

MIL-STD-1682/7(SH)
27 October 1976

MILITARY STANDARD

**SHIPYARD INSPECTION AND CLEANING
PROCEDURES FOR SUBMARINES**

PART 7

**NAVIGATION CENTER
SSBN 627 CLASS**



FSC 1905

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DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, D.C. 20362

Shipyards Inspection and Cleaning
Procedures for Submarines, Navigation
Center SSBN 627 Class

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1. This Military Standard is approved for use by Naval shipyards during overhaul and conversion periods for submarines.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Ship Engineering Center, Center Building, SEC 6124, Prince George's Center, Hyattsville, Maryland 20782 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FOREWORD

This part provides inspection and cleaning procedures for the Navigation
water aboard SSBN 627 Class submarines.

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1. SCOPE

1.1 This part provides inspection and cleaning procedures for the Navigation Center (NC) aboard SSBN 627 Class submarines. In addition, it provides inspection and cleaning procedures for the Ventilation System cooling coil, ducts, and fans, and provides filter maintenance and replacement procedures. The basic standard and this part are to be considered as an integral single document.

2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on the date of invitation for bids form a part of this standard to the extent specified herein.

GOVERNMENTAL

SPECIFICATION

MIL-D-16791 - Detergents, General Purpose (Liquid, Nonionic)

(Copies of specifications, standards, drawings, and publications required of suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. DEFINITIONS

3.1 Clean. Clean is being free of all loose scale, rust, grit, filings, and other foreign substances; and free of oil, grease, and other organic materials.

3.2 Cleaning solvent. Cleaning solvents as used in this standard refer to water soluble (Type I) liquid detergent conforming to specification MIL-D-16791.

3.3 Dewpoint. The temperature at which condensation first occurs when a vapor is cooled.

4. REQUIREMENTS

4.1 General requirement.

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4.2 Safety and precautions.

Note: Listed below are warnings appearing in this procedure.
All personnel involved in operating and maintaining
equipment must fully understand the warnings.

4.2.1 Supplemental filter material used in this standard is a restricted use item and should be used only during construction and availability periods such as upkeep, conversion, and overhaul. Cyanide gas is generated when filter material burns; therefore, its use is prohibited at all other times.

4.2.2 Do not use flammable cleaning solvents or solvents in spray form.

4.2.3 Do not take MIL-D-16791 cleaning detergent internally. Keep out of eyes. If swallowed, induce vomiting and call a physician; for eyes, flush with plenty of water and get medical attention.

4.2.4 To avoid possibility of shock hazard, do not damp wipe areas around cable plugs and equipment jacks.

4.2.5 Ensure that proper warning tags are placed at power controller to prevent fans from being inadvertently energized during maintenance.

4.3 Materials.

4.3.1 Materials required to perform the normal inspection, cleaning, and associated maintenance procedures are as follows:

- (a) Containers for cleaning solution
- (b) Cleaning solvent, MIL-D-16791 (NSN 7930-00-282-9699 or equivalent)
- (c) Supplemental filter material (NSN 1G-9330-00-965-0481 or equivalent)
- (d) Coated cloth: fire retardant curtains (NSN 8305-00-082-5586/5587 or equivalent)
- (e) Portable vacuum cleaner (nonmetallic hose)
- (f) Assortment of sponges and wiping cloths
- (g) Lint-free cloth (NSN 7920-00-514-2420 or equivalent)
- (h) Masking tape (roll)
- (i) Thermometer
- (j) Fan cleaning kit (see figure 1)

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RADIATOR BRUSH-HORSEHAIR. TWISTED-IN-WIRE
CONSTRUCTION. BRUSH AREA: 2 1/4" DIA. X 6"
LONG OVERALL LENGTH IS 23"



NSN-7920-00-234-9317

COTTON YARN ON FLEXIBLE WIRE FRAME THAT CAN
BE REFORMED TO DESIRED SHAPES. 3" DIA. WITH
5" PLASTIC HANDLE.



OVERHEAD PIPE SWAB-4 PLY

NOTE: To facilitate
cleaning, suit-
able plastic
tubing or wood
extensions may
be attached to
these tools.
Also, the wire
handle brushes
may be bent to
a convenient
angle to clean
the fan blades.

WARNING - DO NOT USE
FLAMMABLE SOLVENT OR
SOLVENT IN SPRAY FORM.

GREY HAIR AND POLYPROPYLENE 11 1/2" OVERALL
LENGTH, 1 1/2" BRUSH TRIM AND 1 1/2" BRUSH FLARE.



PAINTED STYLE, WIRE HANDLE, ROUND FERRULE

BRUSH DESIGNED FOR USE WITH APPROVED
CLEANING SOLVENTS AND SOAP COMPOUNDS WITH
WATER. SIZE 10 WITH FIBER FILLER OF RED
MIX TAMPICO. 11 1/2" LONG.



WATER TOOL BRUSH

NSN-7920-00-252-4084

Figure 1. Cleaning kit

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4.4 Inspection and cleaning intervals.

4.4.1 Inspection, cleaning, and maintenance shall be performed at the following time periods. The following are minimum requirements. Clean more frequently if inspections indicate additional cleaning is required.

