NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-16
DATE: 18 NOV 2016
CATEGORY: II

1. SCOPE:

1.1 Title: Electronic Equipment; repair

2. REFERENCES:

2.1 Equipment Technical Manual

2.2 407-5291780, Standard Electromagnetic Interferences (EMI) Survey Procedures

2.3 SE000-01-IMB-010, Navy Installation and Maintenance Book (NIMB), Section VI, Electronics Installation and Maintenance Book - General Maintenance (Source CD: N0002400003)

2.4 SE000-01-IMB-010, Navy Installation and Maintenance Book (NIMB), Section IX, Installation Standards (Source CD: N0002400003)

2.5 S9300-A6-GYD-010, Electrical Workmanship Inspection Guide for Surface Ships and Submarines

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

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

2.8 MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety

3. REQUIREMENTS:

3.1 Disassemble equipment for cleaning, inspection, and repair, using 2.1 for guidance.

(V) "VISUALLY INSPECT"

3.1.1 Visually inspect components prior to cleaning to detect evidence of casualties and deteriorating conditions that may not be apparent after cleaning.

3.1.2 Clean equipment and remove foreign matter.

3.1.3 Dry equipment, removing moisture and cleaning solvents.

3.1.4 Inspect equipment for applicable electromagnetic interference (EMI) fixes using Shipboard Electromagnetic Compatibility Improvement Program (SEMCIP) Technical Assist Network (STAN) in accordance with 2.2.

3.1.4.1 Submit one legible copy of a report, in approved transferrable media, listing the applicable EMI fixes not installed and EMI fixes that have been improperly installed, to the SUPERVISOR.

(V) "INSPECT AND TEST TO DESIGN CHARACTERISTICS"

3.2 Inspect and test electrical and mechanical components, assemblies, subassemblies, equipment enclosures, internal circuitry, and enclosure hardware to design characteristics and determine missing and defective components, circuitry, and enclosure hardware in accordance with 2.1.

3.2.1 Remove existing and install new electrical and mechanical components, assemblies, subassemblies, internal circuitry, and enclosure hardware in place of those identified to be missing or defective. New material shall conform to the requirements of 2.1.

3.2.1.1 Soldering, desoldering, and removal of components and circuitry shall be in accordance with Section 4 of 2.3.

3.2.1.2 Miniature and microminiature repair of printed circuit boards shall be in accordance with Sections 5 and 6 of 2.3.

3.2.1.3 New wiring shall conform to MIL-DTL-16878. Wire size and color code shall be in accordance with 2.1. Individual wires in harnesses and chassis wiring may be plain white conductors with conductor identification sleeving at each end, stenciled with indelible ink to indicate color coding.

(V) "INSPECT SHIELDING TERMINATIONS"

3.3 Inspect braided wire shielding terminations for conformance to Paragraph 2-19.3 of 2.4.

3.3.1 Remove existing and install new grounding sheath connectors in place of those identified to be missing or defective. Installation shall be in accordance with Paragraph 2-14 of 2.4.

(V) "INSPECT WIRE CONNECTIONS"

3.4 Inspect terminal board wire connections for termination with lugs conforming to SAE-AS7928 of each conductor at the terminal board connections.

3.4.1 Remove existing and install new lugs in place of those identified to be missing or defective, using 2.5 for accept or reject criteria. New lugs shall conform to SAE-AS7928.

(V) "INSPECT WIRE MARKERS"

3.5 Inspect for missing and defective conductor identification sleeving.

3.5.1 Remove existing and install new conductor identification sleeving in place of those identified to be missing or defective, using 2.5 for accept or reject criteria. New conductor identification sleeving shall conform to SAE-AMS-DTL-23053, Class One, white, marked with indelible ink.

3.5.1.1 Conductor identification sleeving shall be marked in accordance with 2.1.

3.6 Correct discrepancies identified in terminal board connections in accordance with 2.1 and as modified by applicable field changes identified on the field change accomplished plate.

(V) "INSPECT FOR SLACK"

3.7 Inspect existing cabling and cable harnesses between hinged parts and between chassis and parts which are subject to removal for slack to prevent breaking of individual wires by repeated flexing and for chafing protection.

3.7.1 Provide slack in accordance with Paragraph 2-15 of 2.4 to prevent breaking of individual wires.

3.7.2 Install new chafing protection in accordance with Paragraph 2-15 of 2.4.

3.8 Tie loose harness lacing in accordance with Paragraph 2-15.2 of 2.4.

3.9 Secure loose wiring harness clamps and install new plastic clamps where identified to be missing or defective, in accordance with Paragraph 2-15.3 of 2.4.

3.10 Adjust relays and burnish contacts in exposed type relays and switches.

3.11 Remove high spots on pinion and gear teeth by stoning.

3.12 Adjust and align mechanical components in accordance with 2.1.

3.13 Assemble equipment, using 2.1 for guidance.

3.13.1 Tighten loose controls and hardware. Free-up binding in moving parts, controls, switches, chassis slides, and runners.

3.13.2 Lubricate equipment in accordance with 2.1.

3.13.3 Install heat-dissipating tube shields conforming to MIL-DTL-24251.

3.14 Bond and ground equipment in accordance with 2.6 through 2.8.

3.15 Energize the equipment; calibrate, adjust, and align to achieve optimum operational characteristics in accordance with 2.1.

3.16 Update field change accomplished plate to indicate completed field changes when the Work Item directs the installation of new field changes.

4. NOTES:

4.1 Equipment technical manual will be listed in the invoking Work Item.

4.2 Shipboard Electromagnetic Compatibility Improvement Program (SEMCIP) Technical Assist Network (STAN) referred to in 3.1.4 is available at https://www.nde.navy.mil.

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-17
DATE: ***01 OCT 2017***
CATEGORY: II

1. SCOPE:

1.1 Title: Rotating Electrical Equipment; repair

2. REFERENCES:

2.1 Standard Items

2.2 Equipment Technical Manual

2.3 S9086-KC-STM-010/CH-300, Electric Plant - General

2.4 S9086-KE-STM-010/CH-302, Electric Motors and Controllers

2.5 S9086-KN-STM-010/CH-310, Electric Power Generators and Conversion Equipment

2.6 S9086-HN-STM-010/CH-244, Propulsion Bearings and Seals

2.7 S6260-BJ-GTP-010, Electrical Machinery Repair, Electric Motor, Shop Procedures Manual

2.8 S9310-AC-HBK-010, Commutator/Slip Ring Maintenance Handbook

2.9 MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety

2.10 S9086-DA-STM-010/CH-100, Hull Structures

2.11 MIL-DTL-17060, MOTORS, ALTERNATING CURRENT, INTEGRAL-HORSEPOWER, SHIPBOARD USE

3. REQUIREMENTS:

3.1 Accomplish preliminary repair preparations as follows:

3.1.1 Prior to disconnecting equipment:

3.1.1.1 Record and retain electrical hook-up data.

3.1.1.2 Inspect couplings for cracks, broken segments, wear, and misalignment in excess of tolerances specified in 2.2. Record and retain air gap readings. Record and retain bearing clearances for sleeve bearing equipment only.

3.1.2 Identify associated cables and wiring. Disconnect equipment mechanically, using 2.2 for guidance.

3.1.2.1 Matchmark, identify, and retain chocks, shims, shock mounts, sound damping pads, and other accessories associated with equipment.

3.1.2.2 Record shaft thrust and run out readings.

3.2 Remove equipment including rotating components connected directly to the shaft.

3.2.1 Remove entire vaneaxial and tubeaxial fan assemblies from the duct system and transport to the shop for repair.

3.3 ***Accomplish a structural inspection of each foundation in accordance with 2.10.***

3.4 Submit one legible copy, in approved transferrable media, of a report for electrical hook up data recorded in 3.1.1.1, mechanical inspection required by 3.1.1.2 through 3.1.2.2, and structural inspection required in 3.3 to the SUPERVISOR ***upon request***.

3.5 Matchmark, disassemble, and inspect the equipment removed in 3.2, using 2.2 through 2.7 for guidance.

3.5.1 Inspect and dimensionally measure end bells, frame, rabbet fits, shaft, sleeve and pedestal bearings, keyways, fan and running surfaces for wear, eccentricity, and other defects, using 2.2 for accept or reject criteria, and 2.6 for location and type of measurements to be taken. Record data.

3.6 Accomplish 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2 through 300-3.2.3, 300-3.4.8, 300-3.4.11, and 300-5.3.7.1 of 2.3 for guidance. Record data.

3.6.1 Disconnect solid-state devices and ground temperature-sensing leads prior to measuring insulation resistance of windings.

3.7 Accomplish a ***phase resistance balance test*** of windings, using a Wheatstone or Kelvin bridge, or with an ohmmeter capable of resolving one milliohm (0.001 ohm). Record phase balance for multi-phase equipment, using Paragraph 5.21 of 2.7 ***and 3.6.1 of 2.11*** for guidance. Record data.

3.8 Accomplish a voltage surge test in accordance with Paragraphs 300-3.5.4 through 300-3.5.5 of 2.3. Record data.

3.9 Accomplish a DC HI POT test in accordance with Paragraph 300-3.5.2 through 300-3.5.2.3.4 of 2.3. Record data.

3.10 Accomplish a Polarization Index Test in accordance with Paragraph 300-3.4.12 of 2.3. Record data.

3.11 Measure resistance value of each winding temperature detector, heater, and heater strip using low voltage ohmmeter. Record data.

3.12 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.5 through 3.11 to the SUPERVISOR ***upon request***.

3.13 Clean the equipment and windings in accordance with Paragraphs 300-4.5.1 through 300-4.5.5 of 2.3.

3.13.1 Dry the equipment by placing it in an oven in accordance with Paragraph 300-5.3.2.3 of 2.3.

3.14 Allow to cool to ambient temperature and accomplish a 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2 through 300-3.2.3, 300-3.4.8, 300-3.4.11, and 300-5.3.7.1 of 2.3 for guidance. Record data.

3.15 Accomplish a DC HI POT test in accordance with Paragraphs 300-3.5.2.3 through 300-3.5.2.3.4 of 2.3. Record data.

3.16 Repeat cleaning, drying, and testing in 3.13 through 3.15 if DC HI POT test readings are questionable, or if insulation resistance readings (minimum of 500 Meg Ohms for motors with a VPI Sealed Insulation System) are not in accordance with the following:

3.16.1 DC generators and motors (except propulsion and auxiliary generators for submarines) including exciters, Table 300-3-***64*** of 2.3.

3.16.2 DC propulsion generators and motors and DC auxiliary generators for submarines, Table 300-3-**7** of 2.3.

3.16.3 AC generators and motors other than propulsion, Table 300-3-***8*** of 2.3.

3.16.4 AC propulsion generators and motors, Table 300-3-***9*** of 2.3.

3.17 If satisfactory readings are not obtained after the second cleaning, repeat 3.13 through 3.15.

3.18 Notify the SUPERVISOR if satisfactory readings are not obtained after a third cleaning.

3.19 Accomplish a ***phase resistance balance test*** of windings, using a Wheatstone or Kelvin bridge, or with an ohmmeter capable of resolving one

milliohm (0.001 ohm). Record phase balance for multi-phase equipment, using Paragraph 5.22 of 2.7 ***and 3.6.1 of 2.11*** for guidance. Record data.

3.20 Accomplish a voltage surge test in accordance with Paragraphs 300-3.5.4 through 300-3.5.5 of 2.3. Record data.

3.21 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.14 through 3.17, 3.19 and 3.20 to the SUPERVISOR upon request.

3.21.1 Include test results from 3.14 through 3.17, 3.19 and 3.20.

3.22 Protect the windings and machined surfaces. Accomplishment of cleaning and painting requirements for equipment housing exterior, including fan(s) and interior and exterior of each end bell shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.23 Inspect and test non-wound rotors for loose or cracked bars, localized overheating, and rubbing in accordance with 2.7. Inspect wound rotors, slip ring leads, and armatures for insulation damage and burns/hot spots. Inspect for loose coils and slot wedges. Inspect slip rings and commutators for damage and for wear limits, using 2.2 for criteria. Record data.

3.24 Inspect brush rigging for cracks, chips, worn areas, distortion, spring condition, and insulating material for cracks and arc paths. Record data.

3.25 Inspect leads and terminal lugs for damage and defects. Identify and tag leads with aluminum wrap-around bands with metal stamped or embossed markings. Record data.

3.26 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.23 through 3.25 to the SUPERVISOR ***upon request***.

(V) "VARNISH TEMPERATURE, VISCOSITY, AND GEL TIME TESTS"

3.27 Select the proper insulating process based on winding insulation classifications and to meet state or local air pollution standards.

3.27.1 Select varnish methods and material, using Paragraphs 300-4.5.8 through 300-4.5.8.2 of 2.3 for guidance.

3.27.1.1 Maintain the varnish in accordance with Paragraphs 300-4.5.8.3 through 300-4.5.8.3.3 of 2.3 and the varnish manufacturer's instructions.

3.27.1.2 Maintain a current revision of the varnish manufacturer's instructions on storage, maintenance, and use of the type of varnish to be applied.

3.27.1.3 Maintain a record of varnish temperature, viscosity and, for solventless varnish, gel time tests. Tests must show varnish is within varnish manufacturer's recommendations and have been accomplished in the intervals specified by the varnish manufacturer. The record must also show that the varnish is being stored as recommended by the varnish manufacturer.

3.27.1.4 Delete the requirements of 3.27 through 3.27.1.3 for motors with a VPI Sealed Insulation System.

3.28 Varnish windings in accordance with Paragraphs 300-4.5.8.***4*** of 2.3 and the varnish manufacturer's instructions.

3.28.1 Do not immerse the leads.

3.28.2 Wipe surfaces that affect assembly, such as rabbet fits and mounting flanges, with a cloth moistened with a solvent after draining and before baking.

3.28.3 Delete the requirements of 3.28 through 3.28.2 for motors with a VPI Sealed Insulation System.

3.29 Remove excess varnish run-off from the component locations described in 3.28.2, after baking. Apply a thin coat of air-dry varnish to metal surfaces exposed by the removal process in accordance with Paragraph 300-4.5.8.5 and 300-4.5.8.6 of 2.3.

3.29.1 Delete the requirements of 3.29 for motors with a VPI Sealed Insulation System.

3.30 Repeat tests described in 3.14, 3.15, 3.19, and 3.20.

3.30.1 Delete the requirements of 3.30 for motors with a VPI Sealed Insulation System.

3.31 Accomplish an AC HI POT test in accordance with Paragraphs 300-3.5.3 through 300-3.5.3.2.9 of 2.3. Record data.

3.31.1 Delete the requirements of 3.31 for motors with a VPI Sealed Insulation System.

3.32 Accomplish a 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2 through 300-3.2.3, 300-3.4.8, 300-3.4.11, and 300-.3.7.1 of 2.3 for guidance. Record data.

3.32.1 Delete the requirements of 3.32 for motors with a VPI Sealed Insulation System.

3.33 Measure resistance value of each winding temperature detector, using a low voltage ohmmeter. Record data.

3.34 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.30 through 3.33 to the SUPERVISOR ***upon request***.

3.35 True the commutator or collector rings. Eccentricity shall not exceed the requirements of 2.8. Resurface or machine each individual collector ring to the same exact diameter to allow symmetrical brush holder to ring clearance spacing. Ensure metal shavings are not permitted to contaminate the rotor or stator assembly.

3.35.1 Each cut shall not exceed 0.010 inch. Finish thickness shall not be less than design wear tolerance as shown in 2.2.

3.35.2 Undercut the mica between the commutator bars with the edge of the mica not exceeding a depth of 5/64-inch below the bars.

3.35.3 Chamfer the bar edges and remove rough surfaces in accordance with Paragraph 7-4.1.3 of 2.8.

3.35.4 Burnish the commutator with a very fine commercial burnishing stone conforming to A-A-58052. Polish collector rings to a mirror finish.

3.36 Accomplishment of the balancing requirement for each rotating assembly shall be in accordance with NAVSEA Standard Items (See Note 4.8).

3.37 Accomplish the following for the brush rigging:

3.37.1 Disassemble the brush rigging.

3.37.2 Remove foreign matter.

3.37.3 Replace existing cadmium-plated parts with zinc in accordance with ASTM A 153.

3.37.4 Recondition threads of plated parts.

3.37.5 Assemble brush rigging.

3.38 Repair lightly scored areas of frame, end bells, and shaft by manual methods. Recondition threads and fit key to keyway. Visually inspect keyway for deformed, cracked or chipped edges or high spots. Verify that fit between key and key-seat sides has a minimum clearance of 0.002 inch or maximum interference of 0.0005 inch. High spots in keyway may be removed by machining or grinding. Do not unnecessarily repair any keyway; instead, use a step key up to a maximum of 0.010 inch oversize and, where possible, include a radius in step. If key tightness cannot be corrected with a step key, re-machine worn/damaged keyways to recommended over-sizes as follows: Maximum of 0.015 inch oversize for a 1/8-inch key and increasing oversize allowance of 0.010 inch for each 1/8-inch increase in key size up to a

maximum of 0.075 inch. If key tightness cannot be corrected by keyway repair, replace part involved.

3.38.1 Apply a thin coat of petrolatum to unpainted mating surfaces except for explosion-proof motors, which shall have clean, dry mating surfaces.

3.39 Prepare and refinish equipment. Protect machine surfaces, windings, and nameplates from being painted or otherwise damaged.

3.39.1 Accomplishment of cleaning and painting requirements for housing, fan, and interior and exterior of each end bell shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.40 Accomplishment of cleaning and painting requirements for foundations of equipment removed in 3.2 shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.41 Accomplish the following on equipment having other than sleeve-type bearings unless otherwise specified in the invoking Work Item, using 2.7 for guidance.

3.41.1 Except as indicated in 3.41.1.1 (utilizing Attachment A for guidance), install new bearings, seals, fittings, lock washers, and locknuts conforming to 2.2, using 2.6 and Chapter 6 of 2.7 for guidance.

3.41.1.1 Install Type 111, Class 8 (double seal), bearings in motors meeting the criteria identified in Chapter 6 of 2.7. Only double seal bearings identified in Chapter 6 of 2.7 are acceptable for use.

3.41.1.2 For vaneaxial and tubeaxial fan motors not meeting the criteria of Chapter 6 of 2.7, if not originally furnished or already accomplished during previous repair, install Type 111, Class 8 (double seal), bearings with a C3 (greater than normal) radial internal clearance in place of the Type 111 bearing originally furnished. Install Type 120 bearings in vaneaxial and tubeaxial fan motors originally furnished with Type 120 bearings.

3.41.1.3 Install new label plates with the inscription "DO NOT LUBRICATE" on equipment using double seal bearings (Type 111, Class 8, or Type 120).

3.41.1.4 For equipment converted from re-lubricable bearings to double seal bearings, install pipe plugs on all grease fills and drains.

3.41.1.5 For equipment converted from lubricated bearings to double seal bearings, submit one legible copy, in approved transferrable media, of a report that reflects the change in the maintenance requirements for the converted motor to the SUPERVISOR.

