). See schematic 2. *Video Distribution* (Confluence > Engineering and Tools > VIT > Schematic Diagrams).
5. For NTSC video, the S109 card should have the Video LED on.
6. For HD1080i video, the S309 card should be on with link established.

**Figure 3. IRIS VIT Control LabVIEW Program.**

## 2.4 LED DIAGNOSTIC INDICATORS

1. SS-309 HD-SDI VIDEO CARD (**Fig. 4**).

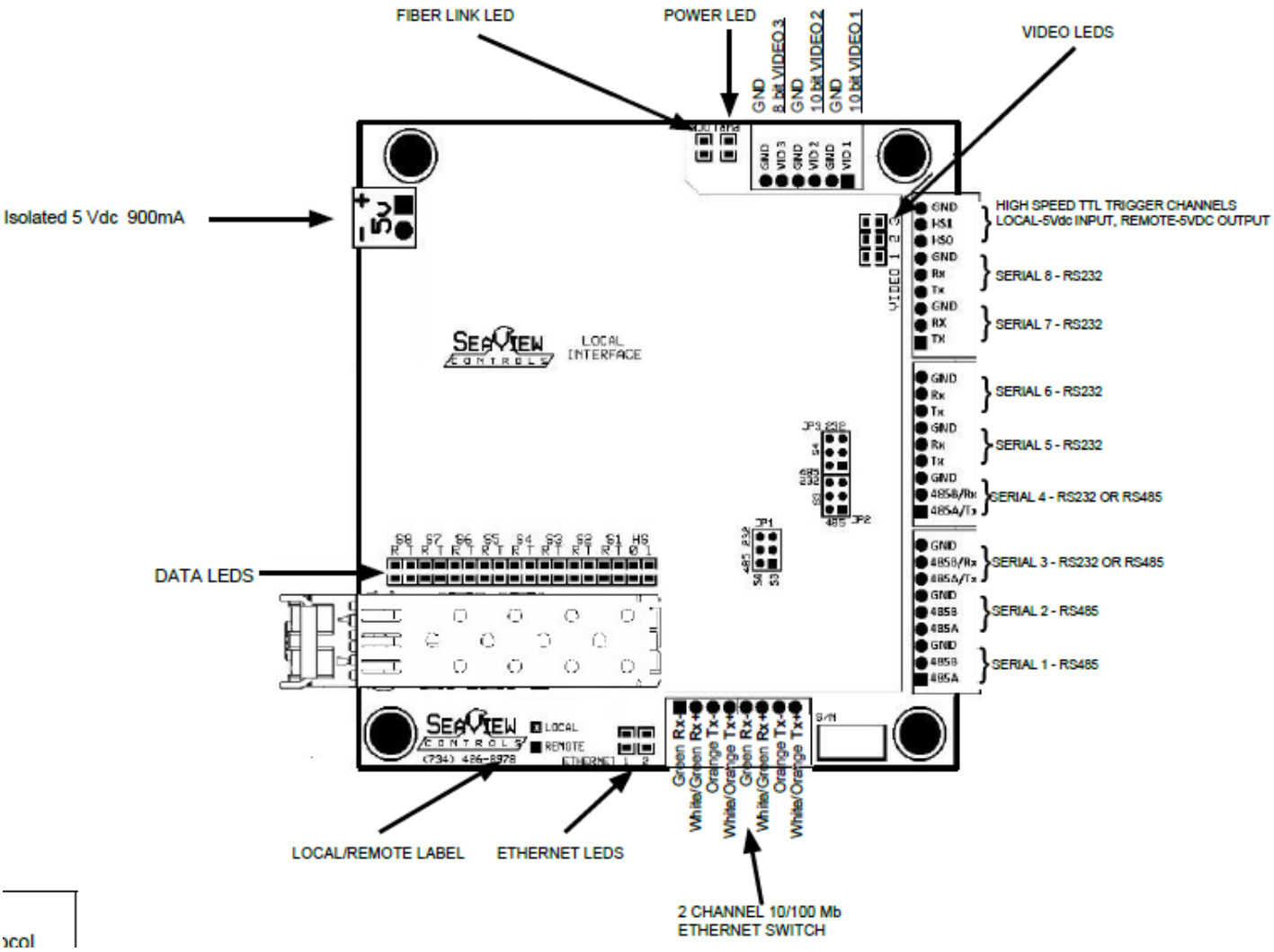
**Figure 4. SS-309 HD-SDI Video Card. Surface on Left, Pod on Right.**




| | | |
|---|---|---|
| **LOCK (YEL)** | Lock to Video data | Lock to Video data |
| **HD (GRN)** | On by default | On by default |
| **CD (GRN)** | Optical link established | Video Signal detected |
| **PWR (RED)** | Power | Power |

2. SVS-109 Multiplexer Card (**Fig. 5**).

**Figure 5. SVS 109 Multiplexer Card.**




| | |
|---|---|
| **PWR (RED)** | Indicates presence of 5 V supply to card. |
| **LINK (YEL)** | Optical link established. |
| **DATA** | Serial activity from far end on RED, to far end on GRN. |
| **VIDEO (GRN)** | LED will turn on when video present. |
| **ETHERNET (GRN)** | Indicating activity on respective channel. |

3. SVS-209 GBIT ETHERNET

| | |
|---|---|
| **PWR (RED)** | Indicates presence of 5 V supply to card. |
| **LINK (YEL)** | Optical link established. |

# CHAPTER 3.0 CONTINGENCY PLANS

## 3.1 LOSING COMPLETE FRAME (UNLIKELY):

If the complete frame is lost perform these steps:

1. On the spare frame, mount:
   a. Spare Telemetry Pod
   b. Spare LED light to POD port 6
   c. Spare Composite camera to POD port 2

   Both the video and LED control are now supported by SVS-109A, optically connected to surface via the ORG fiber in the umbilical.

2. Splice spare POD FO connector (C11) pigtail to the umbilical end:
   - 3 x AC power conductors on pigtail to umbilical.
   - FO YEL (3) on pod to FO ORG on umbilical (Composite Video and LED RS-485 control).
   - Scotchcast the splice and secure.

3. No physical changes required in DP.

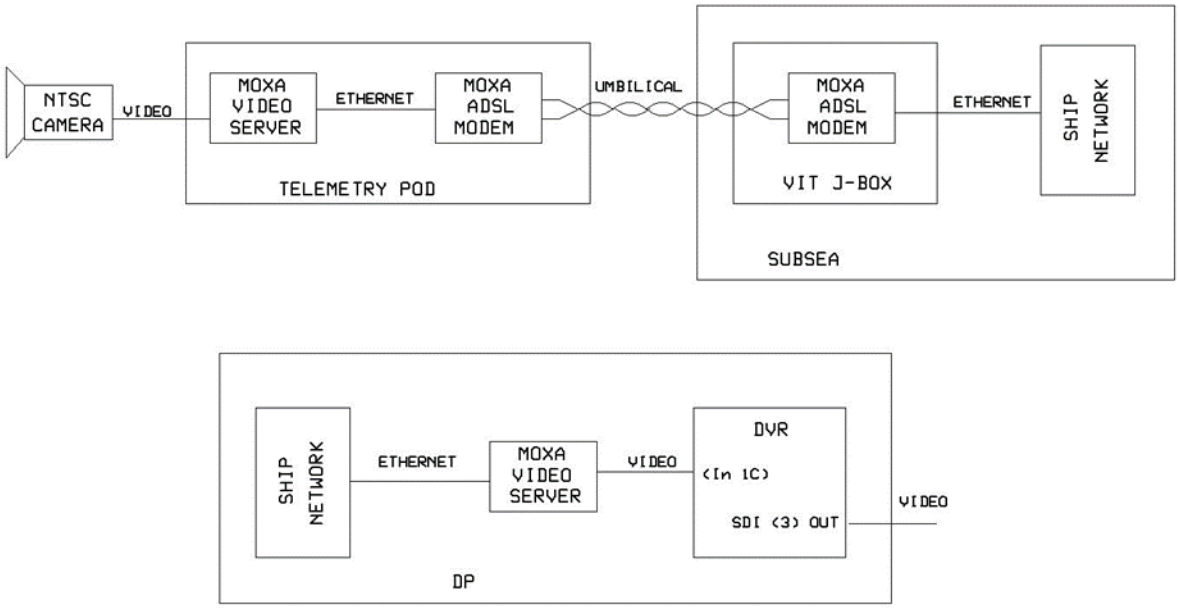
   Composite video should be available on Multiplexer Box backplane V1 and DVR Input (In 1C). See Confluence > Engineering and Tools > VIT > Schematic Diagrams 1. VIT Block Diagram. Configure one of the two DVR outputs (In 1C). Video should now be available on the ship's TV distribution system.