<u>Paragraph</u>	<u>Title</u>	<u>Inspection Frequency</u>	<u>Cleaning Frequency</u>
5.1	FBM navigation compartment inspection and cleaning	Daily	Daily and weekly
5.2	Check of differential pressure gage indication	Daily	Not applicable
5.3	Supplemental filter maintenance	Daily	Weekly
5.4	Filter replacement	Determined by 5.2	Determined by 5.2
5.5	Inspection and cleaning of navigation system ducts	Monthly	Once per overhaul
5.6	Cooling coil and air-intake duct inspection and cleaning	Monthly	Once per overhaul
5.7	Fan inspection and cleaning	Determined by 5.2	Once per overhaul

5. INSPECTION, CLEANING, AND MAINTENANCE PROCEDURES

Note: In various paragraphs in the following procedure, reference is made to an ESGM electronics unit and an ESGM navigation computer no. 3. This equipment may not be installed on all 627 Class SSBNs at the time these procedures are accomplished. If the equipment is not installed, disregard instructions pertaining to the equipment, but observe instructions pertaining to the equipment foundation.

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5.1 FBM NC inspection and cleaning.

5.1.1 After landing first piece of navigation equipment and before equipment turn-on, proceed as indicated in 5.1.1.1 through 5.1.1.6 (after equipment turn-on, proceed to 5.1.2).

5.1.1.1 Daily check that equipments exposed to possibility of damage, water leaks, hydraulic leaks, etc., are protected by suitable covers or padding.

5.1.1.2 Maintain environmental conditions to protect all navigation equipment against dust, dirt, moisture, or other foreign matter.

5.1.1.3 Ensure that wherever possible, access through the NC is restricted to reduce traffic, dirt, and grime, using suitable local procedures.

5.1.1.4 Daily inspect NC, and if necessary, clean as follows:

- (a) Remove dust, chips, etc., from work surfaces, exposed equipment, wire raceways, readily accessible areas of overhead, space above navigation equipment, bedplate, exposed foundations, deck, etc.
- (b) Empty refuse containers and splash pans.

5.1.1.5 Once per week, clean the NC as outlined in 5.1.1.4(a) and (b).

5.1.1.6 Daily take psychrometer readings to maintain the NC within conditions specified in table I.

Table I. Temperature and dewpoint limitations before equipment turn-on

DRY BULB READING		MAXIMUM DEWPOINT	
°FAHRENHEIT	°CELSIUS	°FAHRENHEIT	°CELSIUS
90*	32.2	81	27.2
85	29.4	78	25.6
80	26.7	75	23.9
75	23.9	71	21.7
70	21.1	68	20.0
65*	18.3	62	16.7

*Do not allow NC temperature to go above 90°F(32.2°C) or below 65°F(18.3°C). Use coolers, dehumidifiers, or heaters to prevent NC from going outside temperature limitations or exceeding maximum dewpoint at various temperatures.

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5.1.2 After equipment turn-on, perform 5.1.2.1 through 5.1.2.5.

5.1.2.1 Isolate the NC by arranging coated cloth (fire retardant curtains) at the following locations:

- (a) In port passageway separating ship control center directly aft of the ballast control panel including the area formerly occupied by the Type XI periscope booth.
- (b) In the aft end from bulkhead 58 at the stiffener between the A/D converter and the hatch to the back aft corner of the workbench. Arrange these curtains as much as practical from the overhead to the deck.

5.1.2.2 Rig coated cloth (fire retardant curtains) as much as practical in starboard passageway and aft from the overhead to the deck on starboard side (back side) of the workbench and extending forward in front of various heater controllers, heaters, fan controllers, and the ship's constant frequency power supply in the starboard passageway to the nonstructural bulkhead that separates the ship's control center from the NC.

5.1.2.3 Clean NC as follows on an as required basis, but at least as often as indicated below:

- (a) Install clean vacuum cleaner filter, and vacuum deck and protective coverings to remove accumulations of dust, dirt, or other foreign matter (daily).
- (b) Using wiping cloths and/or vacuum cleaner, remove dust from following, then dispose of cloths:
 - (1) Work surfaces, shelves, equipment (daily)
 - (2) Readily accessible overhead areas, wire raceways, bulkheads, and passageways (weekly)

WARNING

To avoid possibility of shock hazard, do not damp wipe areas around energized cable plugs and equipment jacks.

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- (c) Using a sponge and cleaning solution, damp wipe equipment and work surfaces as necessary to remove dirt not removed by dusting or vacuuming. Follow with damp wiping using clean, fresh water. Do not wipe switches, indicators, and lights (weekly).
- (d) Empty refuse containers and install replacement liner bag (daily).

5.1.2.4 Maintain NC within conditions stated in table II. Take psychrometer readings daily if NC relative humidity is 50% or less. If relative humidity is greater than 50%, take psychrometer readings every 4 hours. Each time psychrometer readings are taken, if any equipment listed below is operating, place a thermometer on one of the cabinets at its coldest point. If it appears that cabinet temperature will go below NC dewpoint, have temporary dehumidifiers and/or heaters installed in NC to lower dewpoint to ensure against condensation on navigation equipment or inside of an equipment if a drawer or cabinet is opened.

Navigation operational checkout console (NOCC)

Navigation control console (NCC)

Receiving Set, Sonar AN/BQN-3 recorder

Radio Navigation Set AN/BRN-3 receiver

LORAN sensor

A/D converter

D/D converter

SINS no. 1 or 2 console

Central navigation computer (CNC) no. 1 or 2

SINS gyromonitor console

Spare MARDAN

Magnetic tape unit (MTU)

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ESGM electronic unit

ESGM navigation computer no. 3

5.1.2.5 Daily inspect NC to ensure that equipment exposed to dust, dirt, moisture, or other foreign matter is protected as follows:

- (a) Equipments exposed to possibility of damage are protected by suitable covers or padding. Welding and grinding activities are isolated from other sections of NC by suitable containment; and access through NC is restricted to reduce traffic, dirt, and grime.
- (b) Machined surfaces, shock mounts, open connectors, ship's wiring terminations, open air conditioning penetrations, open-end pipes, etc., exposed to dust, dirt, moisture, or other foreign matter, are protected by suitable sealed coverings.

