

## Milestone 7.2.1 Report: Fiber Optic Installation, Well 16B

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**Recipient Organization:** Rice University  
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**Project Period:** 10/01/2021 – 09/30/2024

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**Date of Report Submission:** 04/05/2024

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### **Milestone 7.2.1 Report: Fiber-Optic Installation**

This report documents the successful installation of the FOGMORE fiber-optic cable in well 16B(78)-32 which occurred during the summer of 2023, in fulfillment of Milestone 7.2.1. This cable was intended to be one of the primary monitoring tools utilized by the project. The goal of Milestone 7.2.1, as laid out in the project SOPO, was to install the system, including the fiber, fiber-optic interrogator units, and telemetry systems and verify functioning by recording at least 7 days of data using all DFOS modalities. This milestone is the primary endpoint of subtask 7.2, “*Installation of fiber optic cable in production well*” which was originally scheduled for the end of Q3/Yr 2. The completion of the milestone was delayed due to the delays in drilling and completion of the 16B. For reference, we include below the text of the milestone

**Milestone 7.2.1:** *Production well fiber-optics systems installed and commissioned:* Milestone 7.2.1 is the completion of the production well fiber-optic system installation and commissioning of the monitoring infrastructure including IUs and compute components. This milestone is contingent on the FORGE drilling schedule. This milestone is linked to task 7.2 and will be managed by Silixa (Coleman) (Q3, Yr3). The milestone will be completed if the primary measurement IUs can successfully record 7 days of DTS, DSS, and DAS data on the installed cable system, cross-validated against available reference data.

The primary installation was conducted in mid-July 2024 (7/8-7/15) during the drilling and completion of well 16B with a second visit to arrange for a permanent connection to our recording container, also located on the 16 well pad. We considered this milestone completed by September 2024 when 7 uninterrupted days of DFOS data became available. This memo is to document completion and provide archival information for the project.

Attached to this memo you will find a detailed installation report from Silixa LLC, the primary fiber contractor detailing (a) cable specifications including fiber, protection, termination, and wellhead details, (b) mobilization/preparation description, (c) details of the installation procedure including termination and RiH, and wellhead completion, (d) description of the final enclosure and surface run installation, and (e) QC information on the fiber after connection. This provides archival information on the fiber installation procedure.

One issue we observed were higher than expected optical losses on the cable, likely due to manufacturing defects in the cable that led to microbends in the FIMT assembly. While this did not impact early measurements relevant to this milestone, we intend to develop a follow-on report detailing observations of fiber health over time, an on-going challenge at the site. Pre-travel and as-installed OTDR traces are included in the installation report to document this issue (pg. 40-47).



## FIELD INSTALLATION REPORT

**Project: FORGE 16B(78)-32**

**Client: RICE University**

Client Representative:	Jonathan Ajo-Franklin
Site Representative:	John Mclennan
Site Location:	FORGE EGS, Milford, UT, USA
Date:	07/24/2023 Rev 1
Completed by:	Ben Broman Matt Derosier

Engineer (1):	Ben Broman
Engineer (2):	Matt Derosier
Engineer (3):	
Engineer (4):	

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## 1 List of Acronyms

**CCUS:** Carbon Capture, Utilization and Storage

**CF:** Constellation™ Fiber

**DAS:** Distributed Acoustic Sensing

**DFOS:** Distributed Fiber Optic Sensor

**DSS:** Distributed Strain Sensing

**DTS:** Distributed Temperature Sensing

**EDU:** Electrical Distribution Unit

**EOF:** End of Fiber

**FAT:** Factory Acceptance Test

**FOC:** Fiber Optic Cable

**GPS:** Global Positioning System

**ICI:** Incoming Inspection

**ITP:** Inspection Test Plan

**IU:** Interrogator Unit

**KVM:** Keyboard Video Mouse

**LER:** Local Equipment Room

**MM:** Multimode Fiber

**MMV:** Monitoring, Measurement and Verification

**MRB:** Manufacturers Record Book

**ODU:** Optical Distribution Unit

**OFS:** Optical Feedthrough System

**OTDR:** Optical Time Domain Reflectometer

**RAID:** Redundant Array of Independent Disks

**RIH:** Run-in-Hole

**RTPU:** Real-time Processing Unit

**SCM:** Subsea Controls Module

**SEM:** Subsea Electronics Module

**SIT:** System Integration Test

**SMF:** Singlemode Fiber

**SNR:** Signal to Noise Ratio

**TDMS:** Technical Data Management System

**UTA:** Umbilical Termination Assembly

**VSP:** Vertical Seismic Profiling

**WHO:** Wellhead Outlet

## 2 Executive Summary

This document presents Silixa's summary of the permanent fiber optic cable installation in the deviated geothermal production well 16B(78)-32 located in the Utah FORGE underground geothermal laboratory situated near Milford, UT, USA.

A downhole fiber optic cable was installed outside the 7" production casing with well dimensions and fiber optic cable hardware outline below:

### Well Details:

- Measured Depth = 10,208.40 ft
- Production casing: 7" 38# P110EC VAM TOP HT  
7" 38# P110MS VAM TOP HT
- Open hole: 9.5"
- KB: 31 ft

### Permanent Hardware:

- Downhole A825 fiber optic cable with 5 FIMT fibers/ one impregnated strain fiber in belting
- A825 Bottom Hole Assembly (BHA) with steel clamp
- Surface enclosure with emergency shutoff valve and surface cable terminated with E2000/APC connectors

Cabling RIH started on July 10th and was completed on July 12th. The cable was tested every 20 joints passing QA/QC at each test. Before landing the casing hanger, cable was wrapped around the hanger neck 3 times on the rig floor, then another 2 times prior to exiting through the adapter. On a prior visit to site, Silixa engineers installed an instrumentation cabinet (the "edge monitoring system") to acquire data during operations and future phases of the project. A Silixa XT-DTS™, Carina™, and iDSS™ were used to monitor cementation and circulation testing, and the cable was temporarily terminated in a NEMA 4 aluminum junction box with surface cable and E2000/APC connectors. Just after wellhead repairs were performed on August 30<sup>th</sup>, an in-line splice repair was also performed in the cellar due to breakage of the cable during wellhead removal. During final system commissioning, a permanent NEMA 4/IP66 junction box was installed near the well cellar and spliced into a surface cable running to the Rice University/Silixa acquisition trailer. Silixa engineers left after ensuring the edge monitoring system was operating as expected, with optical fibers connected to each IU in the acquisition trailer.



### 3 Scope of Work

Silixa was contracted to provide cable, components, and installation services for an installation at 16B well located at the FORGE site near Milford, UT, USA. The cable fiber count included 2 multimode, 2 singlemode, 1 Constellation, and 1 strain fiber. Cable and all ancillary components were specified by Silixa. The scope of Silixa's services were to provide personnel and equipment required to attach the cable to casing as the casing was run in hole. A field team of three personnel and equipment including truck, powered spooler, sheave, cable clamp tools, fiber splicing and test instruments, and hand and power tools were required. Design specifications for the installation and equipment are below.

An additional scope of work, completed later during the week of August 28<sup>th</sup>, was performed to trench and install the downhole cable into buried conduit and connect via a tactical surface FOC to the acquisition trailer.

#### 3.1 Downhole Design Specifications

##### 3.1.1 Well Completion Design

The completion design for well 16B is presented in Figure 1.

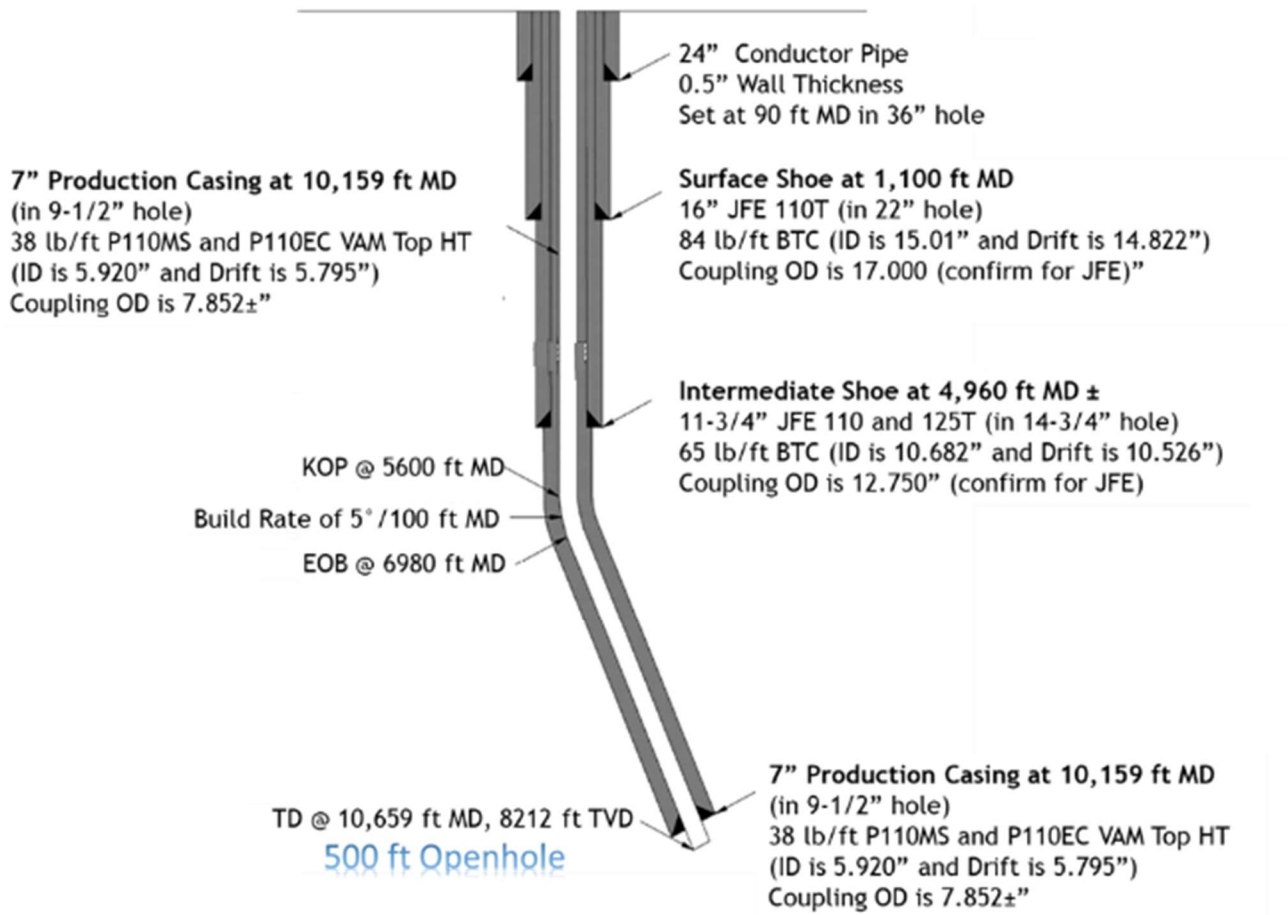


Figure 1. Well completion diagram from 16B(78)-32 planning phase.

### 3.1.2 Casing Specifications

Details are provided in the Casing Tally Run Report presented in Appendix C: Casing Tally.

- Length: 46' nominal
- Production casing: 7" 38# P110EC VAM TOP HT, optimal torque 23,150 ft.lbs.  
7" 38# P110MS VAM TOP HT, optimal torque 23,150 ft.lbs.
- Open hole: 9.5" ID

### 3.1.3 Fiber Optic Cable Specifications

The installed cable included two multimode fibers, two singlemode fibers, and one Silixa engineered Constellation fiber incorporated in a 1.8 MM FIMT. A belting layer encapsulated the strain fiber, FIMT, and a bare ¼" O.D. A825 outer tube served as the primary physical protection layer.

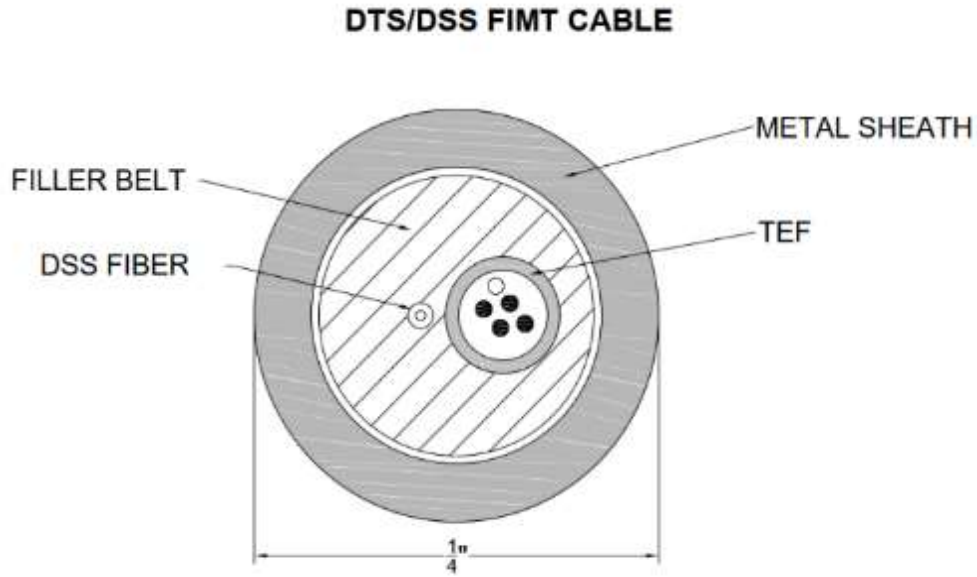


Figure 2: 1/4" OD A825 alloy tube downhole cable with belting and 1/8" OD FIMT.

The proposed cable designs provide multiple layers of hydrogen protection. The hydrogen barriers include a carbon hermetic coating layer to resist hydrogen darkening, and the fibers sit in hydrogen scavenging gel within the inner metal tube.

Parameter	Specification
<b>Outer tube diameter</b>	6.35 mm (0.250")
<b>Outer tube material</b>	Incoloy A825
<b>Outer tube wall thickness</b>	0.889 mm (0.035")
<b>Belting</b>	4.45mm OD PFA
<b>Inner tube diameter</b>	1.8 mm
<b>Inner tube material</b>	Stainless Steel 316L
<b>Number of multimode fibers</b>	2
<b>Number of singlemode fibers</b>	3
<b>Number of Constellation fibers</b>	1
<b>Temperature rating</b>	260 °C
<b>Static bend radius</b>	159 mm (6.26")
<b>Dynamic bend radius</b>	635 mm (25.0")
<b>Approximate weight</b>	167 kg/km (112 lb/kft)
<b>External Collapse Pressure</b>	275,790 kpa (40,000 psi)

Table 1: Fiber optic cable specification.

### 3.2 Bottom Hole Assembly and Protector Specifications

An A825 Silixa high pressure 1" OD bottom hole assembly (BHA) seals the end of the cable and houses optical fiber turnarounds (Figure 3). The BHA was attached to the casing with a custom designed steel protector and clamp. Protector clamp schematics and running OD are presented in Figure 4 and Figure 5. The BHA was installed on a 20 ft pup joint to allow for a centralizer to be installed below the adjacent downhole collar and provide additional protection for the BHA.



Figure 3: Silixa’s high-pressure bottom hole assembly (BHA).