## 3.2 TOTAL LOSS OF UMBILICAL OPTICAL FIBERS (HIGHLY UNLIKELY)

Establish communication between Pod and Surface equipment via the copper twisted pairs in the umbilical (**Fig. 6**). The current LED lights on the frame require communication to be switched on. They can be replaced with the new ROS SeaStar LED lights which are set to turn on to 60% intensity when power is cycled.

1. Mount the spare NTSC camera to the VIT frame.
2. In the POD, install:
   - 1 x MOXA Video Server, VPort 461 OV0827
   - 1 x MOXA ADSL Modem, IEX-402-SHDSL OV0970

## Figure 6. Block Diagram of the Emergency Moxa Setup.




3. Connect video from the camera to the Moxa Video Server (**Fig. 7**) input.
4. Connect the Server Ethernet output to the ADSL Modem (**Fig. 7**) input.
5. Connect the ADSL-Modem twisted pair output via a Burton connector on the POD to the 2 x twisted pairs, paralleled in the Umbilical.
6. Connect the 2x paralleled twisted pairs In the Subsea VIT J-Box from the umbilical to the ADSL Modem input.
7. Connect the ADSL Modem Ethernet output to the ship network in Subsea.
8. In DP, connect the Video Server to the DP's Ship Network.
9. Connect the video output from this server to the DVR Input (In 1C). Configure DVR output SDI (3) for this input. Video should now be available on the ship's TV distribution system.

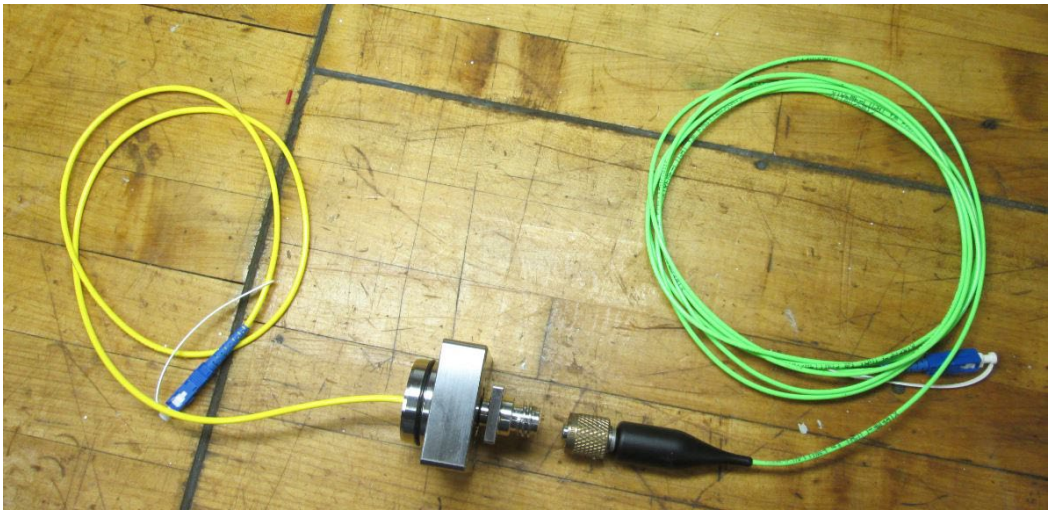
**Figure 7. Photo of the Moxa Video Server (Left) and ADSL Modem (Right).**


## 3.3 LOSS OF MAIN POWER/OPTICAL CONNECTOR (C11) ON POD

To repair the loss of the main power of the optical Connector on the pod, perform these steps:

1. Remove the damaged FO Connector set (C11) from the Pod.
2. Install the Birns single fiber connector/adaptor (**Fig. 8**) on the Pod.
3. Connect fiber internally to SVS-109A.
4. Splice the Birns single fiber pigtail to the ORG fiber in the VIT Frame J-Box.

**Figure 8. Birns Single Fiber Connector/Adaptor.**



5. Wire the Pod 3-phase Power, via one of the Burton connectors on the Pod, to the umbilical in the VIT Frame J-Box.
6. Mount the spare NTSC camera to frame and connect to Pod port 2.

The LED mounted on the Pan/Tilt equipment and the Pan/Tilt will now be functional. No physical changes required in DP.

NTSC video should be available on Multiplexer Box backplane V1 and DVR Input (In 1C). See schematic *2. Video Distribution* (Confluence > Engineering and Tools > VIT > Schematic Diagrams). Configure one of the two DVR outputs for DVR Input (In 1C). Video should now be available on the ship's TV distribution system.

# CHAPTER 4.0 MAINTENANCE

## 4.1 PLANNED MAINTENANCE

### VIT FRAME

At start of the expedition:

1. Visually inspect all devices mounted to frame for any obvious deficiency. Pay special attention to cables and connectors.
2. Replace any suspect parts.
3. Confirm that all connectors are hand-tight.
4. Confirm that system is operational and in a ready state for deployment.
5. Verify that Frame J-Box is filled with oil.
6. Periodically hose-down devices on frame with fresh water to limit salt build-up, especially around the connectors. **Do not undo** connectors unless absolutely necessary.

### UMBILICAL

1. Mechanical
   - Always flush cable with fresh water while retrieving.
   - On the last and on the deepest deployment, apply a suitable lubricant to cable while being retrieved.
   - At the end of the expedition, clean and grease cable section from winch drum to Cablegrip.
2. Optical

   At start of expedition, with OTDR, perform a measurement on Optical link from DP to Pod on the reference fiber (BRN) and compare with previous expeditions for any significant changes in attenuation. Save plot for future reference to the ship server at U:\Operations\2-Engineering\1 VIT\6 UMBILICAL\7 OTDR Traces
3. The umbilical at the frame end is more susceptible to corrosion; therefore, a 30 m section should be cut back every two years.

### FORJ/SLIPRING

After 2 years of service, this device needs to be returned to the vendor for refurbishment of the electrical slipring portion. There is no need to refurbish the optical portion unless there is evidence of performance degradation.

## 4.2 O-RINGS ON UNDERWATER CONNECTORS

An O-ring failure (**Fig. 9**) in the main power/optical connector set allowed seawater in and the resulting arcing of the 480 VAC power destroyed the connector set.

**Figure 9. Damage to O-ring and Connector due to Failed O-ring.**

Damage to O-rings was noticed on MINL connectors (**Fig. 10**) following unmating of connector sets to replace Pod with spare.

**Figure 10. Damaged O-Rings on MINL Connectors.**

## 4.3 MAINTENANCE RECOMMENDATIONS FROM SEACON

- ✓ Once connected, a connector-set requires no maintenance.
- ✓ When connectors are periodically unmated, Seacon recommends inspecting, cleaning and installing new O-rings.
- ✓ Do **not** unmate a connector unless it is **absolutely necessary** as there is always risk of compromising a seal when mating/unmating a connector set.

## 4.4 REPLACING CONNECTOR O-RINGS

Before unmating connectors on the VIT-frame equipment:

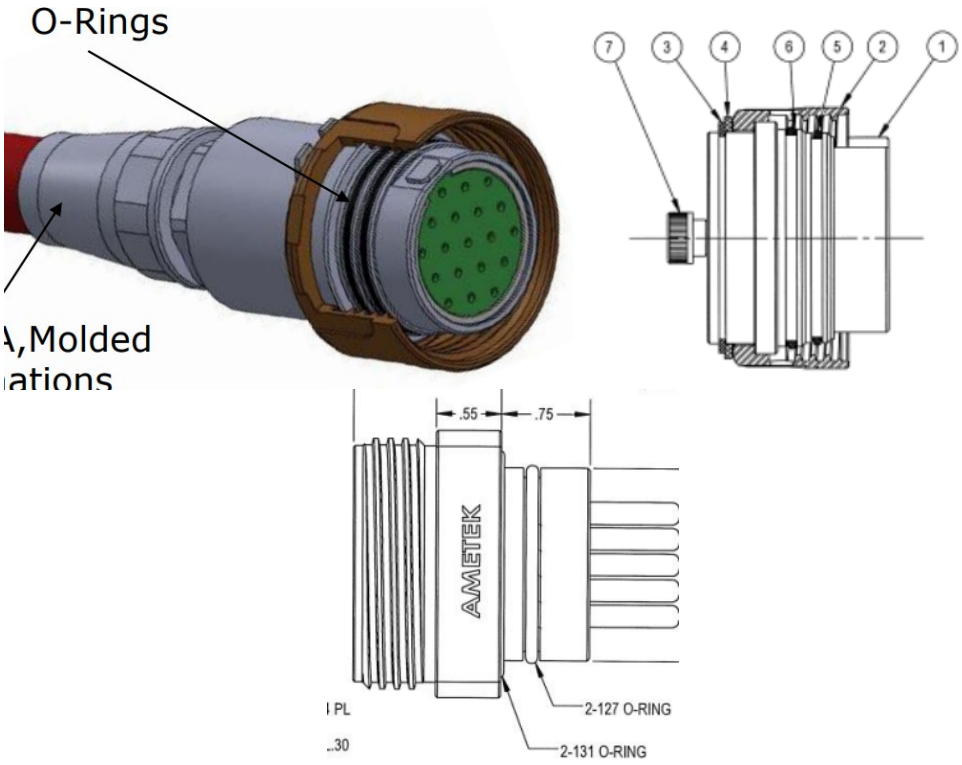
1. Confirm the power is turned off.
2. Wash connector set with fresh water and dry.

### CONNECTORS WITH O-RINGS REPLACEMENT PROCEDURE

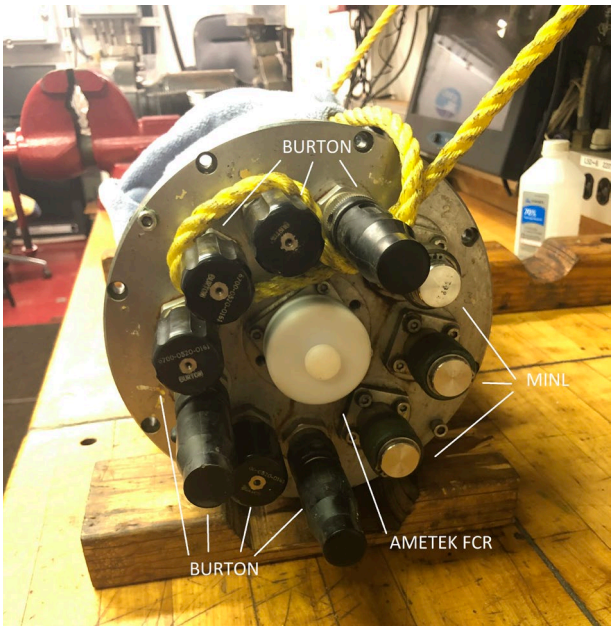
Currently we have only **two** connector sets with O-ring seals.

- AMETEK FCR/CCP (**Fig. 11**) is used as the main optical and power connector set to the Pod.
- The MINL FCR/CCP (**Fig. 14**) coaxial connector set is used to connect the HD Camera to the Pod

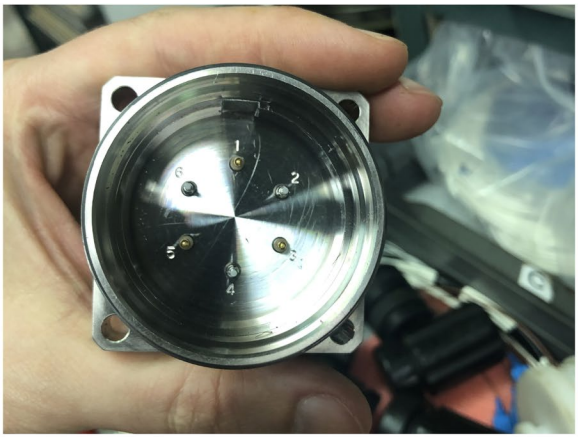
**Figure 11. AMETEK CCP (Left), Dust Cap (Right), and FCR (Bottom) O-ring placements. CCP and Dust Cap share O-ring placement/sizes.**



## Figure 12. Pod Optical and Power Connectors.




## Figure 13. AMETEK FCR (Left, no O-rings) and MINL FCR Radial O-Ring (Right).



FCR


MINL

1. On the MINL FCR connector replace the Radial O-ring, size 2-018 (C on **Figs. 13-15**).
2. On the MINL CCP connector replace the Facial O-ring, size 2-019 (D on **Fig. 14**; **Fig. 15**).
3. On the AMETEK CCP connector replace the Radial O-rings, size 2-031 (6 in **Fig. 11**) and 2-030 (5 in **Fig. 11**).

**Figure 14. MINL Connector (FCR and CCP) O-rings.**

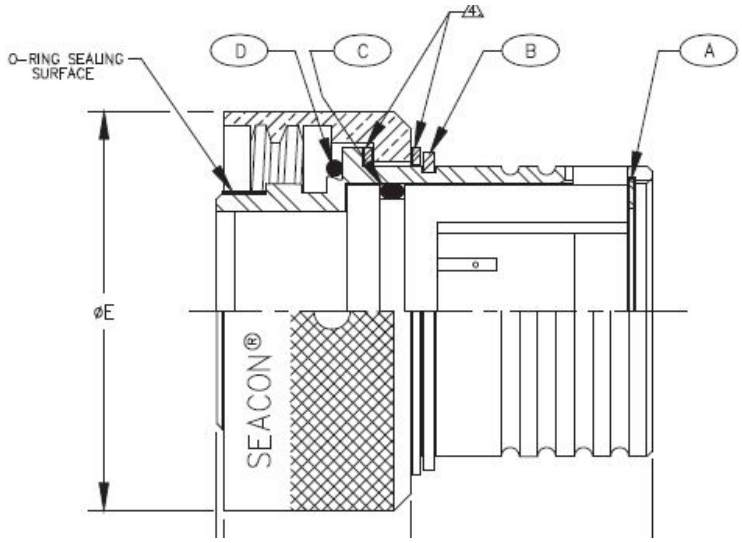



**Figure 15. Ametek FCR Radial O-Rings (Left) and MINL-FCR Facial O-Ring (Right).**

Ametek FCR


MINL FCR

**Note: Installing the facial seal O-ring on the CCP connector can be tricky. It has to be stretched and plied into the slightly bigger diameter dovetail groove. If this is not performed properly, it will not stay seated.**

4. Clean any grease, moisture or foreign particles from O-ring sealing area, O-ring groove and inside connector.
5. Lubricate O-rings lightly with DOW CORNING 111 grease and install carefully. Excess grease in the groove could compromise the seal.
6. Apply a thin film of grease to O-ring sealing surfaces.

## CONNECTORS WITHOUT O-RINGS

The 5500/6600 Burton 8-pin connectors (***Fig. 16***) have no O-ring seals. The plug and receptacle have a face-type seal integrally molded. For it to properly seal it has to be clean and free of cuts, nicks, and tears.

**Figure 16. 5500/6600 Burton Connector (No O-Ring).**


5500/6600 Burton

Lightly lubricate all rubber surfaces, including the face, with DOW CORNING 111 before mating.

## 4.5 UMBILICAL MAINTENANCE

### MECHANICAL

For prolonged service, it is necessary to establish a preventative maintenance program to assure continual protection of this asset. This includes the periodic rinsing of the cable with fresh water and application of corrosive inhibited lubricating oil. Exposed armor layers provide numerous voids for entrapping water and debris. This entrapment of corrosive material will result in accelerated deterioration of the galvanized steel wire layers.

### OPTICAL

A proper cable design will protect the optical fibers against strain and crushing forces. A protected fiber will offer less attenuation to the longer wavelengths (green 1550 nm) than to the shorter (blue 1310 nm; ***Fig. 17***) ones. In a strained fiber, the reverse is true. The longer wavelength (green 1550 nm) is attenuated more than the shorter (blue 1310 nm; ***Fig. 18***). Strained fibers will eventually lead to a break in the optical path, thus; at least one of the fibers in the umbilical should be measured periodically to check for strain to alert the user and allow him/her to plan for a potential future break.