Table II. Temperature and dewpoint limitations after equipment turn-on

DRY BULB READING		MAXIMUM DEWPOINT* (with navigation equipment operating, utilizing cooling air from Navigation Equipment Cooling System)	
°FAHRENHEIT	°CELSIUS	°FAHRENHEIT	°CELSIUS
90 max**	32.2 max**	68	20
85	29.4	68	20
80	26.7	68	20
75	23.9	68	20
70	21.1	68	20
65 min**	18.30 min**	63	17.2

*If the dewpoint conditions stated are exceeded, temporarily install dehumidifiers and/or heaters in the NC to bring dewpoint condition within tolerance. Maintaining these conditions ensures that ambient air coming in contact with the navigation equipment or mixing with cooling air will not cause condensation.

**Take corrective action, e.g., spot coolers, dehumidifiers, heaters, etc., if these conditions exceed the indicated limits. If corrective action is not adequate, shut down navigation equipment until conditions return to the acceptable limits.

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5.2 Check of differential pressure gage indication.

5.2.1 Daily check (more frequently under extremely dirty conditions) to verify that differential pressure gage VH-323-GA-10 indicates between 0.4 and 2.0 inches water. If differential pressure gage indicates below 0.4 inch water or above 2.0 inches water, replace differential procedure filters per 5.4.

CAUTION

Air flow must not be restricted by stored or loose materials or damage to navigation equipment may result.

- Notes: 1. Gage indications below 0.4 inch water indicate tears or leaks in differential pressure filters or a gage malfunction. Indications between 0.4 and 2.0 inches water indicate normal filtering action. Indications greater than 2.0 inches water denote restricted air flow due to a clogged filter.
2. For equipment configuration, see figure 2 showing Navigation Ventilation System.

5.2.2 Daily inspect the navigation equipment air conditioning for the following:

- (a) That lint or dust-producing materials (such as rags) are not stored in the navigation equipment air conditioning room.

CAUTION

Ensure that any loose articles that might be drawn into differential pressure filters are kept well clear of intake.

- (b) That an area extending 2 feet in front of prefilters (no. 80) in the NC is clear of all obstructions and stored materials.

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* Indicates location of inspection and cleaning access covers. Inspection plates in CNC, ESGM D/D converter and MTU foundations not shown.

- A. FILTER 80
- B. FILTER 81
- C. COOLING COIL C-36
- D. FAN 66
- E. FAN 50
- 1. D/D CONVERTER, 250 CFM
- 2. A/D CONVERTER, 50 CFM
- 3. AN/BRN-3 RECEIVER, 120 CFM
- 4. CNC (2), 300 CFM
- 5. GME, 75 CFM
- 6. MTU, 300 CFM
- 7. LORAN SENSOR, 40 CFM
- 8. SPARE MARDAN, 210 CFM
- 9. SINS (2), 400 CFM/UNIT
- 10. AN/BRN-3 INDICATOR, 75 CFM
- 11. NAV CONTROL CSL, 250 CFM
- 12. NAV OPER CHECKOUT CSL, 200 CFM
- 13. ESGM - 520 CFM