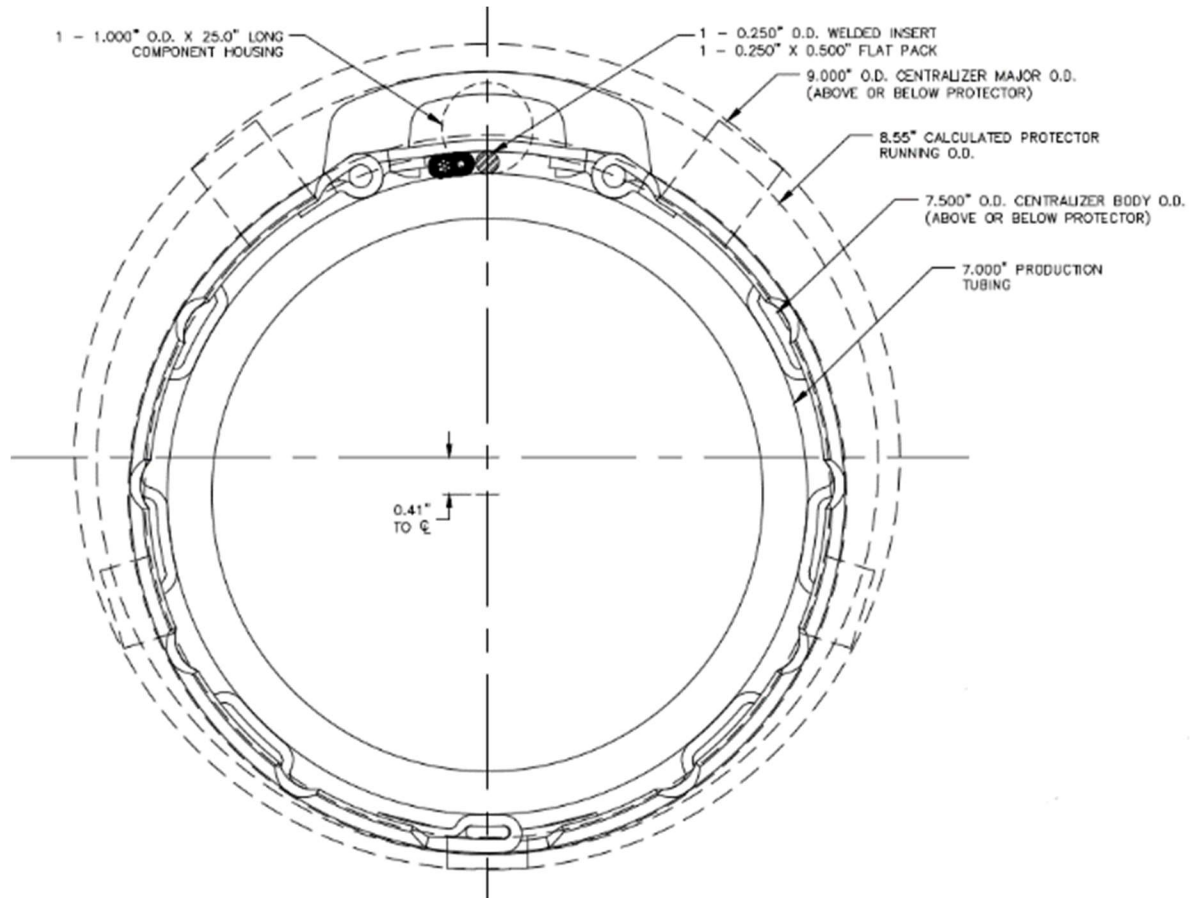


Figure 4: Cross section of example BHA Clamp

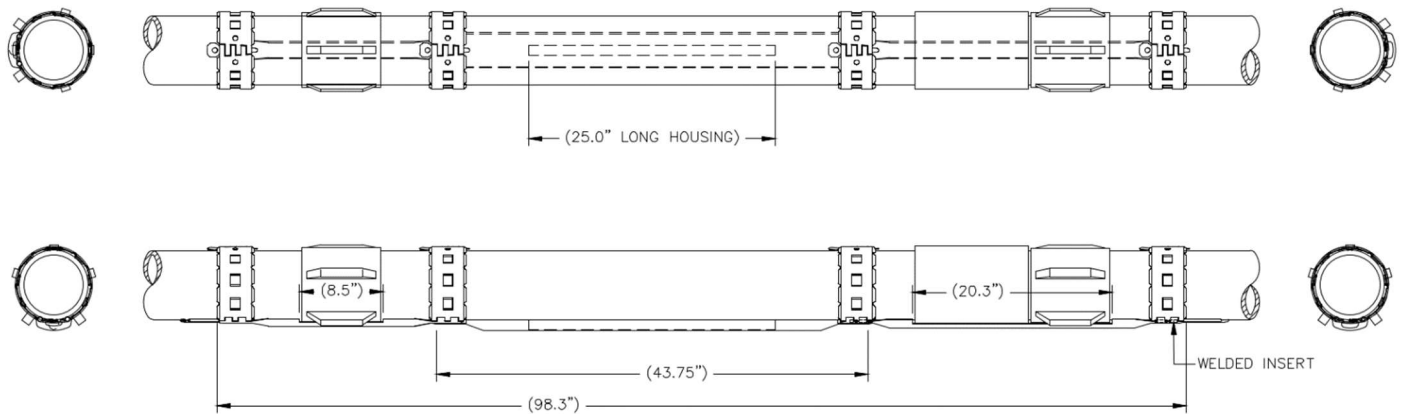


Figure 5: Side view of BHA clamp.

### 3.3 Cross-coupling Protector with Centralizers

A cross-coupling fiber optic cable clamp protector with solid body centralizers fixed the cable to the casing. This also provided protection against abrasion with the borehole wall during deployment, in contrast to simple band clamp or mid-joint style designs. This notched design (Figure 6 and Figure 7) locks over each collar preventing vertical movement, while set screws prevent rotational migration to reduce the risk of failure during installation. These components were used at every coupling in the open hole section of the well.

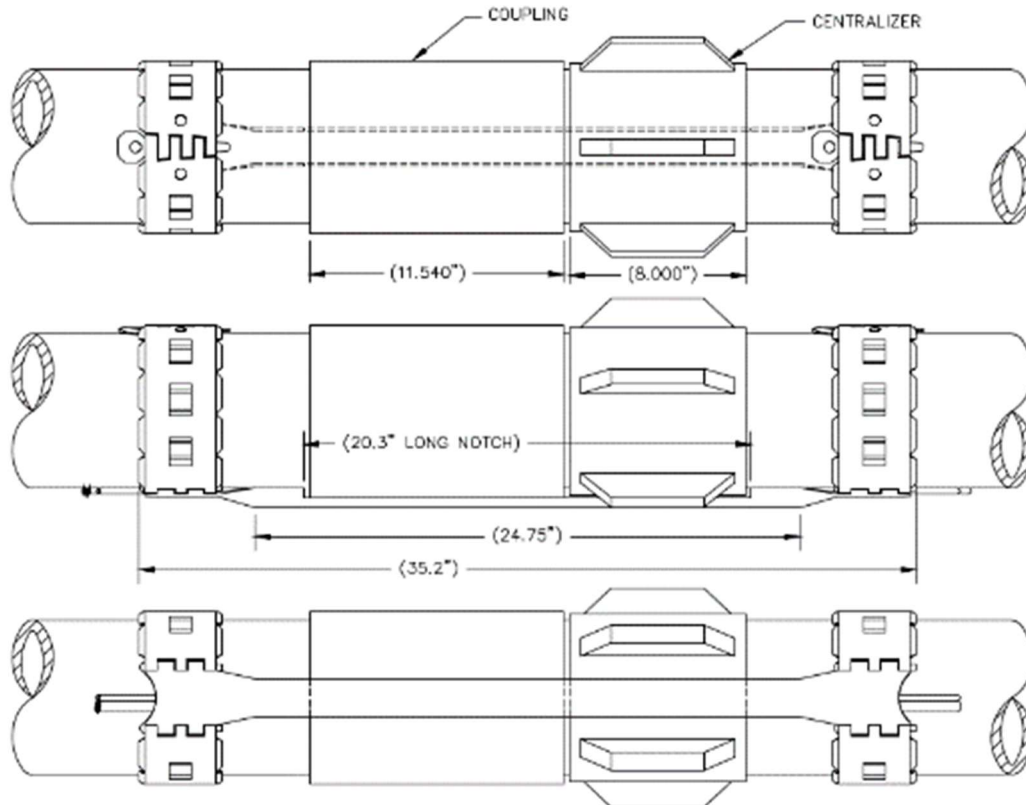


Figure 6: Notched clamp over collar and solid body centralizer.

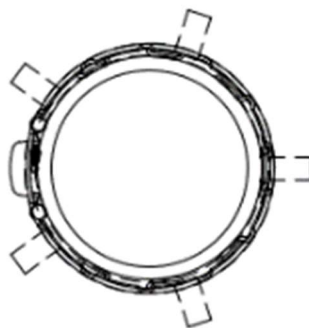


Figure 7: Solid body centralizer.

### 3.4 Surface Completion

A custom-designed wellhead system was implemented, incorporating high-temperature-resistant components to withstand the extreme conditions associated with geothermal drilling. The 1/4" stainless steel cable was routed through the wellhead, passed through an autoclave assembly and Swagelok fitting to ensure proper pressure sealing. At the surface, the cable was protected and cleanliness was maintained by enclosing it within ~10 feet of 1" Sealtite conduit, providing both rigid and flexible protection with PVC coating.

The surface enclosure process involved initial cable routing outside the cellar to monitor cementing and the circulation test, respectively. Subsequently, the cable was secured around the wellhead and later cut, wrapped, and further secured. Field engineers returned for final cable routing on August 30<sup>th</sup>. Cables were spliced into an enclosure after necessary wellhead maintenance procedures, including a lift to redo the wellhead seals and pass the pressure test again. During disassembly, a damaged section of the 1/4" cable required an inline splice with a Silixa minisaddle splice assembly. This splice allowed for the connection of the fiber optic cable to the strut rack, supporting the junction box that housed the shutoff valve assembly. The cable was then spliced onto a surface tactical cable. This cable ran into the acquisition trailer where interrogator units were housed, which were responsible for measuring temperature, acoustic, and strain data.

### 3.4.1 Wellhead

The wellhead schematic is presented in Figure 8 below.

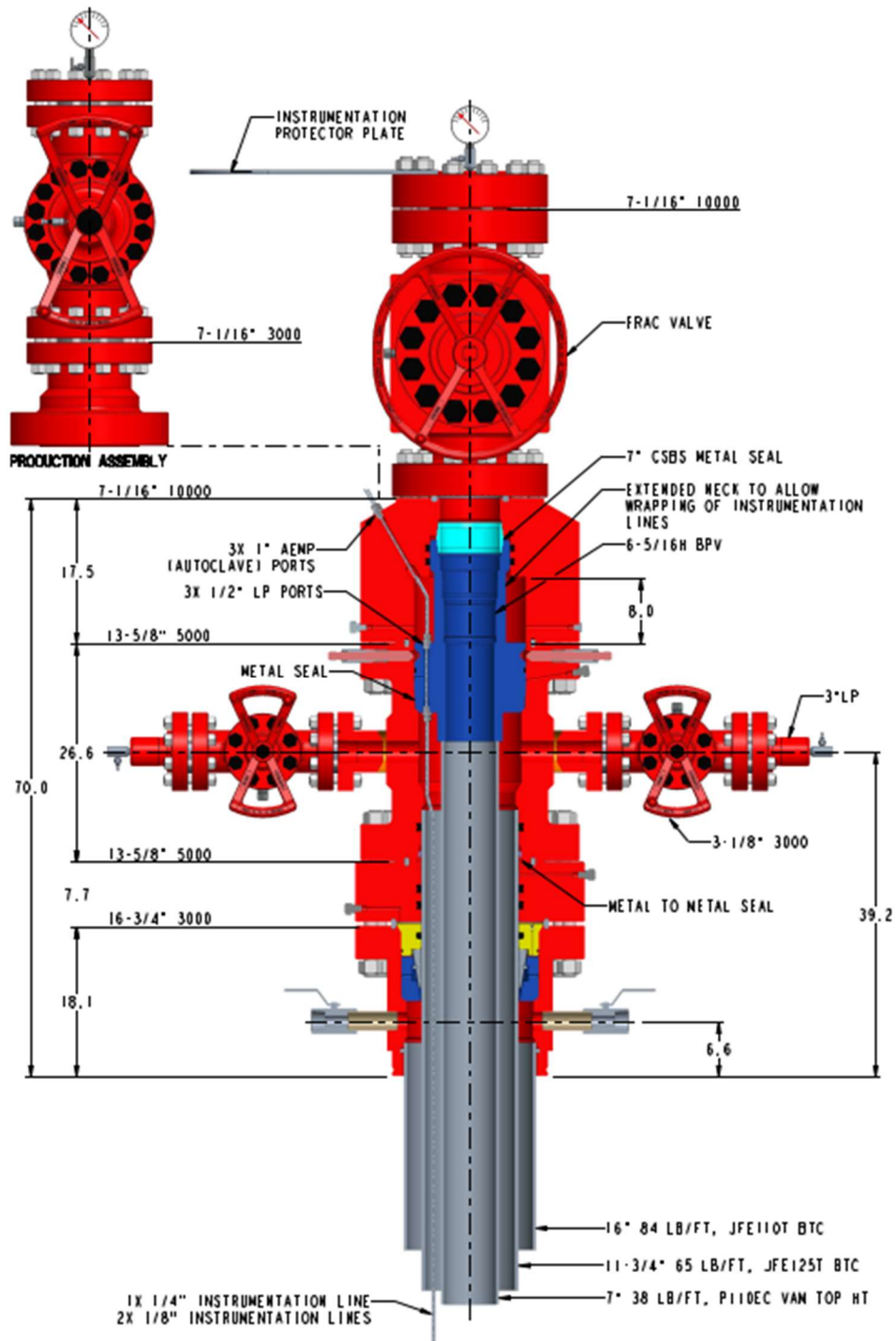


Figure 8. Streamflo Wellhead Schematic.



## 4 Mobilization and Preparation

### 4.1 Pre-mobilization Component and Equipment QA/QC

Prior to mobilization of the equipment, rigorous QA/QC checks were carried out to ensure the quantity and integrity of all components including conformance to optical and physical specifications, form/fit, and compliance with the completion plan. Installation equipment parts were tested to verify functionality. A summary is presented in Appendix A: Pre-Mobilization Checklist.

### 4.2 Pre-mobilization BHA Termination

OTDR tests were conducted on the cable to ensure the integrity of all fibers. The cable was terminated with an A825 BHA, which was pressure tested for 30 min at 6000 psi. The cable was fitted with temporary E2000/APC connectors to facilitate testing prior to, during, and post installation. OTDR traces are presented in Appendix D: OTDR Traces. A schematic of BHA splicing and resultant fiber configuration is presented in Figure 9.