**Figure 17. Normal Fiber Attenuation at 1550 nm and 1310 nm.**

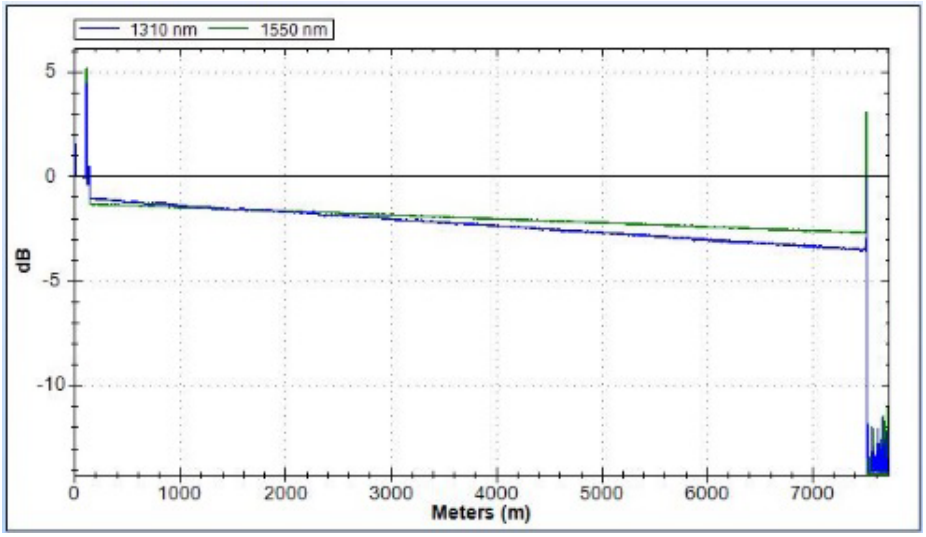
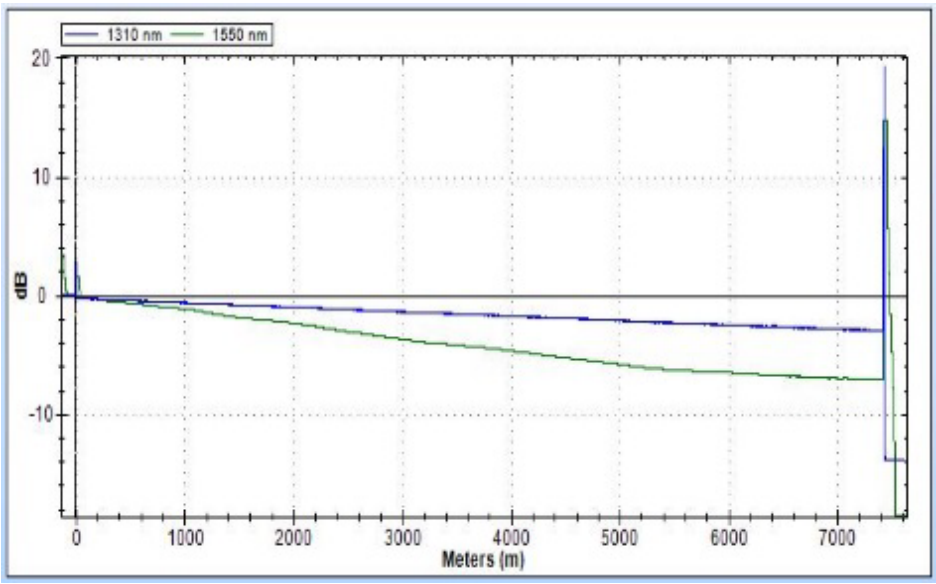



**Figure 18. Strained Fiber with Attenuation at 1550 nm and 1310 nm.**



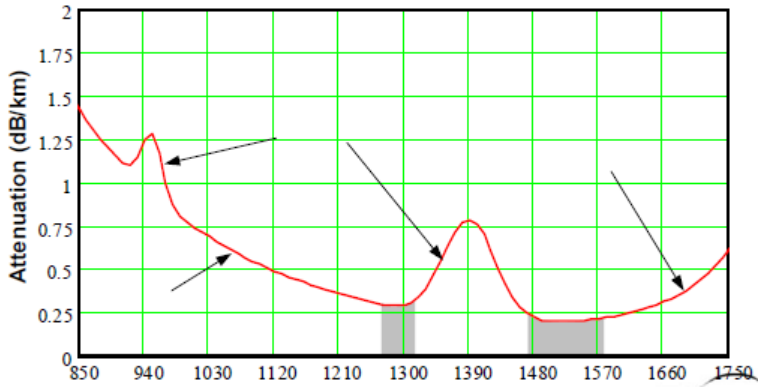

## 4.6 OPTICAL MEASUREMENTS

### OVERVIEW

Optical attenuation varies with wavelength (***Fig. 19***). Measurements must be done within the range of wavelengths in use to be meaningful. Both the Optical Time Domain Reflectometer (OTDR) and power source/power meter instruments support measurements at 1550 nm. This falls within the range of wavelengths utilized by the IODP

design, and measurements are made at this wavelength setting unless otherwise stated. Keep in mind that OTDR attenuation measurements are calculated while the AFL Optical Source and meter instrument set transmit and measure actual power values.

**Figure 19. Fiber Attenuation Standard Singlemode Fiber (SMF).**




## FLUKE OTDR

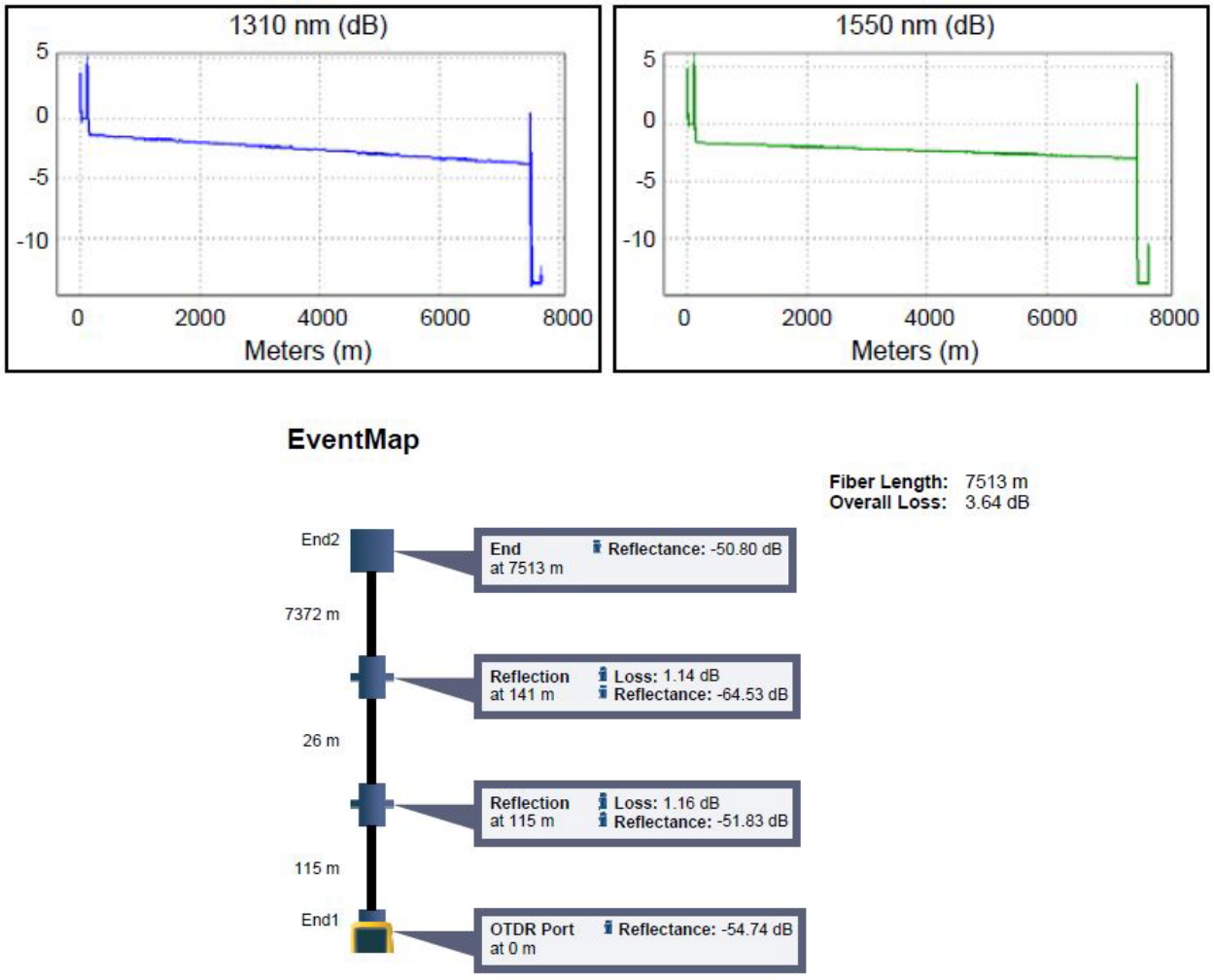
Read the Optical Time Domain Reflectometer (OTDR Getting Started.pdf) manual before operating.