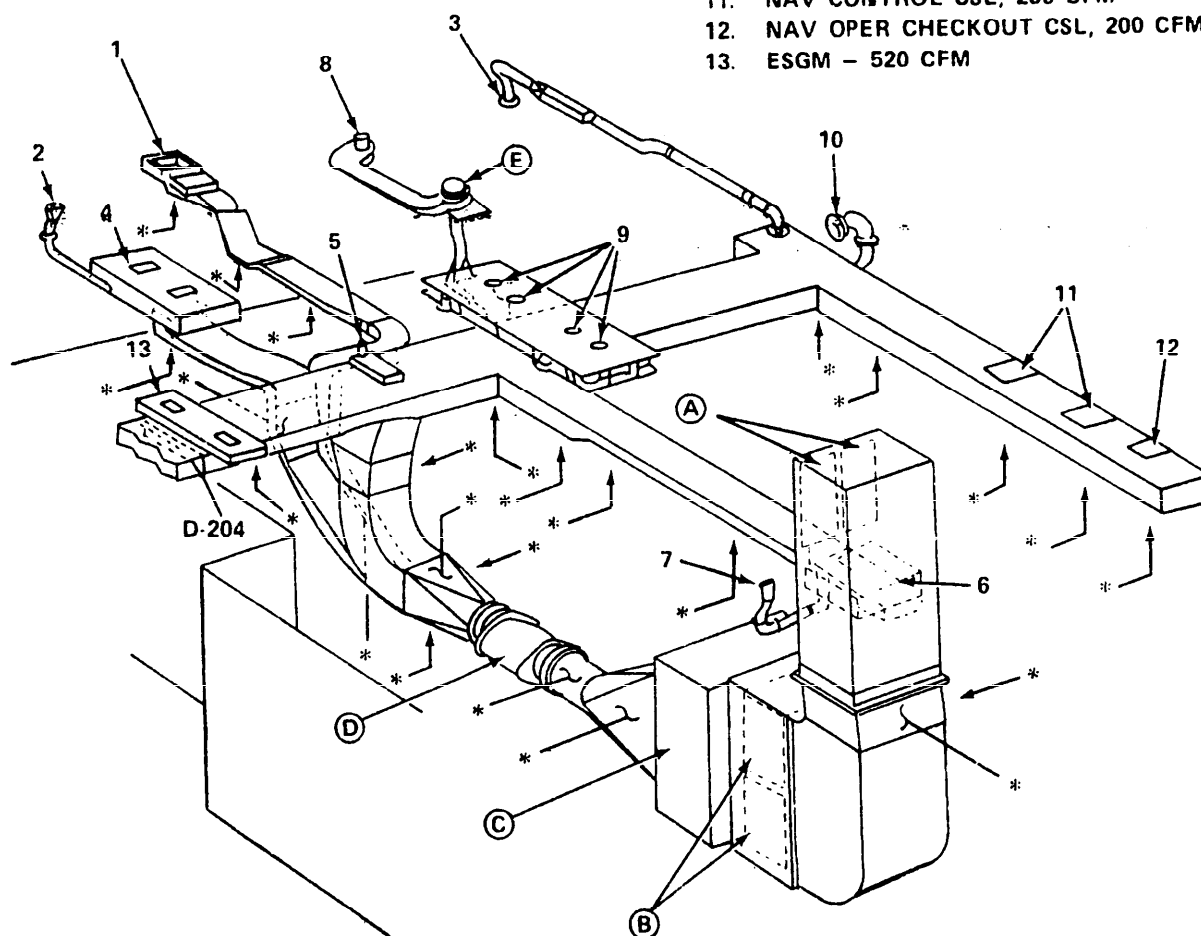


Figure 2. Ventilation system - Navigation Center 627 Class

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5.3 Supplemental filter maintenance.

WARNING

Supplemental filter material used in this standard is a restricted use item and should be used only during construction and availability periods such as upkeep, conversion, and overhaul. Cyanide gas is generated when filter material burns; therefore, its use is prohibited at all other times.

5.3.1 Ventilation System - Before using the Navigation Ventilation System, tape supplemental filter material over each of the air-intake prefilters (no. 80) in the NC. This material should be replaced daily throughout the test period.

5.3.2 Navigation Subsystem Equipment - Before starting operational testing of the below listed equipment, tape supplemental filter material over external filters located on the listed equipments. This material is to be inspected daily and replaced weekly.

Radio Navigation Set AN/BRN-3 data processor

Radio Navigation Set AN/BRN-3 computerwriter adapter

Precision frequency standard

CNC computers (2)

D/D converter

LORAN Sensor AN/BRN-5

ESGM electronic unit

ESGM navigation computer no. 3

Note: Supplemental filter material described above may be reused after cleaning in a water/detergent solution, rinsed in clean water, and air dried.

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5.4 Filter replacement.

Note: Prefilter and differential filter cleaning and filter replacement can be accomplished only when fan 66 is secured. Therefore, this work must be scheduled for a time when no testing is in progress and navigation equipment may be secured or when the backup system is available to supply cooling air.

5.4.1 Navigation Ventilation System Fan Room - When the Ventilation System differential pressure gage described in 5.2 indicates below 0.4 or above 2.0 inches water, replace system filter assemblies as described below.

WARNING

Ensure that proper warning tags are placed at power controller to prevent fans from being inadvertently energized during maintenance.

5.4.1.1 If no system testing is in progress and equipment may be shut down, deenergize individual equipments and perform the following:

- (a) At START/STOP pushbuttons in the NC, deenergize fan 66.
- (b) Check that differential pressure gage VH-323-GA-10 indicates 0.
- (c) Remove the 2 prefilters (no. 80) and perform the following:
 - (1) Inspect the prefilters for accumulations of dirt, grease or other foreign matter.
 - (2) Remove small accumulations of dirt by vacuuming.
 - (3) If necessary, clean the prefilters in ultrasonic cleaner. Do not oil. Dry by application of low-pressure air.
- (d) Remove the differential pressure filters (no. 81).

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- (e) Using a vacuum cleaner or a clean, lint-free cloth, remove any dirt or dust exposed after the removal of the prefilters and differential pressure filters inside the filter casing. Remove the access cover on the circular duct just upstream of fan 66. Inspect the fan blades for cleanliness. If cleaning is required, proceed to 5.7.

CAUTION

Handle new differential pressure filters with care to prevent damage. Prevent any foreign matter from dropping into the filters.

- (f) Install new differential pressure filters. Ensure that each filter is seated properly in the filter casing.
- (g) Reinstall the 2 prefilters and tape supplemental filter material over the prefilters per 5.3.1. Also, replace the access cover removed in 5.4.1.1.(e).
- (h) At the START/STOP pushbuttons in the NC, energize fan 66.
- (i) Check that differential pressure gage VH-323-GA-10 indicates between 0.4 and 2.0 inches of water.

5.4.1.2 When system testing precludes shutdown of the Navigation Ventilation System and the backup system is available, perform filter replacement as follows:

- (a) Verify that the following filters are clean and properly installed:

<u>Filter Number</u>	<u>Service/Location</u>
1	Ship's control center exhaust/NC
40*	Galley exhaust precipitation prefilter/ galley
47*	Battery supply/crews' lounge
49	Mid-level exhaust/main air conditioning room

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75	Fan 60 cooling coil 32/main air conditioning room
76	Fan 61 cooling coil 33/main air conditioning room
77	Fan 62 cooling coil 34/main air conditioning room
78	Fan 63 cooling coil 35/main air conditioning room
79	Fans 60, 61, and 63 cooling coils 32, 33, and 35 bypass/main air conditioning room

*Need not be cleaned if the precipitators are not operating.

- (b) If operable, verify that the following electrostatic precipitators (EPs) are clean and operating:

EP no. 1, upper level exhaust, in the main air conditioning room.

EP no. 2, lower level exhaust, in the main air conditioning room.

EP no. 3, galley exhaust, in the galley.