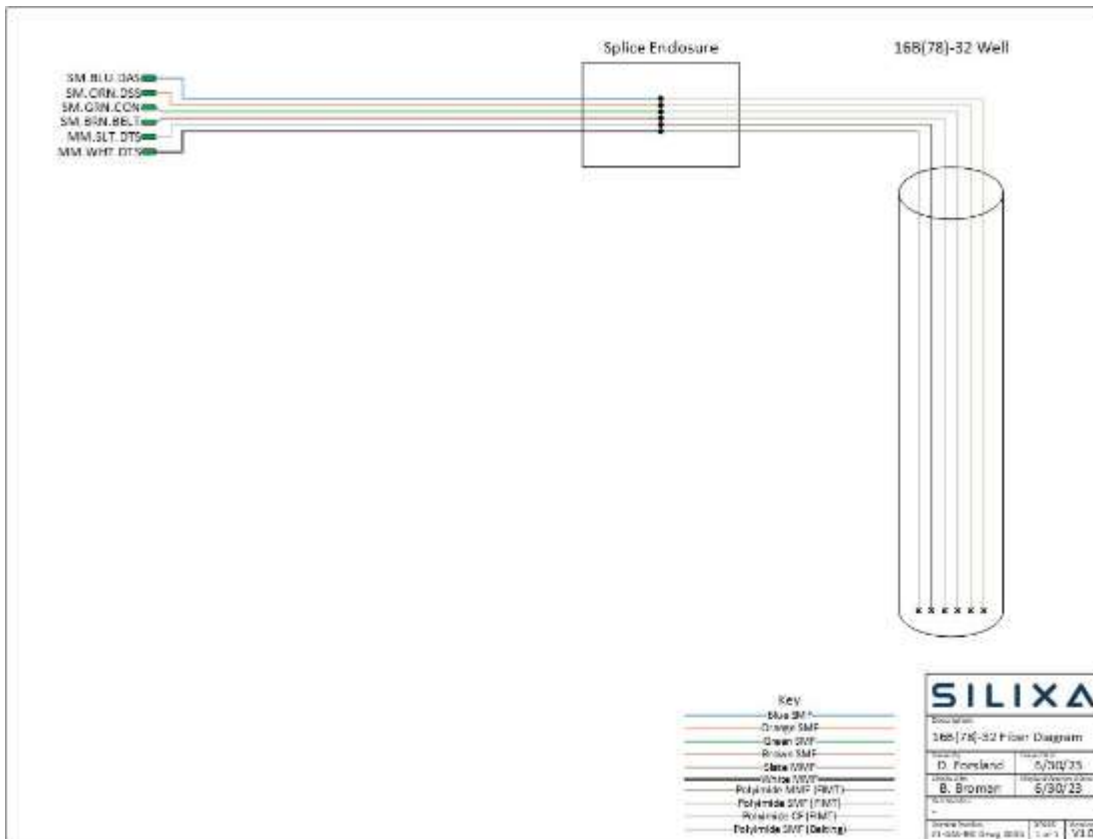


Figure 9: Fiber Splice Diagram for RIH.

### 4.3 Mobilization

The field team mobilized on July 7<sup>th</sup>, 2023, from Missoula, Montana to Milford, UT with all required equipment. Immediately upon arriving onsite, the Silixa field engineers tested the cable, DTS unit, and all equipment before RIH operations started.



Figure 10. Silixa site mobilization.



Figure 11. Silixa site mobilization.

## 5 Installation Execution

### 5.1 Rig Up

Setting up for the installation required coordination and precision, from both Silixa and Baker Hughes engineers. The crucial step of positioning the sheaves and spreader bar was executed with attention to detail. A forklift was used to maneuver the sheave into place, and once secured each FOC was carefully threaded through it. Throughout this phase, engineers from Silixa and Baker Hughes worked together ensuring control over the movement of the spreader bar as another team member acted as a tag line. From the rig floor a member of the drilling crew operated the crane to lift the spreader bar to the monkey boards' designated location. This collaborative effort guaranteed an efficient deployment of both BHAs and cable.

Rigging up the BHA went smoothly and according to procedure. Despite the site conditions with winds, a busy and challenging environment, the BHAs were secured by Baker Hughes and Silixa on the rig floor as a measure to ensure access and quick deployment once the appropriate casing joint was available on deck.

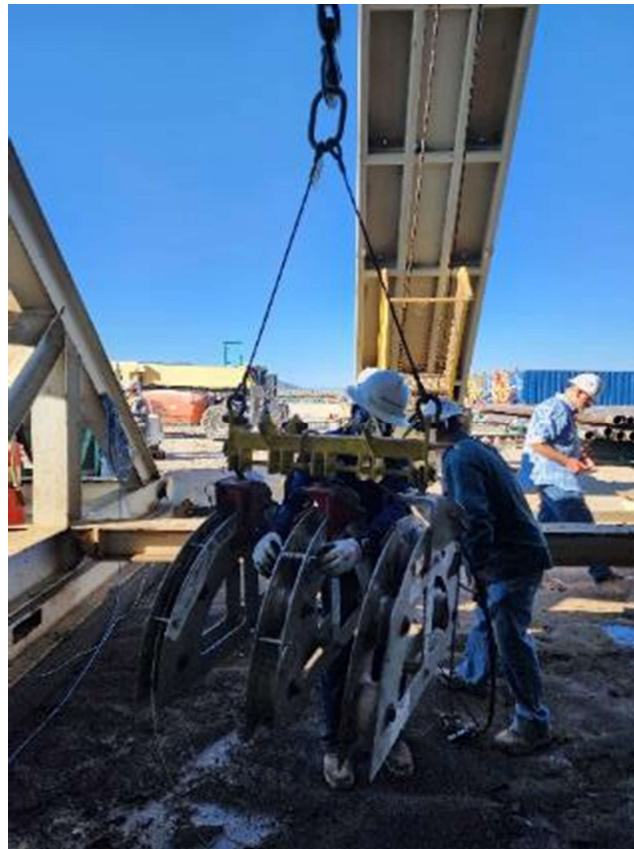


Figure 12. Sheave and spreader bar.



Figure 13. Spooler with Fiber Optic Cable.

## 5.2 BHA Installation

The fiber optic BHA was installed using a clamp protector assembly to ensure protection of the BHA during RIH. The location of the BHA was on Pup Joint A with the final fiber turnaround location placed at a measured depth of 9999.89ft.



Figure 14. Installation of fiber optic cable BHA.

### 5.3 RIH Completion Program

Silixa's BHA and protector clamp were installed per specifications with a Silixa field engineer present to ensure proper delivery. Baker Hughes had one gauge installed approximately 61 casing joints later. The FOC management was excellent and there were no issues or interference with Silixa's equipment.

### 5.4 RIH Integrity Testing

Cable integrity tests were performed using an optical time domain reflectometer (OTDR) at all critical moments and on a regular interval during run in hole. Integrity tests were also taken before and after cementation. Traces were taken:

- 1) On site upon arrival
- 2) After rig-up
- 3) Every 10 casing joints
- 4) After reaching TD

OTDR traces taken after RIH was completed are shown in Appendix D: OTDR Traces.

### 5.5 Wellhead Completion

The fiber optic cable installation was successfully completed. Three fiber wraps were placed around the casing hanger on the rig floor. A temporary junction box was installed for cement monitoring with a surface cable spliced on with E2000/APC connectors. Later on the cable was cut prior to nipple down operations. Two more wraps were made during wellhead termination, so the fiber passed through in the correct direction based on the wellhead orientation. This yielded a total of 5 wraps. This changed later during trenching and junction box install to 2 remaining wraps.



Table 2. Completion of FOC through the wellhead.

## 5.6 Cementation Monitoring

Monitoring during cementing operations was carried out using a Silixa XT-DTS ruggedized distributed temperature sensor. Cementation was carried out in 1 stage with operations commencing on July 13<sup>th</sup> at 5am. DTS acquisition ceased at July 14<sup>th</sup> at 11:28am. Field depth calibration was carried out using the control points in Table 3, Table 4, and Table 5 and determined from interrogator spray test and optical data. 'Cementing configuration' refers to the optical layout prior to pumping cement and after cutting the cable from the spool. 'Circulation configuration' refers to the optical layout after the cable had been passed through the wellhead and re-terminated. 'Final configuration' refers to the optical layout after wellhead repairs and junction box splicing were completed.

Control Point	Fiber Color in Trailer/Downhole Fiber Type	Fiber Distance (m/ft KB)	Measured Depth (m/ft)
<b>KB (Cementing configuration)</b>	Green, CF	172.60 / 566.28	0
<b>BHA (Cementing configuration)</b>		3237.00 / 10620.08	3047.97 / 9999.89
<b>KB (Circulation configuration)</b>	White, MMF	179.71 / 589.61	0
<b>BHA (Circulation configuration)</b>		3237.00 / 10620.08	3047.97 / 9999.89
<b>KB (Final configuration)</b>	Slate, MMF	171.91 / 564.00	0
<b>BHA (Final configuration)</b>		3231.00 / 10600.39	3047.97 / 9999.89

Table 3. Depth Calibration for Carina DAS interrogator. KB rig floor height is 31ft.

Control Point	Fiber Color in Trailer/Downhole Fiber Type	Fiber Distance (m/ft KB)	Measured Depth (m/ft)
<b>KB (Cementing configuration)</b>	White, MMF	174.65 / 573.00	0
<b>BHA (Cementing configuration)</b>		3223.75 / 10576.61	3047.97 / 9999.89
<b>KB (Circulation configuration)</b>	Slate, MMF	178.14 / 584.44	0
<b>BHA (Circulation configuration)</b>		3223.30 / 10575.13	3047.97 / 9999.89
<b>KB (Final configuration)</b>	White, MMF	172.25 / 565.11	0
<b>BHA (Final configuration)</b>		3218.00 / 10557.74	3047.97 / 9999.89

Table 4. Depth Calibration for XT-DTS interrogator. KB rig floor height is 31ft.

Control Point	Fiber Color in Trailer/Downhole Fiber Type	Fiber Distance (m/ft KB)	Measured Depth (m/ft)
<b>KB (Cementing configuration)</b>	Blue, SMF	174.38 / 572.11	0
<b>BHA (Cementing configuration)</b>		3242.00 / 10636.48	3047.97 / 9999.89
<b>KB (Circulation configuration)</b>	Blue, SMF	177.93 / 583.76	0
<b>BHA (Circulation configuration)</b>		3241.00 / 10633.20	3047.97 / 9999.89
<b>KB (Final configuration)</b>	Orange, SMF	172.01 / 564.34	0
<b>BHA (Final configuration)</b>		3237.10 / 10620.41	3047.97 / 9999.89

Table 5. Depth Calibration for iDSS interrogator. KB rig floor height is 31ft.

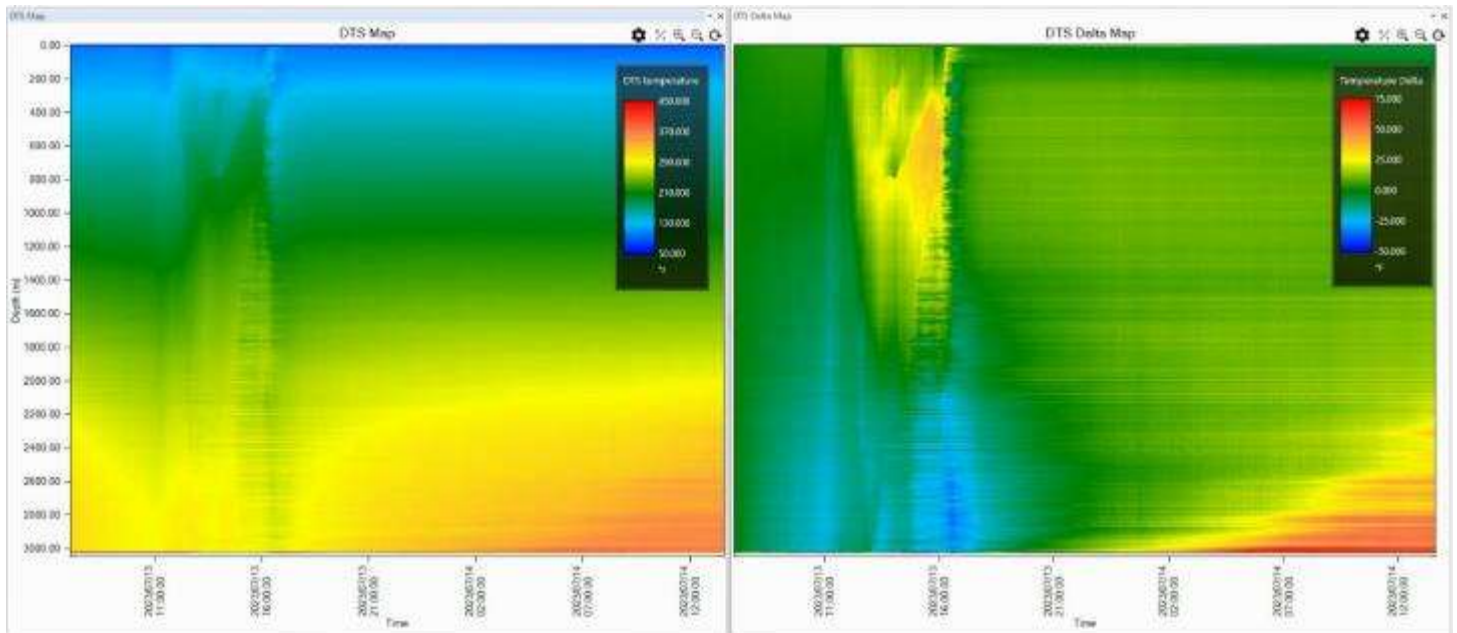


Figure 15. Thermal plot during cementing operations.



## 5.7 Final Surface Enclosure Installation and FOC Routing/Splicing

A stainless steel surface enclosure was installed on the 16B(78)-32 pad to connect the Silixa ¼" downhole cable to more flexible tactical surface cable. This surface cable routed directly to the Silixa instrumentation in the Rice University acquisition trailer. See Figure 22 for the final physical fiber schematic.

### 5.7.1 Physical Fiber Layout

The Silixa and Baker Hughes/Shell downhole fiber optic cables were protected from damage during future site operations by burying them in 2" PVC conduit. This scope of work was performed in conjunction with a wellhead repair operation, from August 30<sup>th</sup> to September 3<sup>rd</sup>. A Unistrut frame was erected away from the cellar (to mount the surface enclosure), and conduit was run both from the frame towards the well cellar and away to the acquisition trailers (located on the North side of the sump; see Figure 16). Flexible surface fiber optic cables were pulled through the conduit from the trailers to the enclosure Unistrut frame. The downhole cables were routed from the well cellar into conduit that penetrated the cellar wall, where it then ran to the enclosure Unistrut frame. Cables in the cellar were protected with 1" Sealtite conduit.



Figure 16. Conduit trenching from enclosure frame to acquisition trailer.



Figure 17. Conduit routing for fiber optic cable into Silixa acquisition trailer.



Figure 18. Silixa acquisition trailer after trench has been backfilled.



Figure 19. Trenching for permanent trailer electrical supply.



Figure 20. Fiber optic cables after Silixa removed three wraps (during wellhead repair).



Figure 21. Cables exiting Wellhead Outlets after the wellhead adapter was replaced.

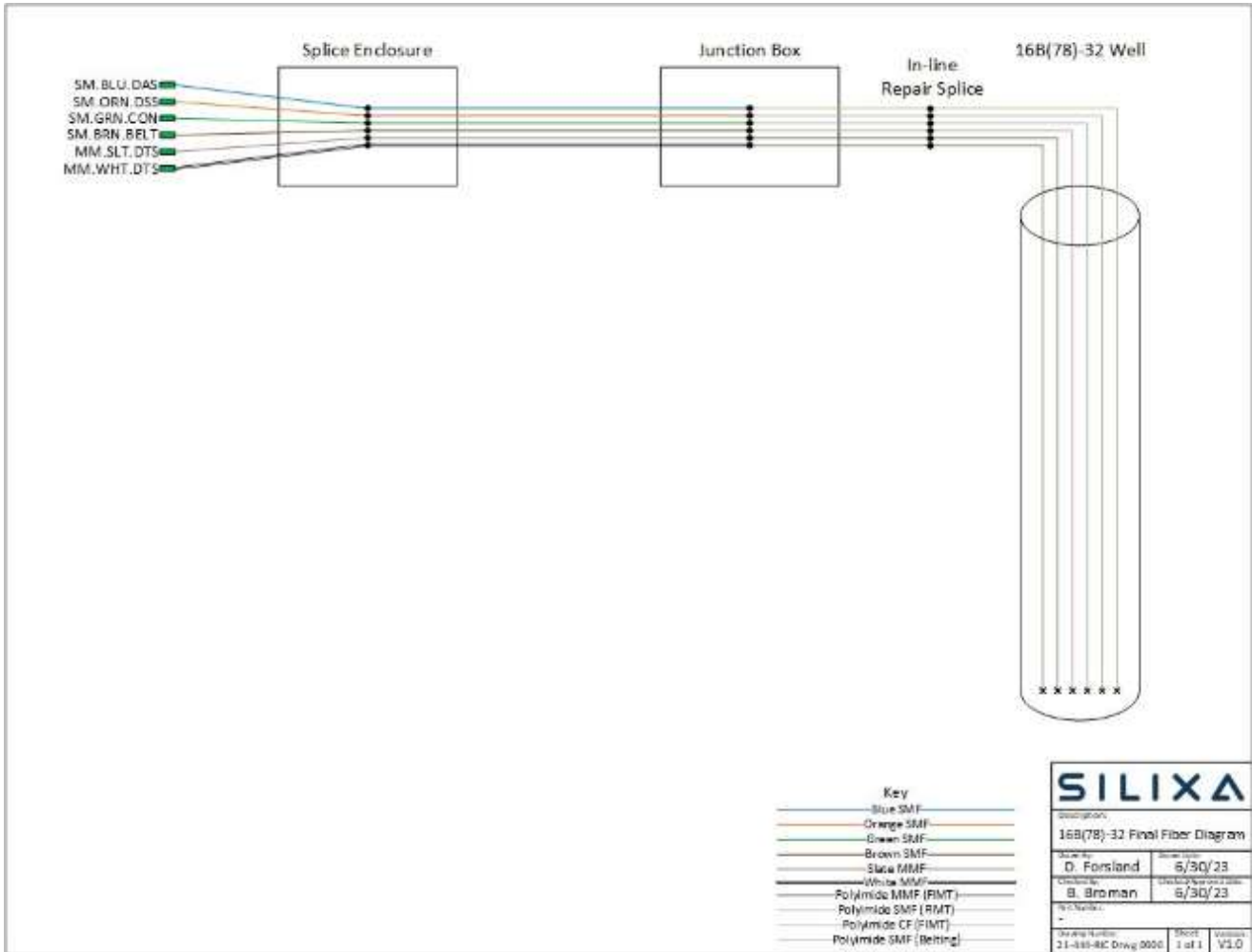


Figure 22. Final fiber splice arrangement.

### 5.7.1 Silixa FOC Repair Splice

During wellhead repair operations on August 30<sup>th</sup>, a Swagelok fitting seized on the Silixa downhole cable while removing it. The cable was damaged during efforts to remove the fitting. To proceed with wellhead repair operations, the cable was cut at the fitting and wraps were removed from the wellhead to facilitate an in-line repair splice. The wraps were removed during the wellhead repair process and did not affect the Shell FOCs.

After the wellhead repair was successfully completed and Unistrut frame was erected (see Figure 24), the repair splice was installed on the cable (see Figure 23). All repair fiber splices were acceptable, and the in-line splice box was mounted to a bar extending from the cellar wall. The cellar grate was replaced around the wellhead after repairs were completed.



Figure 23. In-line repair splice located underneath 16B cellar grating.



Figure 24. Final installation with Silixa/Baker Hughes enclosures on the Unistrut frame.



Figure 25. Excess Silixa fiber optic service loops stored on the back of the frame.

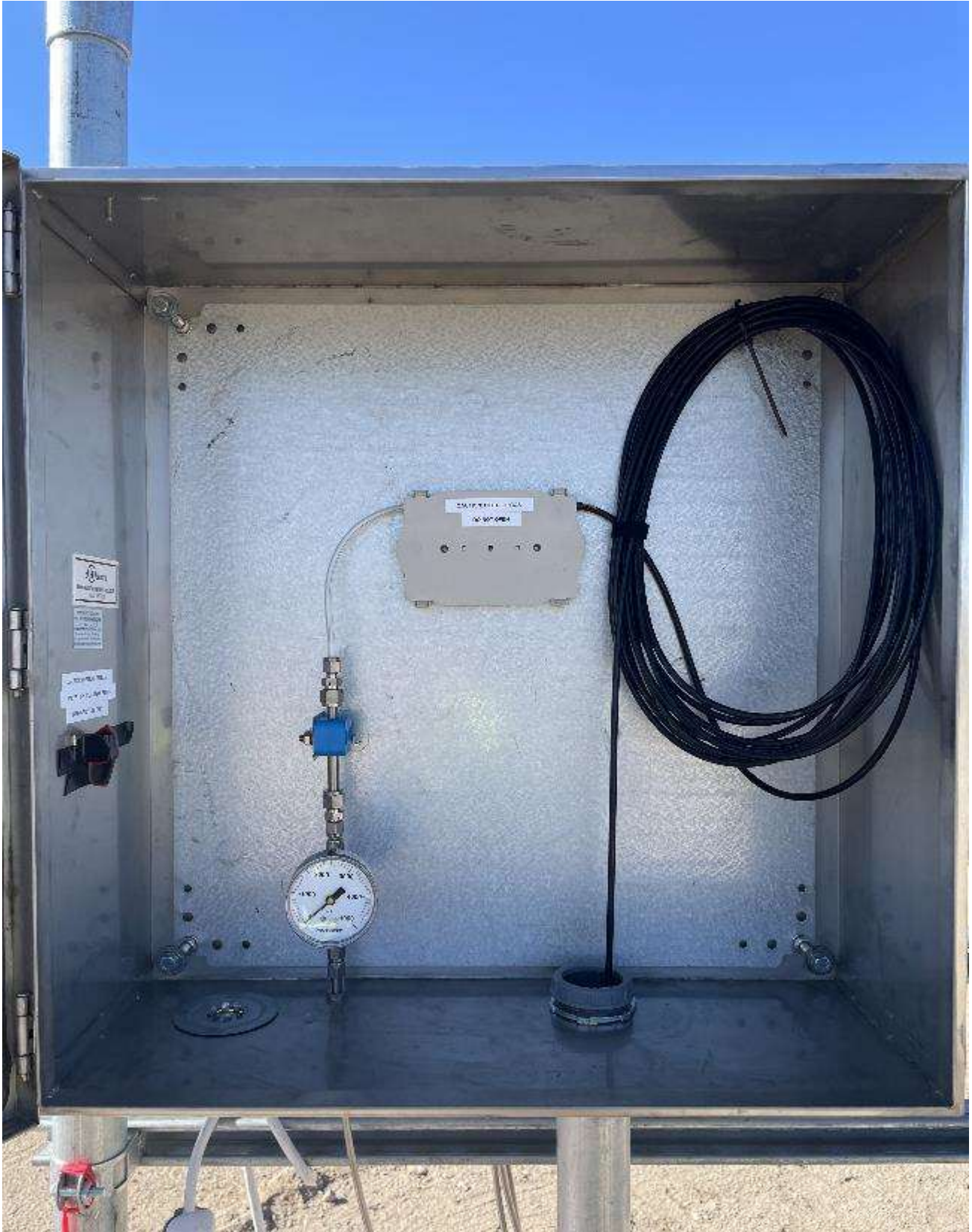


Figure 26. Surface enclosure interior with valve assembly shutoff.



## 6 Final Remarks

The fiber optic cable installation for the 16B(78)-32 well, although faced with fiber attenuation issues from the manufacturer, was successfully run to the planned depth. Silixa's precaution of having spare FOC on hand, though unnecessary, underscored our commitment to project success.

Careful planning during cable installation facilitated smoother decision-making during the RIH process, particularly concerning the tactical cable route from the RICE trailer to the rig floor. Edge system cabinet installation and surface cable splicing in advance of the FOC installation also facilitated setup of the systems (before cementing operations) when time was short. Although an acquisition issue occurred with the DSS during cement pumping, the other two interrogators captured the cementing process and all three were acquiring during the circulation test. Additionally, Silixa provided an online dashboard for remote parties to view the livestream of the data, which several parties successfully accessed during operations. The edge monitoring system was left operating and intact at the conclusion of system commissioning, with optical fibers plugged into each interrogator for remote operation. The system is operating as expected.

Notably, the project benefitted from strong communication and teamwork among all parties. Alan Reynolds from Baker Hughes and the Silixa team cooperated effectively, resulting in a safe installation without any damage during RIH. This collaborative effort enhanced project efficiency and safety.

Considering future projects with this client, maintaining communication and collaboration among stakeholders remains essential. Vigilance regarding cable quality, length, and attenuation mitigation remains a priority. Our detailed preplanning processes during cabinet installation should serve as a blueprint for future projects, ensuring more efficient field operations.



Figure 27. Edge monitoring system cabinet.



Figure 28. Rice/Silixa acquisition trailer.

## Appendix A: Pre-Mobilization Checklist

- ✓ Backup DTS
- ✓ Backup DAS
- ✓ Field Processing Laptop
- ✓ Fusion Splicer Kit
- ✓ AFL FS300 OTDR
- ✓ 2 x Multimode launch cables
- ✓ 2 x Singlemode Launch cables
- ✓ 2 x Multimode patch cables
- ✓ 2 x Singlemode patch cables
- ✓ Hydraulic clamping tools
- ✓ Manual clamping tools
- ✓ Cannon taper pins
- ✓ 150m 2MM/4SM tactical cable
- ✓ Splice boxes
- ✓ Splice trays
- ✓ Silixa Window Maker
- ✓ Backup 825 BHA
- ✓ Backup BHA protector clamps
- ✓ 2 x 825 mini saddle kit
- ✓ Mini saddle protector clamps
- ✓ Assortment of Swagelok parts
- ✓ 4 x wellhead outlet 1" autoclave assembly
- ✓ 4 x 1" NPT to sealtite adapter
- ✓ 60ft of 1" sealtite
- ✓ 2 x Silixa Half Moon bending cap
- ✓ 24" x 24" Junction box for shutoff valve assembly
- ✓ Cable bender
- ✓ Cable straightener
- ✓ Hydraulic pressure tester kit
- ✓ Wrench set
- ✓ Drill set
- ✓ PPE – hard hat, gloves, safety toe boots, glasses, ear plugs

## Appendix B: Daily Activity Reports

### Saturday 7/8

1130 – Matt and Ben arrived onsite and checked in with Leroy  
1145 - unloaded spooler  
1230 - unloaded truck and trailer into RICE trailer  
1330 - parked trailer at upper pad  
1400 - FET tools on rig floor  
1430 - Hydessco spool moved to NE corner of pad  
1500 - OTDR traces taken and uploaded  
1530 - installed TeamViewer remote access on server for cementing operations  
1600 - setup external backup drives  
1615 - checked in with Leroy and John M  
1645 – Both left site. Headed to Milford

### Sunday 7/9

1730 - all 3 arrived onsite, checked in  
1745 - quick tour for Joey  
1800 - moved spooler into location  
1830 - touched base with Alan, John M, Baker Hughes  
1840 - left site. All 3 Headed to hotel

### Monday 7/10

0520 - Matt and Joey arrived onsite  
0530 - safety meeting  
0550 - Silixa internal safety meeting  
0600 - OTDR traces on spool  
  
1100 – Start RIH  
  
1340 – Silixa BHA on  
1730 - Ben onsite. Matt and Joey leave

### Tuesday 7/11

0530 - Matt and Joey arrived onsite. Ben leaves  
1730 - Ben onsite. Matt and Joey leave

### Wednesday 7/12

0530 - Matt and Joey onsite. Ben leaves  
1200 - Ben onsite  
1300 - rope attached to Silixa fiber  
1500 - BH starts setting up cable to pass through hanger  
1800 - Silixa starts setting up cable to pass through hanger  
1900 - Silixa hanger pressure test  
1930 - Silixa wraps  
2000 - landing joint  
2100 - Silixa starts splicing  
2330 - done splicing. Continue config

**Thursday 7/13**

0000 - Matt leaves site  
0030 - spray mapping on DTS and DSS  
0102 - started DTS acquisition  
0104 - started DSS acquisition  
0109 - started DAS acquisition  
0118 - started tap test  
0200 - setup Aquidash  
0330 - setup remote access for DSM and clients  
0345 - Ben and Joey left site  
1530 - all 3 arrived onsite. Started Mosaic depth correction  
1600 - Joey talk with Alan Reynolds and Peter Meier  
1800 - spooler loaded on trailer  
1845 - dropped off trailer. Left site

**Friday 7/14**

0700 - all 3 arrived onsite  
0715 - small gradient adjustment to Aquidash  
0800 - plotting cementation on Mosaic  
0830 - checked in with Dana from Neubrex  
0900 - looking for top of cement in Mosaic  
1000 - dry fit autoclave fitting on wellhead termination  
1123 - stopped acquiring on all units  
1200 - cut cable  
1230 - Ben leaves site  
1300 - started nipple down  
1500 - completed nipple down  
1700 - well head landed. Silixa and BH fibers OK. Still needs torqued down  
1800 - Silixa well head auto clamp and fittings done  
1845 - Ben arrives onsite  
1930 - temp splicing starts  
2215 - done splicing. Take traces  
2300 - all 3 left site to hotel

**Saturday 7/15**

0930 - hardware store  
1000 - all 3 onsite. Starting on setup  
1100 - noise check and assigned fibers  
1200 - configuration of DTS, DAS, and DSS  
1300 - spray and tap test  
1400 - depth correction math  
1430 - Aquidash config  
1600 - hooked up trailer and loaded  
1745 - all 3 left site. To hotel

## Appendix C: Casing Tally

As Ran FORGE 16B(78)-32 Audited to KB				Instrumentation Casing Running Tally			
Caseing	Min	Max	Op	How Start	How Stop	How	How
7" 20# P16000 VAM TOP HT	26,850	27,450	27,450	10,168.85	ft		
7" 20# P16000 VAM TOP HT	26,850	27,450	27,450	10,168.85	ft		
7" 20# P16000 VAM TOP HT	26,850	27,450	27,450	10,168.85	ft		
Average Joint Length 4.3" 12.00				Open Hole	ft		
Average Joint Length 4.3" 12.00				7" 20# P16000 VAM TOP HT	ft		
TD 10330.40				7" 20# P16000 VAM TOP HT	ft		
Grade Level 10177.40				13.75' 65 BVR P16000, 825	ft		
Well Hole 10.00				Open-hole from 825 to 10	ft		

If you have any questions regarding instrumentation and CIP installation on this tally please contact the engineer - Alan Jaynebo - 257 384 5977

Time/ID	Item	Jt #	Need CIP	Case/Annular	Threads off length	Center length	Bottom depth	Top Depth	Centralizer	CIP	Jt #	Protectors	Comments
20210104/1102	David Lynch Seal Shoe	1			27.10	45.77	10,208.79	10,208.79	David Lynch Seal Shoe		1		
	7" 20# P16000 VAM TOP HT	1			27.10	45.77	10,208.79	10,208.79	DM-AL10 Centralizer		1		21 0700 0912 22V20 - pre-installed
2200	Seal Shoe?	1			45.90	64.75	10,258.62	10,258.62	None		1	7800-35-015R020.0	
	7" 20# P16000 VAM TOP HT	2		Seal Shoe Start	45.90	64.75	10,258.62	10,258.62	None		2	None	
	7" 20# P16000 VAM TOP HT	3			47.02	107.17	10,355.15	10,355.15	DM-AL10 Centralizer		3	7800-35-015R020.0	21 0700 0912 22V20
2400	7" 20# P16000 VAM TOP HT	4			50.03	207.10	10,452.25	10,452.25	DM-AL10 Centralizer		4	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	5		Slide Shoe Start	20.06	207.27	10,452.25	10,452.25	DM-AL10 Centralizer		5	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	6			24.93	274.76	10,531.14	10,531.14	DM-AL10 Centralizer		6	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	7		Full Optical Sails	10.30	283.87	10,531.14	10,531.14	DM-AL10 Centralizer		7	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	8			2.25	286.02	10,627.22	10,627.22	David Lynch Seal Shoe		8	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	9		Apply Full tension	10.10	286.87	10,627.22	10,627.22	DM-AL10 Centralizer		9	7800-35-015R020.0	21 0700 0912 22V20 - pre-installed
	7" 20# P16000 VAM TOP HT	10			32.24	340.85	10,712.08	10,712.08	DM-AL10 Centralizer		10	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	11			3.81	350.74	10,807.27	10,807.27	DM-AL10 Centralizer		11	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	12			4.61	357.70	10,857.06	10,857.06	Petro-Stop Landing Tool Kit		12	7800-35-015R020.0	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	13		Tool Start?	8.87	362.78	10,857.06	10,857.06	DM-AL10 Centralizer		13	7800-35-015R020.0	21 0700 0912 22V20 - pre-installed
	7" 20# P16000 VAM TOP HT	14			45.90	411.85	10,857.06	10,857.06	DM-AL10 Centralizer		14	7800-35-015R020.0	21 0700 0912 22V20
2700	7" 20# P16000 VAM TOP HT	15		Full Optical Sails	46.75	456.44	10,796.75	10,796.75	Two 4.025 Centralizers		15	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	16			56.20	524.85	10,732.96	10,732.96	Two 4.025 Centralizers		16	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	17			58.25	549.24	10,665.97	10,665.97	Two 4.025 Centralizers		17	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	18			58.55	574.50	10,602.07	10,602.07	Two 4.025 Centralizers		18	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	19			59.24	600.22	10,533.22	10,533.22	Two 4.025 Centralizers		19	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	20			59.93	626.35	10,458.28	10,458.28	Two 4.025 Centralizers		20	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	21			60.62	652.87	10,379.25	10,379.25	Two 4.025 Centralizers		21	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	22			61.31	679.76	10,296.28	10,296.28	Two 4.025 Centralizers		22	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	23			62.00	707.01	10,209.29	10,209.29	Two 4.025 Centralizers		23	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	24			62.69	734.52	10,118.26	10,118.26	Two 4.025 Centralizers		24	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	25			63.38	762.29	10,023.27	10,023.27	Two 4.025 Centralizers		25	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	26			64.07	790.32	9,924.24	9,924.24	Two 4.025 Centralizers		26	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	27			64.76	818.51	9,821.27	9,821.27	Two 4.025 Centralizers		27	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	28		Full Optical Sails	65.45	846.86	9,715.22	9,715.22	Two 4.025 Centralizers		28	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	29			66.14	875.37	9,606.21	9,606.21	Two 4.025 Centralizers		29	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	30			66.83	904.04	9,494.16	9,494.16	Two 4.025 Centralizers		30	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	31			67.52	932.87	9,379.07	9,379.07	Two 4.025 Centralizers		31	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	32			68.21	961.86	9,260.84	9,260.84	Two 4.025 Centralizers		32	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	33			68.90	991.01	9,139.37	9,139.37	Two 4.025 Centralizers		33	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	34			69.59	1020.32	9,014.56	9,014.56	Two 4.025 Centralizers		34	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	35			70.28	1050.79	8,887.31	8,887.31	Two 4.025 Centralizers		35	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	36			70.97	1081.42	8,757.62	8,757.62	Two 4.025 Centralizers		36	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	37			71.66	1112.21	8,625.59	8,625.59	Two 4.025 Centralizers		37	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	38			72.35	1143.16	8,491.12	8,491.12	Two 4.025 Centralizers		38	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	39			73.04	1174.27	8,354.21	8,354.21	Two 4.025 Centralizers		39	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	40			73.73	1205.54	8,214.86	8,214.86	Two 4.025 Centralizers		40	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	41			74.42	1236.97	8,073.15	8,073.15	Two 4.025 Centralizers		41	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	42			75.11	1268.56	7,929.08	7,929.08	Two 4.025 Centralizers		42	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	43			75.80	1300.31	7,782.55	7,782.55	Two 4.025 Centralizers		43	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	44			76.49	1332.22	7,633.56	7,633.56	Two 4.025 Centralizers		44	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	45			77.18	1364.29	7,482.11	7,482.11	Two 4.025 Centralizers		45	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	46			77.87	1396.52	7,328.20	7,328.20	Two 4.025 Centralizers		46	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	47			78.56	1428.91	7,171.83	7,171.83	Two 4.025 Centralizers		47	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	48			79.25	1461.46	7,013.00	7,013.00	Two 4.025 Centralizers		48	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	49			79.94	1494.17	6,851.71	6,851.71	Two 4.025 Centralizers		49	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	50			80.63	1527.04	6,687.96	6,687.96	Two 4.025 Centralizers		50	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	51			81.32	1560.07	6,521.75	6,521.75	Two 4.025 Centralizers		51	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	52			82.01	1593.26	6,353.08	6,353.08	Two 4.025 Centralizers		52	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	53			82.70	1626.61	6,181.95	6,181.95	Two 4.025 Centralizers		53	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	54			83.39	1660.12	6,008.36	6,008.36	Two 4.025 Centralizers		54	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	55			84.08	1693.79	5,832.31	5,832.31	Two 4.025 Centralizers		55	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	56			84.77	1727.62	5,653.80	5,653.80	Two 4.025 Centralizers		56	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	57			85.46	1761.61	5,472.83	5,472.83	Two 4.025 Centralizers		57	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	58			86.15	1795.76	5,289.40	5,289.40	Two 4.025 Centralizers		58	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	59			86.84	1830.07	5,103.51	5,103.51	Two 4.025 Centralizers		59	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	60			87.53	1864.54	4,915.16	4,915.16	Two 4.025 Centralizers		60	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	61			88.22	1899.17	4,724.35	4,724.35	Two 4.025 Centralizers		61	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16000 VAM TOP HT	62			88.91	1933.96	4,531.08	4,531.08	Two 4.025 Centralizers		62	7800-344-018-70	21 0700 0912 22V20
	7" 20# P16												

As Ran FORGE 16B(78)-32 Audited to KB				Instrumentation Casing Running Tally			
Casing		Min	Max	Op	High start	10' Gauge	Well Gauge
7" 200 P10002 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10003 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10004 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10005 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10006 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10007 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10008 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10009 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10010 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10011 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10012 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10013 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10014 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10015 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10016 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10017 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10018 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10019 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10020 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10021 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10022 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10023 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10024 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10025 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10026 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10027 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10028 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10029 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10030 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10031 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10032 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10033 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10034 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10035 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10036 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10037 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10038 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10039 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10040 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10041 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10042 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10043 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10044 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10045 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10046 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10047 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10048 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10049 VAM TOP HT		26,850	27,450	27,150			
7" 200 P10050 VAM TOP HT		26,850	27,450	27,150			

If you have any questions regarding instrumentation and CIP installation on this tally please contact the engineer - Alan Joyce - 257 264 297

Time	Item	Jt #	Need	Case/Note	Threads off length	Center length	Bottom length	Top depth	Centralizer	CIP	Jt #	Protectors	Comments
	7" 200 P10002 VAM TOP HT	72			48.07	4,900.58	8,714.24	8,887.82	One 9.125" Centralizer		72	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10003 VAM TOP HT	73			48.07	4,958.48	8,950.07	8,871.24	One 9.125" Centralizer		73	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10004 VAM TOP HT	74			48.07	4,900.72	8,842.92	8,277.66	One 9.125" Centralizer		74	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10005 VAM TOP HT	75			48.08	4,877.00	8,877.88	8,333.00	One 9.125" Centralizer		75	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10006 VAM TOP HT	76			48.09	4,752.10	8,841.00	8,484.10	One 9.125" Centralizer		76	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10007 VAM TOP HT	77		Full Optical Sails	48.07	4,771.25	8,844.10	8,457.17	One 9.125" Centralizer		77	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10008 VAM TOP HT	78			48.04	4,858.55	8,827.15	8,280.45	One 9.125" Centralizer		78	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10009 VAM TOP HT	79			48.03	4,888.20	8,890.25	8,833.20	One 9.125" Centralizer		79	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10010 VAM TOP HT	80			48.03	4,811.15	8,848.10	8,594.10	One 9.125" Centralizer		80	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10011 VAM TOP HT	81			48.07	4,859.15	8,826.12	8,349.22	One 9.125" Centralizer		81	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10012 VAM TOP HT	82			48.07	4,829.58	8,799.25	8,267.42	One 9.125" Centralizer		82	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10013 VAM TOP HT	83			48.08	4,888.20	8,900.25	8,280.45	One 9.125" Centralizer		83	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10014 VAM TOP HT	84			48.08	4,700.15	8,744.10	8,285.15	One 9.125" Centralizer		84	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10015 VAM TOP HT	85			48.05	4,847.00	8,806.12	8,351.12	One 9.125" Centralizer		85	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10016 VAM TOP HT	86			48.09	4,828.07	8,803.42	8,247.42	One 9.125" Centralizer		86	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10017 VAM TOP HT	87		Full optical sails	48.01	4,740.00	8,714.04	8,387.40	One 9.125" Centralizer		87	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10018 VAM TOP HT	88			48.14	4,787.12	8,787.12	8,521.12	One 9.125" Centralizer		88	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10019 VAM TOP HT	89			48.06	4,834.10	8,812.20	8,274.22	One 9.125" Centralizer		89	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10020 VAM TOP HT	90			48.04	4,880.99	8,816.24	8,447.12	One 9.125" Centralizer		90	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10021 VAM TOP HT	91			48.04	4,877.14	8,817.12	8,541.12	One 9.125" Centralizer		91	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10022 VAM TOP HT	92			48.05	4,875.54	8,781.25	8,754.25	One 9.125" Centralizer		92	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10023 VAM TOP HT	93			48.03	4,800.00	8,724.15	8,289.25	One 9.125" Centralizer		93	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10024 VAM TOP HT	94			48.04	4,888.99	8,808.20	8,401.20	One 9.125" Centralizer		94	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10025 VAM TOP HT	95			48.14	4,811.12	8,841.12	8,498.12	One 9.125" Centralizer		95	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10026 VAM TOP HT	96			48.00	4,859.72	8,805.12	8,540.00	One 9.125" Centralizer		96	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10027 VAM TOP HT	97		Full optical sails	48.02	4,728.00	8,729.04	8,262.24	One 9.125" Centralizer		97	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10028 VAM TOP HT	98			48.08	4,782.00	8,800.00	8,386.00	One 9.125" Centralizer		98	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10029 VAM TOP HT	99			48.04	4,735.44	8,744.12	8,409.12	One 9.125" Centralizer		99	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10030 VAM TOP HT	100		Show extenders open hole	48.01	4,845.04	8,806.07	8,364.00	One 9.125" Centralizer		100	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10031 VAM TOP HT	101			48.06	4,880.70	8,841.24	8,447.12	One 9.125" Centralizer		101	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10032 VAM TOP HT	102			48.06	4,807.88	8,817.12	8,270.72	One 9.125" Centralizer		102	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10033 VAM TOP HT	103			48.15	4,888.31	8,870.74	8,574.95	One 9.125" Centralizer		103	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10034 VAM TOP HT	104			48.03	4,830.23	8,824.59	8,279.12	One 9.125" Centralizer		104	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10035 VAM TOP HT	105			48.05	4,878.99	8,838.12	8,401.12	One 9.125" Centralizer		105	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10036 VAM TOP HT	106			48.06	4,828.41	8,783.12	8,284.12	One 9.125" Centralizer		106	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10037 VAM TOP HT	107		Full Optical Sails	48.12	4,880.78	8,854.72	8,509.45	One 9.125" Centralizer		107	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10038 VAM TOP HT	108			48.06	4,825.23	8,838.07	8,493.07	One 9.125" Centralizer		108	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10039 VAM TOP HT	109			48.03	4,828.00	8,860.00	8,428.00	One 9.125" Centralizer		109	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10040 VAM TOP HT	110			48.07	4,828.41	8,844.12	8,499.12	One 9.125" Centralizer		110	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10041 VAM TOP HT	111			48.06	4,830.27	8,808.48	8,453.12	One 9.125" Centralizer		111	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10042 VAM TOP HT	112			48.01	4,885.24	8,866.12	8,421.00	One 9.125" Centralizer		112	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10043 VAM TOP HT	113			48.04	4,884.09	8,843.08	8,749.12	One 9.125" Centralizer		113	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10044 VAM TOP HT	114			48.07	4,885.04	8,768.12	8,519.45	One 9.125" Centralizer		114	7800-35-0138920.5	21.4700 0912 22VWS
	7" 200 P10045 VAM TOP HT	115		Show extenders kept	48.00	4,835.00							



As Ran FORGE 16B(78)-32 Audited to KB			Instrumentation Casing Running Tally		
Case	Min	Max	Qtc	Wire start	10,128.88
7" 30# P110M2 VAM TOP HT	28,850	23,450	23,450	Tool Gauge	N/A
7" 30# P110M2 VAM TOP HT	28,850	23,450	23,450	Well Gauge	2078.00
Average Joint Length 1.3" L138			Open Hole	9.260'	
Average Ann Length 3.3" L138			7" 30# P110M2 VAM TOP HT	0.184'	2078.00
TD: 10388.25			7" 30# P110M2 VAM TOP HT	0.41	Leaking Seal 7,000.00
Ground Level: 10177.40			13.75' 45 8/16 P113/125, 87C	0.00	HT Csg 4,837.89
Max hole: 3.00			cross-over from 87C to LC	0.00	25 (10 csg down)

If you have any questions regarding instrumentation and CCF installation on this tally please contact the engineer: Alan Reynolds - 737.384.1577

Time	Form	Jt #	Well ID	Case/Ann	Threads off length	Conn Length	Bottom length	Tag length	Extruders	CCF	Jt #	Protectors	Comments
158	7" 30# P110M2 VAM TOP HT	158			28.50	7,842.94	7,768.79	7,800.58	One 10.125" Centralizer		158	7900-30-0118N20.5	21.8700 2025 22195
159	7" 30# P110M2 VAM TOP HT	159			28.57	7,935.97	7,859.66	7,893.03	One 10.125" Centralizer		159	7900-30-0118N20.5	21.8700 2025 22200
160	7" 30# P110M2 VAM TOP HT	160			28.65	7,974.26	7,893.03	7,926.00	One 10.125" Centralizer		160	7900-30-0118N20.5	21.8700 2025 22205
161	7" 30# P110M2 VAM TOP HT	161			28.61	7,888.28	7,808.00	7,842.13	One 10.125" Centralizer		161	7900-30-0118N20.5	21.8700 2025 22210
162	7" 30# P110M2 VAM TOP HT	162			28.68	7,974.97	7,893.17	7,927.49	One 10.125" Centralizer		162	7900-30-0118N20.5	21.8700 2025 22215
163	7" 30# P110M2 VAM TOP HT	163			28.50	7,782.86	7,672.43	7,723.54	One 10.125" Centralizer		163	7900-30-0118N20.5	21.8700 2025 22220
164	7" 30# P110M2 VAM TOP HT	164			28.62	7,826.72	7,745.24	7,779.67	One 10.125" Centralizer		164	7900-30-0118N20.5	21.8700 2025 22225
165	7" 30# P110M2 VAM TOP HT	165			28.58	7,876.62	7,773.81	7,811.76	One 10.125" Centralizer		165	7900-30-0118N20.5	21.8700 2025 22230
166	7" 30# P110M2 VAM TOP HT	166			28.54	7,917.55	7,831.79	7,868.47	One 10.125" Centralizer		166	7900-30-0118N20.5	21.8700 2025 22235
167	7" 30# P110M2 VAM TOP HT	167			28.55	7,899.85	7,805.42	7,838.87	One 10.125" Centralizer		167	7900-30-0118N20.5	21.8700 2025 22240
168	7" 30# P110M2 VAM TOP HT	168			28.56	8,055.79	7,926.21	7,990.68	One 10.125" Centralizer		168	7900-30-0118N20.5	21.8700 2025 22245
169	7" 30# P110M2 VAM TOP HT	169			28.71	8,082.80	7,987.63	8,028.80	One 10.125" Centralizer		169	7900-30-0118N20.5	21.8700 2025 22250
170	7" 30# P110M2 VAM TOP HT	170			28.58	8,150.94	8,048.00	8,099.54	One 10.125" Centralizer		170	7900-30-0118N20.5	21.8700 2025 22255
171	7" 30# P110M2 VAM TOP HT	171			28.71	8,255.07	8,099.04	8,232.33	One 10.125" Centralizer		171	7900-30-0118N20.5	21.8700 2025 22260
172	7" 30# P110M2 VAM TOP HT	172			27.01	8,222.08	8,042.21	8,200.20	One 10.125" Centralizer		172	7900-30-0118N20.5	21.8700 2025 22265
173	7" 30# P110M2 VAM TOP HT	173			28.58	8,249.97	8,098.13	8,186.43	One 10.125" Centralizer		173	7900-30-0118N20.5	21.8700 2025 22270
174	7" 30# P110M2 VAM TOP HT	174			28.54	8,234.92	8,094.43	8,131.43	One 10.125" Centralizer		174	7900-30-0118N20.5	21.8700 2025 22275
175	7" 30# P110M2 VAM TOP HT	175			28.58	8,234.91	8,041.86	8,205.96	One 10.125" Centralizer		175	7900-30-0118N20.5	21.8700 2025 22280
176	7" 30# P110M2 VAM TOP HT	176			28.58	8,288.27	8,100.89	8,238.13	One 10.125" Centralizer		176	7900-30-0118N20.5	21.8700 2025 22285
177	7" 30# P110M2 VAM TOP HT	177			28.60	8,284.18	8,115.19	8,272.34	One 10.125" Centralizer		177	7900-30-0118N20.5	21.8700 2025 22290
178	7" 30# P110M2 VAM TOP HT	178			28.50	8,285.04	8,172.14	8,258.58	One 10.125" Centralizer		178	7900-30-0118N20.5	21.8700 2025 22295
179	7" 30# P110M2 VAM TOP HT	179			28.50	8,290.00	8,175.26	8,259.26	One 10.125" Centralizer		179	7900-30-0118N20.5	21.8700 2025 22300
180	7" 30# P110M2 VAM TOP HT	180			28.58	8,274.89	8,158.85	8,243.23	One 10.125" Centralizer		180	7900-30-0118N20.5	21.8700 2025 22305
181	7" 30# P110M2 VAM TOP HT	181			28.57	8,274.88	8,153.47	8,244.89	One 10.125" Centralizer		181	7900-30-0118N20.5	21.8700 2025 22310
182	7" 30# P110M2 VAM TOP HT	182			28.52	8,250.77	8,134.58	8,237.83	One 10.125" Centralizer		182	7900-30-0118N20.5	21.8700 2025 22315
183	7" 30# P110M2 VAM TOP HT	183			28.62	8,247.69	8,127.62	8,240.74	One 10.125" Centralizer		183	7900-30-0118N20.5	21.8700 2025 22320
184	7" 30# P110M2 VAM TOP HT	184			28.70	8,245.88	8,140.72	8,233.83	One 10.125" Centralizer		184	7900-30-0118N20.5	21.8700 2025 22325
185	7" 30# P110M2 VAM TOP HT	185			28.47	8,210.80	8,144.07	8,207.40	One 10.125" Centralizer		185	7900-30-0118N20.5	21.8700 2025 22330
186	7" 30# P110M2 VAM TOP HT	186			28.56	8,257.76	8,137.50	8,230.64	One 10.125" Centralizer		186	7900-30-0118N20.5	21.8700 2025 22335
187	7" 30# P110M2 VAM TOP HT	187			28.57	8,242.82	8,126.84	8,230.53	One 10.125" Centralizer		187	7900-30-0118N20.5	21.8700 2025 22340
188	7" 30# P110M2 VAM TOP HT	188			28.58	8,284.88	8,164.47	8,297.81	One 10.125" Centralizer		188	7900-30-0118N20.5	21.8700 2025 22345
189	7" 30# P110M2 VAM TOP HT	189			28.57	8,292.78	8,177.43	8,310.62	One 10.125" Centralizer		189	7900-30-0118N20.5	21.8700 2025 22350
190	7" 30# P110M2 VAM TOP HT	190			28.54	8,242.40	8,120.84	8,230.86	One 10.125" Centralizer		190	7900-30-0118N20.5	21.8700 2025 22355
191	7" 30# P110M2 VAM TOP HT	191			28.61	8,286.27	8,168.88	8,248.83	One 10.125" Centralizer		191	7900-30-0118N20.5	21.8700 2025 22360
192	7" 30# P110M2 VAM TOP HT	192			28.57	8,284.54	8,168.00	8,277.18	One 10.125" Centralizer		192	7900-30-0118N20.5	21.8700 2025 22365
193	7" 30# P110M2 VAM TOP HT	193			28.55	8,285.18	8,172.18	8,278.14	One 10.125" Centralizer		193	7900-30-0118N20.5	21.8700 2025 22370
194	7" 30# P110M2 VAM TOP HT	194			28.57	8,230.22	8,125.21	8,216.21	One 10.125" Centralizer		194	7900-30-0118N20.5	21.8700 2025 22375
195	7" 30# P110M2 VAM TOP HT	195			28.71	8,276.80	8,161.21	8,311.30	One 10.125" Centralizer		195	7900-30-0118N20.5	21.8700 2025 22380
196	7" 30# P110M2 VAM TOP HT	196			28.61	8,274.71	8,141.80	8,284.89	One 10.125" Centralizer		196	7900-30-0118N20.5	21.8700 2025 22385
197	7" 30# P110M2 VAM TOP HT	197			28.51	8,270.52	8,141.80	8,273.50	One 10.125" Centralizer		197	7900-30-0118N20.5	21.8700 2025 22390
198	7" 30# P110M2 VAM TOP HT	198			28.52	8,247.05	8,127.20	8,241.25	One 10.125" Centralizer		198	7900-30-0118N20.5	21.8700 2025 22395
199	7" 30# P110M2 VAM TOP HT	199			28.50	8,284.88	8,164.47	8,303.81	One 10.125" Centralizer		199	7900-30-0118N20.5	21.8700 2025 22400
200	7" 30# P110M2 VAM TOP HT	200			28.54	8,284.04	8,161.01	8,300.47	One 10.125" Centralizer		200	7900-30-0118N20.5	21.8700 2025 22405
201	7" 30# P110M2 VAM TOP HT	201			28.57	8,254.55	8,136.57	8,253.28	One 10.125" Centralizer		201	7900-30-0118N20.5	21.8700 2025 22410
202	7" 30# P110M2 VAM TOP HT	202			28.50	8,242.54	8,122.86	8,241.28	One 10.125" Centralizer		202	7900-30-0118N20.5	21.8700 2025 22415
203	7" 30# P110M2 VAM TOP HT	203			28.52	8,242.03	8,118.28	8,240.57	One 10.125" Centralizer		203	7900-30-0118N20.5	21.8700 2025 22420
204	7" 30# P110M2 VAM TOP HT	204			28.11	8,284.14	8,164.47	8,310.74	One 10.125" Centralizer		204	7900-30-0118N20.5	21.8700 2025 22425
205	7" 30# P110M2 VAM TOP HT	205			28.56	8,233.80	8,120.16	8,240.80	One 10.125" Centralizer		205	7900-30-0118N20.5	21.8700 2025 22430
206	7" 30# P110M2 VAM TOP HT	206			28.58	8,284.88	8,168.00	8,274.91	One 10.125" Centralizer		206	7900-30-0118N20.5	21.8700 2025 22435
207	7" 30# P110M2 VAM TOP HT	207			28.50	8,227.01	8,111.81	8,211.38	One 10.125" Centralizer		207	7900-30-0118N20.5	21.8700 2025 22440
208	7" 30# P110M2 VAM TOP HT	208			28.71	8,274.74	8,151.50	8,304.88	One 10.125" Centralizer		208	7900-30-0118N20.5	21.8700 2025 22445
209	7" 30# P110M2 VAM TOP HT	209			28.56	8,220.20	8,104.00	8,216.20	One 10.125" Centralizer		209	7900-30-0118N20.5	21.8700 2025 22450
210	7" 30# P110M2 VAM TOP HT	210			28.58	8,284.88	8,168.00	8,291.81	One 10.125" Centralizer		210	7900-30-0118N20.5	21.8700 2025 22455
211	7" 30# P110M2 VAM TOP HT	211			27.87	10,214.12	10,111.43	10,421.28	One 10.125" Centralizer		211	7900-30-0118N20.5	21.8700 2025 22460
212	7" 30# P110M2 VAM TOP HT	212			28.57	10,280.70	10,174.78	10,471.81	One 10.125" Centralizer		212	7900-30-0118N20.5	21.8700 2025 22465
213	7" 30# P110M2 VAM TOP HT	213			28.54	10,227.52	10,122.52	10,407.77	One 10.125" Centralizer		213	7900-30-0118N20.5	21.8700 2025 22470
214	7" 30# P110M2 VAM TOP HT	214			27.01	10,220.99	10,077.77	10,412.75	One 10.125" Centralizer		214	7900-30-0118N20.5	21.8700 2025 22475
215	7" 30# P110M2 VAM TOP HT	215			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		215	7900-30-0118N20.5	21.8700 2025 22480
216	7" 30# P110M2 VAM TOP HT	216			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		216	7900-30-0118N20.5	21.8700 2025 22485
217	7" 30# P110M2 VAM TOP HT	217			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		217	7900-30-0118N20.5	21.8700 2025 22490
218	7" 30# P110M2 VAM TOP HT	218			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		218	7900-30-0118N20.5	21.8700 2025 22495
219	7" 30# P110M2 VAM TOP HT	219			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		219	7900-30-0118N20.5	21.8700 2025 22500
220	7" 30# P110M2 VAM TOP HT	220			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		220	7900-30-0118N20.5	21.8700 2025 22505
221	7" 30# P110M2 VAM TOP HT	221			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		221	7900-30-0118N20.5	21.8700 2025 22510
222	7" 30# P110M2 VAM TOP HT	222			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		222	7900-30-0118N20.5	21.8700 2025 22515
223	7" 30# P110M2 VAM TOP HT	223			27.14	10,174.90	10,074.78	10,441.43	One 10.125" Centralizer		223	7900-30-0118N20.5	21.8700 2025

## Appendix D: OTDR Traces

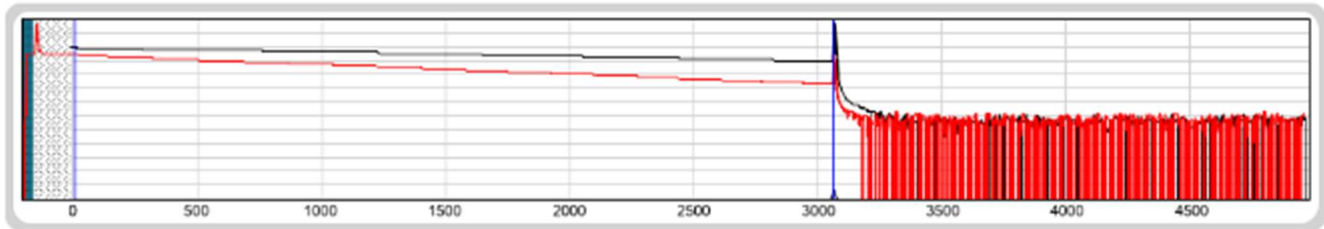
### 6.1 Pre-Travel Check

#### 6.1.1 Multimode Fiber 1

OTDR Results

Wavelength : 850 nm

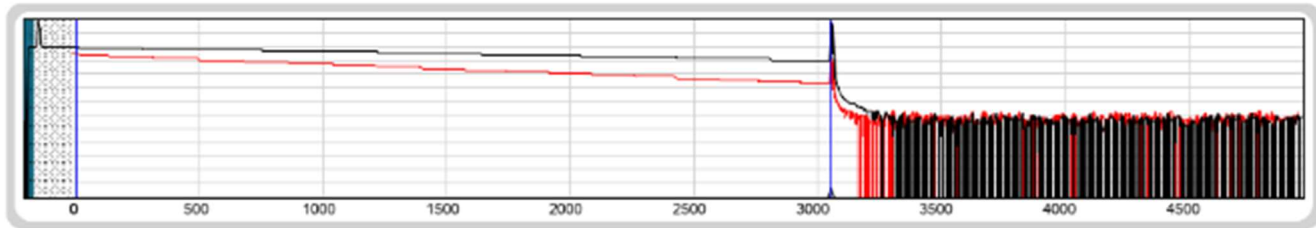
END100-END200-MM1\_004\_M85



OTDR Results

Wavelength : 1300 nm

END100-END200-MM1\_004\_M13

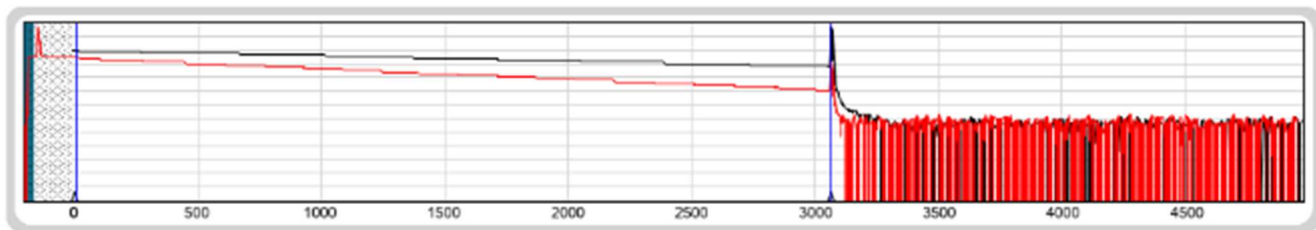


#### 6.1.2 Multimode Fiber 2

OTDR Results

Wavelength : 850 nm

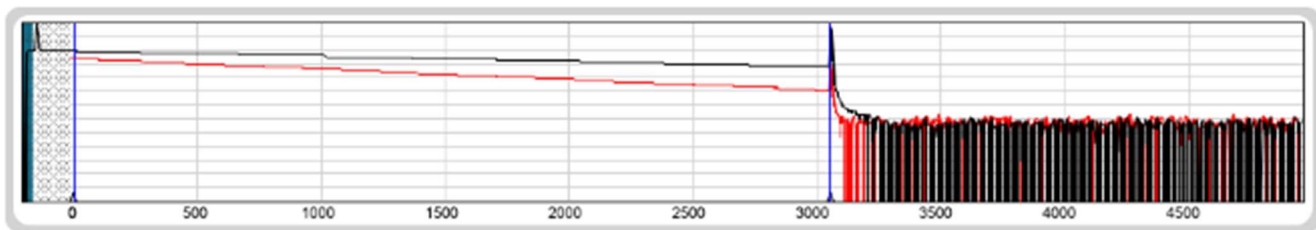
END100-END200-MM2\_005\_M85



OTDR Results

Wavelength : 1300 nm

END100-END200-MM2\_005\_M13

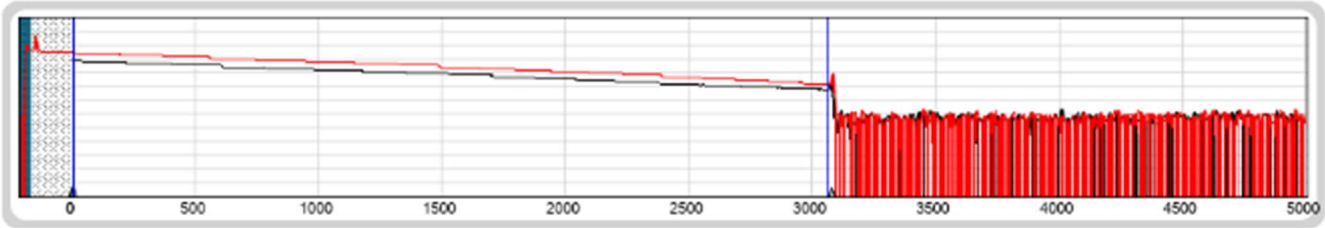


### 6.1.3 Singlemode Fiber 1

#### OTDR Results

Wavelength : 1310 nm

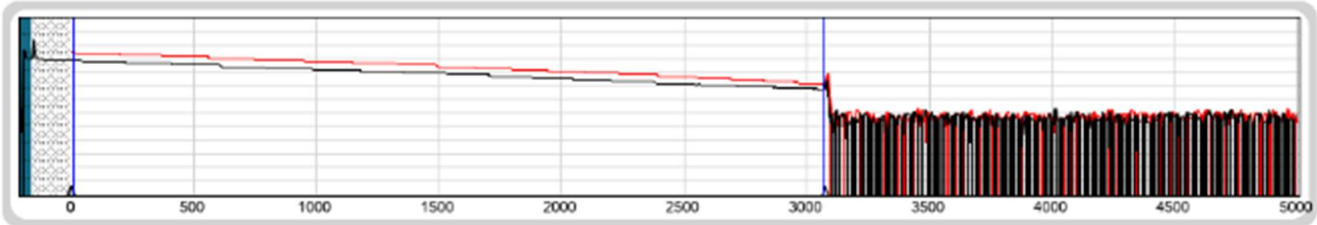
END100-END200-SM1.30ns\_008\_S13



#### OTDR Results

Wavelength : 1550 nm

END100-END200-SM1.30ns\_008\_S15

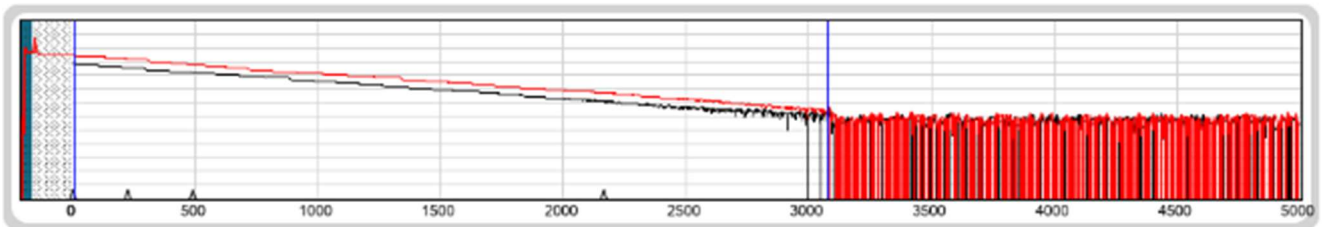


### 6.1.4 Singlemode Fiber 2

#### OTDR Results

Wavelength : 1310 nm

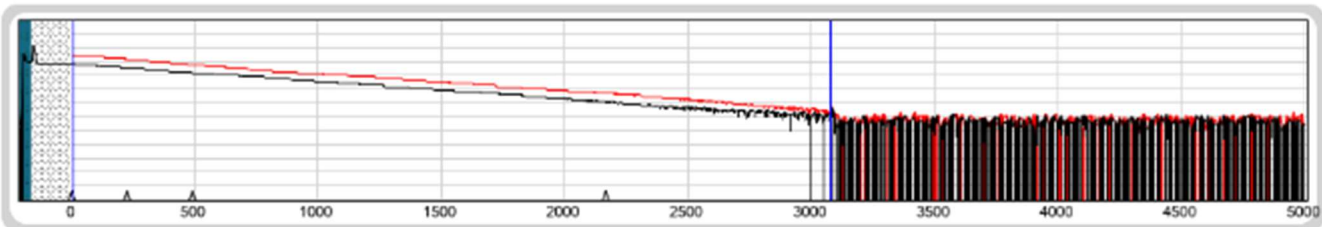
END100-END200-SM2.30ns\_009\_S13



#### OTDR Results

Wavelength : 1550 nm

END100-END200-SM2.30ns\_009\_S15

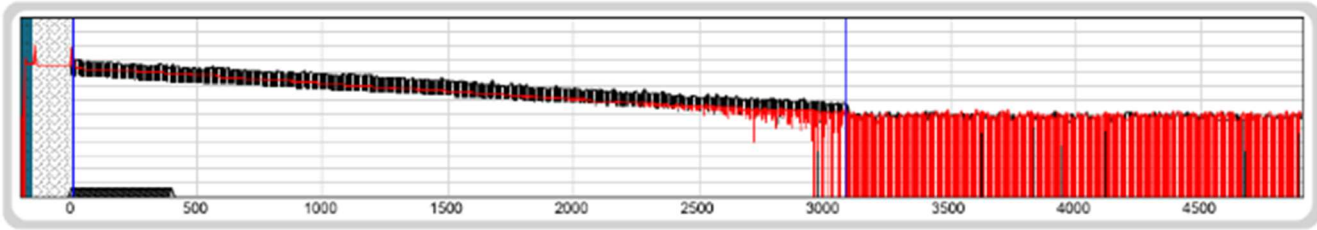


### 6.1.5 Constellation Fiber

#### OTDR Results

Wavelength : 1310 nm

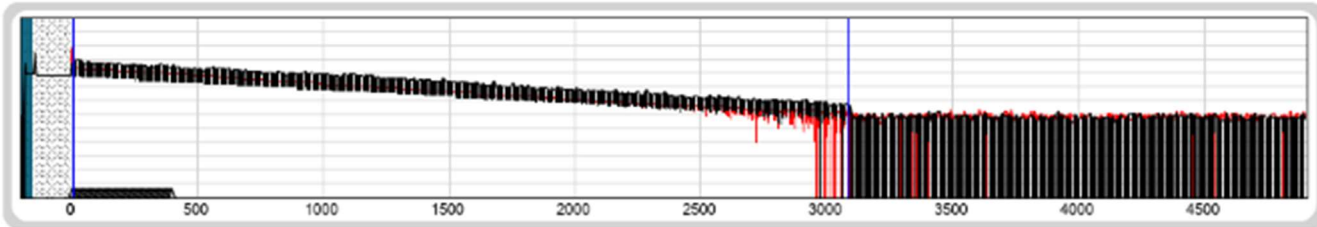
END100-END200-CF.10ns\_010\_S13



#### OTDR Results

Wavelength : 1550 nm

END100-END200-CF.10ns\_010\_S15



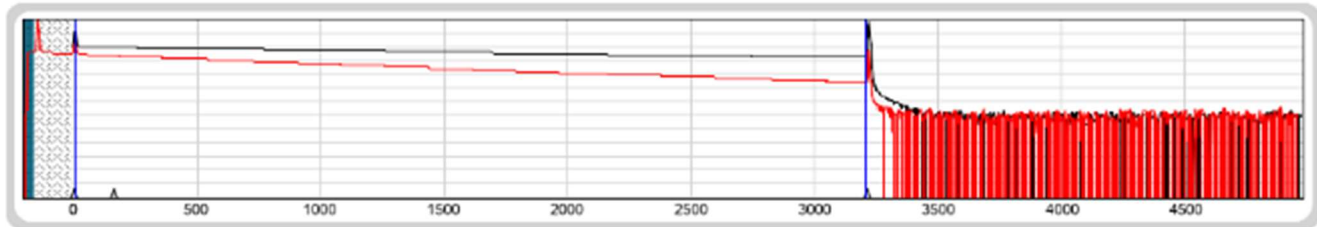
## 6.2 Post Wellhead Check

### 6.2.1 Multimode Fiber A

#### OTDR Results

Wavelength : 850 nm

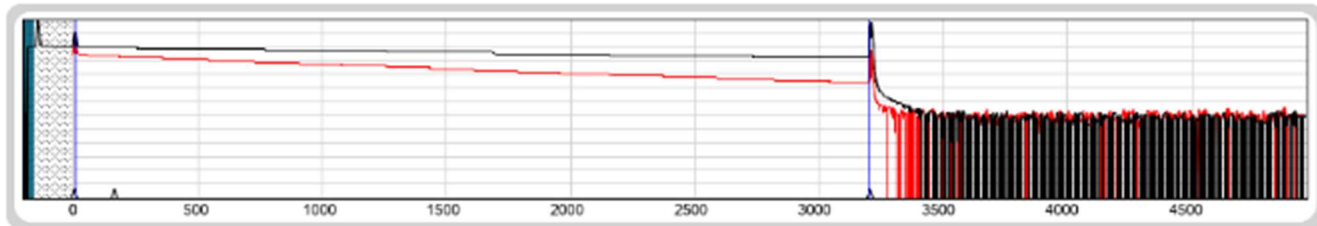
MMA.SLT-END200-16B.post.WH\_001\_M85



#### OTDR Results

Wavelength : 1300 nm

MMA.SLT-END200-16B.post.WH\_001\_M13

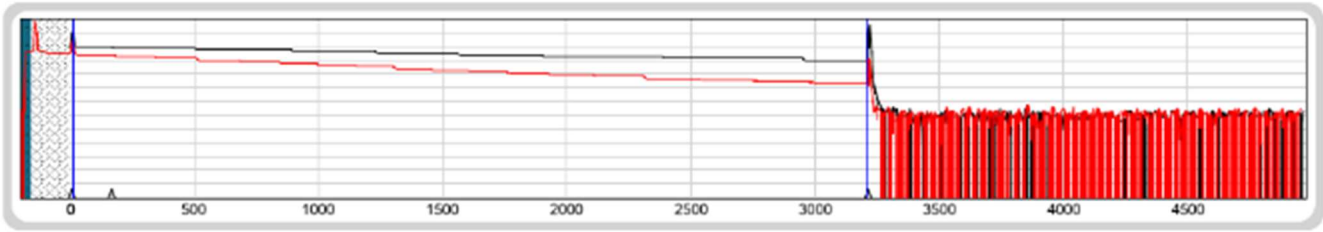


### 6.2.2 Multimode Fiber B

#### OTDR Results

Wavelength : 850 nm

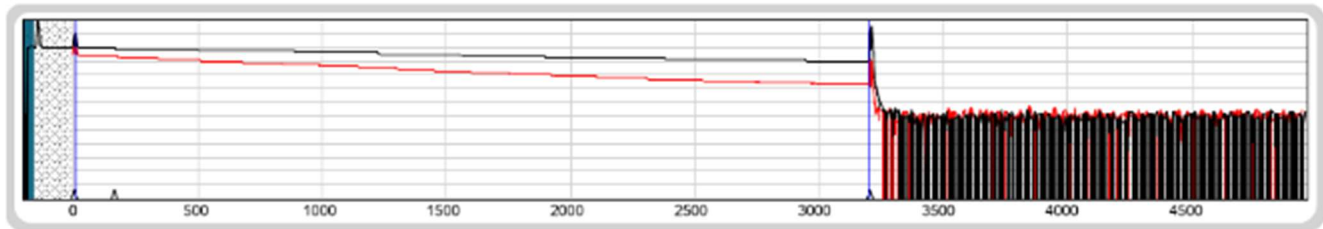
MMB.WHT-END200-16B.post.WH\_001\_M85



#### OTDR Results

Wavelength : 1300 nm

MMB.WHT-END200-16B.post.WH\_001\_M13

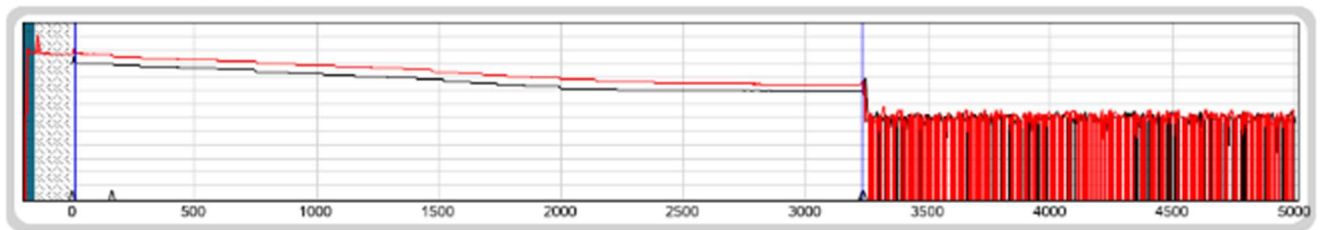


### 6.2.3 Singlemode Fiber 1

#### OTDR Results

Wavelength : 1310 nm

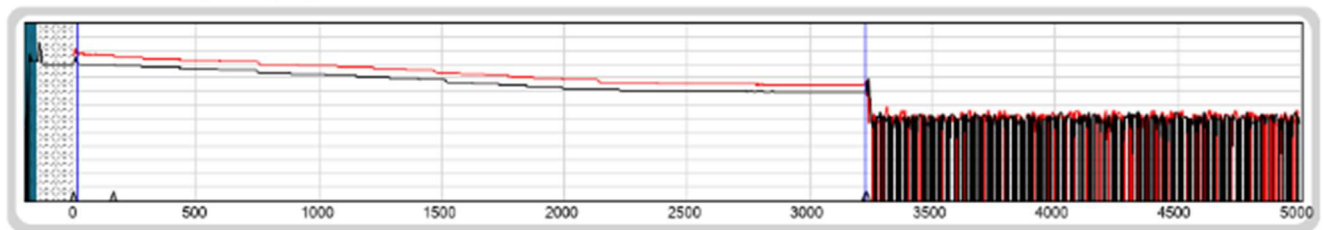
SM1.BLU-END200-16B.post.WH\_001\_S13



#### OTDR Results

Wavelength : 1550 nm

SM1.BLU-END200-16B.post.WH\_001\_S15

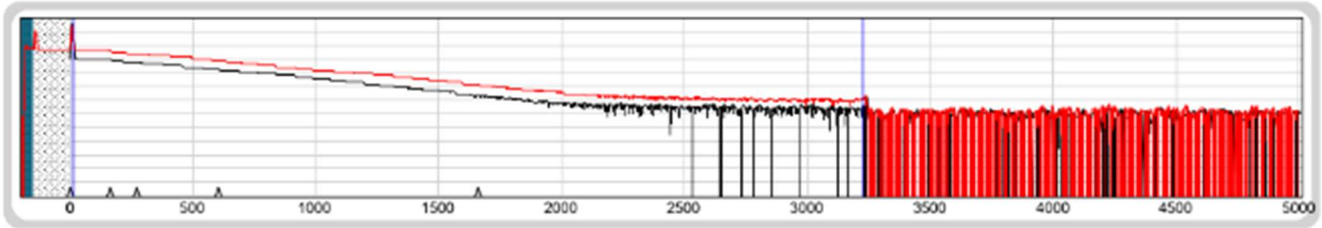


### 6.2.4 Singlemode Fiber 2

#### OTDR Results

Wavelength : 1310 nm

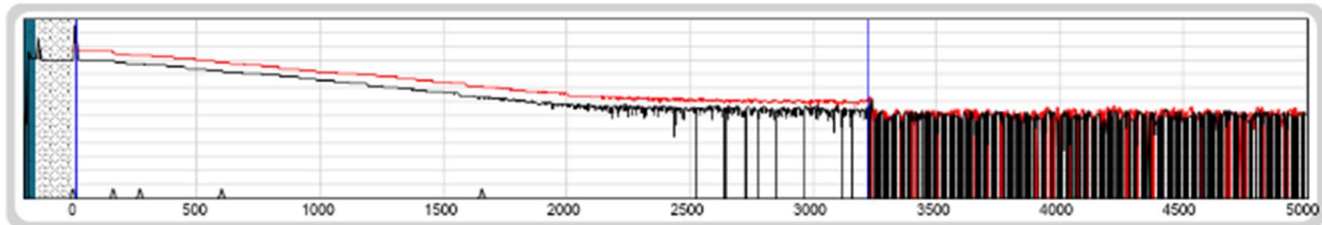
SM2.ORG-END200-16B.post.WH\_001\_S13



#### OTDR Results

Wavelength : 1550 nm

SM2.ORG-END200-16B.post.WH\_001\_S15

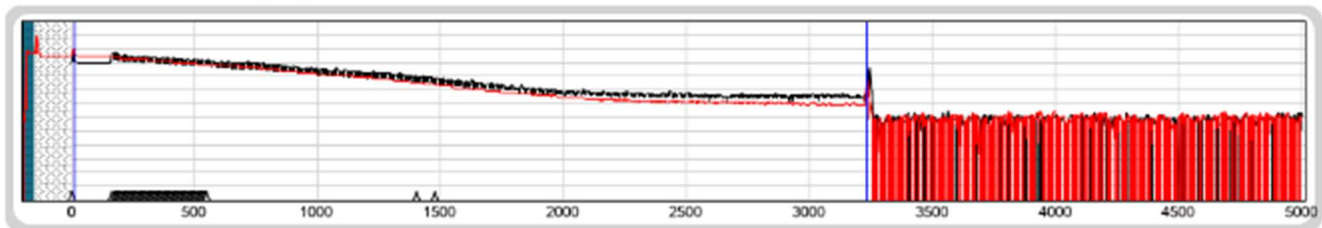


### 6.2.5 Constellation Fiber

#### OTDR Results

Wavelength : 1310 nm

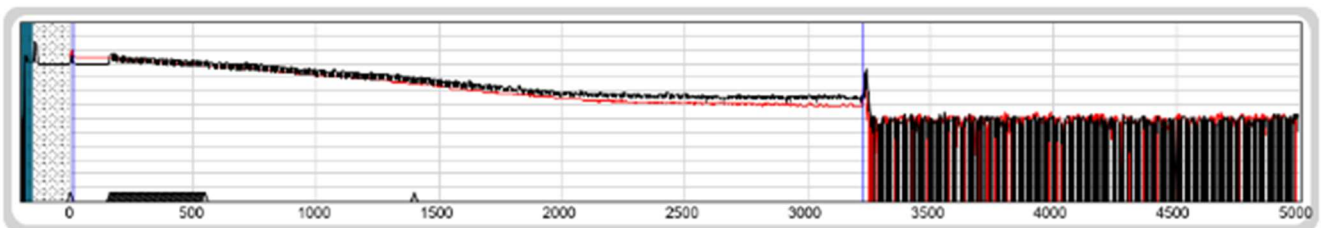
CF.GRN-END200-16B.post.WH\_001\_S13



#### OTDR Results

Wavelength : 1550 nm

CF.GRN-END200-16B.post.WH\_001\_S15

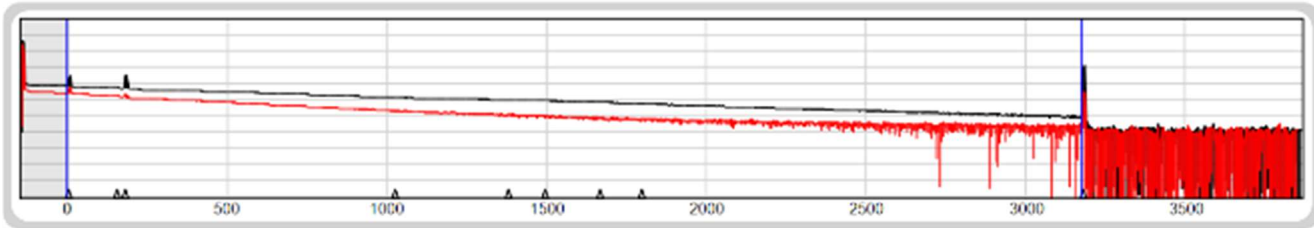


### 6.3 Final fiber array Commissioning Check

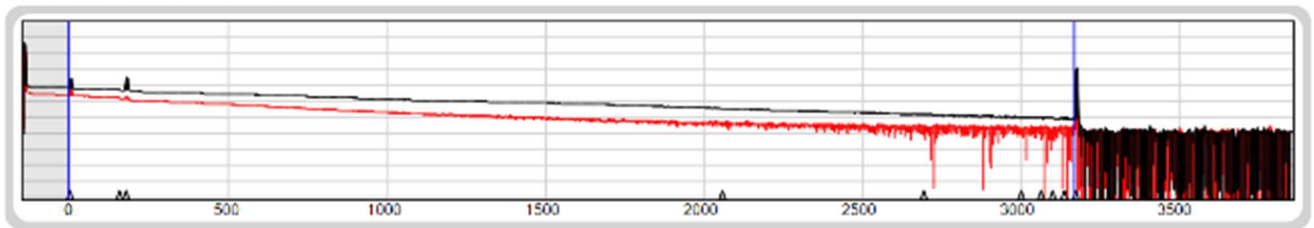
**\*Note:** The DSS strain fiber inside the belting was not included in trace results, as it was rendered unusable/"dark" due to fiber failure from the manufacturer.

#### 6.3.1 Multimode Fiber Slate

OTDR Results Wavelength : 850 nm  
Loc1-Loc2-MM.SLT.MM\_001\_M85

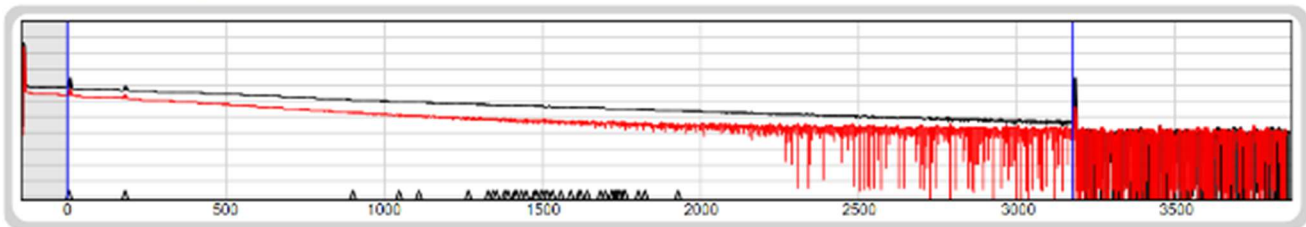


OTDR Results Wavelength : 1300 nm  
Loc1-Loc2-MM.SLT.MM\_001\_M13

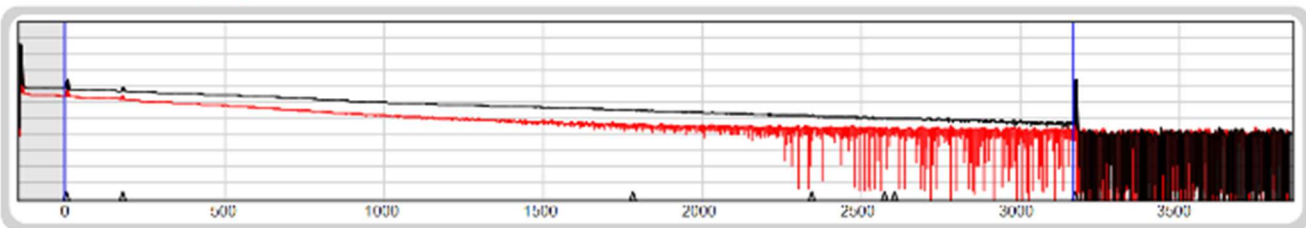


#### 6.3.2 Multimode Fiber White

OTDR Results Wavelength : 850 nm  
Loc1-Loc2-MM.WHT.MM\_001\_M85



OTDR Results Wavelength : 1300 nm  
Loc1-Loc2-MM.WHT.MM\_001\_M13

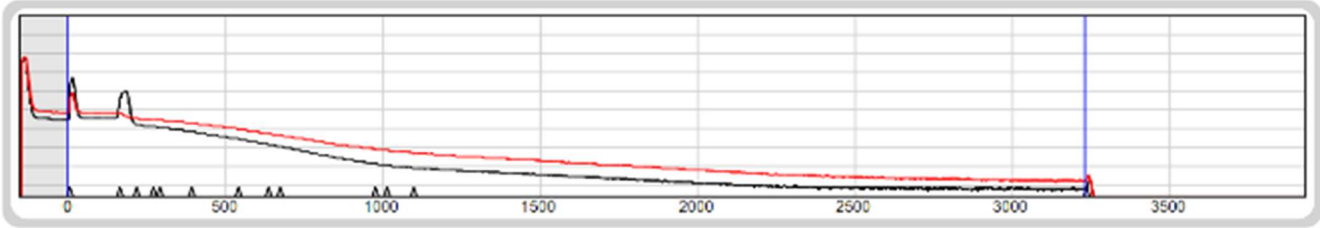


### 6.3.3 Singlemode Fiber 1- Orange

#### OTDR Results

Wavelength : 1310 nm

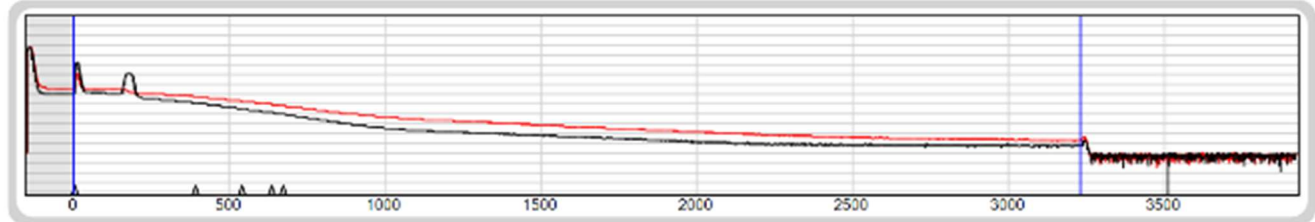
Loc1 Loc2 SM ORG SM1\_001\_S13



#### OTDR Results

Wavelength : 1550 nm

Loc1-Loc2-SM ORG SM1\_001\_S15

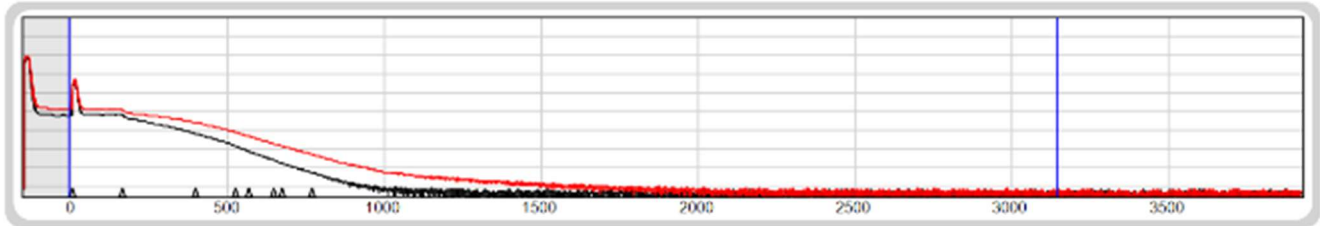


### 6.3.4 Singlemode Fiber 2- Blue

#### OTDR Results

Wavelength : 1310 nm

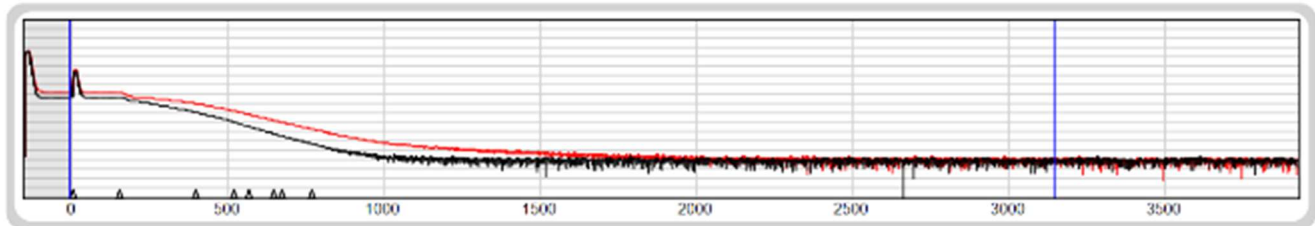
Loc1-Loc2-SM BLU SM2\_001\_S13



#### OTDR Results

Wavelength : 1550 nm

Loc1-Loc2-SM BLU SM2\_001\_S15



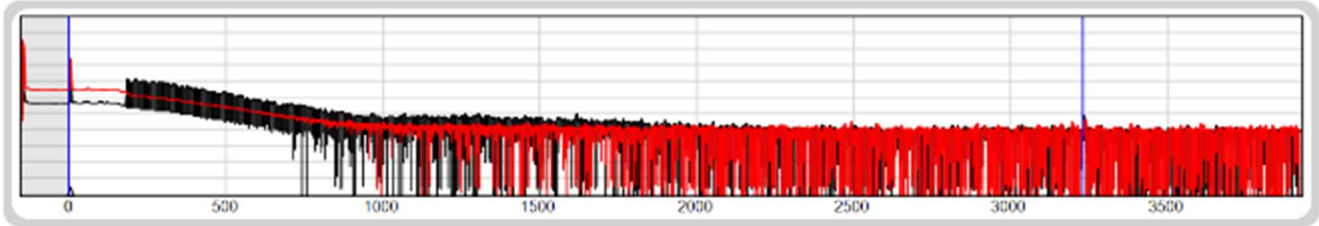


### 6.3.5 Constellation Fiber

#### OTDR Results

Wavelength : 1310 nm

Loc1-Loc2-SM.GRN.CF.30NS\_001\_S13



#### OTDR Results

Wavelength : 1550 nm

Loc1-Loc2-SM.GRN.CF.30NS\_001\_S15