The OptiFiber Pro OTDR (Fig. 20) is an Optical Time Domain Reflectometer that locates, identifies, and measures reflective and loss events in single-mode fibers. Typical maximum test range is 130 km at 1550 nm for single-mode fiber. This instrument will show any deficiencies along the optical link.

**Figure 20. Optical Time Domain Reflectometer (OTDR).**

**Figure 21** shows a typical result from a measurement made on a fiber from the DP to the Telemetry Pod.

## Figure 21. OTDR Measurement on Fiber from DP to Telemetry Pod.




End1 represents the Start at the DP FO J-Box. "115 m" later is the Subsea FO J-Box. "26 m" further is the FORJ on the winch. "7372 m" later is End2 (the Pod at the end of the umbilical).

## AFL POWER SOURCE/METER TEST INSTRUMENTS

The *Optical Laser Source* (**Fig. 22**) output power is ~0 dBm at 1310 nm and 1550 nm. The *Optical Power Meter* (**Fig. 22**), measures absolute power in dBm or relative power in dB.

**Figure 22. Optical Power Meter (Left) and Optical Laser Source (Right).**


CSM1 Power Meter CSS1-SM Laser Source

**NOTE: The CSM1 is not a selective Power Meter. Measurement will only be accurate when all light in the fiber is at one wavelength and the same as the meter setting. Light at different wavelengths than the meter setting will negatively impact the accuracy of the measurement. CWDM wavelengths of SPFs in use by IODP range from 1490 nm to 1570 nm. The closest setting of the CSM1 is 1550 nm. When multiple CWDM wavelengths are present in a fiber, the CSM1 cannot give an accurate measurement.**

Actual attenuation measurements made from DP FO J-Box to Pod on VIT Frame are:

AFL Power source/meter at 1550 nm:

| | |
|---|---|
| BLUE | -7.28 dB (Splitter in Subsea included). |
| ORG | -3.66 dB |
| GRN | -3.84 dB |

## 4.7 FUSION SPLICING

The SpliceMate™ (**Fig. 23**) with PAS technology is designed for splicing a variety of optical fibers. Its small size and light weight make it suitable for any operating environment. It is easy to operate and splices quickly while maintaining low splice loss. To achieve the splicer's full capabilities read instruction manual (FSM-11S SpliceMate manual.pdf) carefully before operating. Read the Cleaver and Splicer manuals as well as this section.

**Figure 23. Splicemate™ Tool.**


### FUSION SPLICING TOOLS

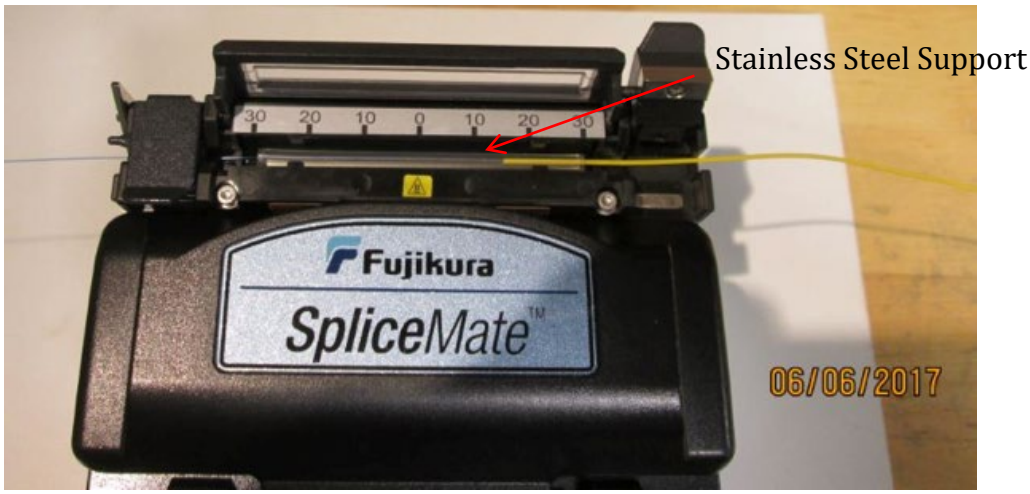
**Figure 24** shows the following Fusion Splicing tools:

- Stripper: Stripping device with notches calibrated to different fiber dimensions. Used to strip the jacket, buffer or both from the optic fiber element.
- Cleaver: This device is used to cut the fiber end with a 90° face end, required for acceptable light transfer.
- Splicer: This device will fusion splice two correctly cleaved fiber ends.

## Figure 24. Fusion Splicing Tools.

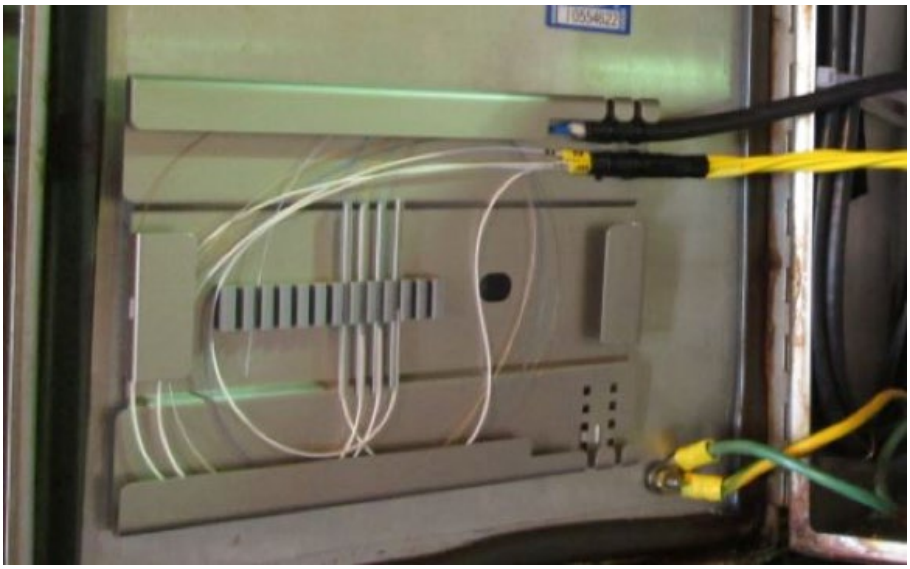

As well as the tools listed above, Stainless Steel Supports (**Fig. 25**) are used.

## Figure 25. Stainless Steel Support with Fibers in Fusion Splicer Oven.




When two optic fiber ends have been fusion spliced together, they are fragile unless supported. The Stainless-Steel Support is a stainless-steel rod with a section of heat shrink. The Stainless-Steel Support is positioned so that the splice is in the center and then inserted into an oven onboard the fusion splicer to shrink the heat sleeving. When cooled, the splice is complete and inserted into the splice tray (***Fig. 26***).

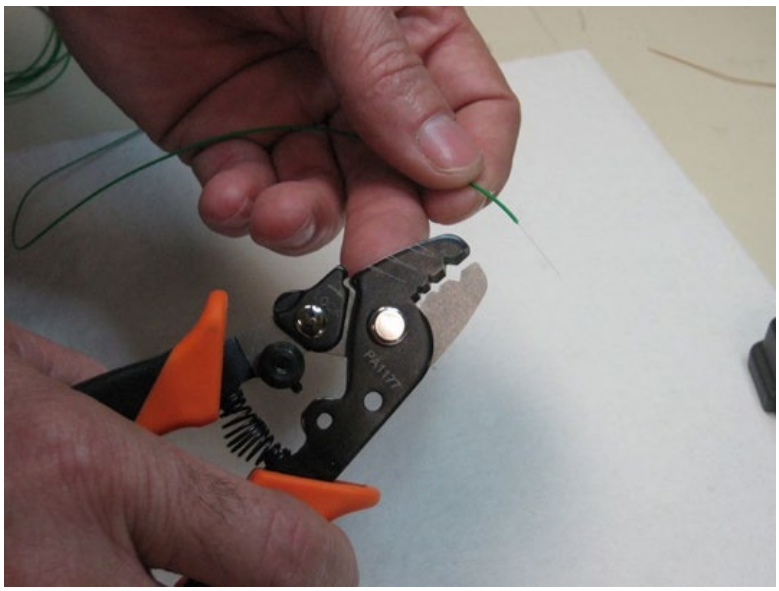
**Figure 26. Splice Tray.**



## STRIPPING PROCEDURE

1. Before stripping, slide a stainless-steel splice support over the fiber element for later use.
2. Using the appropriate stripping tool (**Fig. 27**), strip 1 inch of jacket and buffer, ¼ inch at a time, to expose bare fiber.