EP no. 8, battery air supply, in the crews' lounge.

- (c) Check that the following fans are operating in the speed indicated:

<u>Fan Number</u>	<u>Service/Speed</u>
2*	Ship's supply AFT/FAST
5	Battery exhaust/FAST
6	Upper levels fwd exhaust/FAST
7	Galley and battery exhaust/FAST

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28*	Aft exhaust/FAST
33	Lower levels fwd exhaust/FAST
41	Lower levels fwd exhaust/FAST
42**	Crews' washroom port exhaust/ON
43**	Crews' washroom starboard exhaust/ON
47**	Storeroom forward/ON
51**	Storeroom forward/ON
60	Supply zone 1/FAST
61	Supply zone 2/FAST
62	Supply zone 3/FAST
63	Supply zone 4/FAST

It is not necessary for fans 2 and 28 to be operating. These fans may both be FF. However, if fan 2 is ON, then 28 should also be ON and vice versa. As an alternate, if fan 2 is ON, fan 28 may be OFF, provided all the hatches between compartments from bulkhead 58 aft are open. The opposite configuration of fan 8 ON and 2 OFF is also satisfactory with the hatches open.

**These fans may be OFF.

- (d) Ensure that the ESGM electronic unit, ESGM navigation computer no. 3, CNCs, MTU, A/D, and D/D converters are isolated from Navigation Ventilation System. For the ESGM electronic unit and ESGM navigation computer no. 3, refer to the equipment technical manuals for instructions on operating on ambient air. For CNCs and D/D converter, place lever on blower assembly in bottom of these cabinets in BLOWER AIR position and tape supplemental filter material over air-intake. For A/D converter, shut ventilation duct damper, tape supplemental filter material over air-intake vent (located below filter and opened from underneath cabinet) and place fan switch in the bottom of the cabinet to ON. For MTU, shut ventilation damper on MTU foundation in NC. If MTU must be on during filter changing, install blower assembly, part number 2656407, as follows:

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- (1) Secure MTU.
- (2) Remove lowest row of Type III modules on rear of cabinet, 1A10A95 through 1A10A117.
- (3) Take fan enclosure and 6 hinge screws out of storage.
- (4) Loosen 16 captive screws at top and bottom of air conditioning duct.
- (5) Remove and store air conditioning duct.
- (6) Place cover (part number 2656717) over deck hole and secure it by tightening 8 captive screws.
- (7) Place fan enclosure assembly in bottom of cabinet. Secure it by replacing 6 rear hinge mounting screws and by turning 2 captive front-locking screws clockwise one-quarter turn.
- (8) Connect blower power wires according to tagging or color coding at terminals 7, 8, and 9 of TB5. Reinstall the Type III modules removed in 5.4.1.2(d)(2).
- (9) Tape supplemental filter material over blower assembly intake from underneath cabinet.
- (e) Ensure that the main air conditioning room is maintained in the operating condition specified in steps 5.4.1.2(a) through 5.4.1.2(c).
- (f) Shut CAC-82, CAC-200, CAC-84, and open CAC-83.
- (g) Secure fan 66.
- (h) Shut Navigation Equipment Cooling System damper D202 located in the activities space bulkhead.
- (i) Open backup system isolation damper D204 in middle level passageway.
- (j) Position fan 63 damper D200 to Position II.

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- (k) Increase chilled water flow through high velocity system cooling coil by adjusting thermostat CAC-354-TX-251 located in Navigation Equipment Ventilation System room to lowest temperature setting. Note present setting.
- (l) Repeat 5.4.1.1(c) through (g).
- (m) Position fan 63 damper D200 to Position I.
- (n) Close backup system damper D204 located in middle level passageway.
- (o) Open Navigation Equipment Cooling System damper D202 located in activities space bulkhead.
- (p) Energize fan 66.
- (q) Readjust thermostat CAC-354-TX-251 located in Navigation Ventilation System room to its original setting.
- (r) Verify that differential pressure gage VH-323-GA-10 indicates greater than 0.4 inch of water. If not, shift back to backup system and perform corrective action to eliminate bypass of air around the differential pressure filters on access covers prior to performing (s) below.
- (s) If CNCs, MTU, or A/D converter and D/D converter are operating, restore navigation equipment cooling air to this equipment. For CNCs and D/D converter, place lever on blower assembly to SHIP's AIR position. For the A/D converter, close air-intake vent at bottom of cabinet, set fan switch to OFF, and open ventilation duct damper. Remove blower assembly from MTU by reversing instructions in 5.4.1.2(d). Refer to the respective equipment technical manual for instructions on operating the ESGM consoles on ship's air.

5.5 Inspection and cleaning of navigation ventilation system ducts.

5.5.1 Monthly, inspect FBM Navigation Ventilation System ducts for cleanliness at the following locations:

Note: See figure 2 for ventilation configuration.

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- (a) In crews' mess, open the overhead to gain access to one inspection plate in structural trunk. Remove fastening screws, the plate, and inspect trunk. (If testing status does not permit securing fan 66 for this inspection, inspect only at locations specified in (b) through (e) below.)
- (b) In the NC, inspect the AN/BRN-3 duct by opening the receiver doors and inspecting the plenum in the base of the cabinets.
- (c) In the NC, inspect the CNCs, MTU, and ESGM supplies by removing the inspection plate on the foundation of the CNCs, MTU, and one of the inspection plates on the foundation for the ESGM electronics unit and ESGM navigation computer no. 3.
- (d) In the crews' activity space, insert the D/D converter supply by opening one access cover in the supply duct.
- (e) In the crews' activity space, inspect the A/D converter supply by opening the access cover located at the A/D converter takeoff point from the combined CNCs/A/D converter supply.

