

NAVSEA
STANDARD ITEM

FY-20

ITEM NO: 009-123
DATE: 01 OCT 2018
CATEGORY: II

1. SCOPE:

1.1 Title: Fiber Optic Component; inspect, install, repair, remove, and test

2. REFERENCES:

2.1 Standard Items

2.2 MIL-STD-1678, Fiber Optic Cabling Systems Requirements and Measurements

2.3 MIL-STD-2042, Fiber Optic Cable Topology Installation Standard Methods for Surface Ships and Submarines

2.4 MIL-STD-2003, Electric Plant Installation Standards for Surface Ships and Submarines

2.5 IA PUB-5239/31, Information Assurance Shipboard Red/Black Installation Publication

2.6 NSTISSAM TEMPEST/2-95, Red/Black Installation Guidance (FOUO)

2.7 SE000-01-IMB-010, Navy Installation and Maintenance Book (NIMB), Section IX, Installation Standards (Source CD: N00024000033)

2.8 S9086-PF-STM-010/CH-408; Fiber Optic Cable Topology

2.9 S9AA0-AB-GOS-010, General Specifications for Overhaul of Surface Ships (GSO)

3. REQUIREMENTS:

3.1 Ensure employees accomplishing work (e.g., installer, QA oversight, direct supervision) on fiber optic systems have accomplished Navy Shipboard fiber optic training and achieved certification in accordance with requirement 1306 of Part 1 of 2.2.

3.1.1 Maintain current certification for each employee working on fiber optic systems. Employees **must** present certification card when requested by the SUPERVISOR.

3.1.2 Submit one legible copy, in hard copy or approved transferrable media, of a report listing all personnel involved in accomplishing fiber optic installation or repair (e.g., installers, QA oversight, direct supervision) to the SUPERVISOR prior to the start or continuation of production work. Submit any changes as they occur.

3.2 Inspect existing affected cable installations and interferences within the first 25 percent of contract completion. Inspect each fiber optic cable (conventional and Blown Optical Fiber (BOF)) in accordance with Method 6A1 of 2.3.

3.2.1 Submit one legible copy, in hard copy or approved transferrable media, of a report listing results of the requirements of 3.2 including cable installation conditions not in compliance with 2.3 to the SUPERVISOR within 4 **days** of completion of inspections.

3.3 Accomplish fiber optic installations in accordance with 2.3.

3.3.1 Install each new Fiber Optic Interconnection Box (FOICB), Tube Routing Box (TRB), patch panel, fusion splice tray holder, and cable, cableway, and penetration, including those to be protected from the weather, in accordance with 2.3.

3.3.2 Install saddles on BOF cabling to prevent crushing the BOF tubes when tightening cableway bands in accordance with 2.3.

3.3.3 Use existing ship cableway and penetrations wherever possible. Penetrations **must** be correct size in accordance with 2.3 and 2.4.

3.3.3.1 Accomplishment of a cableway inspection for each modified cableway and penetration **must** be in accordance with NAVSEA Standard Items (See Note 4.7).

3.3.4 Install each fiber optic cable and components which are part of a secure information processing system or are located within a secure processing space in accordance with 2.5 and 2.6.

3.3.5 Install each new fiber optic connector of the correct size and type conforming to MIL-DTL-83522, MIL-PRF-28876, or MIL-PRF-64266 in accordance with Part 5 of 2.3.

3.3.5.1 Ensure each fiber optic connector is not exposed to the industrial environment or weather.

3.3.5.2 Accomplish inspection and cleaning of both fiber optic connectors prior to mating in accordance with Method 6M1 of 2.3.

3.3.6 Accomplish the optical link loss test in accordance with Method 6C1 or Method 6C2 of 2.3 upon the completion of connector attachment, slack management, banding, and penetration closeout for each fiber optic cable.

3.3.7 Accomplish the optical continuity test in accordance with Method 6D1 of 2.3 for cables with fibers that are not terminated on each end.

3.3.8 Accomplish the optical return loss test in accordance with Method 6K1 of 2.3 for single mode fiber links upon the completion of connector attachment, slack management, banding, and penetration closeout for fiber optic cables.

3.3.9 Accomplish the tube seal verification test in accordance with Method 6J1 of 2.3 for BOF cables after installation of connectors and for unused BOF tubes within BOF cables. Accomplish the ball bearing test in accordance with Method 6H1 of 2.3 for unused BOF tubes within BOF cables.

3.3.10 Accomplish the BOF tube end sealing in accordance with Method 2J1 of 2.3 for all empty BOF tubes in tube routing boxes, fiber optic interconnection boxes, and equipment.

3.3.11 Install new cable identification tags in accordance with Part 4 of 2.3, using 2.7 for guidance. Mark each cable, tube, furcation unit, Optical Fiber Cable Component (OFCC) and connector in accordance with the referenced drawings, equipment technical manual and 2.3.

3.3.12 Accomplish post-installation visual inspection in accordance with Method 6A1 and attenuation test Method 6E1 or Method 6E2 of 2.3. For single mode links, accomplish return loss test in accordance with Method 6L1 of 2.3. Use Method 6A1 to verify no mechanical damage exists to the installed fiber optic cables. Use Methods 6E1 or Method 6E2 and 6L1 to measure the optical loss and return loss (respectively) over a series of concatenated optical links, performed after interconnection of the Fiber Optic Cable Topology (FOCT) local and trunk cables.

3.3.13 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.3.

3.3.14 Install connectorized cables to equipment, using system drawings or other technical documents. Light Duty connectors **must** only be installed within fiber optic interconnection boxes (FOICBs) or within

equipment enclosures/racks. Heavy Duty connectors **must** be installed externally to equipment enclosures/racks.

3.4 Accomplish fiber optic repair, relocation, and removal in accordance with 2.3 and 2.8.

3.4.1 Install each Fiber Optic Interconnection Box (FOICB), Tube Routing Box (TRB), patch panel, fusion splice tray holder, cable, and fusion splice tray to be repaired and/or relocated in accordance with 2.3.

3.4.2 Use existing cableways and penetrations wherever possible. Penetrations **must** be the correct size in accordance with 2.3 and 2.4. Penetrations not reused **must** be blanked in accordance with 2.3 and 2.4.

3.4.3 Accomplish the continuity test in accordance with Method 6D1 of 2.3 for each conventional fiber optic cable prior to repair.

3.4.4 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.3.

3.4.5 Isolate and repair fiber optic cable jacket in accordance with Method 1B1 of 2.3.

3.4.6 Isolate and repair each fiber optic connector in accordance with Part 5 of 2.3.

3.4.7 Ensure fiber optic connectors, cables and boxes are not exposed to the industrial environment or weather in accordance with 2.3.

3.4.8 Identify and isolate each cable to be pulled back, rerouted, reused or repurposed.

3.4.9 Install new cable identification tags in accordance with Part 4 of 2.3, using 2.7 for guidance.

3.4.10 Install new banding for cableways affected by cable removals in accordance with Part 4 of 2.3.

3.4.11 Install saddles on BOF cabling to prevent crushing the BOF tubes when tightening cableway bands in accordance with 2.3.

3.4.12 Accomplish the visual inspection of Method 6A1 for each fiber optic cable (conventional and BOF) in accordance with 2.3 upon the completion of the repair and final banding.

3.4.13 Accomplish the link loss test of Method 6C1 or Method 6C2 for each fiber optic cable (conventional and BOF) in accordance with 2.3 upon the completion of the repair and final banding.

3.4.14 Accomplish the return loss test of Method 6K1 for single mode links only for each fiber optic cable (conventional and BOF) in accordance with 2.3 upon the completion of the repair and final banding.

3.4.15 Accomplish the visual inspection of Method 6A1 and the continuity test of Method 6D1 of 2.3 for repaired cables with fibers that are not terminated on each end.

3.4.16 Accomplish the tube seal verification test of Method 6J1 of 2.3 after installation of connectors and for unused BOF tubes within BOF cables. Accomplish the ball bearing test of Method 6H1 of 2.3 for unused BOF tubes within BOF cables.

3.4.17 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.3.

3.4.18 Connect each cable, using referenced drawing or retained hook-up data.

3.4.19 Identify, isolate, and remove each fiber optic cable designated for removal in its entirety.

3.4.19.1 Blank each bulkhead penetration, deck penetration, and multi-cable transit device from which cable was removed and which will not be reused, in accordance with 2.3 and 2.4.

3.4.19.2 Blank each unused hole in equipment, in accordance with 2.3 and 2.6.

3.4.19.3 Remove unused hangers from which cable was removed and which will not be reused, in accordance with Section 070a of 2.9.

3.4.20 Remove and relocate each fiber optic cable and component which are part of secure information processing systems or are located within a secure processing space in accordance with 2.5 and 2.6.

3.5 Accomplish fiber optic splicing in accordance with the BOF Cable Splice Method 1C1 of 2.3 or the fusion splice installation Method 2K1, Method 2K2 or Method 2K3 of 2.3. Install each fusion splice component (e.g., fusion splice, splice protector, fusion splice tray, fusion splice tray holder module) conforming to MIL-PRF-24623/6 and MIL-PRF-24728/8. Ensure each fusion splicer conforms to Commercial Item Description (CID) A-A-59799.

3.5.1 Accomplish the optical test in accordance with Method 6E1 or Method 6E2 of 2.3 upon the completion of fusion splicing, slack management, banding, and penetration closeout of each fiber optic cable.

3.5.2 Accomplish the return loss test in accordance with Method 6L1 of 2.3 for single mode fiber links only upon the completion of fusion splicing, slack management, banding, and penetration closeout of each fiber optic cable.

3.5.3 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.3.

3.5.4 Verify continuity of each spliced tube with a ball bearing in accordance with Method 6H1 of 2.3.

3.5.5 Accomplish the ball bearing test of Method 6H1 and the tube seal verification test of Method 6J1 of 2.3 for unused BOF tubes within BOF cables.

3.6 Accomplish fiber optic testing in accordance with Part 6 of 2.3.

3.7 Install new banding for cableways affected by cable installs, removals, pulled back, reused, rerouted, and repurposed in accordance with Part 4 of 2.3. Saddles **must** be used on BOF cabling to prevent crushing the BOF tubes when tightening cableway bands in accordance with 2.3.

3.8 Accomplishment of local air hose tests after the installation, removal and relocation of fiber optic cables of each new and disturbed multi-cable transit device, multi-cable penetrators, stuffing tubes, kick pipes, and cable penetrations of tightness boundaries **must** be in accordance with NAVSEA Standard items (See Note 4.8).

3.9 Accomplishment of cleaning and painting for new and disturbed surfaces **must** be in accordance with NAVSEA Standard Items (See Note 4.9).

3.10 Inspect fiber optic installations, repairs, relocations, and removals in accordance with 2.3.

3.11 Submit one legible copy, in hard copy or approved transferrable media, of a report listing results of the requirements of 3.3.1.1, 3.3.6 through 3.3.9, 3.3.12, 3.3.13, 3.4.3, 3.4.4, 3.4.8, 3.4.12 through 3.4.17, 3.5.1 through 3.5.5, and 3.6 to the SUPERVISOR within 3 days after recording the data.

4. NOTES:

4.1 The requirements in this Standard Item apply to installation, repair, removal, relocation, test, and inspection of fiber optic components on Naval surface ships and submarines and personnel supporting these tasks. This Standard Item applies to the following fiber optic cable usages; new, pulled back, reused, rerouted, repurposed, removed and replaced.

4.2 Definitions.

4.2.1 New Cable - a cable not previously installed.

4.2.2 Pulled Back Cable - a cable disconnected and physically removed from a wireway, conduit, or cableway to protect the cable from industrial use.

4.2.3 Reused Cable - a cable disconnected from the equipment to facilitate equipment removal.

4.2.4 Rerouted Cable - a cable disconnected from their equipment and physically moved to a new wireway, conduit or, cableway and then reconnected in the new location to the same equipment.

4.2.5 Repurposed Cable - a cable with termination points changed.

4.2.6 Remove Cable - a cable disconnected from equipment and physically removed in its entirety and not being replaced.

4.2.7 Replaced Cable - a cable disconnected from equipment and physically removed to facilitate replacement with a new cable.

4.3 Cable installations consist of cable, banding, boxes, equipment, penetrations, cableways, cable separation and connection(s) and associated components.

4.4 The formats of Attachment A, B and C are provided as guidance. Other reporting formats can be used with the approval of the SUPERVISOR.

4.5 Navy fiber optic Technical Authority policy letters and drawings, and the list of Certified Navy Shipboard Fiber Optic Trainers (CFOTL) can be located by sending an email to DLGR_NSWC_FOWEB@navy.mil with the specific subject line of: website URL request

4.6 The Navy Shipboard Fiber Optic Technical Authority is:
DLGR_NSWC_FO_ENG@navy.mil

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4.7 If local air hose test of 3.8 is required, the use of Standard Item 009-25 "Structural Boundary Test; accomplish" of 2.1 will be specified in the Work item.

4.8 If cleaning and painting for new and disturbed surfaces of 3.9 are required, the use of Standard Item 009-32 "Cleaning and Painting Requirements; accomplish" will be specified in the Work Item.

ATTACHMENT A

OPTICAL MEASUREMENT RECORD (FOR ASSEMBLY LINK LOSS/RETURN LOSS)

DATE ___/___/___ HULL NUMBER _____
 ENDPOINT LOCATIONS OR EQUIPMENT NAME: SOURCE _____ DETECTOR _____
 INSTALLATION/CONFIGURATION DRAWING _____ CABLE SERIAL NUMBER _____ CABLE TYPE¹ _____
 CABLE VISUAL INSPECTION RESULT (INSTALLATION) _____
 CONNECTOR TYPE(S)¹ _____ TEST EQUIPMENT MANUFACTURER/MODEL NO. _____ SERIAL NO. _____ CALIBRATION DUE
 DATE ___/___/___ SOURCE WAVELENGTH(S)(NM) _____ / _____ CONNECTOR ENDFACE QUALITY(IAW Part 5 of 2.3) _____

| SOURCE CABLE NO ² | DETECTOR CABLE NO ² | 850NM/1300NM/1310NM/1550NM WINDOW (CIRCLE ONE) | | | | | | | | | |
|--|---|---|--|--|---|---|---|--|---|---|----------------------------------|
| FIBER COLORS ³ OR NUMBER | FIBER COLORS ³ OR NUMBER | ACCEPTABLE ASSEMBLY LINK LOSS (dB) (6C1/6C2) | ACCEPTABLE RETURN LOSS (dB) (6K1) | FORWARD REFERENCE POWER (6C1/6C2) | FORWARD MEASURED POWER (6C1/6C2) | FORWARD ASSEMBLY LINK LOSS RESULT ⁴ (dB) (6C1/6C2) | FORWARD RETURN LOSS RESULT ⁵ (dB) (6K1) | REVERSE REFERENCE POWER (6C1/6C2) | REVERSE MEASURED POWER (6C1/6C2) | REVERSE ASSEMBLY LINK LOSS RESULT (dB) ⁶ (6C1/6C2) | CABLE LENGTH (M) (6C1/6C2) |
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NOTES: ¹RECORD MIL-SPEC NUMBER IF APPLICABLE. ⁴FOR SINGLEMODE AND MULTIMODE FIBER LINKS IAWMETHOD 6C1 OR 6C2 OF REFERENCE 2.3.
²FOR LINK MEASUREMENTS ONLY. ⁵FOR SINGLEMODE FIBER LINKS ONLY IAW METHOD 6K1 OF REFERENCE 2.3.
³STANDARD COLORS: BLUE, ORANGE, GREEN, BROWN, SLATE, WHITE, RED, BLACK, YELLOW, VIOLET, PINK, AQUA. ⁶FOR MULTIMODE FIBER LINKS IAW METHOD 6C1 OR 6C2 OF REFERENCE 2.3.

REMARKS: _____

SIGNATURE: _____

ATTACHMENT B

BLOWN OPTICAL FIBER (BOF) TEST RECORD

DATE ____/____/____ HULL NUMBER _____
 INSTALLATION/CONFIGURATION DRAWING _____ CABLE SERIAL NUMBER _____ CABLE TYPE¹ _____
 CABLE VISUAL INSPECTION RESULT (INSTALLATION/POST-INSTALLATION) _____/_____

| LOCATION 1 | LOCATION 2 | EQUIPMENT 2 IDENTIFICATION | BOF TRUNK CABLE IDENTIFICATION | BOF TRUNK TUBE NUMBER | BALL BEARING (BB) TEST DIRECTION ² (6H1) | BOF TUBE BB TEST RESULT ³ (PASS/FAIL) (6H1) | BB SIZE PASS/FAIL ⁴ (6H1) | BOF TUBE LODGED WITH BB (Y/N) (6H1) | BOF TUBE SEAL VERIFICATION RESULTS ⁵ (PASS/FAIL) (6J1) | CABLE LENGTH (M) |
|------------|------------|----------------------------|--------------------------------|-----------------------|---|--|--------------------------------------|-------------------------------------|---|------------------|
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NOTES: ¹RECORD MIL-SPEC NUMBER IF APPLICABLE. ⁴FOR EXAMPE, BB SIZE = "4.5 MILLIMETER(MM)".
²FOR EXAMPLE, TEST DIRECTION = "LOCATION 1 → LOCATION 2" OR VICE VERSA. ⁵IAW METHOD 6J1 OF REFERENCE 2.3.
³IAW METHOD 6H1 OF OF REFERENCE 2.3.

REMARKS: _____

SIGNATURE: _____

ATTACHMENT C

OPTICAL MEASUREMENT RECORD (FOR FOCT END-TO-END ATTENUATION AND RETURN LOSS)

DATE ___/___/___ HULL NUMBER _____
ENDPOINT LOCATIONS OR EQUIPMENT NAME: SOURCE _____ DETECTOR _____
INSTALLATION/CONFIGURATION DRAWING _____ CABLE SERIAL NUMBER _____ CABLE TYPE¹ _____
CABLE VISUAL INSPECTION RESULT (POST-INSTALLATION) _____
CONNECTOR TYPE(S)¹ _____ TEST EQUIPMENT MANUFACTURER/MODEL NO. _____ SERIAL NO. _____ CALIBRATION DUE
DATE ___/___/___
SOURCE WAVELENGTH(S)(NM) _____ / _____ CONNECTOR ENDFACE QUALITY (IAW Part 5 of 2.3) _____

| SOURCE CABLE NO. | DETECTOR CABLE NO. | 850NM/1300NM/1310NM/1550NM WINDOW (CIRCLE ONE) | | | | | | | |
|--|-------------------------------------|--|---|---|--|--|--|--|------------------|
| FIBER COLORS ² OR NUMBER | FIBER COLORS ² OR NUMBER | ACCEPTABLE FOCT END-TO-END ATTENUATION (dB) (6E1/6E2) | ACCEPTABLE FOCT END-TO-END RETURN LOSS(dB) (6E1/6E2) | FORWARD REFERENCE POWER (6E1/6E2) | FORWARD MEASURED POWER (6E1/6E2) | FORWARD FOCT END-TO- END ATTENUATION RESULT (dB) ³ (6E1/6E2) | FORWARD FOCT END- TO-END RETURN LOSS RESULT (dB) ³ (6E1/6E2) | TEST DIRECTION ⁴ (6E1/6E2) | CABLE LENGTH (M) |
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NOTES: ¹RECORD MIL-SPEC NUMBER IF APPLICABLE. ⁴IAW 6L1 OF REFERENCE 2.3.
²STANDARD COLORS: BLUE, ORANGE, GREEN, BROWN, SLATE, WHITE, RED, BLACK, YELLOW, VIOLET, PINK, AQUA. ³FOR EXAMPLE, "SOURCE LOCATION → DETECTOR LOCATION".
³IAW 6E1 or 6E2 OF REFERENCE 2.3.

CONNECTION LIST: _____ REMARKS: _____

SIGNATURE: _____