**Figure 27. Stripping Tool.**



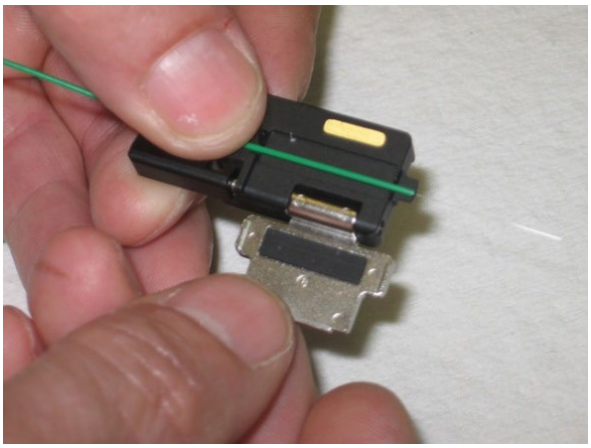
3. After stripping, clean fiber end with a lint free cloth soaked in isopropyl alcohol (**Fig. 28**). Two or three wipes are normally sufficient.

**Figure 28. Clean Fiber End after Stripping.**


## CLEAVING PROCEDURE

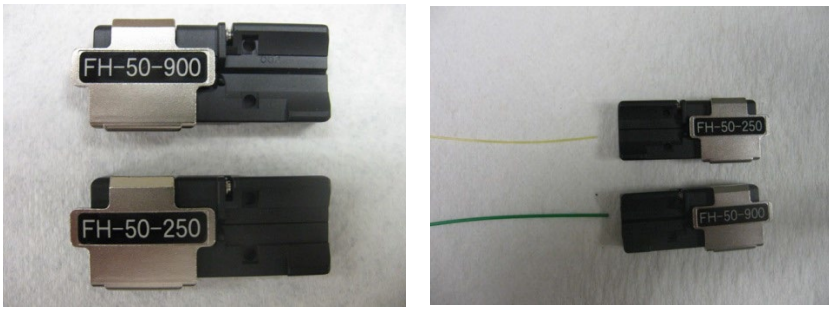
1. Place fiber in appropriate fiber holder (**Fig. 29**).

**Figure 29. Fiber in Holder.**



Two fiber holder types (**Fig. 30**) are provided to support different jacket sizes.

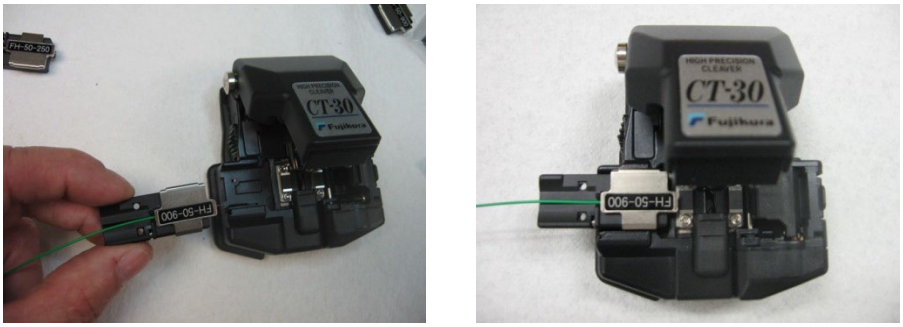
**Figure 30. Types of Fiber Holder.**




The FH-50-900 (**Fig. 30**, Left) is used with the jacket diameter of 900 µm and the FH-50-250 (**Fig. 30**, Right) is used with the smaller diameter jacket (250 µm) of the umbilical fiber element.

2. Cock the cleaver and place the fiber holder (**Fig. 31**) firmly in the spring-loaded slot.

**Figure 31. Load Fiber Holder in to Cleaver.**

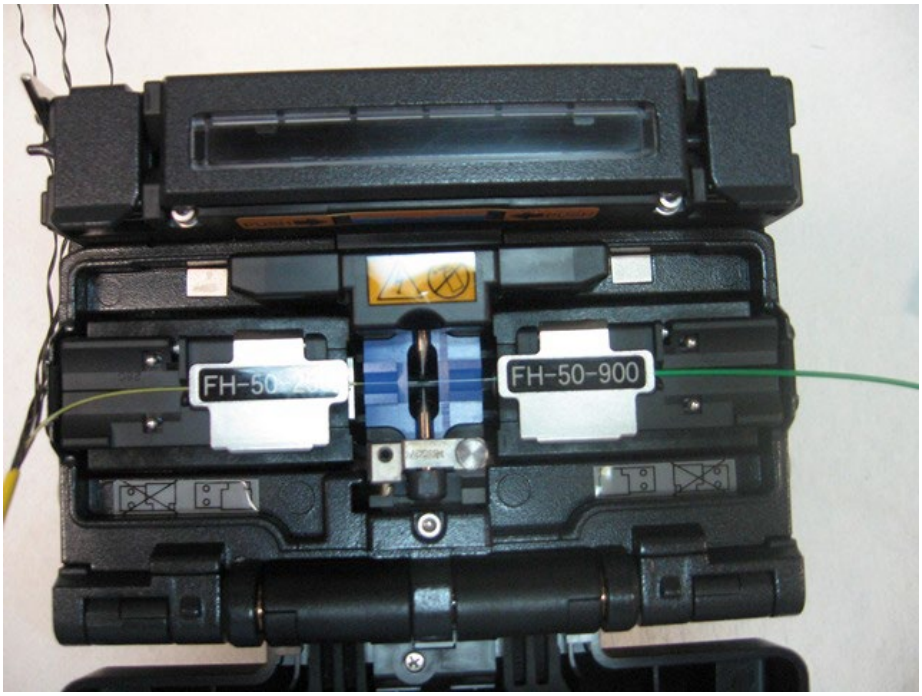



3. Cleave the fiber by pressing down on cleaver top.

## SPLICING

1. Remove fiber holder from cleaver and place in the fusion splicer (**Fig. 32**). Take care not to touch the fiber in the process and note that the fiber holder can only go in one way.
2. After placing both fiber holders, close the top and initiate the splicing process.

**Figure 32. Splicer Containing Two Fiber Holders.**




3. When splicing is done, remove the now joined fiber from the holders.

4. Slide and center the stainless-steel splice support and insert into the heat shrink oven. When the splice support heat cycle is done, the fiber is ready to be mounted onto the splice tray.

# CHAPTER 5.0 VIT CRITICAL SPARES

Spares for all critical parts in the system are available. The spares are listed and stock controlled in the IODP AMS system. Parts are located in Subsea except for the Cortland Umbilical, which is stored onshore.