5.5.2 At least once during overhaul after equipment turn-on, clean or perform a demonstration of cleaning as follows.

5.5.2.1 Ensure all equipment cooled by Navigation Ventilation System is secured.

5.5.2.2 In the NC at the STOP/START pushbuttons, secure fan 66.

5.5.2.3 Perform the following to open Ventilation System as much as possible:

Note: In the following procedure, if orifice plates are installed at any sections that are disassembled, mark the plates for exact replacement during reassembly.

- (a) Remove the 3 access covers in the structural trunk under the NOCC and NCC. These covers contain the ventilation dampers for this equipment. Tape plastic over the openings into the NCC and NOCC.

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- (b) Remove the remaining 4 access covers in the structural trunk. Two of these covers are in the fore/aft portion of the structural trunk. The other 2 covers are located in the athwartship portion of the trunk, one approximately under the SINS consoles and the other in the passageway close to the ship's main air conditioning room.
- (c) Remove the 3 access plates in the structural trunk that supplies the MTU and LORAN sensor.
- (d) Remove the inspection plate in the foundation of the CNCs and MTU and the 2 inspection plates in the foundation of the ESGM electronic unit and ESGM navigation computer no. 3.
- (e) Open the following equipment doors to gain access to the supply duct or plenum. For the CNCs, D/D converter, and ESGM electronic unit and ESGM navigation computer no. 3, it will be necessary to remove the blower assemblies.

CNCs no. 1 and 2

D/D converter

MTU

A/D converter

Radio Navigation Set AN/BRN-3 receiver (remove filter at bottom of cabinet)

ESGM electronic unit and ESGM navigation computer no. 3

- (f) Disconnect the flexible ducts from the LORAN Sensor, gyromonitor, Recorder-Transmitter AN/BQN-3, and spare MARDAN.
- (g) Remove the access cover above the navigation equipment cooling damper, D202, in the plenum that supplies air to the structural trunk. Also, remove the 3 access covers on the duct work that contains the fan 66 diffuser (located just downstream of the fan).

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- (h) Remove the 2 access covers in the combined CNC and A/D converter supply duct.
- (i) Remove the 4 access covers and the removable section of duct that dips below the ceiling in the duct that supplies air to the D/D converter.
- (j) In the NC, remove the inspection plate in the D/D converter foundation.
- (k) Working through the access openings in the duct that contains the fan diffuser, tape sheet plastic around the diffuser in a manner that will prevent cleaning materials from entering the fan.

5.5.2.4 Clean ducts and structural plenums which were opened in 5.5.2.3 as follows:

CAUTION

Use detergent and water to clean perforated ductwork only if brushing and wiping with dry brushes and cloths will not remove all dirt and foreign matter. Do not use 20-psi air for drying perforated ductwork.

- (a) Working through all the various openings, clean all accessible portions of the structural foundations, structural plenums, and ductwork. Use flexible wire or other suitable extension to aid in cleaning of these areas. For nonperforated ductwork, use a clean, lint-free cloth dampened in a solution of detergent and warm water to clean this type of ductwork. Wipe dry with clean, lint-free cloth. For all perforated ductwork, proceed as follows:
 - (1) Remove all loose dirt and foreign matter with a vacuum cleaner. An extension of clear plastic tubing on the vacuum cleaner hose may be used to aid in the cleaning of this ductwork.
 - (2) If necessary, use detergent and warm water to clean perforated ducting as follows:

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- a To prevent water from being introduced into ductwork sound treatment, squeeze the lint-free cloth as dry as possible prior to wiping.
- b Rinse lint-free cloth frequently to prevent any collected dirt from being forced into perforations and crevices.
- c Rinse ductwork with a clean, lint-free cloth squeezed as dry as possible and dry with a clean, lint-free cloth. Do not use 20-psi air for drying perforated ductwork.

CAUTION

When cleaning ducting, care must be exercised to prevent damaging, loosening, or changing orifice plate settings. Failure to do so may result in serious equipment cooling problems.

- (b) If the cleaning procedure outlined in 5.5.2.4(a) does not sufficiently clean all the ductwork, further disassembly of sections of ductwork may be necessary. These sections would include, for example, the ductwork to the A/D converter and the section between the combined MTU/LORAN sensor structural plenum and the LORAN sensor. Clean any disassembled sections as outlined in 5.5.2.4.(a).
- (c) Check that the following equipment ventilation dampers are shut:
 - LORAN sensor
 - Spare MARDAN
 - SINS consoles
 - SINS gyromonitor
 - Receiving Set, Sonar AN/BQN-3
 - Radio Navigation Set AN/BRN-3 receiver

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- (d) To prevent air from entering the CNCs, D/D converter, MTU, A/D converter, ESGM electronic unit and ESGM navigation computer no. 3, arrange a deflector around the ventilation opening in the bottom of these cabinets that will deflect air into the compartment when fan 66 is energized.
- (e) Check that the ventilation damper to the A/D converter and MTU is open. Also, check that the compartment air intake vent cover in the bottom of the A/D converter cabinet is shut.
- (f) Replace the D/D converter duct section that dips below the ceiling.
- (g) Replace the 4 access covers in the supply duct to the D/D converter.
- (h) Replace the 2 access covers in the combined supply to the CNCs and A/D.
- (i) Replace all access covers in the main structural trunk except those under the NOCC and NCC. Also, replace the 3 access covers in the structural trunk that supplies the MTU and LORAN sensor. Replace the access cover in the ductwork above damper D202.
- (j) Remove the sheet plastic installed in 5.5.2.3(k).
- (k) Check that damper D202 is open.
- (l) Turn on fan 66. Operate the fan until the ducts are dry and blown clear.
- (m) Secure fan 66.
- (n) Remove plastic from openings to NCC and NOCC.
- (o) Replace access covers containing NCC and NOCC equipment dampers.
- (p) Replace the inspection plates in the CNC, ESGM, D/D converter, and MTU foundations.
- (q) Remove the deflectors installed in 5.5.2.4.(d).

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- (r) Reinstall the blower assemblies in the CNCs, D/D converter, ESGM electronics unit, and ESGM navigation computer no. 3.

5.5.2.5 Due to inaccessibility, ducts to the AN/BRN-3 receiver, spare MARDAN, LORAN sensor, gyromonitor, and the AN/BQN-3 will be cleaned as follows:

- (a) Check that all equipment cooled by the Navigation Ventilation System are secured. Check that all equipment ventilation system dampers are shut. On the CNCs and D/D converter, check that the lever on the blower assembly is in the BLOWER AIR position. For the ESGM, check that equipment dampers are positioned for operating on compartment air.
- (b) Open the AN/BRN-3 receiver doors and remove the filter in the bottom of each cabinet. To prevent cooling air from entering the equipment, arrange a deflector around the ventilation opening that will deflect the air into the NC when fan 66 is energized. Attach a cheesecloth windsock to the deflector.
- (c) Open the AN/BRN-3 ventilation damper.
- (d) Energize fan 66.
- (e) After operating fan 66 for several minutes, check the cheesecloth for dirt accumulation. If dirt is accumulating, secure fan 66, replace the cheesecloth, and reenergize fan 66. Continue this process until there is no noticeable further accumulation of dirt on the cheesecloth.
- (f) Repeat 5.5.2.5(a) through (e) for the LORAN sensor, gyromonitor, AN/BQN-3 and the spare MARDAN. Each time, ensure that only the damper for the equipment in question is open. For the LORAN sensor, AN/BQN-3 and the spare MARDAN, tape cheesecloth over the open end of the flexible hose (energize the spare MARDAN fan when cleaning the spare MARDAN duct).

5.6 Cooling coil and air-intake duct inspection and cleaning.

Notes: 1. For Ventilation System configuration, see figure 2.

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2. At least once during the overhaul, clean the cooling coil and air-intake duct or perform a demonstration of cleaning.

5.6.1 Monthly, open the access cover located on the tapered ductwork just downstream of the cooling coil and inspect the cooling coil. Also, remove one of the prefilters on the air-intake in the NC and inspect the air-intake duct. If cleaning is necessary, proceed with 5.6.1.1 through 5.6.1.27.

5.6.1.1 Ensure all equipments cooled by the Navigation Equipment Cooling System are secured or the backup equipment cooling system is lined up to supply air to operating equipments. See 5.4.1.2 for instructions on operating on the backup system.

WARNING

Ensure that proper warning tags are placed at the power controller to prevent fan 66 from being inadvertently energized during maintenance.

5.6.1.2 At the START/STOP pushbuttons in the NC, deenergize fan 66.

5.6.1.3 Shut Navigation Equipment Cooling System damper D202.

5.6.1.4 Shut chilled water isolation valves CW-287 and CW-290.

5.6.1.5 Remove the following:

- (a) Four differential filters.
- (b) Access cover on the tapered ductwork just downstream of the cooling coil.
- (c) The 2 access covers located on the ductwork upstream of the cooling coil in the former Type XI well area.
- (d) The 2 prefilters (no. 80) filters on the Navigation Cooling System air-intake in the NC.

Note: A film of dirt or other foreign matter can adversely affect cooling coil performance.

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5.6.1.6 Working through the access openings, clean the prefilter casing in the NC, the air-intake ductwork between the NC and the cooling coil, and the filter casing. Use the procedure outlined in 5.6.1.7 and 5.6.1.8 to clean perforated and nonperforated ductwork and other portions of the system. Use any suitable extension to facilitate wipedown of the maximum duct area.

5.6.1.7 For all nonperforated ductwork, the differential filter casing, and the prefilter casing in the NC, vacuum clean all accessible areas and then wipe these areas with a clean, lint-free cloth dampened in a solution of detergent and warm water. Wipe dry with a clean, lint-free cloth.

5.6.1.8 For perforated ductwork, refer to 5.5.2.4.(a) and (b).

5.6.1.9 Working through the access opening in the tapered section of ductwork just downstream of the cooling coil, tape sheet plastic across the opening leading to the fan. Also, tape a sheet of plastic across the opening of the ductwork upstream of the differential filter casing and filter withdrawal area.

5.6.1.10 Working through the filter case openings and the access downstream of the cooling coil, carefully loosen dirt and foreign matter from the two faces of the cooling coil using a scrub brush or paint brush. Remove loosened dirt with a vacuum cleaner.

5.6.1.11 Working through the access downstream of the cooling coil, blow 20-psi air through the coil fin area to loosen dirt and foreign matter. Vacuum all accessible areas of the cooling coil to remove loosened dirt and foreign matter.

5.6.1.12 Inspect the cooling coil fins for grease or other foreign matter. If additional cleaning is necessary, clean as follows:

- (a) Working through the access downstream of the cooling coil, tape a sheet of plastic across the opening to the cooling coil. Tape the plastic so that when water is sprayed through the coil in 5.6.1.12(b), the water will drain into the drain pan at the bottom of the cooling coil.
- (b) Working through the filter case opening, spray a solution of mild detergent and warm water into the entire coil. A fine spray of solution may be obtained by using a gas welding torch with a suction hose attached to the gas connection and extend into the solution. Connect the oxygen connection to a 100-psi

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air source. The bleed can then be adjusted for a fine or high velocity spray. Allow solution to remain on coil approximately 5 minutes.

