Milestone 7.2.1 Report: Fiber Optic Installation, Well 16B

Organization:	University of Utah
Recipient Organization: DUNS Number: Recipient Address:	Rice University 050299031 MS-126, 6100 Main Street Houston, TX 77005

Award Number: 3-2417 Project Title: Fiber-Optic Geophysical Monitoring of Reservoir Evolution at the Utah FORGE Milford Site

Project Period: 10/01/2021 - 09/30/2024

Principal Investigator:	Jonathan Ajo-Franklin
	Professor, Dept of Earth Environmental and Planetary Sciences ja62@rice.edu
	510-735-4350

Report Submitted by: Jonathan Ajo-Franklin

Date of Report Submission: 04/05/2024

- **Project Partners:** California State University, Long Beach (Prof. Matt Becker), University of Oklahoma (Prof. Ahmad Ghassemi), Silixa LLC (Mr. Thomas Coleman), Class VI Solutions (Dr. Barry Freifeld), Lawrence Berkeley National Laboratory (Dr. Julia Correa).
- Topic Leads: Stuart Simmons, University of Utah Jon Payne, DOE-GTO Angel Nieto, DOE-GTO

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 then 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).

SILIXA ALUNA company

FIELD INSTALLATION REPORT

Project: FORGE 16B(78)-32 Client: RICE University

Client Representative:	Jonathan Ajo-Franklin	Engineer (1):	Ben Broman
Site Representative:	John Mclennan	Engineer (2):	Matt Derosier
Site Location:	FORGE EGS, Milford, UT, USA	Engineer (3):	
Date:	07/24/2023 Rev 1	Engineer (4):	
Completed by:	Ben Broman Matt Derosier		



Table of Contents

Tab	le of	f Contents	2
List	of F	igures	3
List	of T	ables	4
1	Lis	t of Acronyms	5
2	Exe	ecutive Summary	6
3	Sco	ope of Work	7
3.1	۵	Downhole Design Specifications	7
3	3.1.1	Well Completion Design	7
3	8.1.2	Casing Specifications	8
3	8.1.3	Fiber Optic Cable Specifications	8
3.2	E	Bottom Hole Assembly and Protector Specifications	10
3.3	(Cross-coupling Protector with Centralizers	12
3.4	5	Surface Completion	13
3	8.4.1	Wellhead	
4	Мс	bilization and Preparation	15
4.1	F	Pre-mobilization Component and Equipment QA/QC	15
4.2	F	Pre-mobilization BHA Termination	15
4.3	Ν	Mobilization	16
5	Ins	stallation Execution	17
5.1	F	Rig Up	17
5.2	E	3HA Installation	18
5.3	F	RIH Completion Program	19
5.4	F	RIH Integrity Testing	19
5.5	٧	Wellhead Completion	19
5.6	(Cementation Monitoring	20
5.7	F	Final Surface Enclosure Installation and FOC Routing/Splicing	23
5	5.7.1	Physical Fiber Layout	
5	5.7.1	Silixa FOC Repair Splice	



6	Final I	Remarks
6.1	Pre	-Travel Check40
6	.1.1	Multimode Fiber 1 40
6	.1.2	Multimode Fiber 2 40
6	.1.3	Singlemode Fiber 1 41
6	.1.4	Singlemode Fiber 2 41
6	.1.5	Constellation Fiber
6.2	Pos	t Wellhead Check42
6	.2.1	Multimode Fiber A
6	.2.2	Multimode Fiber B
6	.2.3	Singlemode Fiber 1
6	.2.4	Singlemode Fiber 2
6	.2.5	Constellation Fiber
6.3	Fina	al fiber array Commissioning Check45
6	.3.1	Multimode Fiber Slate
6	.3.2	Multimode Fiber White
6	.3.3	Singlemode Fiber 1- Orange
6	.3.4	Singlemode Fiber 2- Blue
6	.3.5	Constellation Fiber

List of Figures

Figure 1. Well completion diagram from 16B(78)-32 planning phase	8
Figure 2: ¼" OD A825 alloy tube downhole cable with belting and 1/8" OD FIMT	9
Figure 3: Silixa's high-pressure bottom hole assembly (BHA)	10
Figure 4: Cross section of example BHA Clamp	11
Figure 5: Side view of BHA clamp	11
Figure 6: Notched clamp over collar and solid body centralizer	12
Figure 7: Solid body centralizer	12
Figure 8. Streamflo Wellhead Schematic	14



Figure 9: Fiber Splice Diagram for RIH 15
Figure 10. Silixa site mobilization
Figure 11. Silixa site mobilization 16
Figure 12. Sheave and spreader bar 17
Figure 13. Spooler with Fiber Optic Cable 18
Figure 14. Installation of fiber optic cable BHA 18
Figure 15. Thermal plot during cementing operations 22
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 27
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
Figure 27. Edge monitoring system cabinet
Figure 28. Rice/Silixa acquisition trailer

List of Tables

Table 1: Fiber optic cable specification.	9
Table 2. Completion of FOC through the wellhead	
Table 3. Depth Calibration for Carina DAS interrogator. KB rig floor height is 31ft	21
Table 4. Depth Calibration for XT-DTS interrogator. KB rig floor height is 31ft	21
Table 5. Depth Calibration for iDSS interrogator. KB rig floor height is 31ft	22



1 List of Acronyms

CCUS: Carbon Capture, Utilization and Storage	MMV : Monitoring, Measurement and Verification
CF: Constellation [™] Fiber	MRB: Manufacturers Record Book
DAS: Distributed Acoustic Sensing	ODU : Optical Distribution Unit
DFOS : Distributed Fiber Optic Sensor	OFS : Optical Feedthrough System
DSS : Distributed Strain Sensing	OTDR: Optical Time Domain Reflectometer
DTS : Distributed Temperature Sensing	RAID: Redundant Array of Independent Disks
EDU: Electrical Distribution Unit	RIH: Run-in-Hole
EOF: End of Fiber	RTPU : Real-time Processing Unit
FAT : Factory Acceptance Test	SCM: Subsea Controls Module
FOC : Fiber Optic Cable	SEM: Subsea Electronics Module
GPS: Global Positioning System	SIT : System Integration Test
ICI: Incoming Inspection	SMF: Singlemode Fiber
ITP: Inspection Test Plan	SNR : Signal to Noise Ratio
IU: Interrogator Unit	TDMS : Technical Data Management System
KVM: Keyboard Video Mouse	UTA : Umbilical Termination Assembly
LER: Local Equipment Room	VSP: Vertical Seismic Profiling
MM : Multimode Fiber	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 30th, 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 28th, 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.



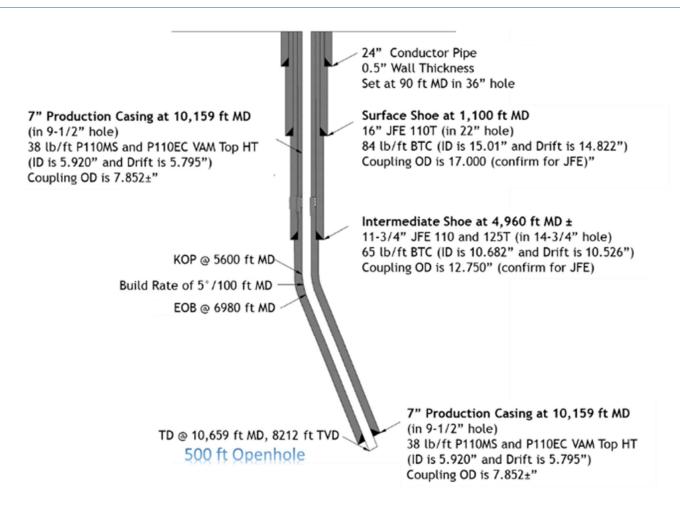


Figure 1. Well completion diagram from 16B(78)-32 planning phase.

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: ¼" 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
Outer tube diameter	6.35 mm (0.250")
Outer tube material	Incoloy A825
Outer tube wall thickness	0.889 mm (0.035")
Belting	4.45mm OD PFA
Inner tube diameter	1.8 mm
Inner tube material Stainless Steel 316L	
Number of multimode fibers	2
Number of singlemode fibers	3
Number of Constellation fibers	1
Temperature rating	260 °C
Static bend radius	159 mm (6.26")
Dynamic bend radius	635 mm (25.0")
Approximate weight	167 kg/km (112 lb/kft)
External Collapse Pressure	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.

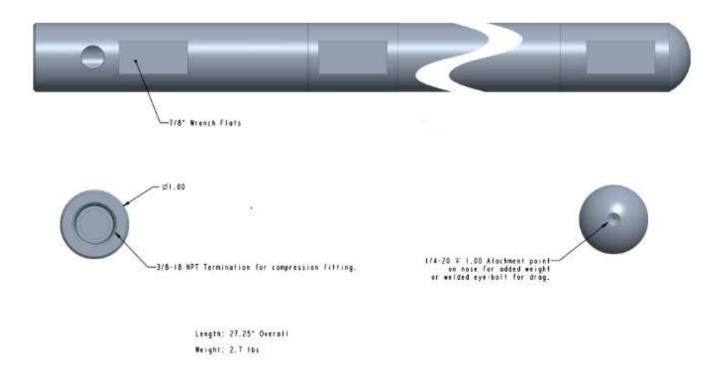


Figure 3: Silixa's high-pressure bottom hole assembly (BHA).