3.41.2 For equipment not using double seal bearings, lubricate bearings with grease conforming to DOD-G-24508 as required in Paragraphs 244-1.7.7.2 and 244-1.7.7.3 of 2.6.

3.42 Assemble the equipment disassembled in 3.5, using 2.2 through 2.7 for guidance.

3.42.1 Do not use materials containing silicone in the repair and assembly of equipment with commutator or collector rings.

3.42.2 Install new gaskets on covers, inspection plates, and between the external connection box and the frame. Gaskets shall conform to MIL-PRF-1149 unless otherwise specified in 2.2.

3.42.3 Set brush holders not less than 1/16-inch or more than 1/8-inch from commutator or collector rings unless otherwise specified in 2.2.

3.42.4 Set brush holders in electrical neutral plane and stagger brushes for maximum coverage of the commutator, in accordance with Paragraph 300-4.7.7.1.10 of 2.3.

3.42.5 Center the brush holder over the collector rings.

3.42.5.1 Ensure the brushes do not extend beyond the edge of the collector rings.

3.42.6 Install new brushes in accordance with 2.2. Sand new brushes to fit curvature of the commutator or collector rings in accordance with Paragraph 6-3.5 through 6-3.5.4 of 2.8.

3.42.6.1 Brushes shall have a surface contact of 100 percent and shall not be chipped, cracked, or broken.

3.42.6.2 Remove sand, carbon, and other foreign matter resulting from fitting new brushes.

3.42.7 Adjust spring tension of brushes in accordance with 2.2.

3.42.8 Adjust air gap as specified in 2.2, plus or minus 10 percent.

3.42.9 Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly shall not be allowed.

3.42.10 Install label plates conforming to MIL-DTL-15024 for those identified to be missing or damaged.

(V) "NO-LOAD SHOP TEST"

3.43 Accomplish a no-load shop test of the motor for a minimum of one-half hour.

3.43.1 Verify proper direction of rotation.

3.43.2 After one-half hour, record current and voltage in each phase, speed and bearing temperature rise measured on the equipment's exterior near each bearing.

3.43.3 Submit one legible copy, in approved transferrable media, of the recorded data to the SUPERVISOR ***upon request***.

(V) "OPERATIONAL SHOP TEST (FOR VANEAXIAL/TUBEAXIAL FANS - ASSEMBLY COMPLETELY REASSEMBLED)"

3.44 With the vaneaxial/tubeaxial fan reassembled, accomplish an operational test for one hour after bearing and stator temperatures stabilize within one degree Celsius for 3 consecutive 15-minute intervals.

3.44.1 Verify proper direction of rotation.

3.44.2 Record current, voltage, frame and bearing temperature rise and speed at 15-minute intervals.

3.44.2.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit, unless otherwise specified in the invoking Work Item or equipment technical manual.

3.44.3 Measure and record hot insulation resistances of winding to ground immediately upon completion of the operational shop test, using a 500-volt megger.

3.45 Install equipment removed in 3.2.

3.45.1 Align equipment in accordance with 2.2. Measure and record facial and peripheral coupling data.

3.45.1.1 Install chocks, shims, shock mounts, and sound damping pads.

3.45.1.2 Accomplishment of pump and driver shaft alignment shall be in accordance with NAVSEA Standard Items (See Note 4.10).

3.45.2 Connect electrical cables to equipment, using data retained in 3.1.1.1.

3.45.3 Bond and ground equipment in accordance with 2.9, using new ground straps.

3.45.4 Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly shall not be allowed.

3.45.5 Measure and record the air gap and bearing clearance (sleeve bearing equipment only), insulation resistance (at 500 volts DC), and thrust.

3.46 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.5.1, 3.6 through 3.11, 3.14, 3.15, 3.19 through 3.21, 3.23 through 3.25, 3.31 through 3.33 and 3.45.1 to the SUPERVISOR.

(V)(G) "OPERATIONAL TEST"

3.4**7** (For continuous duty motors) Accomplish an operational test of the assembled equipment at full system capacity for one hour after bearing and stator temperatures stabilize within one degree Celsius for 3 consecutive 15-minute intervals, unless otherwise specified in the invoking Work Item. When temperatures do not stabilize in four hours, stop test and contact the SUPERVISOR.

3.4**7**.1 Verify proper direction of rotation.

3.4**7**.2 Verify/establish oxide film coating of the commutator/ collector rings, using 2.8 for guidance

3.4**7**.3 Record current, voltage, frame and bearing temperature rise, and speed at 15-minute intervals. Frame and bearing temperature rise and speed is not required for vaneaxial and tubeaxial fan assemblies.

3.4**7**.3.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit, unless otherwise specified in the invoking Work Item or equipment technical manual.

3.4**7**.4 Measure and record hot insulation resistances of windings to ground immediately upon completion of test, using a 500-volt megger.

3.4***8*** (For two speed motors) Accomplish an operational test at low speed in accordance with 3.46. Repeat 3.4**7** for high speed.

3.4***8***.1 Accomplish the requirements of 3.4**7**.1 through 3.4**7**.4.

3.49 (For limited duty motors) Accomplish the requirements of 3.4**7** for a period of time equal to the duty cycle of the motor.

3.4***9***.1 Accomplish the requirements of 3.46.1 through 3.4**7**.4. For motors with a duty cycle equal to or less than 30 minutes, record data every 10 minutes.

3.***50*** Submit one legible copy, in hard copy or approved transferrable media, of a report listing data recorded in 3.44.2, 3.44.3, 3.45.1, 3.45.5, 3.4**7**.3, and 3.4**7**.4 to the SUPERVISOR.

4. NOTES:

4.1 Equipment technical manual, Allowance Parts List (APL) (if applicable) and drawings will be listed in the invoking Work Item.

4.2 Shop test of generator will be addressed in the invoking Work Item.

4.3 The use of silicone is not allowed on any rotating electrical machinery containing brushes.

4.4 The purpose of 3.13.2, 3.16, 3.27.1.4, 3.28.3, 3.29.1, 3.30.1, 3.31.1, and 3.32.1 is to ensure the integrity of motors with a VPI Sealed Insulation System.

4.5 Utilize Attachment A for determination if the Navy's motor bearing conversion program for Extended-Life Double Seal (ELDS) ball bearings is permissible).

4.6 MIL-B-17931 (Bearings, Ball, Annular, for Quiet Operation) bearings are considered to be Long Lead Time (LLT) material. It is recommended these bearings be provided as Government Furnished Material (GFM).

4.7 Data received in 3.41.1.5 shall be used by the SUPERVISOR for the purpose of initiating action ensuring shipboard databases such as the Equipment Guidance List (EGL) are updated to reflect the change in maintenance requirements for converted motors. Additionally, where APL changes are initiated to convert to ELDS bearings, a COSAL feedback report shall be submitted, providing the NSN and part number for the ELDS bearing by the SUPERVISOR. Utilize the following website to initiate changes to Technical Manuals, APLs, etc.: http://www.navy311.navy.mil.

4.8 If balancing of rotating equipment of 3.36 is required; the use of Category II Standard Item 009-15 "Rotating Machinery; balance" of 2.1 will be specified in the Work Item.

4.9 If cleaning and painting of 3.22, 3.39.1, or 3.40 is required, the use of Category II Standard Item 009-32 "Cleaning and Painting Requirements; accomplish" of 2.1 will be specified in the Work Item.

4.10 If pump and driver shaft alignment of 3.45.1.2 is required, the use of Category II Standard Item 009-58 "Pump and Driver Shaft Alignment; accomplish" of 2.1 will be specified in the Work Item.

ATTACHMENT A

1. To reduce motor maintenance and repair costs, the NAVY has implemented a program that allows for the use of Extended Life Double Seal (ELDS) bearings.

2. LIMITATIONS: The ELDS program does NOT apply to motors that are under the cognizance of NAVSEA 08.

3. APLs for motors meeting the conversion criteria requirements have been modified to identify ELDS bearings. In these cases, the APL bearing criteria will override any specifications delineated in the equipment technical manual or the motor "Original Equipment Manufacturer (OEM)" drawings. If ELDS bearings are not indicated in an APL, the following motor criteria must meet the applicability specifications for motors to undergo conversion to ELDS bearings:

3.a Motor must be installed on a surface ship and must NOT be under the cognizance of NAVSEA 08.

3.b Commercial motors are not eligible. Motors must have been furnished to the NAVY in accordance with MIL-DTL-17060 (Motors, Alternating Current, Integral Horsepower, Shipboard use), MIL-M-17413 (Motors, Direct Current, Integral H.P., Naval Shipboard [NAVY]) or MIL-M-17059 (Motors, 60 Cycle, Alternating Current Fractional H.P. [Shipboard Use]).

3.c Motors using one or more noise-quiet bearings per MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation) are NOT eligible for ELDS conversion.

3.d Bearings originally furnished with the motor must be Type 111 bearings per FF-B-171. Motors are NOT to be considered as candidates for ELDS conversion in situations where the equipment technical manual and/or the OEM motor drawings originally specified FF-B-171 bearings but have notes indicating that replacement bearings are to be in accordance with MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation).

3.e The use of ELDS bearings is limited to motors where the full load speed and the size of both bearings are as follows:

1. Maximum bearing size 306 or 206 and full load rpm between 1,801 and 3,600 rpm.

2. Maximum bearing size 313 or 213 and full load rpm between 1,201 and 1,800 rpm.

3. Maximum bearing size 318 or 218 and full load rpm less than 1200 rpm.

4. The repair process using ELDS bearings includes the following requirements:

4.a Only ELDS bearings, in accordance with the following table (Attachment A / Table 1), can be used. Other double seal bearings will not provide an acceptable bearing life.

Attachment A / Table 1

ELDS Bearings NSNs and Part Numbers

SIZE	P/N	NSN
201	6201-2RS1C3/GHY	3110-01-492-0221
202	6202-2RS1C3/GHY	3110-01-491-0233
203	6203-2RS1C3/GHY	3110-01-491-0234
204	6204-2RS1C3/GHY	3110-01-491-6636
205	6205-2RS1C3/GHY	3110-01-451-9166
206	6206-2RS1C3/GHY	3110-01-451-9165
207	6207-2RS1C3/GHY	3110-01-451-9164
208	6208-2RS1C3/GHY	3110-01-451-9170
209	6209-2RS1C3/GHY	3110-01-451-9252
210	6210-2RS1C3/GHY	3110-01-492-1831
211	6211-2RS1C3/GHY	3110-01-518-0937
303	6303-2RS1C3/GHY	3110-01-493-3750
304	6304-2RS1C3/GHY	3110-01-451-9153
305	6305-2RS1C3/GHY	3110-01-451-9158
306	6306-2RS1C3/GHY	3110-01-451-9159
607	6307-2RS1C3/GHY	3110-01-451-9161
308	6308-2RS1C3/GHY	3110-01-451-9167
309	6309-2RS1C3/GHY	3110-01-451-9168
310	6310-2RS1C3/GHY	3110-01-490-6683
311	6311-2RS1C3/GHY	3110-01-492-0223
312	6312-2RS1C3/GHY	3110-01-490-6848
313	6313-2RS1C3/GHY	3110-01-492-0191

314	6314-2RS1C3GHY	3110-01-492-0226
315	6315-2RS1C3/GHY	3110-01-494-0993
316	6316-2RS1C3/GHY	3110-01-492-0188
317	6317-2RS1C3/GHY	3110-01-492-0219
318	6318-2RS1C3/GHY	3110-01-493-3749

4.b Both bearings of each converted motor must be ELDS bearings.

4.c A label plate must be permanently attached to the motor indicating "Do Not Lubricate".

4.d Grease fills and drains, if present, must be fitted with a pipe plug, securely fastened. Fittings to accommodate grease guns must be replaced with pipe plugs."

ATTACHMENT B

SECTION 1. NAME PLATE DATA

EQUIPMENT _____ **USS** _____

MFGR _____ **TYPE** _____ **FRAME** _____

HP _____ **INSULATION CLASS** _____ **TEMP. RISE** _____ ***C/*F** _____

VOLTS _____ **AMPS** _____ **CYO** _____ **R/M** _____ _____
PHASE

SERIAL NO. _____ **ADDITOINAL DATA** _____

SECTION 2. INPLACE INSPECTION

CAUTION: OBSERVE APLICABLE SAFETY PROCEDURES

SATISFACTORY
UNSATISFACTORY

_____INSULATION RESISTANCE IN MEGOHMS (REFER TO TABLE 3-2)_____

POLARIZATION INDEX TEST 1 MIN _____ 10 MIN_____ RATIO _____

_____ MECHANICAL CONDITION (REFER TO PARAGRAPH 3-6) _____

_____ CONTINUITY OF WINDINGS (REFER TO PARAGRAPH 3-5.1) _____

_____ CURRENT BACLANCE (USE LIMITS PRESCRIBED IN PARAGRAPH 3-10) _____

_____ CONDITION OF BRUSHED AND COMMUTATOR _____

_____ CONDITION OF CABLES AND CONTROLLER TO MOTOR _____

_____ CONDITION OF CONTROLLER _____

SECTION 3. INCOMING INSPECTION (GENERAL)

SURGE TEST	1-2 SAT/UNSAT	
	2-3	SAT/UNSAT
	1-3	SAT/UNSAT
INSULATION RESISTANCE TO GROUND		MEGOHMS
RESISTANCE BALANCE	1-2	OHMS
WITH DIGITAL OHMETER	2-3	OHMS
	1-3	OHMS

ACTION **REWIND**
RECONDITION

ITEM NO: 009-17
FY-19

SECTION 4. RECONDITIONING

	AFTER STEPS OF:	
	CLEANING	**DRYING**
INSULATION RESISTANCE (MEGOHMS)		
PHASE RESISTANCE BALANCE TEST		
SURGE TEST (SAT/UNSAT)		
DC HIGH-POTENTIAL TEST		

ACTION **REWIND**
VARNISH

SECTION 5. AFTER RECONDITIONAING OR REWINDING AND VARNISHING

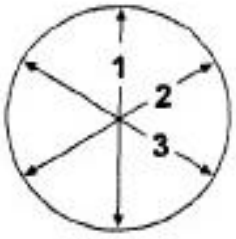
INSULATION RESISTANCE			**MEGOHMS**		
POLARIZATION INDEX TEST	**1 MIN**	_____	**10 MIN**	_____	**RATIO**
RESISTANCE BALANCE WITH DIGITAL OHMMETER			**1-2**	_____	**OHMS**
			2-3	_____	**OHMS**
			1-3	_____	**OHMS**
SURGE TEST				_____	**SAT/UNSAT**
AC HIGH-POTENTIAL TEST				_____	**SAT/UNSAT**
INSULATION RESISTANCE AFTER AC HIGH-POTENTIAL TEST				_____	**MEGOHMS**
NO-LOAD TEST			**PHASE A**	_____	**AMPERES**
			PHASE B	_____	**AMPERES**
			PHASE C	_____	**AMPERES**

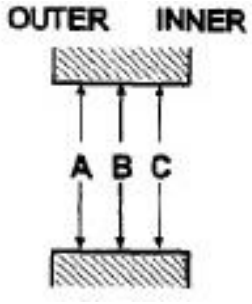
SHIPNAME & HULL NUMBER DATE MONTH/DAY/YEAR

MOTOR LOCATION (I.E., NO.2 MAIN FEED PUMP, ETC.)

HOUSING DIAMETERS

DRIVE END			
	A	B	C
1			
2			
3			

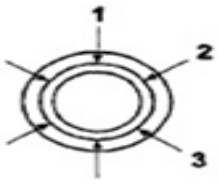


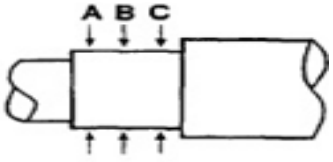


OUTER END			
	A	B	C
1			
2			
3			

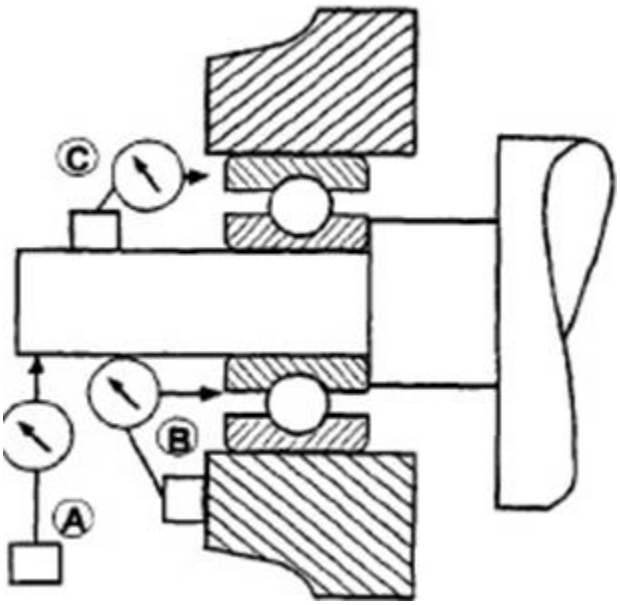
SHAFT DIAMETERS*

	DRIVE END			OUTER END		
	A	B	C	A	B	C
1						
2						
3						





FOR BEARING JOURNAL WIDTH LESS THAN 1 INCH ONLY SIX READINGS ARE REQUIRED.



A SHAFT RADIAL RUNOUT _____

B FACE RUNOUT, BEARING INNER RING
DRIVE END _____
OUTER END _____

C FACE RUNOUT, BEARING OUTER RING
DRIVE END _____
OUTER END _____

MECHANICAL CONDITION
(LOSS OF LUBE, BURNED ETC.)

_____
_____
_____
_____

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-33
DATE: ***01 OCT 2017***
CATEGORY: II

1. SCOPE:

1.1 Title: Rotating Electrical Equipment; rewind

2. REFERENCES:

2.1 Standard Items

2.2 Equipment Technical Manual

2.3 S9086-KC-STM-010/CH-300, Electric Plant - General

2.4 S9086-KE-STM-010/CH-302, Electric Motors and Controllers

2.5 S9086-KN-STM-010/CH-310, Electric Power Generators and Conversion Equipment

2.6 S9086-HN-STM-010/CH-244, Propulsion Bearings and Seals

2.7 S6260-BJ-GTP-010, Electrical Machinery Repair, Electric Motor, Shop Procedures Manual

2.8 S9310-AC-HBK-010, Commutator/Slip Ring Maintenance Handbook

2.9 MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety

2.10 S9086-DA-STM-010/CH-100, Hull Structures

2.11 MIL-DTL-17060, MOTORS, ALTERNATING CURRENT, INTEGRAL-HORSEPOWER, SHIPBOARD USE

3. REQUIREMENTS:

3.1 Accomplish preliminary repair preparations as follows:

3.1.1 Prior to disconnecting equipment:

3.1.1.1 Record and retain electrical hook-up data.

3.1.1.2 Inspect couplings for cracks, broken segments, wear, and misalignment in excess of tolerances specified in 2.2. Record and retain air gap readings. Record and retain bearing clearances for sleeve bearing equipment only.