- (c) Adjust bleed for high velocity spray and wash the coil from the intake side using clean water. Check that the plastic installed in 5.6.1.12(a) remains in place.
- (d) Wipe away any solution remaining in the cooling coils, drain pan and filter casing. If necessary, 20-psi air may be used to blow the coils dry.

5.6.1.13 Remove the sheet plastic installed in 5.6.1.9 and 5.6.1.12(a).

5.6.1.14 Clean the tapered section of ductwork just downstream of the cooling coil per paragraph 5.6.1.6.

5.6.1.15 Check that damper D202 is shut.

5.6.1.16 Check that the A/D converter damper is shut.

5.6.1.17 For the CNCs and D/D converter, check that the lever on the damper assembly is in the SHIP'S AIR position.

5.6.1.18 Remove 1 access plate on the diffuser just downstream of fan 66.

5.6.1.19 Replace the access plate on the tapered section of ductwork and access plates on the section of ductwork between the NC and the cooling coil.

5.6.1.20 Shut the differential filter access doors. Do not reinstall the doors at this time.

5.6.1.21 Energize fan 66.

5.6.1.22 Allow system air to discharge through the open access cover until residual cleaning water is removed.

5.6.1.23 Deenergize fan 66.

5.6.1.24 Reinstall the access cover on the diffuser.

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5.6.1.25 Install clean differential filters and clean prefilters on the air intake in the NC.

5.6.1.26 Open chilled water isolation valves CW-287 and CW-290.

5.6.1.27 Restore Navigation Ventilation System and navigation equipment to normal conditions.

5.7 Fan inspection and cleaning.

Notes: 1. See figure 2 for Ventilation System configuration.

2. Due to limited access, if the cleaning procedure outlined in 5.7.1.1(c) through 5.7.1.1(h) does not sufficiently clean the fan, then it will be necessary to clean the fan per 5.7.1.2.

5.7.1 The Navigation Equipment Ventilation System fan is to be inspected for cleanliness during differential filter replacement when the fan is deenergized. Also, the fan is to be cleaned or a demonstration of cleaning is to be accomplished at least once during the overhaul. Cleaning of the fan is necessary to assure that system flow will not fall below design minimum. Fan cleaning may be accomplished either in-place or by removing the fan. Inspect fan 66 by removing the access cover just upstream of the fan and access cover on the diffuser just downstream of the fan.

5.7.1.1 In-place cleaning of fan 66.

- (a) Ensure that all equipment cooled by the Navigation Equipment Cooling System is secured or the backup system is lined up to supply cooling air to operating equipment. Refer to 5.4.1.2 for instructions on operating with the backup system.
- (b) Shut damper D202, shut the ventilation damper to the A/D converter and on the CNCs and D/D converter, place the lever on the blower assembly in the BLOWER AIR position.
- (c) At the START/STOP pushbuttons in the NC deenergize fan 66.
- (d) Remove the 2 access covers between the cooling coil and the fan.

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- (e) Remove the 3 access covers on the round to rectangular section of ductwork just downstream of the fan.
- (f) Working through the access openings, clean accessible portions of the fan blades, fan housing, motor supports, diffuser, and the sections of ductwork being used for access to the fan. Use the brushes shown in figure 1 or other convenient brushes, an inspection mirror, and mild detergent and warm water to accomplish this cleaning.
- (g) Wipe all surfaces with clean, fresh water to remove the detergent residue. Wipe dry with a clean, lint-free cloth.
- (h) Inspect carefully to ensure removal of all cleaning material or other objects from the fan and ducting.
- (i) Reinstall the 2 access covers removed in 5.7.1.1(d).
- (j) Energize fan 66 for several minutes to remove residual moisture and blow fan clean.
- (k) Deenergize fan 66.
- (l) Replace the 3 access covers removed in 5.7.1.1(e).
- (m) Restore system to normal and check for proper filter differential pressure gage reading.

5.7.1.2 Fan removal for cleaning

- (a) Ensure that all equipment cooled by the navigation equipment Ventilation Cooling System is secured or that the backup system is lined up to supply cooling air to operating equipment. Refer to 5.4.1.2 for instructions on operating the backup system.
- (b) Shut damper D202, shut the ventilation damper to the A/D converter, and on the CNCs and D/D converter place the lever on the blower assembly in the BLOWER AIR position.
- (c) At the START/STOP pushbuttons in the NC, deenergize fan 66.
- (d) Unbolt the rubber flex connections fore and aft of the fan.

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- (e) Disconnect electrical wiring from the motor.
- (f) Rig chainfall to support fan.
- (g) Unbolt fan from foundation. Lower the fan to clear the foundation and move fan to a position convenient for cleaning.
- (h) Remove the 3 access covers on the ductwork that contains the fan diffuser and the access cover on the round ductwork just upstream of the fan.
- (i) Using a mild detergent and warm water, clean the fan, the diffuser, the duct containing the diffuser, and the round section of ductwork just upstream of the fan. Use fresh water to remove residual detergent.
- (j) Reinstall the fan and reassemble the rubber flex connection pieces.
- (k) Replace the access cover on the round ductwork just upstream of the fan.
- (l) Energize fan 66 and allow air to discharge through the access openings for several minutes to remove residual moisture and blow the fan ductwork clear.
- (m) Deenergize fan 66.
- (n) Replace the 3 access covers removed in 5.7.1.2(h).
- (o) Restore system to normal and check for proper differential pressure gage reading.

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