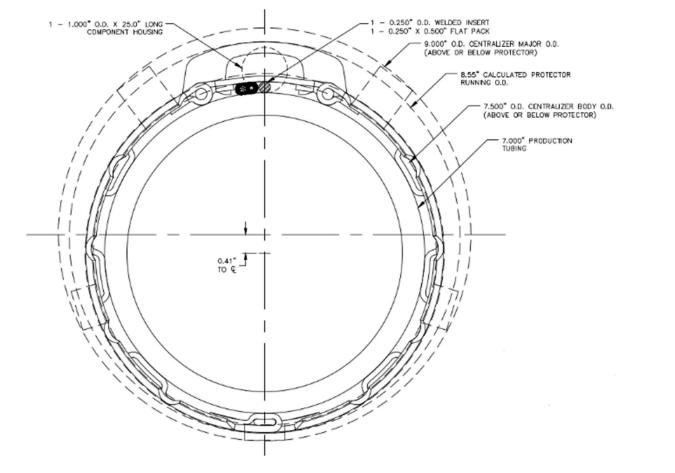
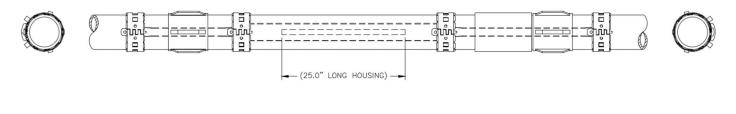


Figure 4: Cross section of example BHA Clamp



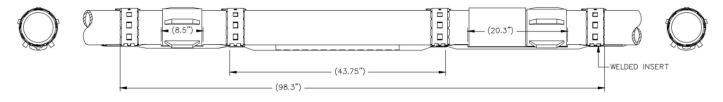


Figure 5: Side view of BHA clamp.



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.

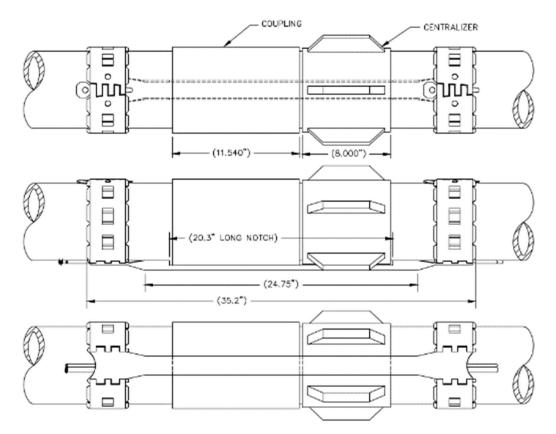


Figure 6: Notched clamp over collar and solid body centralizer.

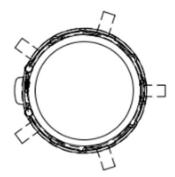


Figure 7: Solid body centralizer.



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 30th. 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.

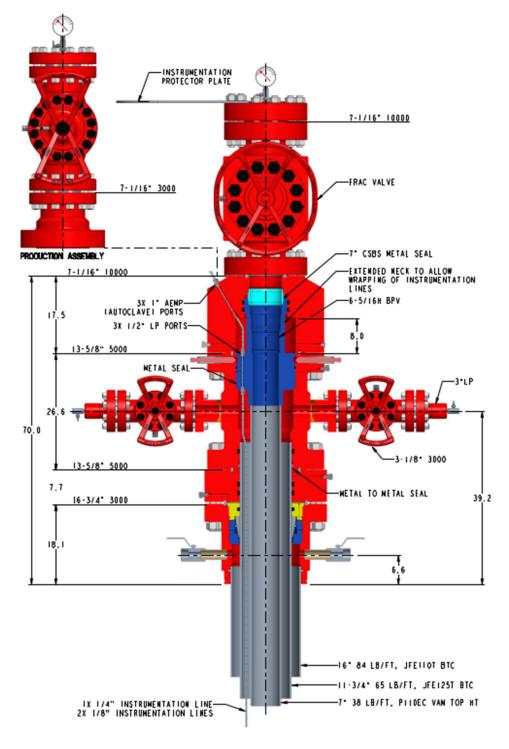


Figure 8. Streamflo Wellhead Schematic.



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.

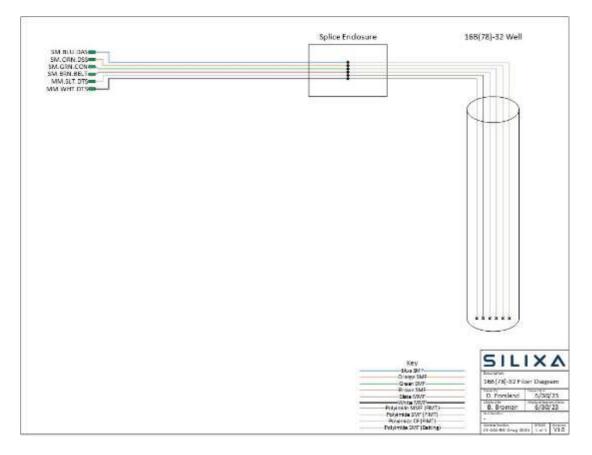


Figure 9: Fiber Splice Diagram for RIH.



4.3 Mobilization

The field team mobilized on July 7th, 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.

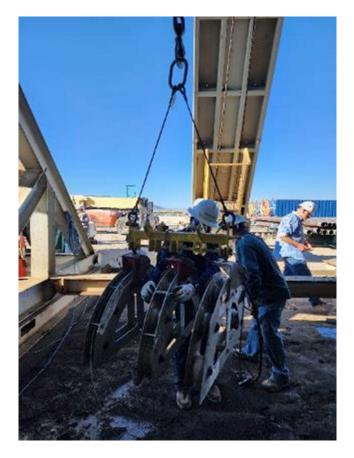


Figure 12. Sheave and spreader bar.





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 13th at 5am. DTS acquisition ceased at July 14th 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 set 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)
KB (Cementing configuration)	Green, CF	172.60 / 566.28	0
BHA (Cementing configuration)		3237.00 / 10620.08	3047.97 / 9999.89
KB (Circulation configuration)	White, MMF	179.71 / 589.61	0
BHA (Circulation configuration)		3237.00 / 10620.08	3047.97 / 9999.89
KB (Final configuration)	Slate, MMF	171.91 / 564.00	0
BHA (Final configuration)		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)
KB (Cementing configuration)	White, MMF	174.65 / 573.00	0
BHA (Cementing configuration)		3223.75 / 10576.61	3047.97 / 9999.89
KB (Circulation configuration)	Slate, MMF	178.14 / 584.44	0
BHA (Circulation configuration)		3223.30 / 10575.13	3047.97 / 9999.89
KB (Final configuration)	White, MMF	172.25 / 565.11	0
BHA (Final configuration)		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)
KB (Cementing configuration)	Blue, SMF	174.38 / 572.11	0
BHA (Cementing configuration)		3242.00 / 10636.48	3047.97 / 9999.89
KB (Circulation configuration)	Blue, SMF	177.93 / 583.76	0
BHA (Circulation configuration)		3241.00 / 10633.20	3047.97 / 9999.89
KB (Final configuration)	Orange, SMF	172.01 / 564.34	0
BHA (Final configuration)		3237.10 / 10620.41	3047.97 / 9999.89

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

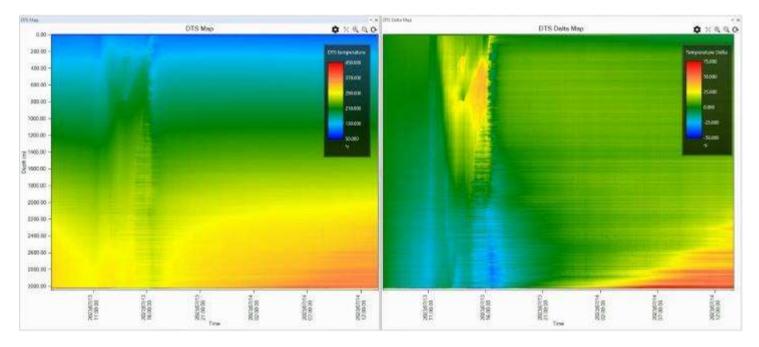


Figure 15. Thermal plot during cementing operations.



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 30th to September 3rd. 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.



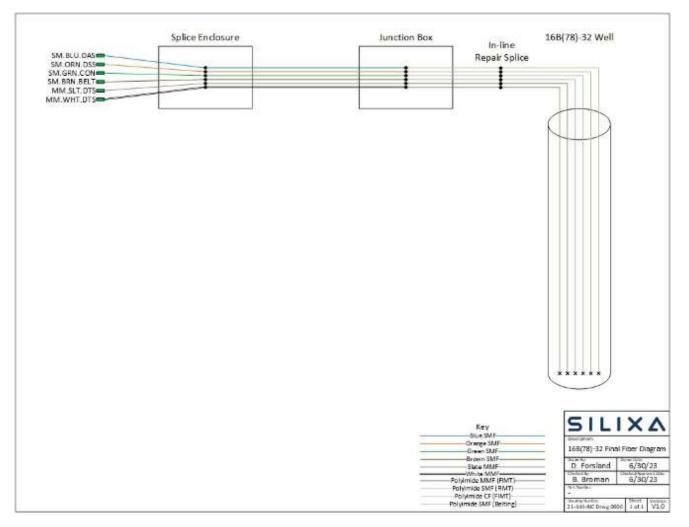


Figure 22. Final fiber splice arrangement.

5.7.1 Silixa FOC Repair Splice

During wellhead repair operations on August 30th, 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 inline splice box was mounted to a bar extending from the cellar wall. The cellar grate was replaced around the wellhead after repairs were completed.



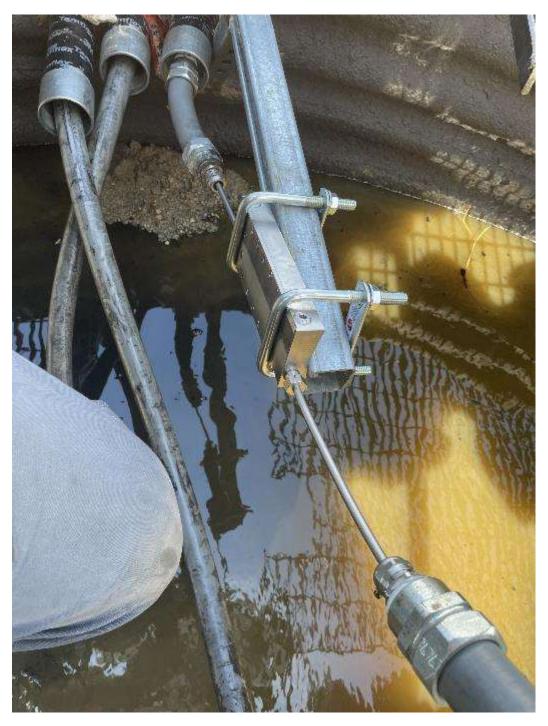


Figure 23. In-line repair splice located underneath 16B cellar grating.





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.

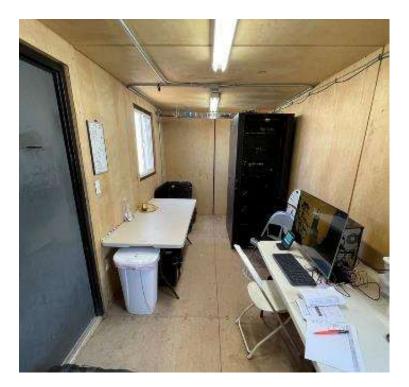


Figure 28. Rice/Silixa acquisition trailer.



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 aquiring 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 clave 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



10	s Ran FORGE 168(78					Terger (b-b	\$	and a state of the	intation Casing Runnin	6			
				cailing	Me	Max	ope			10,108.00	n		
				7" 364 PELOD WAN TOP IT		25,490	23,150		ice Gauge		10 11		
	Average using weight 4.5"	11.08		3, 398 horses and 104 Hz	16190	35,410	28,250 Open Hole		Healt Gauge Actor ¹ Stick-up			2.0	
	Asserage solist Length 5.5"	12.38				SIM PEOPER	NAME TOP HT	print:	5.751 ⁻¹ 10993	1933.00	n	15577	
	TD Ground Level	10235.40				300 P153W5 1 51 65 Ib/R P1			1.755' Landing Point 10.526' Int Cop	7,000.00	л п		
	wat hole:					cross-over th			analy satisfied as a		n	55	
F	Pyse here any	Notion in	reprin	ding tratevenentation and OCA	installation	n on the cally	diama conta	ct the origina	iter - Alam Baynelds - 257 364 55		-		
	item:		Net	COMPANY	Threads	Correr	Bottom	Tax Depth	cestolizen	COP		Protectors	Commenta
		1.1	SII.		off length	Langth	Depth	1000	1 AND	10000	- tear	0000000	2000000.0
30	TO SEA PLACE VAN THE HT	A			2.67	2.8T 49.77	10,208,40	10,208,79	David Lynch Roat Shoe Dhe X.L.S." Centraliber		4		Contraction of the second of
	7" DER FLEDDE WARF TOP HT	1		Terri Shoe?	-10.96	96.75		20,212,67	Nete		1	3000-30-01589(20.0	As ship cess should - pre-installed
	Terminedan Jub		12	Shell Obre Start	11.4	333.10	50,112.67	30,009-14	Reni		B	1039	
	T' MAR PERSONNAL TOP HT	1	31		28.56 47.00	190.15	10,056.15	10 248 24	Dise 9, L15" Centralizer	-	12	7805 01 01185263	31 0706 0913 55745
	" JAR POLICE HAM TOP IT RUP	Fag.D	10		\$0.95	207.10	20,012,23	22, 201, 24	Dir Finadalas		Papo	7000-35-01583(20.5	NO UTVO DANO NEVER ABOR
	T AND POLICIES WANT TOP HT PAP- T AND POLICIES WANT TOP HT	PREA	-	Stive Parts Soft	20-08 26-10	227.27	1.001.33	4,481.12	One Scoutra lost One 9, 545 " Centre lost		PARA.	1000-00-013 83100.0- 1000-05-03-10-03P-40	21 8708 8800 55/05 8405
	" SEN PLICED NAM TOP HT NO	0		Fall Optical Salar	10.36	385.67	9,958.15	8,024.75	DISENTING CHURCH		- 0	7800-35-81584(20.3	31 0700 0913 55735 30 0700 0913 39745
	users synch Host collar	8	1.12.1		-2.22	285.02	8,824.72	1.444.25	Revel (go is final faile)	<u> </u>	¢	7808-60-218 (A.S.	
-	TO MARY LEADER & AND TOP HT HAP	3	111	Apply Full Textion	10.10	286.87	9,813.10	1 847 47	One 5.03" Centralicer One Locence ber	-	2	1800-81-61585(20,8 7800 55 01425(20,5	31 8708 6913 55985 - pre-inara/Rel 31 8708 6800 55985 5803
	" SER PLECED HAM TOP HT PUP	0	121		28.	350.74	9,857.57	8,857,66	Call & BOOM STRATEM		.0	7900-35-815PN20.5	10 0700 0800 10/00, 0404
	NEWSCOLO LEASING SCORES	p	10	Tett Hand)	4.61	397.70	W.R. F.M.	Editors a	Principup Londary Profile		v	20-8,80009-86-0907	
1	T SER FLEERE WAS TOP HE HUS	D A	191	- THE PARTY	8.87 46.90	044.7% 411.6%	4,4119,42	1 621.65	One Stoentre Iour Une 9.103 ' Centre Iber	-	D A	3 5 7000-0-0018 7800 55 0158420/5	34 9708 6900 SSV(d) 0485 - gre-installed as 8705 ceta savas
	31 264 FELSEC KAM TOP HT	3		Full Optical Suita	46.78	455.44	9,796.75	8,753.96	TWO 8,524 ON BROOMS	cen	X	7890-144-018-70	11 2760 DALE 18745
F	2" DRE KEEDEN VAN DOP HE	1			00.00	303.94 849.48	4,753.96 9,709.68	8,705+16- 9,855,977	Two 3:125 Centralizers Two 3:125 Centralizers	CCF .		3030-144-019-70 1030-144-019-70	31 0700 0013 55/65
	T' SER PLICED WAR FOR HT	10	1		46.55	935.26	9,809 48	3 912.12	two #122 Centralizers	0(8 13.6	34	3830-144-01P-7C	35 0700 0013 55V35 35 0700 0013 55V35
	7" 308 PLLODO XAM TOP HT	35	180		40.04	645.52	8,612.22	8,555.25	Two 8.175 Centrations		34	3836-144-018-70	\$1.07000 D413 58V88
	2" JUR FLIDEC VAM TOP HT	32	10		10.00	180.14	RL 016,8	8 518 28	Two 3.125 Centralizers Two 3.125 Centralizers	CKP	12	7030-144-018-7C	21 4706 0913 55955
	T' SEA PLEOED WAR TOP HT	34			48.56	782.52	3,472,67	8 426.00	INO ALLO CARTINIZAN	CCP	34	7800-144-017-70	25 8708 6913 55V25 #5 9708 6913 55V25
	2" 306 RELOCC VAN TOP IT	25	1.2		47500	\$29.32	8,425.05	8,379.06	Two 8,125 Centrations	100	15	3000-144-014-70	11 0700 0413 58V55
	1" JUB FELDEC VAM TOP HT	-23	1.1	Full Optional States	31.00	125.42	4, 879-08	8 212.00 9 248 10	Two 3.525 Centralizers Two 4.525 Centralizers	CCF	10	3030-144-01P-7C 7030-144-01P-7C	31 6706 6913 55705 21 6705 6913 55705
	T' SHE PLINED VAM TOP HT	29	12	Contract Contract	46.26	\$89.50	9,205.10	P. 256.82	TWO KARS CARRIEDHE	CEF	19	3800-644-018-70	10 0700 0913 18/35
	>> dem material water operation	45	1.2		41.14	1,152,13	9,236.92	R 290.27	Then \$135 Gentrativery	149	29	300-04-00-0	\$1.0700 0013 SRV57
1.1	T ARE PLICED VAID TOP HT AUD TT ARE PLICED VAID TOP HT	PLP E			10.01	1,001,130	9,108.37	8,208.02	One 9-125 Contractor (No 8-122 Centralizers	COF	PUP F 20	7000-148-01P-7C 7000-148-01P-7C	35 8708 0913 55705 35 8708 0913 55705
	7" SEA PLICED VAN TOP HT	21			47.00	1,315.05	9,159.33	8,092,52	two 8,520 centraliters	CKE	21	7800-144-017-70	41 9700 D413 19V01
	3" JER FILDEC KAM HOR IN 3" SER FILDEC VAM TOP HT	22			201.12	1,352.00	0.000.0	8,010,000 8,840,00	Two 3.325 Contrations Two 3.525 Contrations	CCP.	26	3030-144-039-7C 3030-144-039-7C	51 d708 d613 55455
	T SAN FLIDEC VIAL TOP HT	24			20.00	1,255.42	1.978.02	110 0	TWO ALLS CONTRIDUCT	COP	24	7830 144-017 70	31 6706 0913 55705 35 6705 0913 55705
	7" SER RELEES VALUE FOR HT	25	130		47.15	1,333,00	4,952.56	8,905.40	Two 8.128 Centralizers	CEP.	25	7898-544-059-70	 11 1700 0413 14040.
	1" JUB FOLDEC VAMINGF HI T" HER FOLDEC VAMINGF HT	32	1.32	Fall Optical Selfs	39,40	1,006,05	1,805-00	1,011,47	Two 3-125 Centralizers Two 3-125 Centralizers	000	43 27	7000-144-019-7C	9) 1760 0913 59455 21 0700 0913 50455
	T' SER RELEGED VANA TOP HT	25	110	Caropies (10)	47.16	1,445.05	4.811.57	1 764.47	THO ALLY CEPTING ON	CLF	2.8	7830-144-019-70	21 E TOE DELS 33775
	1" 384 PLLODO VAM TOP HT	29	133		47,00	3,490.95	\$,764.47	1,717,49	Tax 3.03 Certratoris	125	29	7896-144-019-70	31 0200 0413 58V81
	1" JEE FLIDEC VAM TOP HT	33			317.13 24.96	1.535.00	8,745.43	8 875 94	Two 3.425 Centralisers Two 3.425 Centralisers	CCP	32	7030-168-03#-7C 7030-164-01#-7C	31 8706 9913 55456 31 8706 9913 55495
	7" 364 PELOED VAM TOP HT	52	1.120		47.14	1.652.16	8,423.38	1 576.24	two kazo centralbert	CK#	32	7800-144-017-70	SS-STREE BY LE SIVIE
-	3" SER PERSONNAM TOP HT	32	1		42,01	1,679,17	8,576,24	8,529,23	Two 8.574 destruisers One 9.525" Contralicat	111	- JD Phip A	3000-044-00P-7C 3000-044-01P-7C	41 dave by 14 eauty
P	THE PLUC WAS TOP HT	14p.4			44.76	1,755.05	A 410 14	8 477 14	Two # 225 Centre Cert	USP	14	7830 144 01P 7C	31 9700 0913 55495 35 6700 0913 55495
	7" SHA PLEORD VAMI TOP HT	35			AT.03	1,785.09	8,472.54	1,425.51	THE & STO OF THE OHS	CEP	35	2000-544-0515-70	AS STOP DELY SAVEL
	3" SER PLEED VAM DOP IN T" SER PLEED VAM DOP IN	35	1.2.4	Fall optical sate	46.0V 46.77	2,828,37	8,425.33 8 810 01	8,010.00	Two 3.124 Contrainers Two 3.125 Contrainers	000	35	3030-144-018-7C	41 0700 0914 59485 25 0700 0913 59485
	T' SEA PLOPECINE TOP HT	55	110		20.10	1,821.12	3,554.76	8,267.12	THE REAL CONTRIDUCT	CLF	5.5	1000 144-037 70	30 0 700 0413 557/6
	TT SER PLEODO VAM TOP HT	.99	125		47,04	1,990.16	4,257.28	1,240.24	TWO A 175 CEPTINGER	CEF	39	3806-144-018-70	31 2700 0813 38482
	2" JER PERCONNE (CP.10) 7" JER PERCONNE (CP.10)	42			4000	2,812,127	8,340,24 8,144,38	1,000,00	Two X 125 Centralizers Two X 125 Centralizers	007	41	7830-144-019-70	41 0700 0013 59465 21 0700 0913 5546
	T' SAN PLICED VAN DOP HT	42			47.95	2,199.19	8,148.28	15.000.1	TWO A 325 CENTREDER	0.0	47	7800 144 017 70	25 0.00 0413 S2V05
	7" SER FELODO XAM TOP HT 7" SER FELODO XAM TOP HT	40 41	-		30110	2,150.29	0,099.31	1,052,13	Two 8.575 centralizers Two 9.525 Centralizers	C2.F	43 41	7800-144-019-70 7808-148-019-70	81 0700 0818 58401 31 0700 0813 59485
	TT ARE FORDER VANATOR HT	43			48.08	2,240.18	8,009.10	7 948 37	Two 3.125 Centralicers	CCP.	-23	3030-144-01P-7C	31 6706 0913 59785 31 6706 0913 59785
	TT SEA FOLIDAIS WASHING FRT	45			28.56	2,297.07	7,958.22	7,901.33	Two Also careralisers	CX.P	48	7830-144-017-70	ALC THE BELL SWITE
	7" 39# FOLORIS VARIATOR HT	42		Fall Optical Salts	46.00	2,343.93	7,911.33	2,854,45	One 9,125 Centraliser	CCF.	42 #48.86	7836-144-318-70 7838-148-438-70	41 0700 0413 19931 31 0700 0613 55950
	T" WE FORMS VIEW TOP HT	45			26.91	7,455.53	2,854.61	7 807-47	Two Asks Centralicem	CEP	48	1830-144 (18-20	31 6 706 6913 53785
	77 Star Follow's VAM TOP HT 77 Star Follow's VAM TOP HT	49	1		45.00	2,447,76	7,507.42	7,760.82	Two 8.325 centralizers	CEF (27)	40	7830-144-017-70 7830-144-017-70	35 9700 0813 59910 91 9700 0813 59910
	T ⁴ ION FOLIDING VAMILITY IN	33			AND	2,801.77	7,700.00	7 999-92	Two 3.525 Central corp.	50	32	3030-146-01F-7C	31 0700 0013 35782
	T" NO FILCES VASATOF HT	82			- 40.5G	2,885.65	7,858.41	7 810 77	Two A size Centre loars	UL#	82	7030 144 01P 7V	35 8,000 0913 55909
	7" SEM FOLOMS WARK TOP HT 7" SEM FOLOMS WARK TOP HT	55			47.12	2,695.75	7,619.77	7,571.65	Two 5.325 Centrations	22.0	35	7000-144-017-70 7000-144-017-70	AS STOC DALL DAVID. AD STOC DALL DAVID.
	T" ARE FLIGHT VAM TOP HT	55			47.01	2,725.03	7,810.55	7,879.68	Two 3.525 Central cers	320	43.	10.80-101-01P-7C	31 0700 0913 55485
	TT AN ALLOWS VARATOR RT	45		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	28.98	2,776.88	7,479,48	7 647 47	Two # 525 Centralibers	CLP		1830-144-01P-7C 7830-144-01P-7C	31 6700 0913 SSVIS
	7" SON FOLOMS VAW TOP HT /" JAW FOLOMS VAM TOP HT	57		Fall Optical Salta	477,06	2,822.96	7,453.53	7,305.44	Ten 3.125 Centralizers	128	57	3990-144-019-7C	81 0700 0813 18945 31 0700 0813 58955
	T ² KM POLOMS WHIM TOP HT	6.9			38.72	2,014-01	7,418-33	7,268.28	Two 2.525 Centralicers	CCF	.88	2000-144-01F-7C	31 0700 0913 55/05
	TT SEA FOLGARS VARA TOP HT TT SEA FOLGARS VARA TOP HT	45			48.71	2,581.82	7,298.48	7.248.78	Two # 522 Centre bert Two # 522 Centre bert	CLF	43	7836-144-016-10 7836-144-016-10	JS GIVE BALL SSVID
	P 30K FOLOND VAM TOF IT	44			-460.945 -754.946	3,000.35	7,246.76	7,209,00	Theo 3.323 Centralions	CCF	NL.	700-144-014-70	10 0700 0413 14940 31 0700 0613 59450
	T" ASE FOODLEVANE TOP HT				anat.	4,202.40	7,165.01	7,008.60	Two 9.125 Central Ident	COF	48	7030-144-018-7C	31 0700 0913 55935
HS	T' SAF FOLOWS VAM TOP HT	65	-		45.75	3,349,25	7,008.90	7,959,17	the science ber	10000	. 84	7900 644 017 7C Horse	as eree beve saves each. Mid-jeim addi
	1" JAR POLONIS SAM TOP HT	10	17		9,32	3,339,39	7/009/07	7,002.47	Dee 9.129 Centralise		40	7800-81-01280.00.2	31 8708 6913 55416
	T" SNEED TON'S VALVETOR HT	**			24.57	9,242.40	7,000 87	6 358.00	One 9,115 Centrelber		188	70000000000000	33-8708-6913-55935
	7" SEA FOLDING VARA TOP HT 7" SEA FOLDING VARA TOP HT	47		Pail Optical Sala	45.51	3,295.91	6,956.00	8,900.46	Dre 9.334 Centralitier		47	7800-55-81589(20.5 7800-55-81589(20.5	35 0700 0417 58V(5) 35 0700 0417 58V(5)
	T COM POLICEC WANT FOR HIT PUP	FREE			10.11	4,455.72	4.865.51	3,855,68	Disc 9.125 Contrailout		PARH	1000-31-013 KR30,3	21, (170) (912 35/95
F	T" WE FILLOWS WARE TO FIRT	25			46.65	9,401.60	4,855.62	8 804 52	One 9.125 Centre loer		19	7000 00-01400.NA	31 9705 0913 55735
1.00	TT SER FOLIOMS VAM TOF HT	<u>79</u> 24	1		45.56	3,447.98	6,306.30 6,700.44	1,750,44	Dive 9.115 Centralber Dive 9.129 Centralber	-	- 70	7800-35-81384(20.3	\$1,0705-0413 34V/05



				aling "See Palada water TOP mit	Terque (1: 8x) Mile Mas Opt 1 21,050 23,450 23,250		Non start an anna Tea Gauge mM			n			
	assests with range 4.2	12.38	7	388 PELCHE VZH 107 HT	38,393 7	35,410 304 P10900 304 P10900	38,050 Open Hole NAM TOP HT	print:	Healt Gauge Holen" Stick-op Holen" Borero	7,004.a.1 7.56 9985-20		£.09	
	Ground Leve Hat hole	1.00	·	ie minuremistike and 02	350	51 65 Ibyth Pa cross-over th	314, 55 EVILLE 314 EVILLE			3,837,08 24	n n	3	
	ham	80	Nud >E	Cavenets	Threads off length	Correr Langth	Sottom Depth	Tax Depth	cestolizeo	CCP.		Protectors	Comminta
	T ² MM FOLDMS WANT TOF HT	72			44.83	1.103.55	8,719.48	8.848.32	One 9.115 " Centraliber One 9.115 " Centraliber		. 70	7800 \$4 4118120.5	25 0706 0913 55V85
	7" SER FOLOMS WARK TOP HT 7" SER FOLOMS WARK TOP HT	25			46.67	5,595.45	8,958,62	8,821.98	Day 5.125 Certraliyer		75	7000-55-01584(20.3 7000-25-01584(20.3	35-0700 DH13 58/00. 91 0700 DH18 58/00.
	P 100 P 100H 5 YAM TOP HT	25			29.05	1,877.40	4,877.68	6,831.00	One 0.125 Contraitory		23	YOR- IL-SLAPSYOLD	21.4750.0913.55785
	T" NO FIGHER WHATTOP HT 7" SON FILSONIS WHATTOP HT	28 27		Fall Optical Sala	46.95	4,774 Kh 3,77L23	4,451.00 8,454.10	# 454 10 8,457.17	Drie 9.115 Centraliber Drie 9.115 Centraliber		24.	7800-35-8158930,8	31 0700 0913 55V85 85 0700 0913 55V85
E	7" 20# FELONIS WASH TOP INT	74		ran opened and	16.14	3,818,85	4,497,47	1,00.4	Dar S. 124 Destances		n	1000-20-015470-20.3	11 07YO 0513 19VA1
	T" HIR FOLDMOVAWITOF HT	78	100		aron	4,889.20	4.100.15	0.013.20	One 9.125 Contrailor		.71	ABIO-RI-BELENING	31,0709,0913,55755
	TT SER FOLIOWS WHAT TOP HT TT SER FOLIOWS WHAT TOP HT	-85 81			45.97	9,912 (X	8,5296.22	8,256,27 8,349,25	Drewing Centralber		10	7800 95 01 42 80 00.3	31 0700 0413 537/05 31 0700 0413 347/01
	15 200 ESTORS WAR TOP HT	84	40		4008	1,000,09	6,278.22	5,202.41	Dec 4.125 Contrainer		12	300-20-00540L00.3	91 9769 9919 59465
	T ⁴ NW FOLDMANNAM TOF HT	- 11			47.08 26.02	4,058.25	8,203.31	8.289.38	One 9.125 Centralizer		-11	7000-01-01101/0.0	21 8706 0913 55436
	7" SEE FORMS VARATOR HT 7" SEE FORMS VARA TOP HT	44			40.40	4,15513	8,100,17	1,361.31	One 9,135 Centration		14	7890-95-014863A-5 7890-35-0158820-5	25 0700 0913 55V85
	P 200 FOLDING VAM TOF HT	85			19.10	1,282,97	6,003.00	6,014.43	Date 3.125 " Contration		80	7800-20-01581120.2	31 4704 0813 58485
	T [#] ARE FOLDERS VALUETOF HT T [#] SSA FOLDERS VALUETOF HT	82		Put optical table	28.93 28.52	4,240,88	8 014 68 5 947 62	8, 8417 A2 5, 921, 28	One 9.115 Centralizer		17	7000-01-011033035 7000-55-015042035	31 6700 0913 S5V85
	7" 30# FOLOMS VAM TOP HT	42			46-34	4,287,12	5,921,26	\$ 921.38	One 6.118 Certification		12	7900-35-01589(20,3	30 0 700 0013 33235 91 0 700 0013 53255
	7" JUR FOLDHO VANTOF RE	23			-09.34	4,180.09	5,876.23	5,827.72	One 0.125 Centralisin		93	1995-10-013-0120-2	31 (2004-001)3 59458
	T" NOR FOLIDALS WARK THE HT T" SER FOLIDALS WARK THE HT	81			A6.84	4,477.18 4,475.64	4,817 71 5,761.25	8,783.28 5,754.76	One 9.115 Centralitier One 9.115 Centralitier		41 52	7805-06-010862620 7800-55-015868263	31 6 706 0913 55935 31 6 706 0913 55935
H	7" SOM FOROMS VAMINGE HT	32			45.41	4,520,05	5,754.76	5,599.35	Ann 5,104 Combaster		32	7800-25-81589(20.3	41 07V0 0414 08201
	7 ⁴ JOB FOLDMO VAM TOP HT	85			.00.96	4,595.99	3,610,15	10.106.6	One SLEE' Conhaisea		93	1990-31-8158N20-3	21 8709 6913 5998
	7" NUL FITCHIS WASHING HT 7" SON FILLOWS WASHING HT	85			45.50	4,659,72	5,995.18	5 540.00	One stals "centralber Dise stals" centralber		44	7000-55-0150020-5 7000-55-0150020-5	35 8700 0913 55V05 85 8700 0913 55V05
Ŀ	P SWEESSONS VAN TOP IT	31		Full optical suite	19.43	Ozist	5,5% 66	5,502.45	Dan A.124 Conditioner		17	7000-25-01581100.2	11 0700 0111 19V01
	T ⁴ KREPSIONLVAN TOP HT	80	1.022	0.001000000000	26.08	4,782.08	1 100 41	5,256.27	One 9-515 Centraliser One 9,545 * Centraliser		u.	1900-10-ELXBRIDGE TRAD OF STRENDOLS	31 1700 0913 55985
	77 Stall FollowS WHW TOP HT 77 Stell FollowS WHW TOP HT	09 000		Stow and any open hole	28.50 45.41	4,755.25	5,409.97	9 #00-07 5,364.56	Dive S.LLS CONTRICOP		E DE	7800-55-6158480.3	31 0700 0913 55705 81 0700 0913 58745
t	7" JAW FS10HS VAM TOP IT	244			Tich.	0.040.70	30.101.00	2,317.72	Date 9.025 Conditation		11/5	700525-0150120.2	31 0702 0013 59957
	T ² KER POLICIES WHILE TOP HT T ² KER POLICIES WHILE TOP HT	100	1.1		24.48 44.43	4,447.46	8,819.70	9,210,74	019 9.125 Centralicer Une 9.125 Centralicer		1.02	FROM CO-CLARMON, N-	31 0700 0913 55936
	7" SER FOLOMS VAM TOP HT	108			46.41	4,005.01	5,229.56	5,276.57 5,278.47	Disestan Central Cert		104	7800-85-014863A3 7800-35-81584120.3	25 0700 0413 55745 30 0700 0413 55745
	7" JOR FORMS WANT FOR HT	105	1.00		39.15	3,579,95	3,2(8.2).	2,223.74	One 9-128 Contration		105	188-20-00589-00.2	31 8706 0813 98758
	T" NUM POLICIES CARSE TO PIET T" SAM POLICIES WARM TO PIET	108	1111	Fall Optical Sola	24.4X	8,125.81	R 183 77 R 354 76	8 236 78 5 256 67	One 9.115" Centralizer One 9.115" Centralizer		100	7000-08-011010-018	31-0700-0913-55935 31-0700-0913-55935
	7" SER FLOOM SWAM TOP HT	106	11.2	Concerne And	46.36	5,215.53	5,838,67	1,891.97	Close 9, 628 * Certitalizer		108	7990-35-81589120.3	AL OTHE DALL SWART
	IT SHE FLOOMS VANCTOF HT	108	100		39.51	3,253.06	4,002.07	6.60.36	Des 9-125 Contraces		104	1800-10-00488.00.0	21 4704 4913 59435
	T" NOR FOLIOWS WARK TOP HT T" SER FOLIOWS WARK TOP HT	110			40.56	8,805-91 5,950.27	4,502.45	4,555.13	One 9, LLS " Centraliber Drie 9, LLS " Centraliber		110	7865-01-01485/26.X	31 0700 0913 55705 31 0700 0913 55705
	The PDT MARY CHEDRER FILE	10	100		16.04	5,385.34	4,856.22	4,913.00	Dis 9.109 Certration		112	7000-20-01587120.5	1) 97YO DALA SRUSS
	T [#] SHE FOLDERS VANITOR HT T [*] SHE FOLDERS VANITOR HT	114	-	-	JA 17	5,442,49	4,81.8-CB	8 749-13 - # 715-19	Disc 9-125" Centralicar Disc 9-125" Centralicar		114	3000-01-01347420.2 3000-02-01406030.3	31 0700 0913 55/65 31 0700 0913 55/65
	TT SER FOLOMS VAM TOP HT	115		- Shek kitisers karkit	46.90	5.595.95	4,719.55	4,872.45	DOLLO STORES		115	7800-35-81584(20.3	31 0700 D#13 38VID
	21 200 FORMS WAR TOP IT	115		All seators and a seator of the	40.05	2,586.91	3,672.45	1244.18	Dave 10-24" Conditional	-	116	3000-20-012-012-020-2	91 0700 0513 58VM
H	T ⁴ BREFILMENANTOF HT T ⁴ MR FILMEN NAM TOF HT	117	11.1.1.4	Fall optical salts	20.00	1,628,90	4 977 40	4 917 00	One 10.15" Centralizer One 10.15" Centralizer		112	7880-31-81381020,8 7800 55 81586020,8	31 9700 0913 55435 35 9700 0913 55435
Ŀ	77 SEE FSLOMS VAM TOP HT	115			46.68	5,723.20	4.552.00	4,485.12	Disk 10.15 CHERINGOF		6.13	7990-35-815 FN 20.5	11 0700 0911 19V/81
	7" 200 FOLDMONAW TOP TH T" 100 FOLDMONAW TOP HT	111	100		(16.17) 16.91	9,00005	4,465,12	4 420.25	One 10.35" Centralizar One 10.35" Centralizar		1.0	7800-20-0126882002 7900-01-012682002	11 0700 0015 55/55
	T" SSI F LIGHS VIN TOF HT	172			24.16	5,245.25	4.901.44	4 544 57	Une 10,15 ' cermalber		122	7800 55-01128030-5	31 6706 6913 55V05
	7" SOR FOLOMS VAM TOF HT	113			47,01	5,810.00	4,3%4.35	4,297.54	day 1035" Certralow		123	7800-35-81589120.5	11 0700 0913 18V81
	T ^R JOR FOLDRID VAM TOP HT T ^R MR FOLDRID VAM TOP HT	1.15			28.90	3,897.75	4,240,4A	4,200,00	One 10-15 Centration One 10-15 Centration		114	7808-25-802 KR 2022	31 0700 0013 55/55 31 0706 3025 55/55
	T' SEE F LON'S VAM TOP HT	176	1103		26.91	8,051.56	4,209.75	4 (56.54	one sous "centralber		124	7800 55-4158430.5	32 FIVE 30.0 33VID
F	7" SER FOLGHIS WANT TOP HT	122		Full Optical Suite	47.00	6,090.50	4156.0H	4,209.94	Dive 10.35" Centralizer One 10.35" Centralizer		-117	3800-30-81583(20,3	85 0700 1008 08V81
	T ⁴ JUN FOLDING SAM TOP HT T ⁴ AM POLONIS SAM TOP HT	110			47.01	8,281.42	4,009,02	8,004,13 4,017.06	One 10.25" Centralizer		128	7000-20-0128102023 7000-05-0128102023	31 4706 3025 58485 31 9706 3025 59495
	71 Ste FollowS VAM TOF HT	156			48.50	6,250.11	4,017.05	5 970 25	one tous "cermalber		134	1000-55-01569-003	as prote source savish
	7" SER FORMS NAM TOP IT	133			10.07	5,235,90	2,970.25	2,223.42	One 10.15" Certification One 10.15" Centralizar	-	133	3000-20-00583820.2	41 8790 1014 08201 31 8708 5025 5526
	T" SALE YOOMS WANTED BY	144			24.00	8,975.41	4,876.76	1 10 11	Dise 10.15 Controllogr		100	7800 10-013894200	31 6 AG 30,2 559 8
F	TT SON FOLOMS WARK TOP HT	134			46.77	6,425,40	3,829,77.	3,785.00	Date 10.15 " Central Der Der 10.15" Centralizer		134	7890-55-01384(20.3	31 97KG 1010 187/10
H	7" 258 FS10H5 VAM TOP IT T ² HIR FS10H5 VAM TOP IT	118			15.25	6,472.21	3,783.06	3,735.18	One (0.15" Centralizar	-	115	7800-25-81543520.3 7800-81-0118N20.5	31 (170) 1014 09/45 31 (170) 3025 55/36
	T" SHE F HOM'S WASH TOP HT	197		Pall Optical Sector	26.97	8,986.05	9,800 %	1 847 11	one tous "centralber.		193	7000 51 01100.053	35 8 AG 304 304 507 6
	7" SON PLICONS VAMITOR HT	138			45.25	6,612,90		3, 595, 42	One 10.25 " Centralitier One 10.25" Centralitier		154	7990-55-8LSRH20,5	AD 0700 SADE SAVES
E	7" JUR FOLDING SAM TOP IT	1.16			-10.W	8,326.90	3,396,42	1,919,46 8,601 MD	One 10.25" Centralizer		128	7000-20-01261020.2 7000-00-01261020.2	91 8768 3019 5948 25 8768 3025 55465
	T" SEA FORMS VOM TOP HT	141			28.62	6,752.04	5.501.50	3 453 44	one sous' cerne ber		141	7800 55 0140420.5	ANY ARE STATISTICS
	7" 30# F100MS VAM TOF HT /* 20# F100MS VAM TOF HT	1/2		High DLS	46.03 1 06.09	6,799,77	3,455,46	3,400.53 4,403.04	Day 10.35" Centrality One 10.35" Centrality	1	142	7900-35-01549(20,5	81 0700 3028 18/00. 81 0700 3025 59/00
	T" BUE POLIDING VAMITUR HT	144		inge oce nige mit	30.99	8,381.40	6,843.64	8,454,50	Drie 10.25 Centralizer		144	7800-81-61889120.3	31 8708 3925 59495 31 8708 2025 59495
	TT SHE FOLOWS VAMITOR HT	148		Heli D.S.	20.96	8,540.50	3,314.60	9 347 64	one tous " centrelber		145	1800-55-01584(20.3	as entre sala savia
	7" SOM RELIGNES WARK TOP HT 1" SOM RELIGNES WARK TOP HT	2/6		Shoe at anding point eail optical suite	46.00	6,897,39	3,267.83	3,221.05	Doe 10.35" Certrainer One 10.35" Certrainer		24.7	7900-20-01588820.3 7900-20-01588820.3	11 0700 1020 10400 31 0700 1020 59460
	T" MR FORMING TOP HT	128			29.52	5,060 IA	8,174,10	1.128.22	One 10.35" Centralizer		148	7800-14 01108 251	31 0706 3025 55485
	77 SEA F110MS WAM TOP HT	148			46.65	7,127.05	5,128.22	3, 901 37	One to its ' centraliser		148	7000-55-01584-80-3	as a no sets seven
H	7" 30# F110H15 VAW TOP HT 7" 30# F110H15 VAW TOP HT	106			-10.09	7,473.92	3,325,37	2,234.46	Day 16.35 Centralizer Des 16.35 Centralizer		154	7800-25-81583(20.3 7800-81-81583(20.3	41 0700 1014 09400 31 0700 1015 5548
	TT AND FROM SWATE TOP HT	143			24.97	7,787.7%	2,487.44	7 140 AT	One 10.25 Centraliper		142	7800 55-0148820.5	35 9700 3825 55915
	7" SON FOLOMIS VAMI TOF HT 7" SON FOLOMIS VAMI TOF HT	153			46.61	7,354,54	2,940,67	2,894.06	Dise 10.15 Centralizer		-153	7800-35-6154830.5	an anno sain sevia
F	T ² BUR FOLDHU VAM TOP HT	104			16.W	7,436,10	2,894.05	2,917.30	One 10-15" Centraliser		154	700-20-01549(20.0 300-01-01189(20.0	31 6706 2025 55%8
	TO SAU POTOMS WHAT TOP HT	144			26.97	7,484.10	2.000.00	2 288.41	One tous centraliser		144	7800 55-01426 20.3	30 0 /00 2000 50/16



As Ran FORGE 16B(7	8)-32 As	udited to KB	Instrumentation Casing Running Tally							1	
errore and a second second second	0.000000000			Tanger (B.B.	S.:		and the second				
		tailing the month of the second	March	Max	0,0		Fibre Mart		- n		
		7" JAN PLICEC WAN TOP IN		25,490	23,230		Toe Gauge				
		3" JUR PLICHS VAN 107 HT	38,355	33,450	28,130		America age			121224	
Average Joint Length 1.5					figen Hale		scies" adds-up	7.56	.8	4.89	
Retrige Mint Length 8.9	43.38		1.1	38# P31050 1	VAM TOP HT	prift:	NUMET BOOMS	1952.01	. 11	2695	
T	10285-80		- 19 M	Jaw H133MS 1	WINI COPIEL	Dolt;	1.711 Landing Point	T,000.00	01		
Ground Lave	1.10177.40		31.7	5" 65 RV/H P1	138/125, 870	Drift:	15.526" int Cog	6,837.69	. 11		
eat hole	10.00			cross-ower the			soat to tag anwit	44	+	8	
Wyserhees w	y sugathers.	repirding manuremutation and 00	instante (los	i se the tally	ARREST CONT.	et the ssigire	tory - Alers Reymolds - 757 364 597	1.1		<u>6</u>	(i)
tam		Net	Threads	Cares	Bottom	Tag Depth	Controlized	COP		Protectors	Continents
408.02	125	se	off langth	Length	Depth	NAMES AND	1999 (1999) 1999 (1999)	1.277.23	10000	2012/01/201	
T" WE FLIGHT VIAN TOF HT	110		38.65	7,841.84	2,708.79	7,810.54	Dire 10.25 " Centralizer Dire 10.25 " Centralizer		158	3800-05-01439(20.5	35 6706 5825 55925
7" Ste F110HS VAM TOP HT	159	4.4	48.52	7,595.37	2,859.66	2.813.02	One 10.25 Certifiction		196		31-9769 3815 59VID
7" JOH FELONIS VAM TOP HT T" JOH FELONIS VAM TOP HT	100		72.95	7,642,25	2.563.00	2,556,04	Dec 10.15 Contrainer		168	3900-31-012810,03	41.0700.1074.14V.Mt
T" SM FORMEVAM TOP HT	143		UNITE UNITED	7,889.28	2,000,02	2 518 13	One 10.35 Centralizer		183	3000-31-01383(20,3 1000-35-01705/20,3	31 0700 3025 55/66
17 STR F110MS VAM TOP HT			and the second sec	and the local data			Dive 10.15 Contractor		1111		35 8706 5525 55935
	163		46.86	7,782,86	1.472.42	2,425.54	Day 10.75 Contractor		100	7900-35-813PH20.3	81 0700 0015 18V/ds
7" SER FELORIS VANITOR III 1" SER FELORIS VANITOR III	100		100.01	3,528.73	2,465.54	2,378,97	Des 10.25 Contraiteur	-	164	388-0-01880.0.4	
T" MU POLOM SURVITOP HT	148		24.94	7,876,62	2.812.81	2 841 78	phe 10.25 Centre ber		144		31 E70E 1925 55436
7" Sile Folger's Value TOP HT	167		44.00	7,899.95	2,205,42	2,256.47	Des 10.15 Centralizer	-	144	7900-35-8129130-3	30 6 XX 2023 32 XX
2" SHEFTLORD VAN TOP HT	107		-92.95- G-3A	1,999.95		4 298.01	Day 16.75" Contrainer		107	7900-33-013992013	41 0762 1018 16V/80 41 0762 1016 16V/80
				1.042.10	2,228:07		Ove 10.15 Certralizer		168		
7" MR FILMES VAN TOF HT 7" MR FILMES VAN TOF HT	148		381.71 28.94	1.195 54	2,147,41	2.549.90	Une 10.15 Centra ber		100	7900-01-0138020.8 7900-55-0158020.8	35 8708 3825 55436
7" SER F110MS WAM TOP HT 7" SER F110MS WAM TOP HT	171		40.73	1,135,67	2,049,00	2,000.04	Dise 10.15 Cellifation		171	7800-35-81581(20,3	20-07/00 2025 50/45 93 87/00 2029 58/485
1" SER FELONIS VANITOR HT 1" SER FELONIS VANITOR HT	171				2,099,04		Disciplify Contrainer		1/1	7800-35-81599(20,5 3900-30-81599(20,5	
T ² SHE FOLDER CHAIN TOP HT	173		47.01	8,323,09	2 3 3 4 61	1.048.24	One 10.25" Centralizer		111	1001-01-01089-00.8	31 0700 3025 55485
T" Ma F HOM S VAM TOP HT	174		48.08	1,295.02	1.052.45	1.946.24	the 10.15 Centralber		174	7000-05-01920/20.5	31 8708 1815 55465
			40.05				Dise 10.15 Contrainer				Science sain sovin
7" SER FELORIS VAN TOP HT 1" WE FELORIS VAN TOP HT	175		10.74	1,342,41	1,911,40	1,905.96	Disc 10.25 Contrainer		102	788-33-6138820.3	ALLENG SETS WANT
T" MILEFILLOWS WANT TOP HT	1379		41.11	1,189,27	1.010.10	1 277.34	One 10.25 Centralizer		111	100-01-01800004	31 0700 3219 55485
7" MM FORMAS VANA TOP HT	178		26.36	8.485.04	1.772.24	1.728.54	THE TOTE, CALIFICAL		178	7500.55.0112100.3	31 6700 5815 55V05 31 6700 3815 59V05
P DIR FOLDING VAMITUR IT	175		20.00	1.530.00	1,725.36	1.570.46	Day 16.29" Centuriner		1.78	7909-20-01587(20.2	41 07Y0 1014 19UNT
T ⁴ BH FLOMS VAM TOP HT	100		38.79	8,379,49	1,476.48	1.8/1.64	Over 10-25" Centralieur		198	798-0-018820.2	31 8706 3015 55455
T" SAU E LIGHTS WANT TOP HT	161		77.84	8.421.38	1.410.45	1 614 10	Une 10.15" Centraliper		141	2005-99-0148620-5	31 0700 3025 55745
7" SIN FILOMS VAM TOP HT	103		46.92	1.670.77	1.534.55	1.557.63	Das 10'12, Celtinges.		182	7890-35-8158120,5	91 0700 1010 10V0
7" JOR FELOMS VANTOR IT	193		10.93	8,717,00	1,227,62	2.990.72	Day 18.35" Contrainer		193	J98-3-61288.00.2	41 0700 1024 18VA1
T" MER POLICIES VANITOR HT	103		20.00	8,767,99	1.000.02	3 454.00	Disc 10.25 Controlleur		184	200-01-0138100.3	
T" Star F 110M S VAM TOF HT	1/4		24.25	1.0.00	T.atd.Of	\$17 AC	One 10,25" Centreliber		144	7800 55 41 580 20.5	31 8708 3825 55935 35 8708 3825 55935
7" SEM FILSOMS VAMITOR HT	100		40.06	8,857.76	1,397.60	1,350.64	Day 10.15" CHARLOW		104	3800-35-8158 m 20.3	91 CINC 1018 19V89
2 JAR F 2008 S VINE TOP IT	10/		10.17	8.822.92	13000	1,300.00	Dire 10.24 Comb data	-	197	100-2-0156840.0	\$1.07Y0.1014 19/01
T" KINF FALSBUR VALA TOP HT	118		20.00	1,893.28	1.8%4.47	1,237.81	Dire 10-25 Centralizer	-	128	788-91-61189(20.5	35 6706 5825 55405
T' SHE FILLOWS WARE TOP HT	164	10	46.67	8.097.78	2,257.53	1,210.44	une 10.15" certraiber		1.84	7000.95.01520.20.5	31 8 AC 30A 30A 30YA
7" SER F110H15 VAM TOF HT	1.06		44.54	8.041.40	5.210.64	1,050.00	dive 10.35" Certifician		Lee	7900-25-6154H20.3	ALCINE 1918 1940
I" JUR FELONIS VANI 108 HT	193		20.041	8.549.27	1.006.00	1.110.00	Day 10.25" Certralian		192	100-21-0148820.J	91 8700 3815 55435
T ² SHE FILLON C WALK TOP HT	102	10.1	406.577	8,195.14	1,128,08	1 272.3#	One 10.15" Centralizer		100	7000-01-011010.00.1	31 6700 1825 55485
T" SANT LOOMS WANT TOP HT	105		45.92	81,281,18	1.072.18	1 125.74	une 10.45 " certraiber		109	7800.55-81520/20.3	Ja erke sein savin
7" SER FEDORIS VAW TOP IT	194		46.97	8,230,13	1025.24	816.27	Dis 10.35" Centralian"		184	7800-35-81589(20.3	\$1 0700 1018 18V/01
I" DEFESSIONS VANITOP HT	193	10	296.77	8,275,90	8/8-17	821.00	Disa 10.25" Contraheut		190	1002-03-0138100.0	91 0700 1025 (SVat
TT ARE EXCLUSIVE VALUE TOP HT	148		48.51	8,925.71	841.40	814.01	One 10.25" Centralizer	-	108	7000-99-01083030.5	31 0700 1015 55905
T" SIN F 10005 VANA TOP HT	1.97		48.11	1.370.52	\$54.60	857.50	UNA 10.15 CHITIS DH		197	7800-55-41589-20-5	31 C/VD 1015 16V/15
7" SHE FOROMS VANTION IT	LVB	5123	199.54	8,457,05	817.00	791.35	Disc 10.29" Graduation		198	7800-25-61589(200)	41 0700 1014 14UM
T" INF FIDDRE VAN TOF HT	Line		38.18	8,882.38	794.00	100.08	Disc 10.75" Contralient		198	188-81-8118R.81.8	31.0700.1813.55485
T" SAN FOLINMS VALVETOP HT	208		44.64	1.155.05	747.01	200 57	One 10.25 Centrelber		. 10E	7000 95 81181030.5	31 0/00 3025 50/25
7" SER FLLON'S VANITOR HT	203	1.4	40.53	8,554.55	300.57	\$53.65	Dire 16.15" Caverality		101	7000-55-81581(20.3	di ente inin tavas
P DOW FORDING SHAM FOR HT	200		10.74	8,585.55	8-1-10	613.25	Day 10,39" Configures		2012	7800-25-01589120-3	15 0700 1015 15VM
T ^R HER FLICKLE VANI TOP HT	208	1925	discust.	0.042.03	415.28	\$66.07	One 10.15" Centralicer		2018	3980-81-4134R20.2	21 0706 3023 55466
T" SALET LON'S VALUE TOP HT	204		48.11	1.455.14	458.57	\$20.04	One 10.45" Centraliser		704	7890 95 0148120.5	J1 0700 1010 30V/6
T" SON FILLONS VAMI TOP HT	205		43.66	\$,735.60	\$20.26	474.50	Dise 10.35 Contractor		208	7900-55-81589(20.3	11 0700 1015 18V/8
7" JUR FEDORE WANTER TH	206		THE OF	6,783,199	8/6.60	107.91	One 10.05" Contration		20.0	1008-30-015480.00.0	11 0700 1015 19451
T ² 688 FILLING WAVE TOP HT	103		40.10	8,827.01	417.01	821.18	One 10.35" Centralizer		101	1000-00-01188100.4	31 #700 SH15 S5V05
T SA FLIGHS VIA TOP HT	208	1.0	48.75	1,175.74	\$51.50	354.00	une 10.15 ' cermalour		108	7000 98 01180/20.5	12 0 / 00 30 0 30 / 0 0 / 0 0 C
7" SILE FLLOHIS VAIN TOP HT	206		49.49	8,820.20	354.66	236.20	Die 10.15 CHINKH		208	7000-35-01589(20.3	\$1 0700 1018 18V/01
P ANY PEDDING VIEW DOM HT	212		101.28	8,85/.09	248.45	213.23	Deve 10.25" Conditations		410	100-0-01460400	95 0700 3325 55485
T ⁴ SHE FOLDERS WAAR TOP HT	211		47.00	10,014,12	.841.83	194.19	One 10-25" Centralizer		F12 -	7000-00-01385(20,8	31 6700 1025 55905
T" SHE F LOWS VANETOF HT	212		JA AT	12,080,70	104.78	147.81	tine 10.45 " centralitier		212	7900 95-8158920.5	35 E/VE 2010 Solvins
7" 30# F210H45 VAM TOP HT	213	No.	40.04	10.307.63	147.64	200.77	Disc 10.33 Contrainer		213	1000-20-015RN20-3	AL OND 1818 NAVAT
" NEW PERSONS DAMING HT	214		61.04	10,350,95	500.01	48.13	Dire 10-25" Centration		114	1000-10-01289L013	No control con an last fai permi
T" SHE FOLDER VAM TOP HT	Page	1.02	70114	10,174,79	10.78	11.41			Phi B	2000-01-01581020-3	Or space-out page
Harger Pap	Pap.		416	12,175,95	55.61	19.48			PLP	in the second se	a destruction of the
nurger	Hanper		111	10.200.20	28.85	10.14		-	Hanger	1	
Forger neck	mack		141	30,381.38	10.14	17.14			Hech	1	
land of port	ingel		u.m	12714.68	17.14	17.94	-		200mt		
A CONTRACTOR OF A CONTRACTOR OFTA CONTRACTOR O				10,000,000		1.41			1000		-

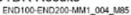


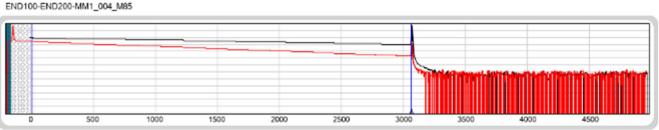
Appendix D: OTDR Traces

6.1 Pre-Travel Check

6.1.1 Multimode Fiber 1





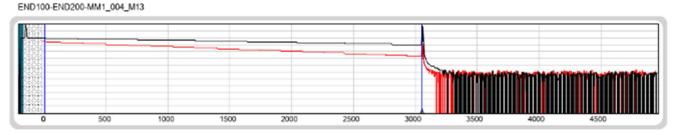


OTDR Results

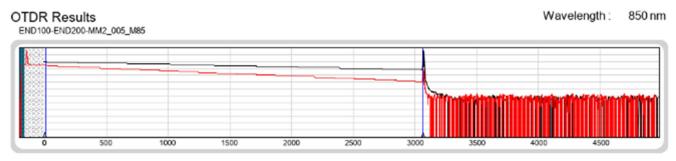
Wavelength: 1300 nm

Wavelength:

850 nm

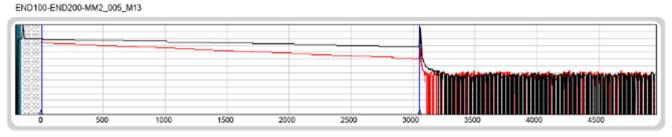


6.1.2 Multimode Fiber 2



OTDR Results

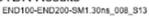
1300 nm Wavelength:



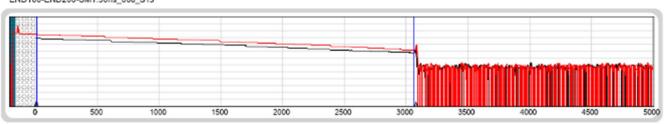


6.1.3 Singlemode Fiber 1

OTDR Results

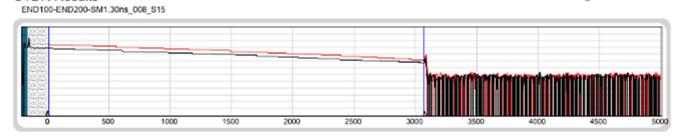


Wavelength: 1310 nm

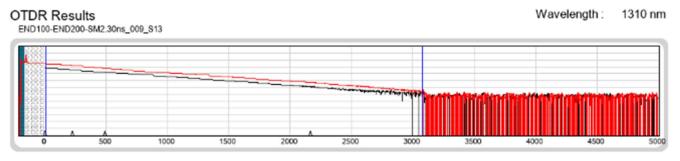


OTDR Results

Wavelength: 1550 nm

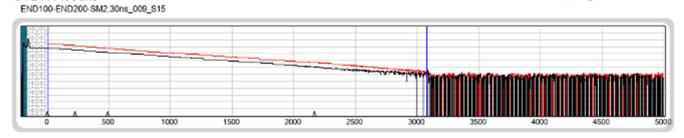


6.1.4 Singlemode Fiber 2



OTDR Results

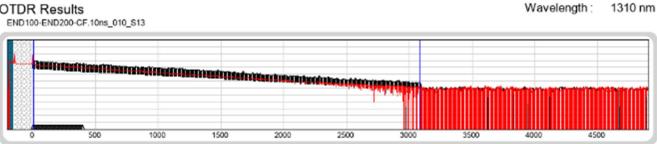
Wavelength: 1550 nm





6.1.5 Constellation Fiber

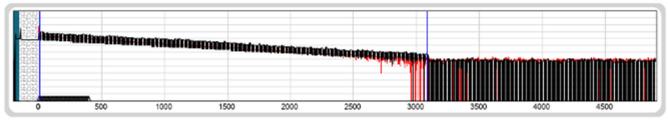
OTDR Results



OTDR Results

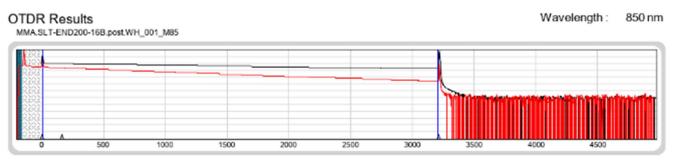
END100-END200-CF.10ns_010_S15

Wavelength: 1550 nm



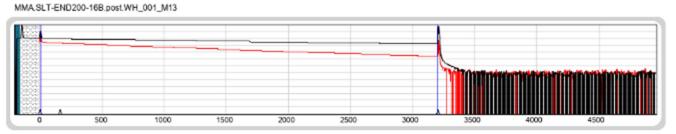
6.2 Post Wellhead Check

6.2.1 Multimode Fiber A



OTDR Results

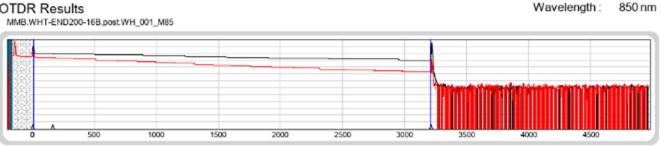
Wavelength: 1300 nm





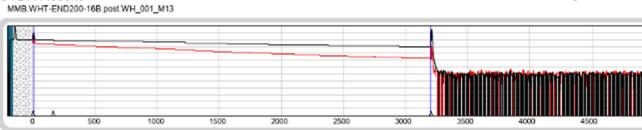
6.2.2 Multimode Fiber B

OTDR Results

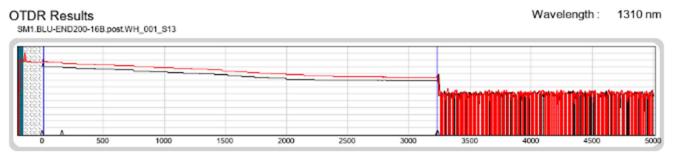


OTDR Results

Wavelength: 1300 nm

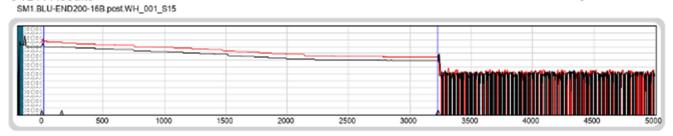


6.2.3 Singlemode Fiber 1



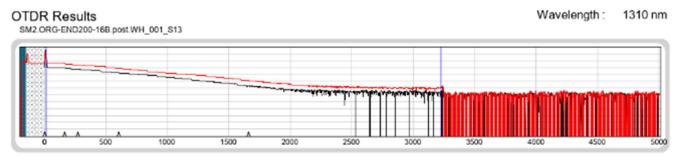
OTDR Results

1550 nm Wavelength:



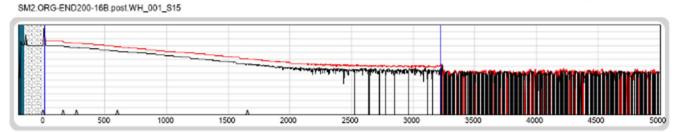


6.2.4 Singlemode Fiber 2

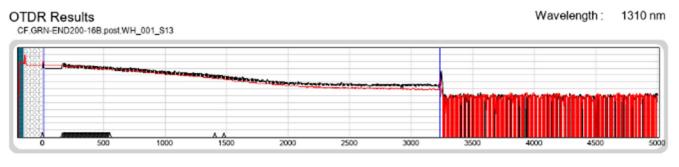


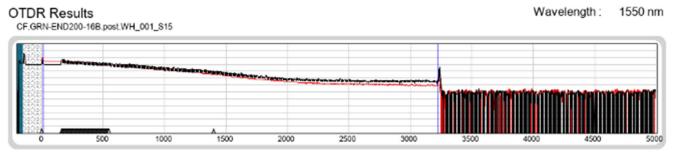
OTDR Results

Wavelength: 1550 nm



6.2.5 Constellation Fiber



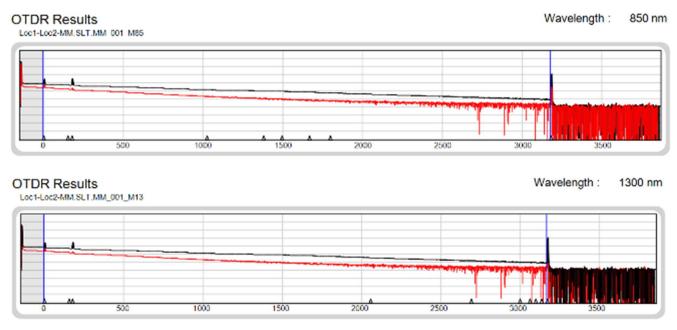




6.3 Final fiber array Commissioning Check

***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.

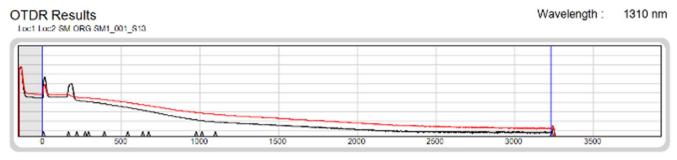
6.3.1 Multimode Fiber Slate



6.3.2 Multimode Fiber White

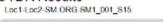


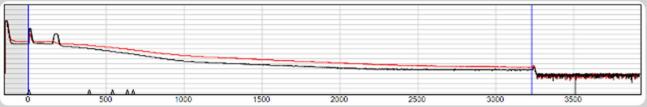
6.3.3 Singlemode Fiber 1- Orange



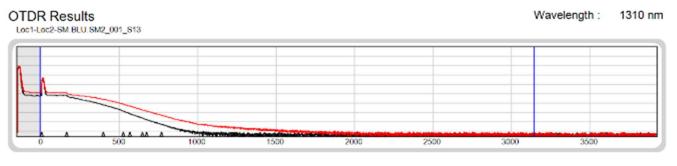
OTDR Results

Wavelength : 1550 nm





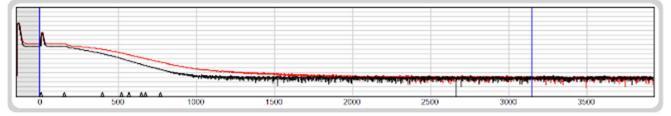
6.3.4 Singlemode Fiber 2- Blue



OTDR Results

Loc1-Loc2-SM.BLU.SM2 001 S15

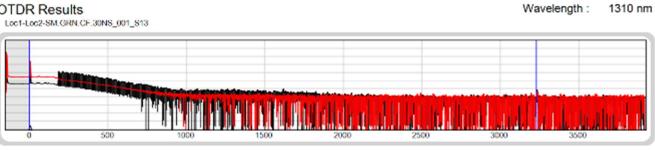
Wavelength : 1550 nm





6.3.5 Constellation Fiber

OTDR Results



OTDR Results

Wavelength : 1550 nm

Loc1-Loc2-SM.GRN.CF.30NS_001_S15