| Part No. | Spare Part Description | Location |
|---|---|---|
| OV9018 | Birns FO Connector + Adaptor | C4-8 |
| OD2028 | O-Ring, Opto Pod Connector, #028 | C4-5-B |
| OD2029 | O-Ring, Opto Pod Connector, #029 | C4-5-B |
| OD2116 | O-Ring, Electro Pod Connector, #116 | C4-5-B |
| OD2263 | O-Ring, Telemetry Pod End Cap, # 263 | C4-5-B |
| OD2265 | O-Ring, Telemetry Pod End Cap, 70 Duro, #265 | C4-5-B |
| OD2368 | O-Ring, VIT Frame Junction Box, 70 Duro | C4-5-B |
| OM3007 | Cable Grip | -- |
| OM3027 | FORJ, Slipring | -- |
| OM3061 | Cable Grip, Thimble | C2-3-A |
| OV0801 | Camera, NTSC Complete with pressure vessel | -- |
| OV0802 | Camera only, Sony NTSC | C4-2-C |
| OV0806 | Umbilical, Cortland | Shore |
| OV0807 | Camera only, Sony HD-SDI | C4-2-C |
| OV0811 | Pan/Tilt | -- |
| OV0812 | Light, Underwater, Ross, 10 kln | C4-6 |
| OV0813 | Cable, Underwater, Sonar (Peek) Blue | C4-9 |
| OV0814 | Cable, Underwater, 6 ft blue | C4-9 |
| OV0815 | Cable, Underwater, 8 ft blue | C4-9 |
| OV0816 | Connector, Underwater, Pod, Burton # 6607-1608 | C4-3-D |
| OV0818 | Connector, Underwater, Opto, Pod Flange | C4-3-F |
| OV0819 | Connector, Underwater, Opto, Pigtail | -- |
| OV0820 | Cable, Underwater "Y" LED, Blue | C4-9 |
| OV0824 | Fuse, Littelfuse, 2 A #67K1923 | C4-2-A |
| OV0827 | MOXA NTSC Video Encoder | C4-6 |
| OV0830 | Power Supply, Quint, 24 V/20 A | C4-6 |
| OV0838 | Fan, 24 VDC P-Sup | C4-2-C |
| OV0839 | Vicor 5V DC-DC Converter | C4-2-A |
| OV0840 | Connector, Underwater, Coaxial | C4-3-D |
| OV0841 | Cable, Underwater, HD Camera, Grn | C4-9 |
| OV0846 | Hose, braided, compensator | C4-8-A |
| OV0848 | Conax Comp Gland | C4-8-A |
| OV0849 | Cable, Underwater, "Y" P/T Org | C4-9 |
| OV0850 | Gyro | -- |
| OV0852 | Sonar, Tritech | -- |
| OV0853 | Light, Underwater, Bowtech 2.5 kln | C4-5-A |
| OV0854 | Cable, Underwater, Coax 8 ft, Org | C4-9 |

| Part No. | Spare Part Description | Location |
|---|---|---|
| OV0860 | Telemetry Pod, Assembly Complete | -- |
| OV0864 | BlackMagic Mini Converter, SDI to HDMI | C4-2-D |
| OV0866 | BlackMagic Mini Converter, SDI to Analog | C4-2-D |
| OV0869 | FO Sleeve, Fusion Splice 3M Telcom # 2170 | -- |
| OV0904 | Connector, Underwater, Burton # 5506-1508 | C4-3-D |
| OV0932 | SFP, ABL45-24-80-D 1000Base-BX-UTX 1490/RX 1550 80 KM DDM | C4-2-F |
| OV0933 | SFP, ABL54-24-80-D 1000Base-BX-D TX 1550/RX 1490 80 KM DDM | C4-2-F |
| OV0934 | SFP, ASF55-24-80-D 1.25G CWDM 1570NM 80KM DDM | C4-2-F |
| OV0935 | SFP, ASF57-24-80-D 1.25G CWDM 1550NM 80KM DDM | C4-2-F |
| OV0936 | SFP, ASF53-24-80-D 1.25G CWDM 1530NM 80KM DDM | C4-2-F |
| OV0937 | SFP, ASF51-24-80-D 1.25G CWDM 1510NM 80KM DDM | C4-2-F |
| OV0938 | SFP, YACRR-XX3X-1L4D 3G Video SFPCWDM 40 KM DDM | C4-2-F |
| OV0939 | SFP, YACTT-5557-1L4D 3G Video SFP CWDM 1550/1570NM 40 KM DDM | C4-2-F |
| OV0970 | MOXA ADSL Modem | C4-7 |
| OV6059 | Cable Head, Stress Boot | C4-8-A |
| OV6080 | Silicon Oil, 200 fluid, 100 CS, Xiameter-PMX | -- |
| OV6124 | Cable Head, Armor Pot. | C4-8-A |
| OV9011 | SVS-109-R, Multiplexer, Pod | C4-2-F |
| OV9012 | SVS-209, GB Etherenet | C4-2-F |
| OV9013 | SVS-309R, HD-SDI Video, Pod | C4-2-F |
| OV9014 | SVS-309L, HD-SDI Video, DP | C4-2-F |
| OV9015 | FO CWDM 2-ch 1550/1570 nm | C4-2-E |
| OV9016 | FO Splitter, 2-ch | C4-2-E |
| OV9017 | FO CWDM 4-ch 1510/1570 nm | C4-2-E |
| OV9019 | SVS-109-L, Multiplexer, DP | C4-2-F |

# CHAPTER 6.0 VIT PARTS LIST

| IODP Part No. | Part Description |
|---|---|
| OD2028 | O-ring, Opto Pod Connector, #028 |
| OD2029 | O-ring, Opto Pod Connector, #029 |
| OD2116 | O-ring, Electro Pod Connector, #116 |
| OD2263 | O-ring, Telemetry Pod End Cap, #263 |
| OD2265 | O-ring, Telemetry Pod End Cap, #265 |
| OD2368 | O-ring, Frame J-Box, #368 |
| OM3006 | Bearing, VIT Winch Drum |
| OM3007 | CableGrip, VIT Umbilical RHL (see OM3061 for thimble) |
| OM3027 | FORJ, Slipring |
| OM3035 | Drum, VIT Winch |
| OM3061 | Thimble, 5/8, for OM3007 Cablegrip |
| OV0750 | All Mounts Assembly, VIT |
| OV0751 | Bumper Light Fixture, VIT |
| OV0752 | Light Mount, VIT |
| OV0758 | Camera Mount Assembly, VIT |
| OV0762 | Beacon Transducer Mount, VIT |
| OV0770 | Cable Lock, VIT |
| OV0772 | Deployment Handle, VIT |
| OV0800 | Assembly, VIT-OF |
| OV0801 | Camera, NTSC Complete with 6 km pressure vessel |
| OV0802 | Camera only, Sony NTSC |
| OV0803 | Plate, Mounting, Cable Drum J-Box |
| OV0805 | Reel, Shipping VIT Cable |
| OV0806 | Umbilical, Cortland |
| OV0807 | Camera only, Sony HD-SDI |
| OV0808 | Encoder, Video, Haivision HDSDI, H-264 |
| OV0809 | Decoder, Video Haivision HDSDI, H-264 |
| OV0810 | Pressure vessel only, SD Camera |
| OV0811 | Pan/tilt |
| OV0812 | Light, Underwater, Ross 10 kln. |
| OV0813 | Cable, Underwater, SONAR (PEEK) Blue |
| OV0814 | Cable, Underwater, 6' Blue |
| OV0815 | Cable, Underwater, 8' Blue |
| OV0816 | Connector, Underwater, Pod, Burton # 6607-1608 |
| OV0817 | CAP, Male, Pressure, Series 6600 |
| OV0818 | Connector, Underwater, Opto, Pod Flange |
| OV0819 | Connector, underwater, Opto, pigtail |
| OV0820 | Cable, Underwater "Y" LED, Blue |

| Part No. | Part Description |
|---|---|
| OV0821 | Connector, Underwater, Electrical, PBOF 1508 |
| OV0822 | Connector, Underwater, Electrical, PBOF 1608 |
| OV0824 | Fuse, Littelfuse, 2A # 67K1923 |
| OV0827 | Video Server, VPort 461-T |
| OV0830 | Power Supply, Quint, 24V/20A |
| OV0831 | Fuse, Littelfuse, 6.3A # 67K1939. |
| OV0832 | PCB, LV Distribution |
| OV0833 | Fuse, High Voltage 1kV, 3A #75R5350 |
| OV0834 | PCB, Terminal Interconnect |
| OV0836 | PCB, 8 Port Distribution |
| OV0837 | PCB, HV Distribution. |
| OV0838 | Fan, 24VDC P-Sup |
| OV0839 | VICOR 5V DC-DC Converter |
| OV0840 | Connector, Underwater, Coaxial |
| OV0841 | Cable, Underwater, HD Camera, Grn |
| OV0842 | J-Box VIT Frame (see OV0843) |
| OV0843 | Cover, J-Box VIT Frame (see OV0842) |
| OV0844 | Mount, Pressure Compensator, VIT Frame |
| OV0845 | Trap, Pressure Compensator, VIT Frame |
| OV0846 | Hose, Braided, Compensator |
| OV0847 | Pressure Compensator, VIT Frame J-Box |
| OV0849 | Cable, Underwater, "Y" P/T. Org |
| OV0850 | Gyro, Fiber Optic, DSP-3000 |
| OV0852 | Sonar, Tritech |
| OV0853 | Light, Underwater, Bowtech 2.5 kln |
| OV0854 | Cable, Underwater, Coaxial 8 ft., Org |
| OV0855 | Pan/Tilt, Baseplate (part of OV0856) |
| OV0856 | Pan/Tilt, Mounting |
| OV0857 | Pan/Tilt. Crossbar |
| OV0858 | Bracket, ROS LED |
| OV0859 | Joystick, VIT, Samsung, SPC - 2000 |
| OV0860 | Telemetry Pod, Assembly Complete |
| OV0861 | End Cap Bottom, Telemetry Pod |
| OV0862 | Pressure Case, Telemetry Pod |
| OV0863 | End Cap Top, Telemetry Pod |
| OV0864 | Converter, Black Magic SDI/HDMI |
| OV0865 | Support Bar, Long, Pod Chassis |
| OV0866 | Converter, Black Magic SDI/Analog |
| OV0867 | Plate, Mounting, Pod Chassis |
| OV0869 | Sleeve, Fusion Splice 3M TELCOM # 2170 |
| OV0872 | Mounting Plate, PC Board Mount, Pod Chassis |
| OV0873 | Board Mount, Pod Chassis |