3.1.2 Identify associated cables and wiring. Disconnect equipment mechanically, using 2.2 for guidance.

3.1.2.1 Matchmark, identify, and retain chocks, shims, shock mounts, sound damping pads, and other accessories associated with equipment.

3.1.2.2 Record shaft thrust and run out readings.

3.2 Remove equipment including rotating components connected directly to the shaft.

3.2.1 Remove entire vaneaxial and tubeaxial fan assemblies from the duct system and transport to the shop for repair.

3.3 ***Accomplish a structural inspection of each foundation in accordance with 2.10.***

3.4 Submit one legible copy, in approved transferrable media, of a report for electrical hook up data recorded in 3.1.1.1, mechanical inspection required by 3.1.1.2 through 3.1.2.2, and structural inspection required in 3.3 to the SUPERVISOR ***upon request***.

3.5 Matchmark, disassemble and inspect the equipment removed in 3.2, using 2.2 through 2.7 for guidance.

3.5.1 Accomplish a core loss test prior to winding removal in accordance with Paragraphs 300-4.5.6 and 300-4.5.6.1 of 2.3. Record data.

3.5.1.1 Inspect for hot spots in accordance with the Core Loss Tester Instruction Manual.

3.5.1.2 Conduct a loop test in accordance with Paragraph 300-4.5.6.1.2 of 2.3 when core indicates a marginal satisfactory reading or when test equipment does not directly support equipment being subjected to testing.

3.5.2 Remove each winding, using Paragraph 300-4.5.7.2 of 2.3 for guidance for winding removal and 2.7 for core inspection.

3.5.2.1 Verify the temperature limitations of the core material prior to exercising the burnout oven option.

3.5.2.2 Record winding data. Verify conformance of recorded data to the manufacturer's winding data.

3.5.2.3 Accomplish a core loss test after winding removal in accordance with Paragraph 300-4.5.6 and 300-4.5.6.1 of 2.3. Record data.

3.5.2.4 Inspect for hot spots in accordance with the Core Loss Tester Instruction Manual.

3.5.2.5 Conduct a loop test in accordance with Paragraph 300-4.5.6.1.2 of 2.3 when core indicates a marginal satisfactory reading or when test equipment does not directly support equipment being subjected to testing.

3.5.2.6 Dip core in a 20 percent solution of varnish MIL-I-24092 and dry. In localities where MIL-I-24092 does not meet state and local Air Pollution Control District (APCD) standards, spray the iron core with a clear air-drying varnish.

3.5.3 Protect machined surfaces. Accomplishment of cleaning and painting for equipment housing exterior, fan(s), core and interior and exterior of each end bell shall be in accordance with NAVSEA Standard Items (See Note 4.7).

3.6 Inspect non-wound rotors for loose or cracked bars, localized overheating, and rubbing. Inspect wound rotors, slip ring leads, and armatures for insulation damage and burns/hot spots. Inspect for loose coils and slot wedges. Inspect slip rings and commutators for damage and for wear limits, using 2.2 for criteria. Record data.

3.7 Inspect and dimensionally measure end bells, frame, rabbet fits, shaft, sleeve and pedestal bearings, keyways, fan and running surfaces for wear, eccentricity, and other defects, using 2.2 for accept or reject criteria, and 2.6 for location and type of measurements to be taken. Record data.

3.8 Inspect brush rigging for cracks, chips, worn areas, distortion, spring condition, and insulating material for cracks and arc paths. Record data.

3.9 Accomplish commutator pre-installation and post-installation test, using Table 300-3-9 of 2.3 for guidance. Record data.

3.10 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.5 through 3.9 to the SUPERVISOR ***upon request***.

3.11 Rewind the equipment in accordance with Original Equipment Manufacturer's (OEM) "for Navy use" winding data.

3.11.1 Do not permanently connect winding until after successful completion of testing of 3.11.3 through 3.11.6.

3.11.2 Material shall conform to:

3.11.2.1 Magnet wire, National Electrical Manufacturers Association (NEMA) MW-1000, Table MW 16 (round wire), or NEMA MW-1000, Table MW 20 (rectangular wire), or equivalent to OEM original

3.11.2.2 Slot and phase insulation, NEMA FI-3-2004

3.11.2.3 Slot wedge-spacers and fillers, MIL-I-24768/17

3.11.2.4 Lead wire, stranded, MIL-DTL-16878 except for type EPDM, which may be commercial grade

3.11.2.5 Glass banding, MIL-I-24178

3.11.2.6 New temperature detectors in accordance with 2.2

(V) "INSULATION RESISTANCE TEST"

3.11.3 Accomplish 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2 through 300-3.2.3, 300-3.4.8, 300-3.4.11, and 300-5.3.7.1 of 2.3 for guidance.

(V) "DC RESISTANCE TEST"

3.11.4 Accomplish a DC resistance test of windings, using a Wheatstone or Kelvin bridge, or with an ohmmeter capable of resolving one milliohm (0.001 ohm). Record phase balance for multi-phase equipment, using Paragraph 5.21 of 2.7 ***3.6.1 of 2.11*** for guidance.

(V) "VOLTAGE SURGE TEST"

3.11.5 Accomplish a voltage surge test in accordance with Paragraphs 300-3.5.4 through 300-3.5.5 of 2.3.

(V) "DC HI POT TEST"

3.11.6 Accomplish a DC HI POT test in accordance with Paragraph 300-3.5.2 through 300-3.5.2.3.4 of 2.3.

3.12 Permanently connect the windings.

3.12.1 Repeat tests described in 3.11.3 through 3.11.6.

(V) "BAR-TO-BAR TEST"

3.12.2 Accomplish DC bar-to-bar test on commutators after making coil connections to the risers in accordance with Paragraph 300-4.7.11.3 of 2.3.

(V) "VARNISH TEMPERATURE, VISCOSITY, AND GEL TIME TESTS"

3.13 Select the insulation process based on winding insulation classifications and to meet state or local air pollution standards. Windings of a sealed insulation system by vacuum pressure impregnation shall be by a NAVSEA-certified repair facility. Accomplishment of work on windings for sealed insulation systems shall be in accordance with NAVSEA Standard Items (See Note 4.8).

3.13.1 Select varnish methods and material, using Paragraphs 300-4.5.8 through 300-4.5.8.9 of 2.3 for guidance.

3.13.1.1 Maintain the varnish in accordance with Paragraphs 300-4.5.8.3 through 300-4.5.8.3.3 of 2.3 and the varnish manufacturer's instructions.

3.13.1.2 Maintain a current revision of the varnish manufacturer's instructions on storage, maintenance, and use of the type of varnish to be applied.

3.13.1.3 Maintain a record of varnish temperature, viscosity, and, for solventless varnish, gel time tests. Tests must show varnish is within varnish manufacturer's recommendations and have been accomplished in the intervals specified by the varnish manufacturer. The record must also show the varnish is being stored as recommended by the varnish manufacturer.

3.14 Varnish windings in accordance with Paragraphs 300-4.5.8.2 of 2.3 and the varnish manufacturer's instructions.

3.14.1 Do not immerse the leads.

3.14.2 Wipe surfaces that affect assembly such as rabbet fits and mounting flanges with a cloth moistened with a solvent after draining and before baking.

3.15 Remove excess varnish runoff from the component locations described in 3.14.2 after final baking. Apply a thin coat of air-dry varnish to metal surfaces exposed by the removal process in accordance with Paragraphs 300-4.5.8.5 and 300-4.5.8.6 of 2.3.

3.16 Repeat tests described in 3.11.3 through 3.11.6. Record data.

3.17 Accomplish an AC HI POT test in accordance with Paragraphs 300-3.5.3 through 300-3.5.3.2.9 of 2.3. Record data.

3.18 Accomplish a 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2 through 300-3.2.3, 300-3.4.8, 300-3.4.11, and 300-5.3.7.1 of 2.3 for guidance. Record data.

3.19 Measure resistance value of each winding temperature detector, using a low voltage ohmmeter. Record data.

3.20 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.16 through 3.19 to the SUPERVISOR ***upon request***.

3.21 True the commutator or collector rings. Eccentricity shall not exceed the requirements of 2.8. Resurface or machine each individual collector ring to the same exact diameter to allow symmetrical brush holder to ring clearance spacing. Ensure metal shavings are not permitted to contaminate the rotor or stator assembly.

3.21.1 Each cut shall not exceed 0.010 inch. Finish thickness shall not be less than design wear tolerance as shown in 2.2.

3.21.2 Undercut the mica between the commutator bars with the edge of the mica not exceeding a depth of 5/64-inch below the bars.

3.21.3 Chamfer the bar edges and remove rough surfaces in accordance with Paragraph 7-4 of 2.8.

3.21.4 Burnish the commutator with a very fine commercial burnishing stone conforming to A-A-58052. Polish collector rings to a mirror finish.

3.22 Accomplishment of the balancing requirement for each rotating assembly shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.23 Accomplish the following for the brush rigging:

3.23.1 Disassemble the brush rigging.

3.23.2 Remove foreign matter.

3.23.3 Replace existing cadmium-plated parts with zinc in accordance with ASTM A 153.

3.23.4 Recondition threads of plated parts.

3.23.5 Assemble brush rigging.

3.24 Install identification markers on wiring in the external connection box.

3.24.1 Markers shall be aluminum wrap-around type with metal stamped or embossed markings.

3.25 Repair lightly scored areas of frame, end bells, and shaft by manual methods. Recondition threads and fit key to keyway. Visually inspect keyway for deformed, cracked or chipped edges or high spots. Verify that fit between key and key-seat sides has a minimum clearance of 0.002 inch or maximum interference of 0.0005 inch. High spots in keyway may be removed by machining or grinding. Do not unnecessarily repair any keyway; instead, use a step key up to a maximum of 0.010 inch oversize and, where possible,

include a radius in step. If key tightness cannot be corrected with a step key, re-machine worn/damaged keyways to recommended over-sizes as follows: Maximum of 0.015 inch oversize for a 1/8-inch key and increasing oversize allowance of 0.010 inch for each 1/8-inch increase in key size up to a maximum of 0.075 inch. If key tightness cannot be corrected by keyway repair, replace part involved.

3.25.1 Apply a thin coat of petrolatum to unpainted mating surfaces except for explosion-proof motors that shall have clean, dry mating surfaces.

3.26 Prepare and refinish equipment. Protect machine surfaces, windings, and nameplates from being painted or otherwise damaged.

3.26.1 Accomplishment of cleaning and painting for housing, fan, and interior and exterior of each end bell shall be in accordance with NAVSEA Standard Items (See Note 4.7).

3.27 Accomplishment of cleaning and painting for foundations of the equipment removed in 3.2 shall be in accordance with NAVSEA Standard items (See Note 4.7).

3.28 Accomplish the following on equipment having other than sleeve-type bearings unless otherwise specified in the invoking Work Item, using 2.7 for guidance.

3.28.1 Except as indicated in 3.28.1.1 (utilizing Attachment A for guidance), install new bearings, seals, fittings, lock washers, and locknuts conforming to 2.2, using 2.6 and Chapter 6 of 2.7 for guidance.

3.28.1.1 Install Type 111, Class 8 (double seal) bearings in motors meeting the criteria identified in Chapter 6 of 2.7. Only double seal bearings identified in Chapter 6 of 2.7 are acceptable for this use.

3.28.1.2 For vaneaxial and tubeaxial fan motors not meeting the criteria of Chapter 6 of 2.7, if not originally furnished or already accomplished during previous repair, install Type 111, Class 8 (double seal) bearings with a C3 (greater than normal) radial internal clearance in place of the Type 111 bearing originally furnished. Install Type 120 bearings in vaneaxial and tubeaxial fan motors originally furnished with Type 120 bearings.

3.28.1.3 Install new label plates with the inscription "DO NOT LUBRICATE" on equipment using double seal bearings (Type 111, Class 8 or Type 120).

3.28.1.4 For equipment converted from re-lubricable bearings to double seal bearings, install pipe plugs on all grease fills and drains.

3.28.1.5 For equipment converted from lubricated bearings to double seal bearings, submit one legible copy, in approved transferrable

media, of a report that reflects the change in the maintenance requirements for the converted motor.

3.28.2 For equipment not using double seal bearings, lubricate bearings with grease conforming to DOD-G-24508 as required in Paragraphs 244-1.7.7.2 and 244-1.7.7.3 of 2.6.

3.29 Assemble the equipment disassembled in 3.5, using 2.2 through 2.7 for guidance.

3.29.1 Do not use materials containing silicone in the repair and reassembly of equipment with commutator or collector rings.

3.29.***2*** Install new gaskets on covers, inspection plates, and between the external connection box and the frame. Gaskets shall conform to MIL-PRF-1149 unless otherwise specified in 2.2.

3.29.***3*** Set brush holders not less than 1/16-inch or more than 1/8-inch from commutator or collector rings unless otherwise specified in 2.2.

3.29.***4*** Set brush holders in electrical neutral plane and stagger brushes for maximum coverage of the commutator, in accordance with Paragraph 300-4.7.7.1.10 of 2.3.

3.29.***5*** Center the brush holder over the collector rings.

3.29.***5***.1 Ensure the brushes do not extend beyond the edge of the collector rings.

3.29.***6*** Install new brushes in accordance with 2.2. Sand new brushes to fit curvature of the commutator or collector rings, using Paragraphs 6-3.5 through 6-3.5.4 of 2.8 for guidance.

3.29.***6***.1 Brushes shall have a surface contact of 100 percent and shall not be chipped, cracked, or broken.

3.29.***6***.2 Remove sand, carbon, and other foreign matter resulting from fitting new brushes.

3.29.***7*** Adjust spring tension of brushes in accordance with 2.2.

3.29.***8*** Adjust air gap as specified in 2.2, plus or minus 10 percent.

3.29.***9*** Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly shall not be allowed.

3.29.***10*** Install label plates conforming to MIL-DTL-15024 for those identified to be missing or damaged.

(V) "NO-LOAD SHOP TEST"

3.30 Accomplish a no-load shop test of the motor for a minimum of one-half hour.

3.30.1 Verify proper direction of rotation.

3.30.2 After one-half hour, record current and voltage in each phase, speed and bearing temperature rise measured on the equipment's exterior near each bearing.

3.30.3 Submit one legible copy, in approved transferrable media, of the recorded data to the SUPERVISOR ***upon request***.

(V) "OPERATIONAL SHOP TEST (FOR VANEAXIAL/TUBEAXIAL FANS - ASSEMBLY COMPLETELY REASSEMBLED)"

3.31 With the vaneaxial/tubeaxial fan reassembled, accomplish an operational test for one hour after bearing and stator temperatures stabilize within one degree Celsius for 3 consecutive 15-minute intervals.

3.31.1 Verify proper direction of rotation.

3.31.2 Record current, voltage, frame and bearing temperature rise and speed at 15-minute intervals.

3.31.2.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit, unless otherwise specified in the invoking Work Item or equipment technical manual.

3.31.3 Measure and record hot insulation resistances of winding to ground immediately upon completion of the operational shop test, using a 500-volt megger.

3.32 Install equipment removed in 3.2.

3.32.1 Install new gaskets conforming to MIL-PRF-900 on disturbed ventilation.

3.32.2 Align equipment in accordance with 2.2. Measure and record facial and peripheral coupling data.

3.32.2.1 Install chocks, shims, shock mounts, and sound damping pads.

3.32.2.2 Accomplishment of pump and driver shaft alignment shall be in accordance with NAVSEA Standard Items (See Note 4.10).

3.32.3 Connect electrical cables to equipment, using data retained in 3.1.1.1.

3.32.4 Bond and ground equipment in accordance with 2.9, using new ground straps.

3.32.5 Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly shall not be allowed.

3.32.6 Measure and record the air gap and bearing clearance (sleeve bearing equipment only), insulation resistance (at 500 volts DC), and thrust.

3.33 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.1.1.1, 3.1.1.2, 3.1.2.2, 3.3, 3.5 through 3.9 and 3.16 through 3.19 to the SUPERVISOR.

(V)(G) "OPERATIONAL TEST"

3.3***4*** ***(For continuous duty motors)*** Accomplish an operational test of the assembled equipment at full system capacity for one hour after bearing and stator temperatures stabilize within one degree Celsius for 3 consecutive 15-minute intervals, unless otherwise specified in the invoking Work Item.

3.3***4***.1 Verify proper direction of rotation.

3.3***4***.2 Verify/establish oxide film coating of the commutator/ collector rings, using 2.8 for guidance.

3.3***4***.3 Record current, voltage, frame and bearing temperature rise, and speed at 15-minute intervals. Frame and bearing temperature rise and speed is not required for vaneaxial and tubeaxial fan assemblies.

3.3***4***.3.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit unless otherwise specified in the invoking Work Item/equipment technical manual.

3.3***4***.4 Measure and record hot insulation resistances of windings to ground immediately upon completion of test, using a 500-volt megger.

3.35 (For two speed motors) Accomplish an operational test at low speed in accordance with 3.34. Repeat 3.34 for high speed.

3.35.1 Accomplish the requirements of 3.34.1 through 3.34.4.

3.36 (For limited duty motors) Accomplish the requirements of 3.34 for a period of time equal to the duty cycle of the motor.

3.36.1 Accomplish the requirements of 3.34.1 through 3.34.4. For motors with a duty cycle equal to or less than 30 minutes, record data every 10 minutes.

3.37 Submit one legible copy, in hard copy or approved transferrable media, of a report listing data recorded in 3.31.2, 3.31.3, 3.32.2, 3.32.6, 3.3***4***.3, and 3.3***4***.4 to the SUPERVISOR.

4. NOTES:

4.1 Equipment technical manual, Allowance Parts List (APL) (if applicable) and drawings will be listed in the invoking Work Item.

4.2 Shop test of generator will be addressed in the invoking Work Item.

4.3 The use of silicone is not allowed on any rotating electrical machinery containing brushes.

4.4 Utilize Attachment A for determination if the Navy's motor bearing conversion program for Extended Life Double Seal (ELDS) ball bearings is permissible.

4.5 MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation) bearings are considered to be Long Lead Time (LLT) material. It is recommended these bearings be provided as Government Furnished Material (GFM).

4.6 Data received in 3.28.1.5 shall be forwarded to the SUPERVISOR for the purpose of initiating action ensuring shipboard databases such as the Equipment Guidance List (EGL) are updated to reflect the change in maintenance requirements for converted motors. Additionally, where APL changes are initiated to convert to ELDS bearings, a COSAL feedback report will be submitted, providing the NSN and part number for the ELDS bearing. The following website to initiate changes to Technical Manuals, APLs, etc.: http://www.navy311.navy.mil.

4.7 If cleaning and painting of 3.5.3, 3.26.1, or 3.27 is required; the use of Category II Standard Item 009-32 "Cleaning and Painting Requirements; accomplish" of 2.1 will be specified in the Work Item.

4.8 If work on windings for sealed insulation systems of 3.13 is required; the use of Category II Standard Item 009-113 "Rotating Electrical Equipment with Sealed Insulation Systems (SIS); rewind" of 2.1 will be specified in the Work Item.

4.9 If balancing of rotating equipment of 3.22 is required; the use of Category II Standard Item 009-15 "Rotating Machinery; balance" of 2.1 will be specified in the Work Item.

4.10 If pump and driver shaft alignment of 3.32.2.2 is required; the use of Category II Standard Item 009-58 "Pump and Driver Shaft Alignment; accomplish" of 2.1 will be specified in the Work Item.

ATTACHMENT A

1. To reduce motor maintenance and repair costs, the NAVY has implemented a program that allows for the use of Extended Life Double Seal (ELDS) bearings.

2. LIMITATIONS: The ELDS program does NOT apply to motors that are under the cognizance of NAVSEA 08.

3. APLs for motors meeting the conversion criteria requirements have been modified to identify ELDS bearings. In these cases, the APL bearing criteria will override any specifications delineated in the equipment technical manual or the motor "Original Equipment Manufacturer (OEM)" drawings. If ELDS bearings are not indicated in an APL, the following motor criteria must meet the applicability specifications for motors to undergo conversion to ELDS bearings:

3.a Motor must be installed on a surface ship and must NOT be under the cognizance of NAVSEA 08.

3.b Commercial motors are not eligible. Motors must have been furnished to the NAVY in accordance with MIL-DTL-17060 (Motors, Alternating Current, Integral Horsepower, Shipboard use), MIL-M-17413 (Motors, Direct Current, Integral H.P., Naval Shipboard [NAVY]) or MIL-M-17059 (Motors, 60 Cycle, Alternating Current Fractional H.P. [Shipboard Use]).

3.c Motors using one or more noise-quiet bearings per MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation) are NOT eligible for ELDS conversion.

3.d Bearings originally furnished with the motor must be type 111 bearings per FF-B-171. Motors are NOT to be considered as candidates for ELDS conversion in situations where the equipment technical manual and/or the OEM motor drawings originally specified FF-B-171 bearings but have notes indicating that replacement bearings are to be in accordance with MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation).

3.e The use of ELDS bearings is limited to motors where the full load speed and the size of both bearings are as follows:

1. Maximum bearing size 306 or 206 and full load rpm between 1,801 and 3,600 rpm.

2. Maximum bearing size 313 or 213 and full load rpm between 1,201 and 1,800 rpm.

3. Maximum bearing size 318 or 218 and full load rpm less than 1200 rpm.

4. The repair process using ELDS bearings includes the following requirements:

4.a Only ELDS bearings, in accordance with the following table (Attachment A / Table 1), can be used. Other double seal bearings will not provide an acceptable bearing life.

Attachment A / Table 1

ELDS Bearings NSNs and Part Numbers

SIZE	P/N	NSN
201	6201-2RS1C3/GHY	3110-01-492-0221
202	6202-2RS1C3/GHY	3110-01-491-0233
203	6203-2RS1C3/GHY	3110-01-491-0234
204	6204-2RS1C3/GHY	3110-01-491-6636
205	6205-2RS1C3/GHY	3110-01-451-9166
206	6206-2RS1C3/GHY	3110-01-451-9165
207	6207-2RS1C3/GHY	3110-01-451-9164
208	6208-2RS1C3/GHY	3110-01-451-9170
209	6209-2RS1C3/GHY	3110-01-451-9252
210	6210-2RS1C3/GHY	3110-01-492-1831
211	6211-2RS1C3/GHY	3110-01-518-0937
303	6303-2RS1C3/GHY	3110-01-493-3750
304	6304-2RS1C3/GHY	3110-01-451-9153
305	6305-2RS1C3/GHY	3110-01-451-9158
306	6306-2RS1C3/GHY	3110-01-451-9159
607	6307-2RS1C3/GHY	3110-01-451-9161
308	6308-2RS1C3/GHY	3110-01-451-9167
309	6309-2RS1C3/GHY	3110-01-451-9168
310	6310-2RS1C3/GHY	3110-01-490-6683
311	6311-2RS1C3/GHY	3110-01-492-0223
312	6312-2RS1C3/GHY	3110-01-490-6848
313	6313-2RS1C3/GHY	3110-01-492-0191

314	6314-2RS1C3GHY	3110-01-492-0226
315	6315-2RS1C3/GHY	3110-01-494-0993
316	6316-2RS1C3/GHY	3110-01-492-0188
317	6317-2RS1C3/GHY	3110-01-492-0219
318	6318-2RS1C3/GHY	3110-01-493-3749

4.b Both bearings of each converted motor must be ELDS bearings.

4.c A label plate must be permanently attached to the motor indicating "Do Not Lubricate".

4.d Grease fills and drains, if present, must be fitted with a pipe plug, securely fastened. Fittings to accommodate grease guns must be replaced with pipe plugs."

ATTACHMENT B

SECTION 1. NAME PLATE DATA

EQUIPMENT _____ **USS** _____

MFGR _____ **TYPE** _____ **FRAME** _____

HP _____ **INSULATION CLASS** _____ **TEMP. RISE** _____ ***C/*F** _____

VOLTS _____ **AMPS** _____ **CYO** _____ **R/M** _____ _____
PHASE

SERIAL NO. _____ **ADDITOINAL DATA** _____

SECTION 2. INPLACE INSPECTION

CAUTION: OBSERVE APLICABLE SAFETY PROCEDURES

SATISFACTORY
UNSATISFACTORY

_____INSULATION RESISTANCE IN MEGOHMS (REFER TO TABLE 3-2)_____

POLARIZATION INDEX TEST 1 MIN _____ 10 MIN_____ RATIO _____

_____ MECHANICAL CONDITION (REFER TO PARAGRAPH 3-6) _____

_____ CONTINUITY OF WINDINGS (REFER TO PARAGRAPH 3-5.1) _____

_____ CURRENT BACLANCE (USE LIMITS PRESCRIBED IN PARAGRAPH 3-10) _____

_____ CONDITION OF BRUSHED AND COMMUTATOR _____

_____ CONDITION OF CABLES AND CONTROLLER TO MOTOR _____

_____ CONDITION OF CONTROLLER _____

SECTION 3. INCOMING INSPECTION (GENERAL)

SURGE TEST	1-2 SAT/UNSAT	
	2-3	SAT/UNSAT
	1-3	SAT/UNSAT
INSULATION RESISTANCE TO GROUND		MEGOHMS
RESISTANCE BALANCE	1-2	OHMS
WITH DIGITAL OHMETER	2-3	OHMS
	1-3	OHMS

ACTION **REWIND**
RECONDITION

ITEM NO: 009-33
FY-19

SECTION 4. RECONDITIONING

	AFTER STEPS OF:	
	CLEANING	**DRYING**
INSULATION RESISTANCE (MEGOHMS)		
PHASE RESISTANCE BALANCE TEST		
SURGE TEST (SAT/UNSAT)		
DC HIGH-POTENTIAL TEST		

ACTION **REWIND**
VARNISH

SECTION 5. AFTER RECONDITIONAING OR REWINDING AND VARNISHING

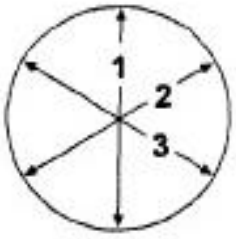
INSULATION RESISTANCE			**MEGOHMS**		
POLARIZATION INDEX TEST	**1 MIN**	_____	**10 MIN**	_____	**RATIO**
RESISTANCE BALANCE WITH DIGITAL OHMMETER			**1-2**	_____	**OHMS**
			2-3	_____	**OHMS**
			1-3	_____	**OHMS**
SURGE TEST				_____	**SAT/UNSAT**
AC HIGH-POTENTIAL TEST				_____	**SAT/UNSAT**
INSULATION RESISTANCE AFTER AC HIGH-POTENTIAL TEST				_____	**MEGOHMS**
NO-LOAD TEST			**PHASE A**	_____	**AMPERES**
			PHASE B	_____	**AMPERES**
			PHASE C	_____	**AMPERES**

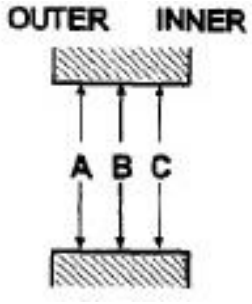
SHIPNAME & HULL NUMBER DATE MONTH/DAY/YEAR

MOTOR LOCATION (I.E., NO.2 MAIN FEED PUMP, ETC.)

HOUSING DIAMETERS

DRIVE END			
	A	B	C
1			
2			
3			

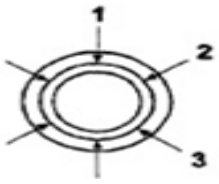


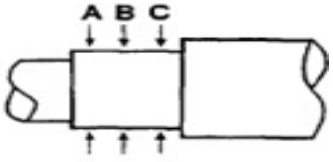


OUTER END			
	A	B	C
1			
2			
3			

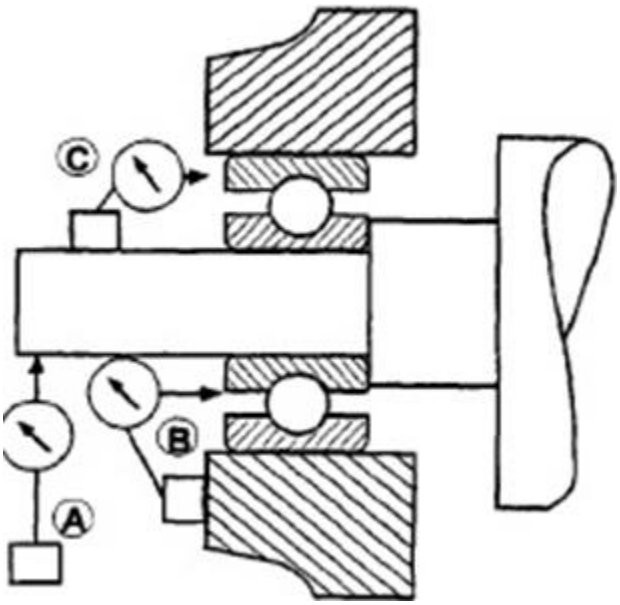
SHAFT DIAMETERS*

	DRIVE END			OUTER END		
	A	B	C	A	B	C
1						
2						
3						





FOR BEARING JOURNAL WIDTH LESS THAN 1 INCH ONLY SIX READINGS ARE REQUIRED.



A SHAFT RADIAL RUNOUT _____

B FACE RUNOUT, BEARING INNER RING
DRIVE END _____
OUTER END _____

C FACE RUNOUT, BEARING OUTER RING
DRIVE END _____
OUTER END _____

MECHANICAL CONDITION
(LOSS OF LUBE, BURNED ETC.)

_____
_____
_____
_____

NAVSEA
STANDARD ITEM

FY-19

ITEM NO:	009-36
DATE:	***01 OCT 2017***
CATEGORY:	II

1. SCOPE:

1.1 Title: Controller; repair

2. REFERENCES:

2.1 Standard Items

2.2 Equipment Technical Manual

2.3 S9086-KC-STM-010/CH-300, Electric Plant - General

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

2.5 S9300-A6-GYD-010, Electrical Workmanship Inspection Guide for Surface Ships and Submarines

2.6 MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety

3. REQUIREMENTS:

3.1 Identify and pull back associated cables. Disconnect mechanically and remove controller.

3.1.1 Matchmark, identify, and retain shims.

3.1.2 Inspect each foundation for cracks, areas of distortion, and deterioration in excess of 25 percent of the thickness of each member of the structure.

3.1.2.1 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.1.2 to the SUPERVISOR.

3.1.3 Accomplishment of cleaning and painting for foundations of equipment removed in 3.1 shall be in accordance with NAVSEA Standard Items (See Note 4.2).

3.2 Disassemble each controller and clean components free of foreign matter.

3.3 Inspect each controller enclosure, mounting board, and component for mechanical and physical defects, improper values, and internal wiring for conformance to 2.2 and controller wiring diagram.

3.3.1 Test internal wiring and each coil for open circuits. Test insulation resistance to ground and between conductors, using a 500-volt megger. Record readings. Minimum acceptable resistance to ground shall be one megohm.

3.3.1.1 Disconnect solid-state devices prior to measuring insulation resistance.

3.3.2 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.3 and 3.3.1 to the SUPERVISOR.

3.4 Repair each controller, using 2.2 for guidance.

3.4.1 Straighten each enclosure and door. Free-up hinges and align door. Plug and seal unused cable openings.

3.4.1.1 Install ground straps on each door on controllers with door mounted energized components in accordance with ***MIL-DTL-2036*** in place of those identified to be missing or defective.

3.4.2 Accomplishment of cleaning and painting of the interior and exterior of the enclosure shall be in accordance with NAVSEA Standard Items (See Note 4.2).

3.4.3 Remove existing and install new enclosure gaskets.

3.4.***4*** Remove existing and install new molded-rubber switch covers.

3.4.***5*** Remove existing and install new components in place of those identified to be missing, defective or of improper value. Remove existing and install new wiring in place of wiring identified to be defective or frayed. Install new wiring where missing.

3.4.***6*** Inspect, dress, and adjust contacts.

3.4.***6***.1 Install new contacts in place of those identified to be missing or defective, or resilver contacts in accordance with ASTM B 700.

3.4.***7*** Remove existing cadmium-plated parts and install new zinc-plated parts in accordance with ASTM A 153.

3.4.***8*** Wash, dip and bake, tape insulated coils and open transformers. Dipping shall be in varnish conforming to MIL-I-24092, Class 155.

3.4.***8***.1 Dip and bake coils and open transformers in Dolph 1105, Epoxylite Esterlite 605, or Schenectady International Isolite 862M varnish in localities where MIL-I-24092 varnish does not meet state and local Air Pollution Control District (APCD) Standards.

3.4.***8***.2 Repair and reinsulate coil and transformer leads.

3.4.***9*** Free-up and lubricate moving parts.

3.4.***10*** Adjust timing devices, relays, and contactors.

3.4.***11*** Repair defective connections.

3.4.***12*** Install a new wiring diagram and new heater table in each controller. The new diagram shall reflect actual configuration of the controller in which it is installed. New diagrams shall be sealed in transparent plastic and shall be mounted on the inside of each controller so as to be conveniently accessible.

3.5 Assemble each controller.

3.5.1 Dress and shape wiring and wire harnesses for neat appearance. Install wire clamps on both ends of wire hinges. Install flexible insulating tubing over wire hinges to prevent chafing.

(V) "SHOP OPERATIONAL TEST"

3.6 Accomplish an operational test of each controller and adjust to ensure correct operation in accordance with the wiring diagram of 3.4.***12***, using 2.2 for guidance.

(V) "INSULATION RESISTANCE TEST"

3.6.1 Accomplish 500-volt megger insulation resistance test, using Paragraphs 300-3.2.2 through 300-3.2.3, 300-3.4.***7***, 300-3.4.***10***, and 300-5.3.7.1 of 2.3 for guidance.

3.7 Install each controller using shims retained in 3.1.1.

3.7.1 Remove existing and install new conductor identification sleeving in place of conductor identification sleeving identified to be illegible or missing. New conductor identification sleeving shall conform to SAE-AMS-DTL-23053, Class One, white, marked with indelible ink.

3.7.2 Repair and reinsulate cable ends terminating in the controller in accordance with Part One of 2.4. Resleeve conductors over 9,000 circular mils.

3.7.3 Remove defective and install new lugs, using 2.5 for accept or reject criteria. Install new lugs where missing. New lugs shall conform to MIL-T-16366 or SAE-AS7928

3.7.4 Bond and ground equipment in accordance with 2.6.

3.8 Connect each controller with the exception of the motor leads and the brake leads if applicable, using retained data of 3.1.

(V) "PRELIMINARY SEQUENCE TEST"

3.8.1 Accomplish a preliminary sequence test of each controller by cycling the controller through 3 start and stop cycles from each local and remote pushbutton station. Observe controller for proper sequence. Correct deficiencies.

3.8.2 Connect the motor leads and brake leads, if applicable, at completion of preliminary sequence test.

(V)(G) "OPERATIONAL TEST"

3.9 Accomplish an operational test of each controller with its associated motor for designed sequence of operation. Verify correct speed selection, correct motor rotation in each mode, and correct value of overload setting or size of heater coils based on motor nameplate full load running current.

4. NOTES:

4.1 Equipment technical manual and drawings will be listed in the invoking Work Item.

4.2 If cleaning and painting of 3.1.3 or 3.4.2 is required; the use of Category II Standard Item 009-32 “Cleaning and Painting Requirements; accomplish” of 2.1 will be specified in the Work Item.

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-73
DATE: ***01 OCT 2017***
CATEGORY: I

1. SCOPE:

1.1 Title: Shipboard Electrical/Electronic Cable Procedure; accomplish

2. REFERENCES:

2.1 Standard Items

2.2 MIL-STD-2003, Electric Plant Installation Standard Methods for Surface Ships and Submarines

2.3 SE000-01-IMB-010, Navy Installation and Maintenance Book (NIMB), Section IX, Installation Standards (Source CD: N0002400003)

2.4 MIL-STD-2042, Fiber Optic Cable Topology Installation Standard Methods for Naval Ships

2.5 S9086-KC-STM-010/CH-300, Electric Plant - General

2.6 MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety

2.7 S9300-A6-GYD-010, Electrical Workmanship Inspection Guide for Surface Ships and Submarines

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

2.9 SE000-01-IMB-010, Navy Installation and Maintenance Book (NIMB), Section VII, Industrial Electromagnetic Compatibility (IEMC) Work Process Instructions (Source CD: N0002400003)

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

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

3. REQUIREMENTS:

3.1 Submit written designation of the Qualified Personnel who will prepare electrical cable endings to receive connectors, assemble connector

parts on the cable endings, and attach the connectors to the cable endings. Submit written designation of the Qualified Personnel who will supervise and inspect the execution of the process.

3.1.1 Submit one legible copy, in hard copy or approved transferrable media, of any additions or modifications to the SUPERVISOR prior to the start or continuation of work.

3.1.2 Maintain current copies of the credentials of the Qualified Personnel for reference by the SUPERVISOR.

3.1.2.1 Submit one legible copy, in hard copy or approved transferrable media, of specific documents when requested by the SUPERVISOR.

3.2 Submit a written procedure to the SUPERVISOR for review and approval prior to the initiation of production work for the installation of multi-pin and coaxial connectors, using 2.2 and 2.3 for the minimum requirements.

3.2.1 Submit new procedure when the Standard Items change and/or references change or are updated. This procedure only requires a one-time submittal/approval and shall contain the following minimum information:

3.2.1.1 Reference the appropriate fabrication document for which the procedure is applicable.

3.2.1.2 Reference the qualification requirements for the personnel performing the work.

3.2.1.3 Reference the inspection and documentation forms.

3.2.1.4 Reference the acceptance and rejection criteria.

3.3 Ensure only Qualified Personnel accomplish the work required by this Standard Item.

3.4 Inspect existing cable installations affected as a result of work required by the individual Work Item and interferences within the first 25 percent of contract completion. Ensure that cable installations are in accordance with 2.2, and 2.4 for fiber optic cable.

3.4.1 Submit one legible copy, in hard copy or approved transferrable media, of a report of cable installation conditions not in compliance with 2.2 and 2.4 to the SUPERVISOR, using Attachments A and B, within 4 days of completion of inspections.

3.4.1.1 Ensure report states cable installation inspection results and identifies non-compliance issues.

3.5 Accomplish a shipboard electrical/electronic cable test on cables affected by the individual Work Items.

3.5.1 Accomplish an insulation resistance test of each electric cable conductor using the appropriate direct current megger using Table 300-3-4 of 2.5 for guidance.

3.5.1.1 Disconnect low voltage equipment associated with circuits to be tested to prevent damage during tests.

3.5.1.2 Ensure the minimum acceptable readings of each cable conductor to ground and between conductors are:

Lighting Circuit	0.5 Megohm
Power Circuit	1.0 Megohm
Degaussing Circuit	0.1 Megohm
Interconnecting Control Circuit	1.0 Megohm
Interior Communication Circuit	0.2 Megohm
Sound Powered Telephone Circuit (with telephone disconnected)	0.05 Megohm
Multiconductor Cables (with circ mil less than 1700)	0.05 Megohm

3.5.1.3 Ensure the minimum acceptable reading of coaxial cable are in accordance with Section 2.8.3.3 of 2.3:

Coax cable with...	Length (feet)	Insulation resistance in megohms (To equal or exceed)
Polyethylene or polytetrafluorethylene (Teflon) dielectric	100 (or less)	40,000
	200	20,000
	500	8,000
	1,000	4,000
Synthetic rubber dielectric	Up to 1,000	1,000
Magnesium oxide dielectric	Up to 1,000	10,000
Dielectric material arranged in layers of conducting and non-conducting rubber	Up to 1,000	500

3.5.1.4 Discharge coaxial cable to ground following insulation resistance test.

3.5.2 Test each cable conductor for continuity and complete circuit. Ensure terminal connections are tight.

3.6 Install each new cable, cableway, penetration, lug, and connector in accordance with 2.2, 2.3, and 2.6 and referenced drawings, to support work required by the individual Work Items.

3.6.1 Ensure new cable conforms to MIL-DTL-24643 (low smoke) and MIL-DTL-24640 (lightweight). New Radio Frequency (RF) cables shall conform to MIL-DTL-17 (low smoke).

3.6.2 Use existing cableways and penetrations wherever possible.

3.6.3 Ensure penetrations are the correct size in accordance with 2.2.

3.6.4 Install new cable conductor identification sleeving conforming to SAE-AMS-DTL-23053, Class One, white, marked with indelible ink.

3.6.4.1 Mark in accordance with the referenced drawings and/or equipment technical manual.

3.6.5 Install lugs and connectors in accordance with 2.2, 2.3 and referenced drawings.

3.6.5.1 Install new lugs of correct size and shape conforming to MIL-T-16366 or SAE-AS7928. Do not cut off strands of copper to reduce size of lead to fit lug. Use correct barrel and hole size.

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

3.6.7 Band disturbed cable in accordance with Part 4 of 2.2.

3.6.8 Bond and ground cable in accordance with 2.6.

3.6.9 Accomplish the requirements of 3.5 through 3.5.2 immediately prior to conductor or cable termination.

3.6.9.1 Submit one legible copy, in hard copy or approved transferrable media, of a report listing results of the requirements of 3.6.9, including circuit number, lead numbers, and readings obtained, to the SUPERVISOR within 3 days of completion of tests.

3.6.10 Connect each cable using referenced drawings.

3.6.11 Install new cable identification tags in accordance with 2.2 and 2.3.

3.7 Disconnect and remove each cable to be replaced in its entirely. Record and retain electrical hook-up data.

3.7.1 Accomplish the requirements of 3.6 through 3.6.9.1.

3.7.2 Connect each cable using referenced drawings and retained electrical hook-up data.

3.7.3 Accomplish the requirements of 3.6.11.

3.8 Identify and isolate each cable to be pulled back, reused, rerouted, relocated, or repurposed to support work required by the individual Work Items.

3.8.1 Inspect each cable end to be disconnected for correct conductor identification sleeving, including size, type, and legible lettering in accordance with referenced drawing. Ensure lugs are secured to leads and are of correct size and type, and the insulation is not damaged. Accept and reject criteria for lugs and sleeving for cables shall be in accordance with Chapters 3 and 4 of 2.7.

3.8.2 Disconnect each cable. Record and retain electrical hook-up data.

3.8.3 Accomplish the requirements of 3.5 through 3.5.2 for disconnected cables.

3.8.4 Remove each cable from equipment and pull back to predetermined locations. Coil each cable and secure to prevent damage.

3.8.4.1 Protect disconnected connectors and wiring from the industrial environment and weather.

3.8.5 Accomplish the requirements of 3.6.6 through 3.6.9.1

3.8.6 Accomplish the requirements of 3.7.2.

3.8.7 Inspect each cable for missing or defective cable identification tags.

3.8.7.1 Install new cable identification tags in place of those identified to be missing or defective in 3.8.7 in accordance with 2.2 and 2.3.

3.9. Identify, isolate and remove each cable designated for removal by the individual Work Items.

3.9.1 Remove each cable in its entirety.

3.9.2 Blank each bulkhead, deck penetration, and multi-cable transit device from which cable was removed and which will not be reused, in accordance with Part 3 of 2.2.

3.9.3 Blank each ***unused hole in equipment, in accordance with 2.2.***

3.9.4 Remove unused hangers from which cable was removed and which will not be reused, in accordance with Section 070a of 2.8.

3.9.5 Install new banding for cableways affected by cable removals, in accordance with Part 4 of 2.2.

3.9.6 Accomplish the requirements of 3.6.6.

3.10 Weatherproof and seal connectors exposed to the weather in accordance with 2.9.

3.***11*** Accomplishment of cleaning and painting for new and disturbed surfaces shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.**12** Remove, install, and relocate cables which are part of the secure electrical information processing systems or are located within a secure processing space in accordance with 2.10 and 2.11 to support work required by the individual Work Items.

4. NOTES:

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

4.2 Definitions

4.2.1 New Cable – a cable is defined as a cable not previously installed.

4.2.2 Pulled Back Cable – a pulled back cable is defined as those which are disconnected and physically removed from a wireway, conduit, or cableway to protect the cable from industrial use.

4.2.3 Reused Cable – a reused cable is defined as those cables disconnected from the equipment to facilitate equipment removal.

4.2.4 Rerouted Cable – a rerouted cable is defined as those cables 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 repurposed cable is defined as those which have had their termination points changed.

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

4.4 Electrical connector fabrication is the preparation of cable endings to receive multi-pin connectors, coaxial connectors, and securing connectors to cables.

4.5 A Qualified Person is defined as a person who has successfully completed connector fabrication training and meets the qualification requirements stated below.

4.5.1 Emphasizes the importance of connector fabrication to the performance and long-term reliability of shipboard combat systems.

4.5.2 Uses 2.2, 2.3, and 2.7 for basic instructional material supplemented by connector manufacturer's instructional material as desired.

4.5.3 Requires classroom lecture, study, and demonstration of each topic in Appendix A of Part 5 of 2.2.

4.5.4 Requires individual student practice in the use of specified tools and performance of connector fabrication techniques and procedures described in Appendices B through H of Part 5 of 2.2 and Paragraph 2-20.2 of 2.3.

4.5.5 Requires a minimum of 32 hours of combined classroom lecture and laboratory practice in the type of connectors to be fabricated.

4.6 Connector fabrication qualifications consist of:

4.6.1 Connector Fabricator Qualification requirement: Successful completion of the training course required in 4.5.5 followed by successful completion of 40 hours on-the-job training under the tutelage of a qualified connector fabricator or a qualified connector fabrication supervisor in the type of connectors to be fabricated.

4.6.2 Connector Fabrication Supervisor Qualification requirement: Successful completion of the classroom training required in 4.5.5 plus be the incumbent of a supervisory electrical or electronic mechanic position.

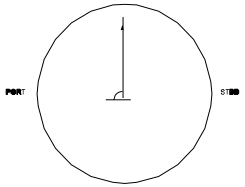
4.6.3 Connector Fabrication Quality Assurance Inspector Qualification requirement: Successful completion of the classroom training required in 4.5.5 plus be the incumbent of a quality assurance specialist or inspector position.

4.7 Attachment B is provided as an aid to completion of Electrical Cableway Inspection Form.

4.8 If local air hose test of 3.6.6 is required, the use of Standard Item 009-25 of 2.1 “Structural Boundary Test; accomplish” will be specified in the Work item.

4.9 If cleaning and painting for new and disturbed surfaces of 3.12 are required; the use of Standard Item 009-32 of 2.1 "Cleaning and Painting Requirements; accomplish" will be specified in the Work Item.

ATTACHMENT A



ELECTRICAL CABLEWAY INSPECTION FORM

DATE _____ HULL NUMBER _____

INSPECTED BY _____ INSPECTING ORGANIZATION _____

SER #	COMPT	DECK	FRAME	P/S	POS	CABLE CIRCUIT DESIG	CABLE TYPE	*CAT	*NAVSEA DWG NO.	EQUIPMENT
DESCRIPTION										
DESCRIPTION										
DESCRIPTION										
DESCRIPTION										

* SEE ATTACHMENT B FOR "CATEGORY" GUIDANCE

ATTACHMENT B

INSPECTION CRITERIA FOR ELECTRICAL CABLES AND CABLEWAYS

CATEGORY 1 - Immediate Hazard
CATEGORY 2 - Potential Hazard
CATEGORY 3 - Non-Hazardous

ITEM		CRITERIA	CATEGORY
I. CABLES			
A. Installation			
	1.	Minimum bend radius exceeded, causing visual damage to cable.	1
	2.	Minimum bend radius exceeded; No visual cable damage, cable rings out and meggers satisfactorily.	3
	3.	Equipment connector supporting weight of cable (more than 32 inches of cable from last support to end use equipment). (18 inches from shock mounted motors).	1
	4.	Cables run on or near hot objects (steam or exhaust pipes, griddles, ovens, etc.	1
	5.	Cable run outside of hangers.	3
	6.	Lack of slack at expansion joints.	2
	7.	Excess slack between hangers. (Minimum distance of 6 feet 4 inches between deck and cables.)	3
	8.	Excess cable slack stored in wireway.	3
B. Damaged			
	1.	Bulging, bubbling or discoloration of cable jacket (evidence of overloading, overheating or hot spots.)	1
	2.	Bulging, bubbling or discolored cable jacket; but cable rings out and meggers satisfactorily.	2
	3.	Cable chafed or cut through outer jacket only.	2
	4.	Cable chafed or cut through, inner wire insulation damage.	1
	5.	Cable pulled out of equipment/junction box penetrations and leads exposed	1
	6.	Armored and unarmored cables in contact at an oblique angle causing chafing of unarmored jacket.	2

ITEM		CRITERIA	CATEGORY
	7.	Fiber cable chafed or cut beyond the cable outer jacket to the Kevlar strength members	1
C. Dead-ended			
	1.	Cable dead-ended, not end sealed and labeled (serialized) properly at both ends.	1
	2.	Cable for future use not properly sealed on both ends and labeled at both ends for the specific use.	1
	3.	Cable dead-ended, end sealed and labeled (serialized) properly.	3
D. Spliced			
	1.	Improper materials/methods used for splicing, or evidence of loose joints.	1
	2.	Splice located in bend of cable.	2
II. BANDING			
A. All Cable Runs			
	1.	Banding cuts cable outer jacket (banding too tight).	1
	2.	Banding compressing outer jacket (banding too tight but not cutting jacket).	3
	3.	Plastic tie wraps used in place of banding straps (metal banding strap required).	2
	4.	Cables secured to hanger with bailing wire or rope.	1
	5.	Bands cut and left in wireway.	2
	6.	Channel rubber not installed where required.	2
B. Horizontal Cable Runs			
	1.	Banding not installed at breakout hangers before and after penetrations or at change of direction of wireway.	2
C. Vertical Cable Runs			
	1.	No banding or loose banding (banding required on every hanger).	2
III.			
A. Cableways			
	1.	Cable hangers or hardware cutting into the cable jacket.	1

ITEM		CRITERIA	CATEGORY
	2.	Improper hanger spacing (Cable hangers are required at least every 32 inches except that hangers for multiple tier overhead aluminum decks shall be spaced every 16 inches).	2
	3.	Inadequate cableway support (hangers, hardware, tiers, or cable straps missing) or welds cracked.	2
	4.	Overload/Overcrowded cable hangers.	3
	5.	Maximum no. of tiers exceeded.	3
	6.	Inadequate fastener length.	3
	7.	One-half inch clearance between cable run and hangers above or structure not provided.	2
IV. EQUIPMENT			
	A. Covers		
	1.	Junction box or equipment covers loose or missing.	1
	B. Mounting		
	1.	Cable supporting the weight of equipment (power junction boxes, lighting fixtures switch boxes, etc.)	1
	2.	Missing loose or improperly installed mounting hardware on equipment.	2
	C. Cable Entrance		
	1.	Watertight penetrators not utilized for entrance to watertight equipment enclosures.	1
	2.	Drip loops, drip shields plastic sealer or bottom penetration not utilized for entrance to non-watertight drip proof equipment.	1
	3.	Cable can be moved in and out of tube. Improperly packed or not packed.	1
	4.	Nylon tube base loose in enclosure. (O-ring missing)	1
V. DECK/BULKHEAD PENETRATION			
	A. Non-watertight Deck or Bulkhead Cable Penetration		
	1.	No plastic sealer around cables through collars where required.	1
	2.	Chafing protection not installed at non-watertight deck or bulkhead cableway penetrations.	2

ITEM		CRITERIA	CATEGORY
	3.	Chafing ring overloaded.	3
	4.	Inadequate chafing protection and damage evidence.	1
B. Watertight Deck or Bulkhead Cable Penetration			
	1.	No plastic sealer around cable at stuffing tubes which are exposed to the weather. Note: If plastic sealer is installed at locations other than those exposed to the weather, it is not required to be removed.	2
	2.	Stuffing tube or kickpipe not utilized (cable installed without tube).	1
	3.	Unused stuffing tube or kickpipe not plugged.	1
	4.	Stuffing tube or kickpipe assembly incomplete (missing gland nut, packing, or pipe connector).	1
	5.	Stuffing tube assembly incorrect (improper packing).	2
	6.	Stuffing tube or kickpipe too large for size of cable.	3
	7.	Multiple cables in a single stuffing tube or kickpipe.	2
	8.	Stuffing tube or kickpipe damaged to point where complete assembly not possible (cracked welds, damaged threads, out-of-round, etc.) if firestop material is installed.	2
C. Watertight Deck or Bulkhead Penetrations Utilizing Multiple Cable Penetration			
	1.	Insert blocks, compression bolts or filler blocks missing.	1
	2.	Improper size blocks used for size cable installed violating watertight integrity.	2
	3.	Incorrect type of RTV used to seal armored cable through MCP blocks.	1
	4.	RISE type MCP not properly sealed.	1

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-75
DATE: ***01 OCT 2017***
CATEGORY: II

1. SCOPE:

1.1 Title: Circuit Breaker; repair

2. REFERENCES:

2.1 Equipment Technical Manual

3. REQUIREMENTS:

3.1 Identify and pull back associated cables and wiring. Mechanically remove each circuit breaker, using 2.1 for guidance.

3.1.1 Matchmark and retain mounting hardware and fasteners.

3.1.2 Protect exposed terminal connections and internal switchboard parts from dirt and damage.

3.1.2.1 Each phase shall be isolated and protected from other phases.

3.2 Disassemble each circuit breaker, using 2.1 for guidance.

3.2.1 Inspect and test electrical and mechanical components, assemblies, subassemblies, internal circuitry, and hardware to design characteristics and determine missing and defective components, circuitry, and hardware in accordance with 2.1.

3.2.1.1 Acceptance criteria for silver contacts is that wear shall be less than 50 percent of original thickness after dressing, contacts shall have no evidence of copper migration, and shall have no irregular, burnt, or pitted interface after dressing.

3.2.1.2 Acceptance criteria for non-silver contacts is that, after dressing, wear shall be less than 10 percent of original thickness and contacts shall have no irregular, burnt, or pitted interface after dressing.

3.2.2 Test internal wiring, coils, and transformers for open and short circuits and 500 volt megger insulation resistance to ground. Record readings. Minimum acceptable resistance to ground shall be one megohm.

3.2.3 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.2.1 and 3.2.2 to the SUPERVISOR.

3.3 Remove defective and install new electrical and mechanical components, assemblies, subassemblies, internal circuitry, and hardware. Install new electrical and mechanical components, assemblies, subassemblies, internal circuitry, and hardware where missing. New material shall conform to the requirements of 2.1 and shall be obtained from the Federal Stock System or the Original Equipment Manufacturer (OEM), except for non-restricted parts.

3.3.1 Clean each component free of dirt, lubricants, and other foreign matter.

3.3.1.1 Steam cleaning of circuit breakers is not authorized.

3.3.2 Resilver previously silver plated contacts in accordance with ASTM B 700.

3.3.3 Dress, burnish, adjust, and align arcing and main contacts (contacts that experience arcing in functional duty) in accordance with 2.1.

3.3.4 Replace existing cadmium-plated parts with zinc in accordance with ASTM A 153.

3.3.5 Dip and bake taped insulated coils and open transformers in varnish conforming to MIL-I-24092, Class 155.

3.3.5.1 Dip and bake insulated coils and open transformers in Dolph Varnish 1105, Epoxylite Esterlite 605, or Schenectady International Isolite 862M varnish in localities where MIL-I-24092 varnish does not meet state and local air pollution control district standards.

3.3.6 Remove existing and install new coil and transformer leads in place of those identified to be missing or defective.

3.3.7 Repair defective connections.

3.3.8 Free-up and adjust moving parts and latching mechanisms.

3.3.9 Lubricate the current-carrying parts (except for interrupting contacts) and sliding joints with lubricant conforming to MIL-L-87177, Type I, Grade B. Lubricate mechanical pivots, excluding latch roller face components, with high performance multi-purpose grease conforming to DOD-G-24508.

3.3.9.1 Apply new lubricant sparingly and wipe off excess.

3.3.10 Test and inspect molded and insulation parts in accordance with the following criteria:

3.3.10.1 Phase-to-phase dielectric strength 2,000 volts minimum.

3.3.10.2 Surface burn marks and hairline cracks are acceptable but shall not deteriorate the mold surface or impair physical strength. Cracks are not permitted in wall section between phase and a ground plane when there is a conducting part in contact with the wall section. Cracks should not exceed 0.75 inch in length, and in no case should be greater than 50 percent of the length of the surface in which the crack appears.

3.3.10.3 Surface cracks should not exceed 1.5 inches in length, and in no case should be greater than 50 percent of the length of the surface in which the crack appears.

3.3.10.4 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.3.10 to the SUPERVISOR.

(V) "SHOP TEST"

3.4 Shop test and inspect each motor operator and motor in accordance with 2.1.

3.4.1 Submit one legible copy, approved transferrable media, of a report to the SUPERVISOR listing defects.

(V) "SETTINGS AND MILLIVOLT DROP TEST"

3.5 Reassemble each circuit breaker and accomplish adjustments and settings in accordance with 2.1.

3.5.1 Align and true each set of stationary and movable contacts to the manufacturer's specifications.

3.5.2 Accomplish millivolt drop test to each set of contacts in accordance with 2.1 or Original Equipment Manufacturer (OEM) requirements.

(V) "TEST, CALIBRATION, AND ADJUSTMENT"

3.6 Test, calibrate, adjust, and certify the trip units of each circuit breaker for time delay and instantaneous trip settings in accordance with 2.1.

3.6.1 Accomplish a heat run test for repaired type ACB and AQB circuit breakers.

3.6.1.1 Connect each ACB type circuit breaker to a test set and apply rated current to each individual phase of the circuit breaker for 30 minutes. After 5 minutes, measure the voltage across the line to load contacts of each pole and calculate the contact impedance. Satisfactory impedance for 1,600-4,000 ampere ACB's is below 225 microhms, and below 1,050 microhms for 600-900 ampere ACB's.

3.6.1.2 Connect each AQB-type molded case circuit breaker to a test set and apply rated current to each phase simultaneously for one hour. The AQB shall not trip within that hour.

3.6.2 Submit one legible copy, in hard copy or approved transferrable media, of a report listing results of the requirements of 3.6.1 to the SUPERVISOR.

3.6.3 Attach a calibration label to the face of each circuit breaker denoting the name and location of the calibration facility and date of calibration. In the event there is insufficient room on the face of the circuit breaker, attach the calibration label to the right hand side of the breaker as viewed from the front.

3.7 Install and connect each circuit breaker.

(V)(G) "OPERATIONAL TEST"

3.8 Accomplish final adjustments and test operate each circuit breaker, including control and safety devices.

3.8.1 Close and trip each circuit breaker electrically from local and remote stations. Three consecutive successful times required.

3.8.1.1 Ensure generator heater interlock is de-energized by the generator circuit breaker.

3.8.2 Repeat the requirements of 3.8.1 manually.

4. NOTES:

4.1 Equipment technical manual will be listed in the invoking Work Item.

4.2 Repair and overhaul will be accomplished by the Navy Designated Overhaul Point (DOP) at Puget Sound Naval Shipyard, the OEM, or a commercial repair facility that has demonstrated to the SUPERVISOR the capability to perform the work. Capability to perform circuit breaker overhaul and repair work includes having the facilities, trained mechanics, and access to the OEM`s qualified parts and repair procedures. Use of non-qualified restricted parts violates the integrity of the circuit breaker, nullifying the breakers prior qualification under the QPL process. Restricted parts must be obtained from the OEM either directly or via (if available) the Federal stock system. If a restricted part is replaced with an unqualified part, the qualification

of the particular circuit breaker is revoked until the full set of QPL required tests are repeated and submitted to NAVSEA for approval.

4.3 Non-restricted parts are defined as nuts, bolts, screws, washers, lockwashers, cotter pins, O-rings, indicator lights, and indicator light globes (colored and clear) only.

4.4 The following ACB circuit breakers listed by manufacturer contain non-friable asbestos arc chutes:

4.4.1 SPD, ITE, ITE/Gould: 640R, 900RC, 901R, 1600R, 1600HR, 1600HRC, 2000HR, 2000RC (450V), 2601R, 2801R, 3200HR, 4000HR.

4.4.2 General Electric: all types.

4.4.3 Westinghouse: All DBN types.

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-76
DATE: 18 NOV 2016
CATEGORY: II

1. SCOPE:

1.1 Title: Waveguide and Rigid Coaxial Lay-Up; accomplish

2. REFERENCES:

2.1 Equipment Technical Manual

2.2 SE000-01-IMB-010, Navy Installation and Maintenance Book (NIMB), Section IX, Installation Standards (Source CD: N0002400003)

3. REQUIREMENTS:

3.1 Disconnect each dry air pressure line at last mechanical joint as designated by the SUPERVISOR and connect temporary nitrogen or dry air lay-up control/monitor panels and associated equipment to ship's dry air panel, using 2.1 for guidance.

3.1.1 Where lay-up conditions permit, ensure temporary nitrogen or dry air lay-up control/monitor panels are operational for continuous monitoring of temporary nitrogen or dry air in the equipment space(s).

3.2 Accomplish uninterrupted nitrogen or dry air lay-up for each waveguide and rigid coaxial cable in accordance with Paragraph 5-2.7 of 2.2 and lay-up procedures of 2.1.

3.2.1 Do not connect unregulated pressurized air to equipment sub-assemblies or components. Ensure that each temporary dry air pressure source is connected in accordance with lay-up procedures of 2.1 to prevent equipment damage due to over-pressurization. No pressurization shall be supplied to waveguide in excess of the normal operating pressures specified for that equipment.

3.2.2 Ensure temporary dry air meets the requirements of Paragraph 5-1.14 and 5-1.15 of 2.2, and the following:

3.2.2.1 Dew Point: Minus 40 degrees Fahrenheit at 80 PSIG.

3.2.2.2 Quality of Air: Filtered to remove all particulate matter greater than one micrometer and filtered for a total amount of

contamination (including oil contaminants) not to exceed one part per million by weight.

3.2.3 Pressurize each line as specified in the lay-up procedures of 2.1.

3.2.3.1 Where specific lay-up instructions are not available, pressurize those lines to 3 PSIG.

3.2.3.2 Install relief valve downstream of temporary source, setting relief pressure at 5 PSIG.

3.2.4 Identify leaks in accordance with Paragraph 5-2.7.2 and 5-2.7.3 of 2.2.

3.2.4.1 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.2.4 to the SUPERVISOR.

3.3 Remove temporary pressurization when directed by the SUPERVISOR.

3.3.1 Connect the dry air pressure line disconnected in 3.1.

3.3.2 Purge and pressurize in accordance with Paragraph 5-2.7 of 2.2.

4. NOTES:

4.1 Equipment technical manual will be listed in the invoking Work Item.

4.2 Where lay-up conditions permit, ensure equipment's dry air control/monitor panels are operational for continuous monitoring of temporary dry air in the equipment space(s).

ITEM NO: 009-104
DATE: ***01 OCT 2017***
CATEGORY: II

1. SCOPE:

1.1 Title: Vibration Testing and Analysis; accomplish

2. REFERENCES:

2.1 S9073-AX-SPN-010/MVA, Vibration Analysis, Machinery

2.2 Equipment Technical Manual

3. REQUIREMENTS:

3.1 Minimum personnel qualifications:

3.1.1 For vibration testing, personnel shall have the equivalent of 1,000 man hours of combined experience in: vibration concepts and terminology, the use of vibration equipment, performing equipment calibration, using electronic data collectors for monitoring and recording of vibration data, the attachment of transducer mounting disks and blocks, the selection and location of transducers, calculating machine frequencies, and have a qualified Vibration Category I certification from the Vibration Institute, or equivalent experience and training.

3.1.2 For vibration analysis, personnel shall have the equivalent of 3,000 man hours experience in: the use of FFT analyzers and data collectors, identifying machinery faults, performing spectral analysis, performing vibration testing, and have a knowledge of the engineering units involved, have a qualified Vibration Category II certification from the Vibration Institute, or equivalent experience and training.

3.1.3 Submit one legible copy, in hard copy or approved transferrable media, of written substantiation of the credentials of the personnel to the SUPERVISOR 7 days prior to the start of vibration testing.

3.1.3.1 Submit any change of certification and/or personnel as it occurs to the SUPERVISOR.

(V) "TESTING AND ANALYSIS"

3.2 Accomplish vibration testing and analysis of the equipment in accordance with 2.1, using the ship’s applicable Vibration Test and Analysis Guide (VTAG), and the following.

3.2.1 Test the equipment at normal operational speed and load, using 2.2 for guidance.

3.2.2 Vibration data shall be recorded after obtaining stabilized bearing temperatures for continuous duty equipment.

3.2.2.1 Prior to collecting any data, operate pumps with electric motor drivers a minimum of 4 hours.

3.2.2.2 Operate pumps with auxiliary turbine drivers a minimum of 2 hours.

3.2.2.3 Operate other equipment a minimum of one hour.

3.2.2.4 For auxiliary turbine drivers or other variable speed equipment, data shall be acquired within plus or minus 5 percent of the specified speed.

3.2.3 Intermittent or special duty equipment shall have vibration data collected during the normal operating cycle.

3.2.4 Acceptable vibration data results shall not exceed like unit average machine values (statistically averaged signatures maintained in the ship's/Class program database). New or newly overhauled units shall be compared to the Mean plus one Standard Deviation of the statistically averaged machine data as criteria. If only one component, the driver or the driven component, was replaced or overhauled and no repair action was accomplished to the other, the unit vibration signature shall be compared to the Mean plus 2 Standard Deviations of the statistically averaged machine data as criteria.

3.2.5 If VTAG information is not available, collect and analyze vibration data in accordance with the following:

3.2.5.1 Record vibration data in accordance with Paragraph 3.1.2 and 3.3 of 2.1.

3.2.5.2 Vibration data shall not exceed the criteria of Paragraph 3.4.3 of 2.1.

3.2.5.3 Test equipment in accordance with 3.2.1 through 3.2.3.

3.2.5.4 For reciprocating machinery, take a minimum of 2 data points, one at each end of the crankshaft centerline, or as close to centerline as possible.

3.2.5.5 Number each vibration measurement location, starting on the driver end furthest from the driven unit. For 2 drivers on a single driven unit, the numbering shall be from one driver end to the other. For 2 driven units from a single driver, the numbering shall be from one driven unit to the other.

3.2.5.6 Provide a sketch of the unit with the following information:

Drive Unit(s)
Driven Unit(s)
Location of Bearings
Location and numbering of vibration measurement points

3.2.5.7 Scale vibration amplitudes on plot to show the best representation of the magnitudes.

3.2.5.8 For machinery consisting of a drive and driven unit, take vibration data on both pieces of equipment, even if only one piece of equipment was subject to overhaul, to allow a complete analysis of the vibration data, including vibration transmitted between the pieces of equipment.

3.2.6 Record results of vibration analysis on a test data sheet, Attachment A.

3.2.6.1 Submit one legible copy, in hard copy or approved transferrable media, of the following to the SUPERVISOR within 2 days of completion of vibration analysis:

Completed Attachment A
Machine's vibration data plots
VTAG applicable to the machine
Average machine values applicable to the machine

4. NOTES:

4.1 Equipment performance shall satisfy vibration requirements of specific average machine values if the machinery item is included in the ship's machinery vibration analysis (MVA) program. Such programs are in compliance with 2.1 and depend on the ship's applicable VTAG to identify machinery, provide pertinent measurement locations, numbering conventions, test conditions, manufacturer's configuration information, analysis ranges and major forcing frequencies.

4.2 For surface ships, other than aircraft carriers, VTAG and average machine values are available from Technical Points of Contact (TPOCs) at 215-897-***8471*** or 215-897-***7424***.

4.3 For aircraft carriers, VTAG and average machine values are available from Supervisor of Shipbuilding Newport News, Aircraft Carrier Planning Office (757-688-5183).

4.4 Equipment Technical Manual will be listed in the invoking Work Item.

4.5 For new or newly overhauled equipment, start of vibration testing can only commence upon satisfactory completion of shipboard operational

testing, which will be addressed in the invoking Work Item. Also consider any other adjacent work in the machinery space that may affect accomplishment of vibration testing.

ATTACHMENT A

MACHINERY VIBRATION ANALYSIS REPORT

DATE OF VIBRATION TEST: _____

SHIP NAME_____ HULL: _____

CONTRACT/JOB ORDER NO.:_____ WORK ITEM NO.:_____

IDENTIFY: DRIVER OVERHAULED ☐ YES ☐ NO
DRIVEN OVERHAULED ☐ YES ☐ NO

EQUIPMENT NAME: _____ EQUIP. NO.: _____

DRIVER MANUFACTURER: _____ SERIAL NO.: _____

DRIVEN MANUFACTURER: _____ SERIAL NO.: _____

VTAG USED: HULL APPLICABILITY: _____, SWAB: _____, MID: _____

RECORD ACTUAL OPERATING CONDITIONS:
(SPEED, LOAD, PRESSURE, ETC., OR OTHER CONDITIONS AFFECTING THE TEST)
_____
_____
_____
TEST RPM:_____

RECORD VIBRATION TEST EQUIPMENT USED:

COMPONENT	MANUFACTURER	MODEL
ANALYZER		
ACCELEROMETER		
CALIBRATOR		

REPORTING CONTRACTOR: _____

PRINTED NAME: _____

TESTS RESULTS: SAT ☐ UNSAT ☐ (Provide recommendation for corrective action(s) if UNSAT)
_____
_____
_____

SIGNATURE: _____ PHONE_____
SIGNATURE OF PERSON PERFORMING ANALYSIS (INDICATES VIBRATION TESTING IS COMPLETE INCLUDING RECORDING RESULTS/DATA)

ATTACH COPY OF VIBRATION SIGNATURES, APPLICABLE VTAG AND AVERAGE MACHINE DATA. FOR NON-VTAG UNITS, PROVIDE BASIC SKETCH.

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-113
DATE: ***18 NOV 2017***
CATEGORY: II

1. SCOPE:

1.1 Title: Rotating Electrical Equipment with a Sealed Insulation System (SIS); rewind

2. REFERENCES:

2.1 Standard Items

2.2 MIL-STD-2037, Procedure to Obtain Certification for Electric Motor Sealed Insulation Systems

2.3 Equipment Technical Manual

2.4 S9086-KC-STM-010/CH-300, Electric Plant - General

2.5 S9086-KE-STM-010/CH-302, Electric Motors and Controllers

2.6 S9086-KN-STM-010/CH-310, Electric Power Generators and Conversion Equipment

2.7 S9086-HN-STM-010/CH-244, Propulsion Bearings and Seals

2.8 S6260-BJ-GTP-010, Electrical Machinery Repair, Electric Motor, Shop Procedures Manual

2.9 MIL-STD-1310, Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety

2.10 9086-DA-STM-010/CH-100, Hull Structures

2.11 MIL-DTL-17060, MOTORS, ALTERNATING CURRENT, INTEGRAL-HORSEPOWER, SHIPBOARD USE

3. REQUIREMENTS:

3.1 Only Repair Activities certified by Naval Sea Systems Command (NAVSEA) in accordance with 2.2 may rewind motors with a Sealed Insulation System.

3.1.1 Submit one legible copy, in hard copy or approved transferrable media of the NAVSEA Certification Recertification letter confirming the Repair Activity has fulfilled the requirements for the Sealed Insulation System process. The NAVSEA letter shall indicate the type of motors and the range of motor frame sizes the activity is qualified to rewind.

3.1.2 Submit any change of certification as it occurs to the SUPERVISOR.

3.***2*** Prior to disconnecting equipment:

3.***2***.1 Record and retain electrical hook-up data.

3.***2***.2 Inspect each coupling for cracks, broken segments, wear, and misalignment in excess of tolerances specified in 2.3. Record and retain air gap readings. Record and retain bearing clearances for sleeve bearing equipment only.

3.***2***.3 Identify associated cables and wiring. Disconnect equipment mechanically, using 2.3 for guidance.

3.***2***.3.1 Matchmark, identify, and retain chocks, shims, shock mounts, sound damping pads, and other accessories associated with equipment.

3.***2***.3.2 Record shaft thrust and run out readings.

3.***3*** Remove equipment including rotating components connected directly to the shaft.

3.***3***.1 Remove entire vaneaxial and tubeaxial fan assemblies from the duct system and transport to the shop for repair.

3.***4 Accomplish a structural inspection of each foundation in accordance with 2.10***

3.***5*** Submit one legible copy, in approved transferrable media, of a report for electrical hook up data recorded in 3.3.1, mechanical inspection required by 3.3.2 through 3.3.3.2, and structural inspection required in 3.5 to the SUPERVISOR ***upon request***.

3.***6*** Matchmark, disassemble and inspect the equipment removed in 3.4, in accordance with the Repair Activity SISRP, using 2.3 through 2.8 for guidance.

3.***6***.1 Accomplish a core loss test prior to winding removal in accordance with the Repair Activity SISRP. Record data.

3.***6***.1.1 Conduct a loop test in accordance with Paragraphs 5.1.2.3.3(a) (1) through (16) or 5.1.2.3.3(b) (1) through (12) as applicable

of 2.2 when core indicates a marginal satisfactory reading or when test equipment does not directly support equipment being subjected to testing.

3.***6***.1.2 Inspect for hot spots in accordance with the Core Loss Tester Instruction Manual.

3.***6***.2 Remove each winding, in accordance with the Repair Activity SISRP for winding removal and 2.8 for core inspection.

3.***6***.2.1 Verify the temperature limitations of the core material prior to exercising the burnout oven option. The surface temperature of the laminated iron surface shall be determined by thermocouple and shall not exceed 370 degrees Centigrade (698 degrees Fahrenheit).

3.***6***.2.2 Record winding data. Verify conformance of recorded data to the manufacturer's winding data.

3.***6***.2.3 Accomplish a core loss test after winding removal in accordance with the Repair Activity SISRP. Record data.

3.***6***.2.4 Conduct a loop test in accordance with Paragraphs 5.1.2.3.3(a) (1) through (16) or 5.1.2.3.3(b) (1) through (12) as applicable of 2.2 when core indicates a marginal satisfactory reading or when test equipment does not directly support equipment being subjected to testing.

3.***6***.2.5 Inspect for hot spots in accordance with the Core Loss Tester Instruction Manual.

3.***6***.2.6 Dip core for preservation in accordance with the Repair Activity SISRP.

3.***6***.3 Protect machined surfaces. Accomplishment of cleaning and painting for equipment housing exterior, fan(s), interior and exterior of each end bell shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.***7*** Inspect each rotor for cracked bars, localized overheating, rubbing, insulation damage, and burns/hot spots. Record data.

3.***8*** Inspect and dimensionally measure end bells, frame, rabbet fits, shaft, sleeve and pedestal bearings, keyways, fan and running surfaces for wear, eccentricity, and other defects, using 2.3 for accept or reject criteria, and 2.7 for location and type of measurements to be taken. Record data.

3.***9*** Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.***6*** through 3.***8*** to the SUPERVISOR ***upon request***.

3.***10*** Rewind the equipment in accordance with the Repair Activity SISRP and the Original Equipment Manufacturer's (OEM) "for Navy use" winding data.

3.***10***.1 Do not permanently connect winding until after successful completion of testing of 3.***10***.3 through 3.***10***.7.

3.***10***.2 Material shall be in accordance with the Repair Activity SISRP.

3.***10***.2.1 New temperature detectors shall be in accordance with 2.3.

(V) "INSULATION RESISTANCE TEST"

3.***10***.3 Accomplish 500-volt megger insulation resistance test in accordance with the Repair Activity SISRP.

(V) "DC RESISTANCE TEST"

3.***10***.4 Accomplish a ***phase resistance balance test*** of windings, using a Wheatstone or Kelvin bridge, or with an ohmmeter capable of resolving one milliohm (0.001 ohm) in accordance with the Repair Activity SISRP ***and 3.6.1 of 2.11*** for guidance. Record phase balance for multi-phase equipment.

(V) "VOLTAGE SURGE TEST"

3.***10***.5 Accomplish a voltage surge test in accordance with the Repair Activity SISRP.

(V) "DC HI POT TEST"

3.***10***.6 Accomplish a DC HI POT test in accordance with the Repair Activity SISRP.

3.***10***.7 Accomplish 500-volt megger insulation resistance test in accordance with the Repair Activity SISRP.

3.***11*** Permanently connect the windings.

3.***11***.1 Repeat tests described in 3.***10***.3 through 3.***10***.7.

(V) "VARNISH TEMPERATURE, VISCOSITY, AND GEL TIME TESTS"

3.***12*** Select varnish methods and material in accordance with the Repair Activity SISRP.

3.***12***.1 Maintain the varnish in accordance with the Repair Activity SISRP and the varnish manufacturer's instructions.

3.***12***.2 Maintain a current revision of the varnish manufacturer's instructions on storage, maintenance, and use of the type of varnish to be applied.

3.***12***.3 Maintain a record, in accordance with the Repair Activity SISRP, of varnish temperature, viscosity, and, for solventless varnish, gel time tests. Tests must show varnish is within varnish manufacturer's recommendations and have been accomplished in the intervals specified by the varnish manufacturer. The record must also show the varnish is being stored as recommended by the varnish manufacturer.

3.***13*** Insulate the windings using the Vacuum Pressure Impregnation (VPI) procedure in accordance with the Repair Activity SISRP.

3.***13***.1 Do not immerse the leads.

3.***13***.2 Wipe surfaces that affect assembly such as rabbet fits and mounting flanges with a cloth moistened with a solvent after draining and before baking.

3.***14*** Remove excess varnish runoff from the component locations described in 3.14.2 after final baking.

3.***15*** Prime equipment housing, fan(s), and end bells with one coat F-84 Alkyd Zinc Molybdate TT-P-645 (1.5 mils dry film thickness).

3.***16*** Submerge wound assembly in fresh water for 24 hours.

3.***17*** Accomplish a Submerged Insulation test in accordance with the Repair Activity SISRP. Record data.

3.***18*** Accomplish a 500-volt megger dry insulation resistance test in accordance with the Repair Activity SISRP. Record data.

3.***19*** Accomplish an AC HI POT test in accordance with the Repair Activity SISRP. Record data.

3.***20*** Accomplish a Surge Comparison test in accordance with the Repair Activity SISRP. Record data.

3.***21*** Accomplish a 500-volt megger dry insulation resistance test in accordance with the Repair Activity SISRP. Record data.

3.***22*** Measure resistance value of each winding temperature detector, using a low voltage ohmmeter. Record data.

3.***23*** Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.***17*** through 3.***22*** to the SUPERVISOR ***upon request***.

3.***24*** Accomplishment of the balancing requirement for each rotating assembly shall be in accordance with NAVSEA Standard Items (See Note 4.10).

3.***25*** Install each identification marker on wiring in the external connection box.

3.***25***.1 Markers shall be aluminum wrap-around type with metal stamped or embossed markings.

3.***26*** Repair lightly scored areas of frame, end bells, and shaft by manual methods. Recondition threads and fit key to keyway. Step keys shall not be used.

3.***26***.1 Apply a thin coat of petrolatum to unpainted mating surfaces except for explosion-proof motors that shall have clean, dry mating surfaces.

3.***27*** Prepare and refinish equipment. Protect machine surfaces, windings, and nameplates from being painted or otherwise damaged.

3.***27***.1 Accomplishment of cleaning and painting for housing, fan, and interior and exterior of each end bell shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.***28*** Accomplishment of cleaning and painting for foundations of the equipment removed in 3.***3*** shall be in accordance with NAVSEA Standard items (See Note 4.9).

3.***29*** Accomplish the following on equipment having other than sleeve-type bearings unless otherwise specified in the invoking Work Item, using 2.8 for guidance.

3.***29***.1 Except as indicated in 3.30.1.1 (utilizing Attachment A for guidance), install new bearings, seals, fittings, lock washers, and locknuts conforming to 2.3, using 2.7 and Chapter 6 of 2.8 for guidance.

3.***29***.1.1 Install Type 111, Class 8 (double seal) bearings in motors meeting the criteria identified in Chapter 6 of 2.8. Only double seal bearings identified in Chapter 6 of 2.8 are acceptable for this use.

3.***29***.1.2 For vaneaxial and tubeaxial fan motors not meeting the criteria of Chapter 6 of 2.8, if not originally furnished or already accomplished during previous repair, install Type 111, Class 8 (double seal) bearings with a C3 (greater than normal) radial internal clearance in place of the Type 111 bearing originally furnished. Install Type 120 bearings in vaneaxial and tubeaxial fan motors originally furnished with Type 120 bearings.

3.***29***.1.3 Install each new label plate with the inscription "DO NOT LUBRICATE" on equipment using double seal bearings (Type 111, Class 8 or Type 120).

3.***29***.1.4 For equipment converted from re-lubricable bearings to double seal bearings, install pipe plugs on all grease fills and drains.

3.***29***.1.5 For equipment converted from lubricated bearings to double seal bearings, submit one legible copy, in approved transferrable

media, of a report that reflects the change in the maintenance requirements for the converted motor.

3.***29***.2 For equipment not using double seal bearings, lubricate bearings with grease conforming to DOD-G-24508 as required in Paragraphs 244-1.7.7.2 and 244-1.7.7.3 of 2.7.

3.***30*** Assemble the equipment disassembled in 3.***6***, using 2.3 through 2.8 for guidance.

3.***30***.1 Do not use materials containing silicone in the repair and reassembly of equipment with commutator or collector rings.

3.***30.2*** Install each new gasket on covers, inspection plates, and between the external connection box and the frame. Gaskets shall conform to MIL-PRF-1149 unless otherwise specified in 2.3.

3.***30.3*** Adjust air gap as specified in 2.3, plus or minus 10 percent.

3.***30.4*** Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly shall not be allowed.

3.***30.5*** Install each label plate conforming to MIL-DTL-15024 for those identified to be missing or damaged.

(V) "NO-LOAD SHOP TEST"

3.***31*** Accomplish a no-load shop test of the motor for a minimum of one-half hour.

3.***31***.1 Verify proper direction of rotation.

3.***31***.2 After one-half hour, record current and voltage in each phase, speed and bearing temperature rise measured on the equipment's exterior near each bearing.

3.***31***.3 Submit one legible copy, in approved transferrable media, of the recorded data to the SUPERVISOR ***upon request***.

(V) "OPERATIONAL SHOP TEST (FOR VANEAXIAL/TUBEAXIAL FANS - ASSEMBLY COMPLETELY REASSEMBLED)"

3.***32*** With the vaneaxial/tube axial fan reassembled, accomplish an operational test for one hour after bearing and stator temperatures stabilize within one degree C for three consecutive 15-minute intervals.

3.***32***.1 Verify proper direction of rotation.

3.***32***.2 Record current, voltage, frame and bearing temperature rise and speed at 15-minute intervals.

3.***32***.2.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit, unless otherwise specified in the invoking Work Item or equipment technical manual.

3.***32***.3 Measure and record hot insulation resistances of winding to ground immediately upon completion of the operational shop test, using a 500-volt megger.

3.***32***.4 Submit one legible copy, in approved transferrable media, of the recorded data to the SUPERVISOR ***upon request***.

3.***33*** Install equipment removed in 3.***2***.

3.***33***.1 Install each new gasket conforming to MIL-PRF-900 on disturbed ventilation.

3.***33.2*** Align equipment in accordance with 2.3. Measure and record facial and peripheral coupling data.

3.***33.2***.1 Install chocks, shims, shock mounts, and sound damping pads.

3.***33.2***.2 Accomplishment of pump and driver shaft alignment shall be in accordance with NAVSEA Standard Items (See Note 4.11).

3.***33.3*** Connect electrical cables to equipment, using data retained in 3.***2***.1.

3.***33.4*** Bond and ground equipment in accordance with 2.9, using new ground straps.

3.***33.5*** Rotate shaft by hand a minimum of 3 revolutions. Rubbing or binding of rotating assembly not allowed.

3.***33.6*** Measure and record the air gap and bearing clearance (sleeve bearing equipment only), insulation resistance (at 500 volts DC), and thrust.

3.34 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.2.2 through 3.2.3.2, 3. through 3.8, 3.17 through 3.22, 3.31 and 3.32 to the SUPERVISOR.

(V)(G) "OPERATIONAL TEST"

3.35 ***(For continuous duty motors)*** Accomplish an operational test of the assembled equipment at full system capacity for a minimum of one hour after bearing and stator temperatures stabilize within one degree C for three consecutive 15 minute intervals, unless otherwise specified in the invoking Work Item. If temperatures do not stabilize in four hours, stop test and contact the SUPERVISOR.

3.35.1 Verify proper direction of rotation.

3.35.2 Record current, voltage, frame and bearing temperature rise, and speed at 15-minute intervals. Frame and bearing temperature rise and speed is not required for vaneaxial and tubeaxial fan assemblies.

3.35.2.1 Bearing temperatures shall not exceed 180 degrees Fahrenheit unless otherwise specified in the invoking Work Item/equipment technical manual.

3.35.3 Measure and record hot insulation resistances of windings to ground immediately upon completion of test, using a 500-volt megger.

3.36 (For two speed motors) Accomplish an operational test at low speed in accordance with 3.35. Repeat 3.35 for high speed.

3.36.1 Accomplish the requirements of 3.35.1 through 3.35.3.

3.37 (For limited duty motors) Accomplish the requirements of 3.35 for a period of time equal to the duty cycle of the motor.

3.37.1 Accomplish the requirements of 3.35.1 through 3.35.3. For motors with a duty cycle equal to or less than 30 minutes, record data every 10 minutes.

3.***38*** Submit one legible copy, in hard copy or approved transferrable media, of a report listing data recorded in 3.***33.2***, 3.***33.8***, 3.35.2, and 3.35.3 to the SUPERVISOR.

4. NOTES:

4.1 This Standard Item is concerned primarily with the requirements to rewind rotating electrical equipment with a sealed insulation system in accordance with 2.2. Each Certified Repair Activity has developed a SIS Rewind Procedure (SISRP) that has been reviewed, approved by and filed with NAVSEA. In most cases, these Repair Activity SISRPs are treated as proprietary and may not be available to the SUPERVISOR for process review. The NAVSEA approved Repair Activity SISRP is the guiding document by which the equipment is to be rewound and supersedes any specification detailed in this Standard Item.

4.2 Equipment technical manual, Allowance Parts List (APL) (if applicable) and drawings will be listed in the invoking Work Item.

4.3 Shop test of generator will be addressed in the invoking Work Item.

4.4 The use of silicone is not allowed on any rotating electrical machinery containing brushes.

4.5 For the current list of NAVSEA-certified facilities for Vacuum Pressure Insulation (VPI) Sealed Insulation Systems, contact Naval Surface Warfare Center Carderock Division, Department 934, Phone (215) 897-7245.

4.6 Utilize Attachment A for determination if the Navy's motor bearing conversion program for Extended Life Double Seal (ELDS) ball bearings is permissible.

4.7 MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation) bearings are considered to be Long Lead Time (LLT) material. It is recommended these bearings be provided as Government Furnished Material (GFM).

4.8 Data received in 3.29.1.5 shall be forwarded to the SUPERVISOR for the purpose of initiating action ensuring shipboard databases such as the Equipment Guidance List (EGL) are updated to reflect the change in maintenance requirements for converted motors. Additionally, where APL changes are initiated to convert to ELDS bearings, a COSAL feedback report shall be submitted, providing the NSN and part number for the ELDS bearing by the SUPERVISOR. Utilize the following website to initiate changes to Technical Manuals, APLs, etc.: http://www.navy311.navy.mil.

4.9 If cleaning and painting of 3.***6***.3, 3.***27***.1, or 3.***28*** is required; the use of Category II Standard Item 009-32 "Cleaning and Painting Requirements; accomplish" of 2.1 will be specified in the Work Item.

4.10 If balancing of rotating equipment of 3.24 is required; the use of Category II Standard Item 009-15 "Rotating Machinery; balance" of 2.1 will be specified in the Work Item.

4.11 If pump and driver shaft alignment of 3.***33.2***.2 is required; the use of Category II Standard Item 009-58 "Pump and Driver Shaft Alignment; accomplish" of 2.1 will be specified in the Work Item.

ATTACHMENT A

1. To reduce motor maintenance and repair costs, the NAVY has implemented a program that allows for the use of Extended Life Double Seal (ELDS) bearings.

2. LIMITATIONS: The ELDS program does NOT apply to motors that are under the cognizance of NAVSEA 08.

3. APLs for motors meeting the conversion criteria requirements have been modified to identify ELDS bearings. In these cases, the APL bearing criteria will override any specifications delineated in the equipment technical manual or the motor "Original Equipment Manufacturer (OEM)" drawings. If ELDS bearings are not indicated in an APL, the following motor criteria must meet the applicability specifications for motors to undergo conversion to ELDS bearings:

3.a Motor must be installed on a surface ship and must NOT be under the cognizance of NAVSEA 08.

3.b Commercial motors are not eligible. Motors must have been furnished to the NAVY in accordance with MIL-DTL-17060 (Motors, Alternating Current, Integral Horsepower, Shipboard use), MIL-M-17413 (Motors, Direct Current, Integral H.P., Naval Shipboard [NAVY]) or MIL-M-17059 (Motors, 60 Cycle, Alternating Current Fractional H.P. [Shipboard Use]).

3.c Motors using one or more noise-quiet bearings per MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation) are NOT eligible for ELDS conversion.

3.d Bearings originally furnished with the motor must be type 111 bearings per FF-B-171. Motors are NOT to be considered as candidates for ELDS conversion in situations where the equipment technical manual and/or the OEM motor drawings originally specified FF-B-171 bearings but have notes indicating that replacement bearings are to be in accordance with MIL-B-17931 (Bearings, Ball, Annular, For Quiet Operation).

3.e The use of ELDS bearings is limited to motors where the full load speed and the size of both bearings are as follows:

1. Maximum bearing size 306 or 206 and full load rpm between 1,801 and 3,600 rpm.

2. Maximum bearing size 313 or 213 and full load rpm between 1,201 and 1,800 rpm.

3. Maximum bearing size 318 or 218 and full load rpm less than 1200 rpm.

4. The repair process using ELDS bearings includes the following requirements:

4.a Only ELDS bearings, in accordance with the following table (Attachment A / Table 1), can be used. Other double seal bearings will not provide an acceptable bearing life.

Attachment A / Table 1

ELDS Bearings NSNs and Part Numbers

SIZE	P/N	NSN
201	6201-2RS1C3/GHY	3110-01-492-0221
202	6202-2RS1C3/GHY	3110-01-491-0233
203	6203-2RS1C3/GHY	3110-01-491-0234
204	6204-2RS1C3/GHY	3110-01-491-6636
205	6205-2RS1C3/GHY	3110-01-451-9166
206	6206-2RS1C3/GHY	3110-01-451-9165
207	6207-2RS1C3/GHY	3110-01-451-9164
208	6208-2RS1C3/GHY	3110-01-451-9170
209	6209-2RS1C3/GHY	3110-01-451-9252
210	6210-2RS1C3/GHY	3110-01-492-1831
211	6211-2RS1C3/GHY	3110-01-518-0937
303	6303-2RS1C3/GHY	3110-01-493-3750
304	6304-2RS1C3/GHY	3110-01-451-9153
305	6305-2RS1C3/GHY	3110-01-451-9158
306	6306-2RS1C3/GHY	3110-01-451-9159
607	6307-2RS1C3/GHY	3110-01-451-9161
308	6308-2RS1C3/GHY	3110-01-451-9167
309	6309-2RS1C3/GHY	3110-01-451-9168
310	6310-2RS1C3/GHY	3110-01-490-6683
311	6311-2RS1C3/GHY	3110-01-492-0223
312	6312-2RS1C3/GHY	3110-01-490-6848
313	6313-2RS1C3/GHY	3110-01-492-0191

314	6314-2RS1C3GHY	3110-01-492-0226
315	6315-2RS1C3/GHY	3110-01-494-0993
316	6316-2RS1C3/GHY	3110-01-492-0188
317	6317-2RS1C3/GHY	3110-01-492-0219
318	6318-2RS1C3/GHY	3110-01-493-3749

4.b Both bearings of each converted motor must be ELDS bearings.

4.c A label plate must be permanently attached to the motor indicating "Do Not Lubricate".

4.d Grease fills and drains, if present, must be fitted with a pipe plug, securely fastened. Fittings to accommodate grease guns must be replaced with pipe plugs."

ATTACHMENT B

SECTION 1. NAME PLATE DATA

EQUIPMENT _____ **USS** _____

MFGR _____ **TYPE** _____ **FRAME** _____

HP _____ **INSULATION CLASS** _____ **TEMP. RISE** _____ ***C/*F** _____

VOLTS _____ **AMPS** _____ **CYO** _____ **R/M** _____ _____
PHASE

SERIAL NO. _____ **ADDITOINAL DATA** _____

SECTION 2. INPLACE INSPECTION

CAUTION: OBSERVE APLICABLE SAFETY PROCEDURES

SATISFACTORY
UNSATISFACTORY

_____INSULATION RESISTANCE IN MEGOHMS (REFER TO TABLE 3-2)_____

POLARIZATION INDEX TEST 1 MIN _____ 10 MIN_____ RATIO _____

_____ MECHANICAL CONDITION (REFER TO PARAGRAPH 3-6) _____

_____ CONTINUITY OF WINDINGS (REFER TO PARAGRAPH 3-5.1) _____

_____ CURRENT BACLANCE (USE LIMITS PRESCRIBED IN PARAGRAPH 3-10) _____

_____ CONDITION OF BRUSHED AND COMMUTATOR _____

_____ CONDITION OF CABLES AND CONTROLLER TO MOTOR _____

_____ CONDITION OF CONTROLLER _____

SECTION 3. INCOMING INSPECTION (GENERAL)

SURGE TEST	1-2	
	SAT/UNSAT	
	2-3	SAT/UNSAT
	1-3	SAT/UNSAT
INSULATION RESISTANCE TO GROUND		MEGOHMS
RESISTANCE BALANCE	1-2	OHMS
WITH DIGITAL OHMETER	2-3	OHMS
	1-3	OHMS

ACTION **REWIND**
RECONDITION

ITEM NO: 009-113
FY-19

SECTION 4. RECONDITIONING

	AFTER STEPS OF:	
	CLEANING	**DRYING**
INSULATION RESISTANCE (MEGOHMS)		
PHASE RESISTANCE BALANCE TEST		
SURGE TEST (SAT/UNSAT)		
DC HIGH-POTENTIAL TEST		

ACTION **REWIND**
VARNISH

SECTION 5. AFTER RECONDITIONAING OR REWINDING AND VARNISHING

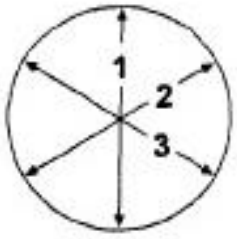
INSULATION RESISTANCE			**MEGOHMS**		
POLARIZATION INDEX TEST	**1 MIN**	_____	**10 MIN**	_____	**RATIO** _____
RESISTANCE BALANCE WITH DIGITAL OHMMETER			**1-2**	_____	**OHMS**
			2-3	_____	**OHMS**
			1-3	_____	**OHMS**
SURGE TEST				_____	**SAT/UNSAT**
AC HIGH-POTENTIAL TEST				_____	**SAT/UNSAT**
INSULATION RESISTANCE AFTER AC HIGH-POTENTIAL TEST				_____	**MEGOHMS**
NO-LOAD TEST			**PHASE A**	_____	**AMPERES**
			PHASE B	_____	**AMPERES**
			PHASE C	_____	**AMPERES**

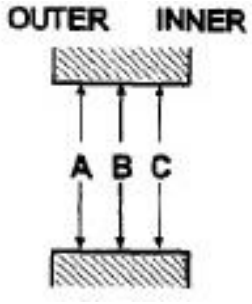
SHIPNAME & HULL NUMBER DATE MONTH/DAY/YEAR

MOTOR LOCATION (I.E., NO.2 MAIN FEED PUMP, ETC.)

HOUSING DIAMETERS

DRIVE END			
	A	B	C
1			
2			
3			

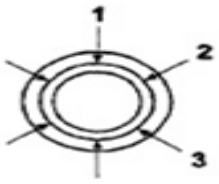


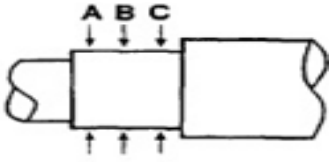


OUTER END			
	A	B	C
1			
2			
3			

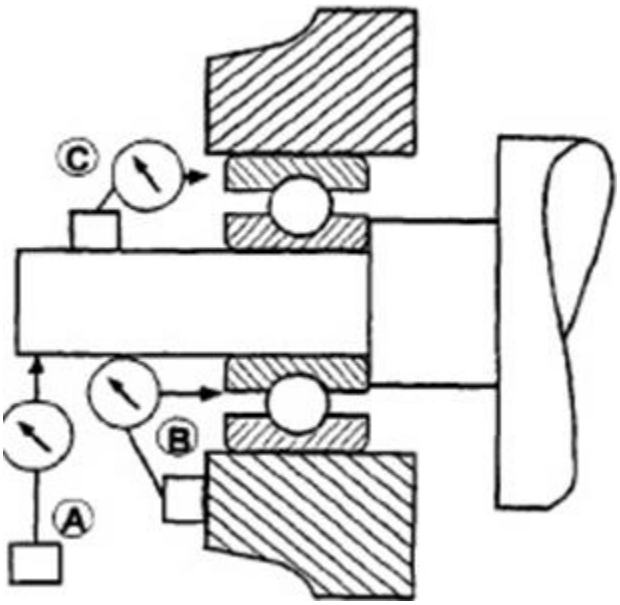
SHAFT DIAMETERS*

	DRIVE END			OUTER END		
	A	B	C	A	B	C
1						
2						
3						





FOR BEARING JOURNAL WIDTH LESS THAN 1 INCH ONLY SIX READINGS ARE REQUIRED.



A SHAFT RADIAL RUNOUT _____

B FACE RUNOUT, BEARING INNER RING
DRIVE END _____
OUTER END _____

C FACE RUNOUT, BEARING OUTER RING
DRIVE END _____
OUTER END _____

MECHANICAL CONDITION
(LOSS OF LUBE, BURNED ETC.)

_____
_____
_____
_____

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-117
DATE: 18 NOV 2016
CATEGORY: I

1. SCOPE:

1.1 Title: Combat Systems, Light-Off; support

2. REFERENCES:

2.1 Standard Items

2.2 S9095-AD-TRQ-010/TSTP, Total Ship Test Program

3. REQUIREMENTS:

3.1 Complete work in designated compartments and support systems prior to the Command, Control, Communications, Computer, Combat Systems and Intelligence (C5I) Light-Off (C5ILO) Key Event to the degree required to support uninterrupted completion of government AIT installations as well as all Stage 3 and follow-on C5I tests. Stage test definitions are detailed in 2.2. Designated compartments and support systems required to support AIT production and testing are listed in a Compartment Release Schedule (CRS) which is provided to the Lead Maintenance Activity (LMA) by the SUPERVISOR as Government Furnished Information (GFI). The selected Stage 3 through 7 or Operational Verification Tests to be conducted during the C5I Light-Off period are to be identified in the LMA's Integrated Test Schedule (ITS) required by SI 009-67 of 2.1.

3.1.1 Obtain from the SUPERVISOR, during the planning phase and no later than A-60, a C5I Compartment Release Schedule (CRS), indicating compartments and Combat Systems Support Equipment (CSSE) required in support of C5I Light-Off.

3.1.2 Ensure all work and testing required to meet CRS dates are fully integrated into the Integrated Production Schedule (IPS) and Integrated Test Schedule (ITS) required by 009-60 and 009-67 of 2.1. Include all work and testing planned for accomplishment by all organizations involved including Commercial Industrial Services (CIS) and Fleet Maintenance Activity (FMA).

3.2 Release compartments to the Government no later than the dates indicated in the approved CRS.

3.2.1 Submit one legible copy, in approved transferrable media, of a report listing the status of CRS completion including a list of preliminary C5I Light-Off discrepancies to the SUPERVISOR weekly beginning at A+30.

3.2.2 Notify the SUPERVISOR immediately upon determination of any discrepancies that cannot be corrected prior to scheduled compartment release dates for each compartment. Include the reason for the discrepancy and when applicable, highlight the new expected completion date on a revised CRS.

(V)(G) "JOINT INSPECTION"

3.2.3 Accomplish a joint inspection of the compartments to be released with the SUPERVISOR, PEO IWS designated Combat Systems Project Engineer (if assigned), and Ship's Commanding Officer (or designated representative), upon completion of industrial work and prior to the required release date per the CRS.

3.2.3.1 The joint inspection team shall document the discrepancies and determine if the scope and nature of work to correct the discrepancies will impede uninterrupted testing.

3.2.3.2 Identify each discrepancy as contractor responsible or government responsible. Develop and implement a discrepancy correction plan for contractor responsible discrepancies identified during the compartment inspection process that allows the release of compartments to the government in support of government responsible work.

3.2.3.3 Submit one legible copy, in approved transferrable media, of a report listing the discrepancies identified during each inspection that will impede testing and the discrepancies identified that will not impede testing, to the SUPERVISOR.

3.2.3.4 The joint inspection team identified in 3.2.3 will sign the report upon completion of discrepancy correction.

3.2.4 Allow no work in compartments released to the government until the end of the availability without written permission of the SUPERVISOR.

3.3 All industrial work in compartments and work on CSSE listed on the CRS shall be complete to the degree that allows for the safe and uninterrupted operation and testing of the ship's C5I equipment. When required, so as not to cause delays in the Light-Off test schedule, suitable temporary support systems and services may be considered acceptable but only after joint concurrence by the SUPERVISOR, PEO IWS Combat Systems Project Engineer (if assigned), and Ship's Commanding Officer.

3.3.1 Industrial work in 3.3 includes but is not limited to hot work, cutting, grinding, deck work (PRC, nonskid, Terrazzo, NOMEX) and spray painting. Repair and installation of electronics equipment, antennas, machinery, equipment, piping systems, gages, thermometers, meters, operating instructions and warning plates, remote shutdown devices, strainer shields, valves and hand wheels, access door and scuttles, ventilation systems,

lighting systems, electric cables and runs, alarm systems, ground straps, flex hose, resilient mounts, safety devices, interior communication systems, tachometers, and resiliently mounted pipe hangers must be completed. Newly installed or repaired gages, thermometers, and meters must be calibrated. Access routes need not be released but must be passable or alternate routes made available at all times. Services, either ship or shore based, must be available on a reliable basis. These services are dependent on ship class and include, but are not limited to, 60HZ/400HZ, Air Conditioning (AC), Chilled Water (CW), Firemain or AEGIS Salt Water Cooling pumps, Ventilation, Electronic Cooling Water (ECW) (demineralized water), Dry Air, High Pressure Air (HP), Low Pressure Air (LP), Fwd and Aft SPY skids (AEGIS only), Sonar skid, AN/SPS 49 skid, Command and Decision (C&D) skid (AEGIS only), AN/SLQ 32 Cooling Unit and CIWS heat exchanger. In addition, the Electric Plant Control Equipment (EPCE) console or remote 400HZ console must be available. Cabling from 60HZ Power panels, Chilled Water (CW) hoses (if CHW cooled) and routes must be intact to 400HZ converters. ECW modifications must be completed and all contractor flushes accomplished. If the ship is in dock, and installed equipment or systems (i.e. AC plants, Cooling Skids, Fire-main) must be placed in operation to support C5ILO, then acceptable means to contain overboard discharge(s) must be installed, when directed by the Supervisor.

3.3.2 When in the best interests of the test program, the SUPERVISOR may waive the requirement for final decking installation as part of the initial compartment release. In these cases, temporary decking to allow safe use of the space will be installed, and final decking installation will occur at a time that does not impede the test program.

3.3.3 C5I testing shall not begin in a compartment which has not been formally released per the joint inspection process in 3.2.3. When discrepancies prevent final compartment release, the SUPERVISOR, PEO IWS Combat Systems Project Engineer (if assigned), and Ship's Commanding Officer will determine if industrial work is completed to the degree allowing for the safe and uninterrupted operation and testing of the ship's C5I Systems and Combat Systems Support Equipment.

4. NOTES:

4.1 C5ILO is an availability Key Event scheduled to allow the start of a comprehensive testing and operation of the ships C5I equipment. C5ILO marks the Project Team’s and Combat Systems Project Engineer’s (if assigned) transition from industrial production work to testing and installation of alterations not able to be performed coincident with industrial work. If discrepancies which preclude uninterrupted testing are identified prior to C5ILO, those discrepancies must be corrected prior to the C5ILO Key Event being declared met.

4.2 The PEO IWS designated representative (if assigned) will provide all CRS documentation, including a list of spaces and systems/equipment along with required completion dates to the SUPERVISOR at A-240 for use in planning and contract award.

NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-123
DATE: ***01 OCT 2017***
CATEGORY: II

1. SCOPE:

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

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 shall 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 of production work.

3.1.2.1 Notify the SUPERVISOR of revisions to the list as they occur.

3.2 Submit one legible copy, in hard copy or approved transferrable media, of a report listing the written procedure for production work involving fiber optic connectors of fiber optic systems, cable plants and components, conforming to the requirements of 2.3 to the SUPERVISOR for review and approval, prior to the start of production work.

3.2.1 This procedure only requires a one-time submittal/approval unless the Standard Items or references change or are updated, and shall contain the following minimum information:

3.2.1.1 Reference of the appropriate fabrication document for which the procedure is applicable.

3.2.1.2 Qualification requirements for the personnel accomplishing the work.

3.2.1.3 Acceptance and rejection criteria.

3.3 Accomplish Navy Shipboard fiber optic installations in accordance with 2.3.

3.3.1 Accomplish a visual inspection of each fiber optic cable (conventional and Blown Optical Fiber (BOF)) in accordance with Method 6A1 of 2.3.

3.3.2 Install each new Fiber Optic Interconnection Box (FOICB), Tube Routing Box (TRB), patch panel, fusion splice tray holder, and cable in accordance with 2.3. |

3.3.2.1 Preserve the cable data package provided with new fiber optic cable. Retain the original cable data package with the unused portion of the cable.

3.3.2.2 Submit one legible copy, in hard copy or approved transferrable media, of a report containing a copy of each cable data package obtained in 3.3.2.1 and cable number listing of the cable measured from each reel to the SUPERVISOR ***upon request***.

3.3.3 Install each fiber optic cable and box to be protected from the weather in accordance with 2.3.

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

3.3.5 Use existing ship cableway and penetrations wherever possible. Penetrations shall be correct size in accordance with 2.3 and 2.***4***.

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

3.3.6 Install each new cable, cableway, and penetration in accordance with 2.3 to support work required by the individual Work Items.

3.3.7 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***.

3.3.8 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.

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

3.3.8.2 Accomplish inspection and cleaning of both fiber optic connectors prior to mating in accordance with Method 6M1 of 2.***3***.

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

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

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

3.3.12 Accomplish the tube seal verification test of Method 6J1 in accordance with 2.3 for BOF cables after installation of connectors.

3.3.13 Accomplish the ball bearing test of Method 6H1 in accordance with 2.3 for unused BOF tubes within BOF cables.

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

3.3.15 Accomplish the tube seal verification test of Method 6J1 in accordance with 2.3 for unused BOF tubes within BOF cables.

3.3.15.1 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachment A for optical measurements and Attachment B for BOF cable tests listing the results of 3.3.9 through 3.3.15 to the SUPERVISOR.

3.3.16 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.

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

3.3.17.1 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachment C listing results of the requirements of 3.3.17 to the SUPERVISOR.

3.3.18 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***3***.

3.3.19 Install connectorized cables to equipment, using system drawings or other technical documents. Light Duty connectors shall only be installed within fiber optic interconnection boxes (FOICBs) or within equipment enclosures/racks. Heavy Duty connectors shall be installed externally to equipment enclosures/racks.

3.4 Accomplish Navy shipboard 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, 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 shall be the correct size in accordance with 2.3 and 2.***4***. Penetrations not reused shall be blanked in accordance with 2.3 and 2.***4***.

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

3.4.3 Accomplish the visual inspection of Method 6A1 for each fiber optic cable (conventional and Blown Optical Fiber (BOF)) in accordance with 2.3.

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

3.4.5 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***3***.

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

3.4.7 Isolate and repair each fiber optic connector in accordance with Part 5 of 2.3 to support work required by the individual Work Items.

3.4.8 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***5***.

3.4.8.1 Ensure fiber optic connectors are not exposed to the industrial environment or weather.

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

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

3.4.11 Install new cable identification tags in accordance with Part 4 of 2.3, using 2.**7** for guidance.

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

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

3.4.14 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.

3.4.15 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.

3.4.16 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.

3.4.17 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.

3.4.18 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.

3.4.19 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachments A and C for optical measurements and Attachment B for BOF cable tests listing results of the requirements of 3.4.14 through 3.4.18 to the SUPERVISOR.

3.4.20 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***3***.

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

3.4.22 Identify and isolate each fiber optic cable designated for removal.

3.4.23 Remove each fiber optic cable designated for removal in its entirety.

3.4.23.1 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***.

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

3.4.23.3 Remove unused hangers from which cable was removed and which will not be reused, in accordance with Section 070a of 2.***9***.

3.4.24 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 of Method 6E1 ***or Method 6E2*** in accordance with 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 of Method 6L1 for single mode fiber links only in accordance with 2.3 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 by accomplishing 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.

3.5.6 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachments A and C for optical measurements and Attachment B for BOF cable tests listing results of the requirements of 3.5.1 through 3.5.5 to the SUPERVISOR.

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

3.6.1 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachment A listing the results of the requirements of 3.6 to the SUPERVISOR.

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 shall 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 shall be in accordance with NAVSEA Standard items (See Note 4.8).

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

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

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 and repurposed.

4.2 Definitions.

4.2.1 New Cable – a new fiber cable is defined as a cable not previously installed.

4.2.2 Pulled Back Cable – a pulled back fiber cable is defined as those which are disconnected and physically removed from a wireway, conduit, or cableway to protect the cable from industrial use.

4.2.3 Reused Cable – a reused fiber cable is defined as those cables disconnected from the equipment to facilitate equipment removal.

4.2.4 Rerouted Cable – a rerouted fiber cable is defined as those cables 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 repurposed fiber cable is defined as those which have had their fiber or non-fiber termination points changed. This could be the result of changing terminal board connections, connector reconfiguration, using spare conductors or fibers, or any change to the way the cable conductors or fibers are used.

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

4.7 If cableway inspection of 3.3.5.1 or 3.4.2.1 is required, the use of Standard Item 009-73 "Shipboard Electrical/Electronic Cable; remove, relocate, repair, and install" of 2.1 will be specified in the Work Item.

4.8 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.

4.9 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 TYPE[1]_____
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***)

NOTES: [1]RECORD MIL-SPEC NUMBER IF APPLICABLE.
[2]FOR LINK MEASUREMENTS ONLY.
[3]STANDARD COLORS: BLUE, ORANGE, GREEN, BROWN, SLATE, WHITE, RED, BLACK, YELLOW, VIOLET, PINK, AQUA.
[4]FOR SINGLEMODE AND MULTIMODE FIBER LINKS IAWMETHOD 6C1 ***OR 6C2*** OF REFERENCE 2.3.
[5]FOR SINGLEMODE FIBER LINKS ONLY IAW METHOD 6K1 OF REFERENCE 2.3.
[6]FOR 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 TYPE[1]_____
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)

NOTES: [1]RECORD MIL-SPEC NUMBER IF APPLICABLE.
[2]FOR EXAMPLE, TEST DIRECTION = "LOCATION 1 → LOCATION 2" OR VICE VERSA.
[3]IAW METHOD 6H1 OF OF REFERENCE 2.3.
[4]FOR EXAMPE, BB SIZE = "4.5 MILLIMETER(MM)".
[5]IAW METHOD 6J1 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 TYPE[1]_____
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)[4] (6E1/6E2)	TEST DIRECTION[5] (6E1/6E2)	CABLE LENGTH (M)

NOTES: [1]RECORD MIL-SPEC NUMBER IF APPLICABLE.
[2]STANDARD COLORS: BLUE, ORANGE, GREEN, BROWN, SLATE, WHITE, RED, BLACK, YELLOW, VIOLET, PINK, AQUA.
[3]IAW 6E1 or ***6E2*** OF REFERENCE 2.3.
[4]IAW 6L1 OF REFERENCE 2.3.
[5]FOR EXAMPLE, "SOURCE LOCATION → DETECTOR LOCATION".

CONNECTION LIST:_____ REMARKS:_____

SIGNATURE:_____