| Part No. | Part Description |
|---|---|
| OV0876 | Support Bar, Short, Pod Chassis |
| OV0877 | Syntactic Foam 12 x 12 x 48  34 lb/ft$^3$ density—remove? |
| OV0878 | Syntactic Foam 12 x 24  x 48  34 lb/ft$^3$ density—remove? |
| OV0880 | Parts List-VIT Telemetry Pod (OV0860) ? |
| OV0881 | Mount, Telemetry Pod |
| OV0882 | Shock Pad, Telemetry Pod & Beacon |
| OV0884 | Mount, Camera |
| OV0885 | Shock Pad, Camera |
| OV0886 | Mount, J-Box VIT Frame |
| OV0887 | Shock Pad, VIT J-Box |
| OV0888 | Bracket, Light, Left |
| OV0889 | Bracket, Light, Right |
| OV0890 | Adapter, Light |
| OV0891 | Mount, Cable Head |
| OV0892 | Mount, Sonar |
| OV0893 | Mount, Universal, Flange 2" |
| OV0894 | Shock Pad, Universal |
| OV0897 | U-Bolt 4.5" SS, Camera/LED Clamp,  McMaster # 3176T21 |
| OV0898 | U-Bolt 4.0" SS, Camera/LED Clamp,  McMaster # 3176T19 |
| OV0902 | Connector, Underwater BCR, 6607-1608-0004 |
| OV0910 | Bracket, Color Camera Pressure Vessel |
| OV0912 | Mounting Disc, Color Camera Pressure Vessel |
| OV0913 | Support Rods, Mod, Color Camera (1/4-20 all-THD) |
| OV0914 | Rod Block, Color Camera Pressure Vessel |
| OV0915 | Board Bracket, Mod, Color Camera |
| OV0916 | Adaptor, Coaxial Connector to Pod |
| OV0920 | CAP, Male, Dust, Series 6600,  #6700-0125-0161 |
| OV0921 | CAP, Female, Dust, Series 6600,  #6700-0520-0161 |
| OV0922 | CAP, Male, Dust, Series 5500,  #6700-0125-0151 |
| OV0923 | CAP, Female, Dust, Series 5500,  #6700-0124-0151 |
| OV0924 | CAP, Coaxial, Dust, Flange  #MINL-PSPL |
| OV0925 | CAP, Coaxial, Dust, Cable  #MINL-PSRL |
| OV0926 | CAP, Pressure, Flange  # MINL-DSPL |
| OV0930 | Protective Cap, Camera Lens, VIT |
| OV0932 | SFP, ABL45-24-80-D 1000Base-BX-UTX 1490 / RX 1550 80KM DDM |
| OV0933 | SFP, ABL54-24-80-D 1000Base-BX-D TX 1550 / RX 1490 80KM DDM |
| OV0934 | SFP, ASF55-24-80-D 1.25G CWDM 1570NM 80KM DDM |
| OV0935 | SFP, ASF57-24-80-D 1.25G CWDM 1550NM 80KM DDM |
| OV0936 | SFP, ASF53-24-80-D 1.25G CWDM 1530NM 80KM DDM |
| OV0937 | SFP, ASF51-24-80-D 1.25G CWDM 1510NM 80KM DDM |
| OV0938 | SFP, YACRR-XX3X-1L4D 3G VIDEO SFPCWDM 40KM DDM |
| OV0939 | SFP, YACTT-5557-1L4D 3G VIDEO SFP CWDM 1550/1570NM 40KM DDM |

| Part No. | Part Description |
|---|---|
| OV0970 | MOXA ADSL Modem |
| OV6059 | Cable Head, Stress Boot |
| OV6080 | Silicon Oil, VIT Frame J-Box |
| OV6082 | Epoxy, Wirelock |
| OV6124 | Cable Head, Armor Pot |
| OV7000 | Assembly, VIT |
| OV7002 | Pipe Frame, Item #1, VIT |
| OV7003 | Hinged Stiffener Rings, VIT Guide Sleeve |
| OV7004 | Hinge & Stiffener Details, VIT |
| OV7005 | VIT Guide Sleeve Assembly |
| OV7009 | Hook, VIT Guide Sleeve |
| OV7010 | Casing Guide Sleeve Assembly, VIT |
| OV7011 | Hinged Stiffener Rings, Casing Guide Sleeve |
| OV7012 | Frame Details, VIT |
| OV7013 | Vibration Isolation Sling (Bungie) |
| OV7015 | Nested Guide Sleeve Assembly, VIT |
| OV9010 | Pallet, VIT Cable and Drum |
| OV9011 | SVS-109-R, Multiplexer, Pod |
| OV9012 | SVS-209, GB Ethernet |
| OV9013 | SVS-309R, HD-SDI Video, Pod |
| OV9014 | SVS-309L, HD-SDI Video, DP |
| OV9015 | CWDM 2-CH, 1550/1570 nm |
| OV9016 | Splitter, 2-CH |
| OV9017 | CWDM 4-CH, 1510/1570 nm |
| OV9019 | SVS-109-L, Multiplexer, DP |
| OV9018 | Birns FO connector + Adaptor |

# CHAPTER 7.0 VENDORS

## 8.1 MULTIPLEXER CARDS

**SeaView Systems, Inc.**
7275 Joy Road, Suite A
Dexter, MI 48130
Office: 734 426 8978
Mobile: 734 417 9362
E-mail: mcook@seaviewsystems.com
Web: www.seaviewsystems.com

## 8.2 SONAR: #SK DFS 385/725 V6 T16K8 C01546

Subsea Technologies Inc.
1323 Price Plaza Dr
Katy, TX 77449
ag@subseatechnologies.com

## 8.3 GYRO: #02-1222-01

KVH Industries, Inc.
8412 W. 185th Street/Tinley Park, Il 60487
Direct Tel:+1 708.444.3843
Tel:+1 708.444.2800/Fax:+1 708.444.3882
KC_Repair@kvh.com
http://www.kvh.com

## 8.4 PAN/TILT

SIDUS
SAN DIEGO, CA 92142
TEL: 619 275 5533
admin@sidus-solutions.com
www.sidus-solutions.com

## 8.5 CAMERAS

SONY FCB-H11 and FCB-EX20D
INTERTEST
303 Route 94, Columbia, NJ 07832
908-496-8008 908-496-8004 fax
www.intertest.com

## 8.6 FORJ

Slipring/FORJ
ALPHA SLIPRINGS
Bill Balliete billb@alphasliprings.com
Tel: 512-535-2353

# CHAPTER 8.0 6 VIT DIAGNOSTICS ET AL REVISION LOG

## 9.1 REVISION DATA

Revisions to the manual are recorded in this table. Please include the page, section or Chapter numbers in the revision Details.

| Revision Date | Authority | Page | Revision Details |
|---|---|---|---|
| 1/29/19 | Graber | Title, Ch 9 | Added VIT Assembly part number to title page, added ch. 9 revision log and TOC, fixed footer file name, and added hyperlinks/bold text for fig citations. |
| 2/6/19 | Meiring | Ch 4 and 6 | Moved Section 1.3 Optical Measurements from doc 2 end devices to 4.6 in this document. Removed syntactic foam part numbers from Ch 6. |
| 3/5/19 | Meiring | All | Approved manual. |
| 11/5/19 | Graber | Ch 4 | Added maintenance text for umbilical (cutting 30 m every two years) and refurbishing electrical portion of FORJ. |
| 9/4/20 | Schulte | Title page & p 36 | Changed OV7000 to VIT assembly on p 36. Changed OV8000 on title page to OV7000. |
| 9/25/22 | Howard | Various | Removed Cumulus references and made general updates |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |