

CHAPTER 6 MAINTENANCE

Section I PERIODIC INSPECTION

6-1. GENERAL.

This section contains periodic inspections that should be performed on a routine basis, as preventive maintenance, to verify the condition of boat systems and equipment and ensure that the boat is operational at all times.

The periodic inspections in this section are not intended to duplicate maintenance instructions furnished in the

Planned Maintenance System (PMS) and are simply recommended and considered supplemental. In case of conflicts, the PMS documentation takes precedence. Such conflicts should be reported immediately on the user comment sheet in accordance with the maintenance procedures for this manual.

Table 6-1. Periodic Inspection

| Item | Inspection | Time Interval — Days | | | |
|-------------------|--|----------------------|---|----|----|
| | | 1 | 7 | 30 | 90 |
| Electrical System | | | | | |
| Lights | a. Check for burned out lamps. | X | | | |
| | b. Inspect condition of features. | X | | | |
| Batteries | a. Check lead acid level. | X | | | |
| | b. Check connections. | X | | | |
| | c. Check voltage. | X | | | |
| | d. Check specific gravity. | | | | X |
| Switches | a. Inspect mounting. | | | | X |
| | b. Check circuit continuity. | | | | X |
| Horn | Check operation and mounting. | X | | | |
| Wiring | Look for damage, loss of identification. | | | X | |
| Receptacle | Check tightness of cables. Check for moisture or evidence of arcing. Check mounting and capping integrity, check labeling. | | | | X |
| Propulsion System | | | | | |
| Engine Controls | Check cable and linkage arrangement for cleanliness, tautness, tight mountings, etc. Refer to onboard Technical Manual S9252-A2-MMC-010. | | | | X |
| Instruments | Check instruments for damage and proper operation. | | | | X |

Table 6-1. Periodic Inspection — Continued.

| Item | Inspection | Time Interval — Days | | | |
|--------------------------------|---|----------------------|---|----|----|
| | | 1 | 7 | 30 | 90 |
| Propulsion System — Continued. | | | | | |
| Engine | a. Check engine mounting for security. | | X | | |
| | b. Check accessory drives, filters pumps, etc. Refer to onboard Technical Manuals. | | X | | |
| Marine Gears | Check for oil seal leakage at shaft connection. | X | | | |
| Propeller Shaft | a. Check stuffing box for damage. | X | | | |
| | b. Check for leakage at stuffing box. | X | | | |
| | c. Check shaft coupling connections for tightness. | | X | | |
| | d. Check shaft tube for cracks or leakage at hull penetration. | | | X | |
| | e. Check propeller and mounting hardware for damage. | | | | X |
| Exhaust System | | | | | |
| Muffler and Pipes | a. Check for leaks and secure mounting. | | X | | |
| | b. Check hoses and clamps for tightness and deterioration. | | X | | |
| | c. Inspect propulsion engine bellows for damage. | | X | | |
| | d. Check drain cocks for damage. | | X | | |
| Fuel System | | | | | |
| Fuel Tanks | a. Check for sludge and water using stripping pump. | X | | | |
| | b. Check fuel vent for obstruction at each fueling. | X | | | |
| Fuel Water Separators | a. Clean. | X | | | |
| | b. Inspect cover gasket for deterioration each time cartridges are replaced. Replace faulty gasket. | | | X | |
| Fuel Lines, Valves | Check complete system for leakage and operation. | | | X | |
| Emergency Shut-off System | a. Operate all emergency fuel shut-off handles. | | | X | |
| | b. Check shut-off controls for cleanliness and tightness. | | | X | |

Table 6-1. Periodic Inspection — Continued.

| Item | Inspection | Time Interval — Days | | | |
|----------------------|---|----------------------|---|----|----|
| | | 1 | 7 | 30 | 90 |
| Bilge System | | | | | |
| Strainer | Clean. | | X | | |
| Piping | Check all lines, hoses and fittings for leakage. | | | | X |
| Valves | Inspect packing and operation. | | | | X |
| Pumps | a. Inspect pump for secure mounting. | | | | X |
| | b. Check pump and motor for proper operation. Refer to onboard Technical Manual S6225-SS-MMC-010. | | | | X |
| Sea Water System | | | | | |
| Strainers and Vents | Clean. | X | | | |
| Valves | Inspect packing and operation. | | | | X |
| Piping | a. Inspect for leakage in all lines and fittings. | | | | X |
| | b. Check for damaged hoses. | | | | X |
| Pumps | Check for proper operation. Refer to Technical Manual S6225-SR-MMC-010. | | | | X |
| Fresh Water System | | | | | |
| Strainers and Vents | Clean. | X | | | |
| Valves | Inspect packing and operation. | | | | X |
| Piping | a. Check for leakage in all lines and fittings. | | | | X |
| | b. Check for damaged hoses. | | | | X |
| Pressure Set | Check for proper system pressure. | | | | X |
| Hot Water Tank | a. Check for leakage or damage. | | | | X |
| | b. Check for proper temperature setting. | | | | X |
| Steering System | | | | | |
| Hydraulic Components | a. Inspect cylinders for leakage. | | | | X |
| | b. Inspect all lines and fittings for leakage. | | | | X |

Table 6-1. Periodic Inspection — Continued.

| Item | Inspection | Time Interval — Days | | | |
|---|---|----------------------|---|----|----|
| | | 1 | 7 | 30 | 90 |
| Steering System — Continued. | | | | | |
| Hydraulic Components — Continued. | c. Check for secure mounting of valves, cylinders, pumps, etc. | | | X | |
| | d. Inspect pump and motor for proper operation. Refer to Technical Manual S9561-BD-MMC-010 | | | X | |
| Electrical Components | a. Inspect wiring interconnections and mounting. | | | | X |
| | b. Check physical condition of controls, switches, solenoids, motors, pumps, etc. | | | | X |
| Rudder Stocks and Linkage | a. Check stuffing glands for leakage. | | | X | |
| | b. Inspect stocks and bearings for freedom of movement and secure mounting. | | | X | |
| | c. Check for secure linkage to follow-up unit. | | | X | |
| Bow Thruster Unit | | | | | |
| Hydraulic Components | a. Inspect all lines and fittings for leakage. | | | X | |
| | b. Check hydraulic level at reservoir. | X | | | |
| | c. Check for secure mounting of valves, pumps, etc. | | | X | |
| Pump | a. Inspect pump coupling at port propulsion engine. | | | X | |
| | b. Check for proper pump operation. | | | X | |
| Electric Components | a. Inspect wiring interconnections and mounting. | | | | X |
| | b. Check physical condition of controls and switches. | | | X | |
| | c. Inspect bow thruster for proper operation. Refer to onboard Technical Manual S9568-AM-MMC-010. | | | | X |
| Ballast System | | | | | |
| Strainers and Vents | Clean. | X | | | |
| Valves | a. Inspect packing and operation. | | | X | |
| | b. Inspect remote valves for proper operation. | | | X | |
| Piping | a. Inspect for leakage in all lines and fittings. | | | X | |
| | b. Check for damaged hoses. | | | X | |

Table 6-1. Periodic Inspection — Continued.

| Item | Inspection | Time Interval — Days | | | |
|----------------------|--|----------------------|---|----|----|
| | | 1 | 7 | 30 | 90 |
| Torpedo Handling | | | | | |
| In-Haul Winch | Inspect operation and mounting. Refer to Technical Manual SG813-BF-MMC-010. | | | | X |
| Cable | Check cable for damage and wear. | X | | | |
| Transfer Carriage | a. Inspect operation of transfer carriage. | X | | | |
| | b. Inspect transfer carriage cylinders for leakage. | | X | | |
| | c. Inspect carriage rollers for damage. | X | | | |
| Transfer Winch | Inspect transfer winch for secure mounting and proper operation. Refer to onboard Technical Manual SG813-BG-MMC-010. | | | X | |
| Controls | Check controls for free movement and proper operation. | X | | | |
| Hydraulic Power Unit | a. Check for proper operation and secure mounting. | X | | | |
| | b. Check hydraulic oil level. | X | | | |
| | c. Clean filters. | | | X | |
| Torpedo Rollers | a. Inspect torpedo roller bearings for freedom of movement. | | | X | |
| | b. Inspect rollers for damage. | | | X | |
| | c. Check for secure roller mounting. | | | X | |
| | d. Inspect snatch blocks and padeyes for secure mounting. | | | X | |
| Halon System | | | | | |
| Cylinders | a. Weigh cylinder. | X | | | |
| | b. Check all valves and fittings for leakage. | X | | | |
| Flame Detector | a. Check for physical damage. | X | | | |
| | b. Clean lens. | X | | | |
| Nozzles | a. Check nozzles for physical damage. | X | | | |
| | b. Check for proper nozzle position. | X | | | |
| Control Panel | a. Check for proper electrical connections. | X | | | |
| | b. Check indicator lights for operation. | X | | | |
| Piping | a. Inspect all lines and fittings for leakage or damage. | X | | | |
| | b. Check for proper valve operation. | X | | | |

Table 6-1. Periodic Inspection — Continued.

| Item | Inspection | Time Interval — Days | | | |
|--------------------------------------|--|----------------------|---|----|----|
| | | 1 | 7 | 30 | 90 |
| Firemain System | | | | | |
| Fire Station | a. Check fire stations for proper equipment. | X | | | |
| | b. Inspect hose for damage. | X | | | |
| Piping | a. Check lines and fittings for leakage. | | X | | |
| | b. Inspect valve packing and operation. | | X | | |
| Fire Extinguishers | a. Check for proper location and mounting. | | X | | |
| | b. Check mechanism. | | X | | |
| | c. Check fill indicator. | | X | | |
| Lifesaving Gear | | | | | |
| Ring Buoys | a. Check mounting and condition of ring buoys. | X | | | |
| | b. Check for lights and batteries. | X | | | |
| Other Gear | a. Check for fresh batteries in hand lantern. | | | X | |
| | b. Check for life preservers in proper location. | | | X | |
| | c. Check life rafts and dinghy for proper stowage. | | | X | |
| | d. Check condition and stowage of ropes, dinghy motor and life line gun. | | | X | |
| Hull | | | | | |
| Compartments and Lockers, Watertight | a. Inspect hatches, access covers and scuttles for general condition. | | | X | |
| | b. Check dog bolts and gaskets. | | | X | |
| | c. Check integrity of all watertight compartments and hull penetrations. | | | X | |
| Anodes | Inspect for corrosion | | | | X |
| Hull | a. Inspect for cleanliness. | | | | X |
| | b. Check for chipping or flaking of paint. | | | | X |
| | c. Check for broken welds or other damage. | | | | X |
| | d. Inspect hull for electrolysis or pitting. | | | | X |
| | e. Inspect hull fittings, fenders and rails for damage or loose mountings. | | | | X |

Table 6-1. Periodic Inspection — Continued.

| Item | Inspection | Time Interval — Days | | | |
|-------------------------|---|----------------------|---|----|---|
| | | 1 | 7 | 30 | 90 |
| Galley Fire Suppression | | | | | |
| Cartridge | a. Weigh cartridge. | | | | Every 6 months. |
| | b. Check for damage. | | | | Every 6 months. |
| Fusible Link | a. Clean. | | | | Every 6 months. |
| | b. Replace. | | | | Annually |
| Bursting Disc | Check for damage. | | | | Every 6 months. |
| Chemical Shell | a. Check for fullness | | | | Every 6 months. |
| | b. Check condition of dry chemical. | | | | Every 6 months. |
| | c. Inspect fill cap threads and gasket. | | | | Every 6 months. |
| Nozzles | Check spring tension on self closing cap. | | | | Every 6 months. |
| Air Handling | | | | | |
| Filter | a. Clean. | | | | Every 3 months. |
| | b. Replace. | | | | As Required |
| Damper Linkage | a. Check for smooth operation. | | | | Every 3 months. |
| | b. Replace linkage. | | | | As necessary. |
| Fan Belt | a. Check tension. | | | | Adjust if necessary. Refer to Technical Manual S9514-B5-MMC-010 |
| | b. Clean. | | | | As required. |
| | c. Check for damage. | | | | Replace belts in a set. |
| Coils | Inspect coils for cleanliness. | | | | Hose down with low pressure water or low pressure air. |
| Fan Wheels | Clean. | | | | Annually |
| Drain Pan | Clean. | | | | Annually |

Section II
LUBRICATION

6-2. GENERAL LUBRICATION.

This section supplies lubrication information for the torpedo weapons retriever systems and components. Table 6-2 supplies lubrication capacities of tanks and components. When lubrication data is contained in the manufacturer's literature, reference is made to the applicable Technical Service Manual. Refer to Table 6-3 for components, lubrication points and time intervals.

6-3. TOOLS.

A Fast Lube Oil Change System for the engines and marine gears and a grease gun for application of grease to various fittings are provided onboard.

Table 6-2. Capacity Chart

| Equipment | Lubrication Type | Capacity |
|--------------------------------------|--|------------------------|
| Main Propulsion Engine Crankcase | Engine Oil SAE 30, Class CD, MIL-L-2104C | 162 gallons each |
| Reverse Reduction Gear | Engine Oil SAE 30, Class CD, MIL-L-2014C | 32 gallons each |
| Ship's Service Gen. Engine Crankcase | Engine Oil SAE 30, Class CD, MIL-L-2104C | 5 gallons each |
| Lube Oil Storage Tank | Engine Oil SAE 30, Class CD, MIL-L-2104C | 250 gallons |
| Torpedo Handling Transfer Winch | SAE 90 EP Gear Lube | 1/2 quart each |
| Torpedo Handling In-Haul Winch | SAE 90 EP Gear Lube | 1-3/4 quart |
| Torpedo Hydraulic Systems Reservoir | SAE 90 EP Gear Lube | 90 gallons |
| Steering System Header Tank | Hydraulic Oil Shell Tellus 32 or equal | 15 gallons |
| Bow Thruster Hydraulic Reservoir | Hydraulic Oil Type SC, SD, SE or equal | 145 gallons |
| Deck Crank Hydraulic Reservoir | Automatic Transmission Fluid, Type F | 30 gallons |
| Anchor Windlass | AGMA #8 Compound | 2-1/4 gallons |
| Steering Ram and General Purpose | Marine Grade Grease | 5 gallons |
| Bearings | Marine Grade EP Grease | 12-11 ounce cartridges |
| Main Engine Cooling | Cat. Cooling System Conditioner | 1 quart |

Table 6-3. Lubrication

| Item | Lubrication Point | Interval — Days | | | | |
|---|----------------------------|-----------------|---|----|----|-----------------|
| | | 1 | 7 | 14 | 30 | 90 |
| Propulsion Engine and Marine Gear* | | | | | | |
| Air Starter | Fill lubricator jar. | X | | | | |
| Governor | Measure oil level. | X | | | | |
| Engine Crankcase | a. Measure oil level. | X | | | | |
| | b. Change oil and filters. | | | | | X |
| Marine Gear | a. Measure oil level. | X | | | | |
| | b. Change oil and filters. | | | X | | |
| Governor Air Actuator | Lubricate fitting. | | | | | Every 6 months. |
| Transmission Output Shaft Seal | Lubricate fitting. | | | | | Every 6 months. |
| *Refer to onboard Technical Service Manual for details. | | | | | | |
| Ship's Service Generator Engines* | | | | | | |
| Air Starter | Fill oiler jar. | X | | | | |
| Clutch Shaft Lever | Lubricate 1 fitting. | X | | | | |
| Clutch Control Lever | Lubricate 2 fittings. | | | | | X |
| Clutch Pilot Bearing | Lubricate 1 fitting. | | | | | X |
| Clutch Main Shaft Bearings | Lubricate 1 fitting. | | | | | X |
| *Refer to onboard Technical Service Manual for details. | | | | | | |
| Generators* | | | | | | |
| Rear Bearing | Grease fitting 1. | | | | | A/R |
| Inboard Bearing | Grease fitting 2. | | | | | A/R |
| *Refer to onboard Technical Service Manual for details. | | | | | | |
| Deck Crane* | | | | | | |
| Winch | a. Check oil level. | | | | | |
| | b. Drain and refill. | | | | | Annually |
| | | | | | | X |

Table 6-3. Lubrication — Continued.

| Item | Lubrication Point | Interval — Days | | | | |
|--|---------------------------------|-----------------|---|----|----|----|
| | | 1 | 7 | 14 | 30 | 90 |
| Deck Crane* — Continued. | | | | | | |
| Cylinders | Coat with light oil. | As required. | | | | |
| Swing Drives | a. Check oil level. | | | | | X |
| | b. Drain and refill. | Annually | | | | |
| Turn Table Bearing | Grease fitting. | X | | | | |
| Bearing Teeth | Brush with open gear compound. | | | | | X |
| Hydraulic Tank | a. Check oil level. | X | | | | |
| | b. Drain, flush and refill. | Annually | | | | |
| Return Filter | Change filter. | As required. | | | | |
| *Refer to onboard Technical Service Manual SG811-AA-MMC-010 for details. | | | | | | |
| Torpedo Handling System* | | | | | | |
| In-Haul Winch and Transfer Winches | Drain and refill final housing. | Annually. | | | | |
| Transfer Carriage Rollers | Grease fittings, 8. | As required. | | | | |
| Torpedo Rollers | Grease fittings, 4. | As required. | | | | |
| Cylinder Rods | Coat with light oil. | As required. | | | | |
| Lead Screw Grease Cup | Apply grease. | As required. | | | | |
| Lead Screw Bearings | Apply grease. | As required. | | | | |
| *Refer to onboard Technical Service Manuals SG813-BF-MMC-010, SG813-BG-MMC-010 for complete details. | | | | | | |
| Anchor Windlass* | | | | | | |
| Clutches, Wildcats and Brakes | Grease fittings. | | | | | X |
| Shaft End Bearings | Grease fittings. | Semi-annually | | | | |
| Main Gear Case | Drain and fill. | Annually | | | | |
| *Refer to onboard Technical Service Manual S9581-A2-MMC-010. | | | | | | |

Table 6-3. Lubrication — Continued.

| Item | Lubrication Point | Interval — Days | | | | |
|---|---|-----------------|---|-----------------|----|----|
| | | 1 | 7 | 14 | 30 | 90 |
| Propulsion Controls | | | | | | |
| Governor Lever | Lube ball joint cup and swivel. | | | | | X |
| Clutch Disconnect Cam | Lube cam. | | | | | X |
| Racks | Lube. | | | | | X |
| Cable End Rods | Grease cable end rods (fully extended). | | | | | X |
| Steering System* | | | | | | |
| Header Tank | Check oil level. | X | | | | |
| Header Tank Strainer | Change filter | | | | | X |
| T Model Actuator | Grease fittings (2). | | | Every 6 months. | | |
| Mini Accumotor | Grease. | | | Every 6 months. | | |
| Roller Rod Slider | Grease. | | | Every 6 months. | | |
| Cam Slot | Grease. | | | Every 6 months. | | |
| Steering Pumps and Steering Motors | Lube at fitting. | | | | | X |
| Helm Pump | Check oil level. Add oil if necessary. | X | | | | |
| *Refer to onboard Technical Service Manual S9561-BD-MMC-010. | | | | | | |
| Fire Pumps* | | | | | | |
| In-Line Pumps | Lubricate at filler plug. | | | | | X |
| *Refer to onboard Technical Service Manual S6225-SS-MMC-010 for details. | | | | | | |
| PE-250 Pump | a. Check priming pump oil level. | | | | | X |
| | b. Drain engine crankcase. | | | Semi-annually. | | |
| | c. Grease priming pump. | | | | | X |
| *Refer to onboard Technical Service Manual NAVSEA 0947-LP-238-5010 for details. | | | | | | |

Table 6-3. Lubrication — Continued.

| Item | Lubrication Point | Interval — Days | | | | |
|--|--------------------------------|-----------------|---|----|----|------------------------------|
| | | 1 | 7 | 14 | 30 | 90 |
| Bow Thruster System* | | | | | | |
| Reservoir | Check oil level. | X | | | | |
| Oil Filters | Change filters. | | | | | Semi-annually. |
| *Refer to onboard Technical Service Manual S9568-AM-MMC-010. | | | | | | |
| Air Compression System* | | | | | | |
| Compressor | a. Check oil level. | X | | | | |
| | b. Change oil. | | | | | Every 250 hours. |
| *Refer to onboard Technical Service Manual S6220-CZ-MMO-010. | | | | | | |
| Outboard Motor* | | | | | | |
| Gear Housing | Fill. | | | | | X |
| Swivel Bracket and Swivel Pin | Lubricate at fitting. | | | | | X |
| Throttle Shift Linkage | Lubricate. | | | | | X |
| Reverse Lock Lever | Lubricate. | | | | | X |
| Clamp Screws | Lubricate. | | | | | X |
| Propeller Shaft | Lubricate at fill hole. | | | | | Every 60 days. |
| *Refer to onboard Technical Service Manual S9236-AA-MMC-010. | | | | | | |
| Fresh Water System* | | | | | | |
| Water Pump Motor | Lubricate. | | | | | X |
| *Refer to onboard Technical Service Manual. | | | | | | |
| A/C Sea Water Pump* | | | | | | |
| A/C Cooling Sea Water Pump Motor | Lubricate bearing with grease. | | | | | As required (see motor tag). |
| *Refer to onboard Technical Service Manual S6225-SR-MMC-010. | | | | | | |

Table 6-3. Lubrication — Continued.

| Item | Lubrication Point | Interval — Days | | | | |
|--|--|-----------------|---|----|----|-----------------|
| | | 1 | 7 | 14 | 30 | 90 |
| Fuel System | | | | | | |
| Fuel Oil Transfer Pump* | Lubricate each grease fitting. | | | | | Every 6 months. |
| *Refer to onboard Technical Service Manual S6225-SQ-MMC-010 for details. | | | | | | |
| Sewage System | | | | | | |
| Water Closets (Flush Valves) | Lubricate moving parts of flush valves with silicone spray. | | | | | Semi-annually. |
| Miscellaneous | | | | | | |
| Rudder Stocks | Bearing block grease fittings. | | | | | Every 90 days. |
| Cables and Sheaves | Apply 1 or 2 drops of oil to bearings. | | | | | Every 90 days. |
| Hatch Dog Bolts | Apply 1 or 2 drops of oil to threads. | | | | | Every 90 days. |
| Access Plate Bolts | Apply 1 or 2 drops of oil to threads. | | | | | Every 90 days. |

Section III REPAIR

6-4. GENERAL REPAIR.

Maintenance falls into two categories: preventive and corrective. Preventive maintenance includes the periodic inspections in Section I, this chapter. When corrective action is beyond the tool, test or personnel capabilities, the problem should be referred to a higher maintenance level. Detailed repair information for equipment on the craft on which specific maintenance instructions are provided is listed in Table 1-3. These manuals are stowed in the lazarette. Repair to systems or components not covered by the onboard manuals is covered in this section.

WARNING

To prevent accidental injury or death, notify appropriate personnel of repair work and secure electrical and/or hydraulic systems which serve the system, components or equipment being repaired. Tag controls, valves and disconnect points to alert personnel of repair condition and prevent accidental start-up of related machinery.

6-4.1. WELDING. All weld repair shall be done in accordance with the requirements of the American Bureau of Shipping and the United States Coast Guard.

6-4.2. PLUMBING. Use materials specified on the applicable onboard drawing in so far as possible to effect repairs to plumbing. Silver brazing of copper tubing shall be done in accordance with NAVSHIPS 0900-001-7000.

6-4.3. ELECTRICAL WIRING. All repairs to wiring shall conform to IEEE Standard No. 45.

6-5. PROPULSION SYSTEM.

6-5.1. PROPELLERS AND SHAFTS. The arrangement of propellers and shafts is shown on onboard NAVSEA drawing 243-6003369.

6-5.1.1. Propellers. To remove and replace the propellers, proceed as follows:

1. Proceed to dry dock and be sure boat is properly blocked to prevent injury to personnel or damage to the boat.

CAUTION

Check stability of boat before attempting repair or service of any kind.

2. Remove the cotter key from the shaft end.
3. Remove heavy hex head nut and jam nut from shaft end.

4. Mark shaft and propeller for reassembly. Pull propeller from shaft and remove propeller hub key.
5. Repair or replace propeller as necessary.
6. Position key in propeller shaft and install propeller on shaft.

NOTE

Be sure to match marks made at removal to insure proper fit.

7. Install jam nut and hex nut on propeller shaft and tighten securely. Install cotter pin through propeller shaft.

NOTE

When installing a new propeller be sure it is the same as the one being removed (left hand or right hand).

6-5.1.2. Stuffing Box Packing. To replace packing in stuffing box, proceed as follows:

1. Close the port or starboard stern tube sea water supply valve at frame 17-1/2 in the engine room to prevent flow of water to the stuffing box.
2. Locate air valve at top aft side of stuffing box. Attach air line and inflate seal to approximately 15 PSI.
3. Remove jam nuts and hex nuts to loosen packing gland. Slide packing gland forward to access packing.

NOTE

Care should be taken not to score shaft when replacing packing which could result in leaks.

4. Install replacement packing. Packing is 3/4-inch square waxed flax packing. Each stuffing box requires approximately 15 foot of packing.
5. Do not overtighten packing gland on new packing as overheating of stuffing box will result.
6. Remove air line from air valve and completely deflate air seal.

6-5.1.3. Propeller Shafts. Removal of propeller shaft must be accomplished in dry dock by certified personnel. If shaft damage has been sustained, there is a possibility of bearing damage as well. These repairs cannot be made at sea.

WARNING

When shaft has been removed it is necessary to align the reduction gear output flange coupling to the line shaft flange coupling or severe damage will result.

6-5.2. PROPULSION CONTROLS. The arrangement of the propulsion controls is shown on the onboard NAVSEA drawing 252-6003371.

6-5.2.1. Control Heads. The control heads in the pilothouse and on the auxiliary control station are identically mounted. To replace the control heads, proceed as follows:

1. Disconnect cables from control heads and mark for reassembly.
2. Remove hardware securing heads to station. Remove heads and repair or replace as necessary.
3. Position heads on control stand and secure with mounting hardware. If gaskets were damaged at removal, replace as necessary.
4. Check cable marking and reassemble the proper cable to the correct control head.

NOTE

Check cabling to be sure it is not binding and move handles through their full 180 degree travel.

6-5.2.2. Main Engine Shutdown Pulls. The main engine shutdown controls are located on the front of the helm station, on the port side of the steering wheel and in the stairwell to the pump room at frame 14. To remove and replace main engine shutdown pulls, proceed as follows:

1. Disconnect cables at helm station or in stairwell to pump room. Tag cables for reassembly.
2. Remove hardware securing emergency shutdown heads to helm station or brackets in stairwell. Repair or replace heads as necessary.
3. Install new or repaired heads and connect cables as necessary. Be sure cables are connected as marked at assembly.

6-5.2.3. Clutch Disconnect Heads. The clutch disconnect heads are located in the pilothouse on the helm station, starboard side of the steering wheel. Replacement of the heads is accomplished in the same manner as replacement of the emergency heads.

6-5.2.4. Transfer Units. The transfer units are located in the engine room directly above the engine they control. To remove and replace the transfer units, proceed as follows:

1. Disconnect and tag all cabling to the transfer units. Refer to NAVSEA drawing 252-6003371 and onboard Technical Service Manual S9252-A2-MMC-010 showing cable hook-up.

NOTE

Be sure all cables are tagged for reassembly.

2. Remove hardware securing transfer units to mounting brackets above engines.

3. Repair or replace transfer unit as necessary.
4. Mount unit and secure with hardware provided.
5. Connect all cabling as marked at removal.
6. Operate levers to be sure the cables are not binding.

6-5.2.5. Cabling. If cabling must be removed, refer to onboard NAVSEA drawing 252-6003371 for complete details of hangers, bulkhead penetration and wireways for removing and replacing specific cables. Refer to onboard Technical Service Manual S9252-A2-MMC-010 for adjustments or additional maintenance that may be required.

6-5.3. PROPULSION ENGINES AND REDUCTION GEAR. Refer to the onboard commercial Technical Service Manual for the propulsion engine and reduction gear for service and repair instructions. Repair of the propulsion engines and reduction gear may or may not be performed aboard the craft depending on the extent of repair. If it is necessary to remove the propulsion units from the craft, the deck above the engine room must be cut out to permit removal. Refer to paragraph 6-24 for removal instructions.

6-6. FUEL SYSTEM.

The fuel system arrangement is shown on NAVSEA drawings 261-6003376 and 261-6003377.

6-6.1. FUEL TANKS. If damage to the fuel tanks occurs, the tanks must be drained and flushed before repair is attempted. All fuel tanks are fitted with oil-tight manhole covers for inspection and repair.

WARNING

If welding is required on the fuel tanks, purging of the tanks will be required to prevent the possibility of fire or explosion.

6-6.2. FUEL TRANSFER PUMP. The fuel transfer pump is located in the engine room at frame 22, port side of centerline. To remove and replace the fuel transfer pump proceed as follows:

1. Close the gate valves on both sides of the fuel transfer pump.
2. Shut off power to the transfer pump motor at the controller.
3. Disconnect, tag and plug all lines to the fuel transfer pump. Plug all holes in the pump to prevent contamination.
4. Disconnect electrical wiring to the pump motor. Tag leads to facilitate assembly.
5. Remove hardware securing pump to mounting plates and carefully remove transfer pump and motor.
6. Refer to onboard Technical Service Manual S6225-SQ-MMC-010 for service information.

7. Install transfer pump on mounting plates and secure with hardware. Check pump alignment.
8. Connect electrical wiring.
9. Remove plugs from pump and fuel lines and connect lines as tagged during removal.
10. Turn on power to the pump at the controller.
11. Open isolation gate valves and check pump operation. Check for leakage and repair if necessary.

6-6.3. **STRIPPING PUMP.** The stripping pump is mounted on the stanchion at frame 22 in the engine room. To replace the stripping pump proceed as follows:

1. Close isolation valves on inlet side of the stripping pump.
2. Disconnect and tag fuel lines to the pump. Plug fuel lines and pump inlet and outlet to prevent contamination.
3. Remove hardware securing pump to mounting plate on stanchion.
4. Refer to onboard Technical Service Manual S6225-XQ-MMC-010 for service details.
5. Secure pump to mounting plate on stanchion.
6. Unplug pump inlet and outlet and fuel lines and connect fuel lines to pump.
7. Open isolation valve on inlet side of stripping pump. Check pump operation. Check for leakage and repair as necessary.

6-6.4. **WATER FILTER SEPARATOR.** The fuel/water separator is located at frame 22 port side of centerline in the engine room. To remove and replace the fuel/water separator proceed as follows:

1. Close isolation valves in the inlet and outlet piping and drain separator.
2. Disconnect piping from the fuel/water separator and plug lines and fittings to prevent contamination. Tag piping to facilitate installation.
3. Refer to onboard Technical Service Manual S9550-BA-MMC-010 for maintenance details.
4. Install fuel/water separator into fuel system piping after removing plugs. Check tags for proper installation.

NOTE

Be sure to correctly identify the inlet and outlet connections to avoid piping the unit backwards. The unit will not perform correctly if connections are reversed.

5. Open isolation valves in the inlet and outlet piping and check for leakage. Repair or replace lines or fittings where leakage is present.
- 6-7. **LUBE SYSTEM.**

The arrangement of the lubrication system components is shown on NAVSEA drawings 262-6003378 and 262-6003379.

6-7.1. **STORAGE TANKS.** The clean oil storage tank is located in the engine room at frame 23 aft of the engine room. The waste oil storage tank is located at frame 15 under the grating in the pump room. If damage to the tanks occurs, the tanks must be drained and flushed before repair is attempted.

WARNING

Purge tanks before attempting to weld on either tank to prevent the possibility of fire.

6-7.2. **WASTE OIL DISCHARGE PUMP.** The waste oil hand discharge pump is located at frame 16 in the pump room, starboard side of the engine room access. To remove the waste oil discharge pump proceed as follows:

1. Open the discharge valve on the main deck to allow any oil in the line to drain back into the tank before pump removal.

NOTE

If valve is not opened, oil trapped in the piping above the pump will drain out as soon as pump is removed.

2. Disconnect inlet and outlet piping to the discharge pump. Wipe up any spills that occur.
3. Remove hardware securing pump to bulkhead.
4. Refer to onboard Technical Service Manual S6225-GL-MMC-010 for maintenance details.
5. Position discharge pump on bulkhead and connect inlet and outlet piping.
6. Secure pump to bulkhead with attaching hardware.
7. Close discharge valve on main deck.
8. Operate pump and check for leakage. Repair as necessary.

6-8. FRESH WATER SYSTEM.

The arrangement of the fresh water system is shown on NAVSEA drawings 533-6003427 and 533-6003428.

6-8.1. **FRESH WATER PUMP.** The fresh water pump is located forward of frame 14 in the pump room. To remove and replace the fresh water pump proceed as follows:

NOTE

Remove hardware securing pump guard plate and remove plate from bulkhead.

1. Turn off electrical power to the fresh water pump motor at the motor controller located in the pump room at frame 12, port side.
2. Close potable water discharge valve located at frame 14 in the pump room. Close water supply valves at tanks.
3. Disconnect electrical connection to the pump motor.

4. Disconnect inlet and outlet piping to the pump and plug to prevent contamination.
5. Remove hardware securing pump to base plate and remove pump.

NOTE

Refer to onboard Technical Service Manual for maintenance details.

6. Position pump on mounting base and secure with hardware.
7. Unplug piping and fittings and install inlet and outlet piping to pump.
8. Install motor on pump and connect wiring to motor.
9. Open water supply valves and turn on electrical power to the water pump.
10. Operate system and check for leakage and proper operation. Repair if necessary.

6-8.2. **FRESH WATER FILTER.** The fresh water filters are mounted in the pump room at frame 12-1/2. To replace fresh water filters proceed as follows:

1. Turn off water to the filter being replaced by turning the valve handle on the filter in full counterclockwise position.
2. Turn colored ring to the left as far as possible, holding onto filter cartridge.
3. Carefully turn cartridge in ledge of ring until cartridge lugs are under cutout in ring.
4. Pull cartridge down and out of ring.
5. With colored ring in lowered position (turned all the way to the left), orient lug on cartridge filter with cutout in ring.
6. Insert cartridge straight up into ring to allow lugs on cartridge to rest on ledge inside ring when cartridge is rotated to the right.
7. When cartridge lugs are resting on inside ledge of ring, turn colored ring as far as possible to the right to drive cartridge filter into head.
8. Move valve handles down to lock ring into place and turn on water. Be sure valve handle legs engage ring locking lugs.
9. Check for leaks in OFF and ON position.
10. Refer to onboard Technical Service Manual S9533-AX-MMC-010 for details.

6-8.3. **BOOSTER HEATER.** The booster water heater is located in the Provisions Storeroom at frame 12, starboard side. To replace the booster heater proceed as follows:

1. Disconnect all power to the booster heater.
2. Close the inlet water supply line from the hot water heater.
3. Open booster heater drain valve and completely drain the heater.
4. Disconnect inlet, outlet and drain piping to the booster heater.

5. Remove hardware securing booster heater to the mounting plate. Carefully remove the booster heater from the plate and lower to the deck.

NOTE

Care should be taken not to damage the valves or electrical connections when moving the heater.

6. Refer to onboard Technical Service Manual S6161-HV-FSE-010 for maintenance details.
7. Install booster heater on mounting plate and secure with attaching hardware.
8. Connect inlet, outlet and drain piping to the heater.
9. Close booster heater drain valve.
10. Open inlet water supply to the heater and fill heater. Capacity is 16 gallons.

CAUTION

Do not turn on current to booster heater until tank has been filled with water and all air has been vented through the rinse nozzle. Heating elements will burn out if not immersed in water.

11. Connect power leads to the control box. Check operation of booster heater. Check all plumbing connections for leakage and repair if necessary.
12. Check water temperature and water pressure after heater has heated up sufficiently.

NOTE

Water temperature at the booster outlet should be 180 degrees to 192 degrees Fahrenheit (82 degrees C to 89 degrees C) and flow pressure should be 20 PSI.

6-8.4. **HOT WATER HEATER.** The hot water heater is located in the pump room forward of frame 16. To remove the hot water heater proceed as follows:

1. Close the cold water supply inlet valve to the heater located in the pump room at frame 14.
2. Close all the outlet valves from the heater.
3. Turn off the electrical disconnect switch.
4. Attach a hose to the drain valve outlet and drain into the pump sink. Open the hot water faucet at the sink. Remove drain hose and close drain valve.
5. Disconnect the electrical connections to the hot water heater.
6. Disconnect the inlet and outlet piping as necessary for removal. Lift heater from angle supports welded to mounting plate.
7. Refer to onboard Technical Service Manual S9533-AY-MMC-010 for maintenance details.
8. Position heater in angle supports and connect inlet and outlet piping.
9. Fill the heater according to onboard manual data.

CAUTION

Never operate the water heater without being certain the heater is filled as damage to the elements will result.

10. Connect the wiring to the heater and turn on the electrical disconnect switch.
11. Open outlet valves and inlet supply valves to the heater and check for proper operation. Check for leakage and repair if necessary.

6-8.5. **CHLORINE TANK.** The chlorine treatment mixing tank can be mounted on the port or starboard side of the TWR at frame 12 on the main deck. To replace the chlorine tank proceed as follows:

1. Close the gate valve at frame 12 and disconnect from tank coupler. Cap gate valve to prevent contamination.

WARNING

Be sure to attach a lifting device of suitable capacity before removing bolts or injury may result.

2. Remove nut and washer securing chlorine tank to the support plate.
3. Lift chlorine tank from support plate.
4. Refer to Naval Preventative Medicine Manual NAVMED-P-5010 for handling and disinfection.
5. Replace tank on support and secure with hardware.
6. Uncap valve and connect valve to tank coupler. Open gate valve and check for leakage.

6-9. **BILGE, BALLAST AND FIREMAIN SYSTEM.**

The arrangement of the bilge, ballast and firemain system is shown on onboard NAVSEA drawings 529-6003425 and 529-6003426.

6-9.1. **FIRE PUMPS.** The two fire pumps which are used for bilge, ballast and firemain operation are located in the lazarette at frame 25, starboard side (Pump No. 1) and in the engine room at frame 17, port side of centerline (Pump No. 2). To replace the fire pumps proceed as follows:

1. Close discharge gate valve slowly before stopping pump.
2. Turn off power to the pump at the pump controller.
3. Close the suction gate valve and remove air vent plug on pump casing to prevent pressure buildup.
4. Disconnect electrical connections to the pump motor. Tag all leads to facilitate assembly.
5. Remove bolts securing motor frame to pump volute. Lift motor straight up and out of pump volute. Rotating elements of pump will be attached to shaft when separated.

NOTE

Pump casing need not be removed from piping unless damage to the casing is noted.

6. Refer to onboard Technical Service Manual S6225-SS-MMC-010 for maintenance data on the motor and pump.
7. If casing is damaged, disconnect pump from pipe fittings and remove casing from system.
8. After maintenance is completed, make sure pump and motor mating surfaces are clean and bolting threads are not damaged.
9. Refer to manual and reassemble pump components on motor shaft.
10. Carefully guide motor shaft with assembled parts into volute.

NOTE

Incorrect alignment directly affects pump performance characteristics once operation is resumed.

11. Install bolts securing motor to pump and install air vent plug on pump casing and open suction gate valve.
12. Connect electrical leads to pump motor.
13. Turn on power to the pump at pump controller.
14. Check pump and suction piping for pressure leaks. Repair if necessary.
15. When pump is running at full speed, slowly open the discharge gate valve. Check discharge piping for pressure leaks. Check pressure gauge for proper reading.

6-9.2. **BALLAST TANKS.** Ballast tanks are fitted with water-tight manhole covers for inspection and repair. If damage to a ballast tank occurs the tank must be deballasted before repair is attempted. Refer to paragraph 4-74 Ballast System Operation for deballast procedure.

6-10. **SEA WATER COOLING SYSTEM.**

The arrangement of the sea water cooling system is shown on onboard NAVSEA drawings 256-6003373 and 256-6003374.

6-10.1. **ENGINE-MOUNTED SEA WATER PUMPS.** The engine-mounted sea water pumps are mounted on the propulsion engines and maintenance information on the pumps is covered in the onboard engine manual.

6-10.2. **HEAT EXCHANGERS.** The sea water heat exchangers are furnished as part of the propulsion engines. Refer to onboard engine manual for maintenance details.

6-10.3. **SEA WATER COOLING PUMP (AIR CONDITIONING UNIT).** The sea water cooling pump is

located in the engine room on centerline at frame 17-1/2. To remove and replace the sea water pump proceed as follows:

1. Turn off power to the sea water cooling system at the motor controller located in the engine room at frame 18, starboard side of centerline. Tag "POWER DOWN."
2. Close isolation valves on both sides of the pump to restrict flow.
3. Disconnect electrical connection to the pump motor and tag for reassembly.
4. Disconnect suction and discharge piping from the pump by removing screws at attachment flanges.

NOTE

Pump and motor weigh approximately 160 pounds. Use a suitable lifting device when removing the complete unit.

5. Attach a suitable lifting device to the pump unit.
6. The pump unit is mounted on supports welded to the fuel oil tank top. Remove bolts, nuts and washers to remove pump unit.
7. Refer to onboard Technical Service Manual S6225-SR-MMC-010 for maintenance information.
8. Lift pump into position on supports and secure with attaching hardware.
9. Connect suction and discharge piping and secure with flange hardware.
10. Connect electrical leads to the pump motor.
11. Open isolation valves on both sides of the pump.
12. Turn on power to the sea water pump at the controller.
13. Operate system and check for leakage or other defects. Repair as necessary.

6-11. STEERING SYSTEM.

The arrangement of the steering gear components, rudder stocks and nozzles is shown on onboard NAVSEA drawings 561-6003436 and 562-6003437.

6-11.1. HELM PUMP. The helm pump is located on centerline in the pilothouse mounted behind the steering wheel. To remove and replace the helm pump proceed as follows:

1. Shut down the steering system before attempting removal of the helm pump.
2. Remove the necessary access panels from the front of the control console in the pilothouse.
3. Close the isolation valves located in the steering system piping inside the console.
4. Disconnect and tag all hoses from helm pump and cap hoses and pump to prevent contamination.
5. Drain helm pump into a suitable container by removing drain plug.

6. Block up helm pump before removing steering wheel to prevent damage to pump shaft.
7. Remove center bolt on steering wheel and pull steering wheel from helm pump shaft. Remove key from shaft.
8. Remove filler cap and dipstick from front of console.
9. Remove hardware securing pump to front of console and pull out through back of console panel. Repair or replace pump as necessary. Refer to onboard Technical Service Manual S9561-BD-MMC-010 for repair details.
10. Position pump in console with shaft protruding through centerline hole and secure with mounting hardware. Install filler cap and dipstick.
11. Block up helm pump inside console to prevent shaft damage.
12. Install key in pump shaft and slide steering wheel onto pump shaft. Secure with bolt.
13. Unplug hoses and pump and connect all hoses. Open isolation valves.
14. Refill helm pump through filler cap.
15. Start up the steering system and check for leaks in system. Repair any leaks.
16. Replace access plates on front of console.

NOTE

Refer to onboard Technical Service Manual S9561-BD-MMC-010 for complete details on helm pump.

6-11.2. STEERING PUMPS. The steering pumps are located in the lazarette at frame 27-1/2, starboard side. To replace the pumpset proceed as follows:

1. Shut down the steering system and close isolation valves in the piping to the pumpset. Valves are located in the lazarette at frame 28, starboard side.
2. Turn off electric power to the pumpset at controller.
3. Disconnect electrical wiring at the pumpset.
4. Disconnect and tag all hoses and piping to the pumpset. Plug hoses and fitting to prevent contamination.
5. Attach a sling of sufficient capacity to the pumpset and remove the four (4) mounting bolts securing the mounting rails to the weld plates. Repair or replace pumpset.
6. Lift pumpset into position and align holes in rails with holes in welded plates. Secure with mounting hardware.
7. Remove plugs from all hoses and fittings and connect lines according to tags attached at removal.
8. Connect electrical connections to pumpset.
9. Open shutoff valves and isolation valves in the piping. Check for leakage.
10. Turn on power at the controller and start up the steering system. Check steering operation.

NOTE

Refer to onboard Technical Service Manual S9561-BD-MMC-010 for complete details on the pumpsets.

6-11.3. **ACCUMOTOR.** The accumotor is mounted above the ram actuator in the lazarette at frame 27-3/4, port side. To replace the accumotor proceed as follows:

1. Shut down steering system and turn off electricity at the controller.
2. Turn off isolation valves on both sides of the accumotor.
3. Disconnect electrical connection to the solenoid-operated 4-way valve.
4. Disconnect hydraulic hoses, tag and plug to prevent contamination. Plug all fittings on accumotor.
5. Disconnect and tag all linkage to the accumotor and remove accumotor from mounting.
6. Mount accumotor and connect linkage. Check tags before assembly.
7. Remove plugs from accumotor and hydraulic lines and connect lines according to tags at disassembly.
8. Connect electrical connections.
9. Turn on isolation valves on both sides of the accumotor.
10. Turn on electric power at controller and start up steering system. Check steering operation.

NOTE

Refer to onboard Technical Service Manual S9561-BD-MMC-010 for complete details on the accumotor.

6-12. BOW THRUSTER (HYDRAULIC) SYSTEM.

The arrangement of the bow thruster system is detailed on NAVSEA drawings 556-6003433, 556-6003434 and 568-6003438.

WARNING

The bow thruster hydraulic system operates at 2500 PSI. Be sure the system has been depressurized before disconnecting hydraulic lines as severe injury may result.

6-12.1. **BOW THRUSTER HYDRAULIC PUMP.** The bow thruster hydraulic pump is driven by the port propulsion engine. The pump is located in the engine room at frame 17-1/2. To replace the pump proceed as follows:

1. Shut down port propulsion engine.
2. Turn off electrical power to the bow thruster control system at the pilothouse lighting panel L101.
3. Close isolation valves in hydraulic lines leading to bow thruster pump.

4. Depressurize system and disconnect and tag hydraulic hoses to the engine driven bow thruster pump. Plug hoses and pump fittings to prevent system contamination.
5. Support pump and remove flange bolts securing hydraulic pump to the port propulsion engine.
6. Grasp pump firmly and slide straight back until shaft disengages from propulsion engine auxiliary drive. Lift pump up and away from engine.
7. Refer to onboard Technical Service Manual S9568-AM-MMC-010 for servicing information.
8. Carefully slide pump shaft into engine. Insure shaft alignment and secure pump to engine with two (2) mounting bolts.
9. Unplug hoses and pump fittings and connect hydraulic hoses according to tags.
10. Open isolation valves in hydraulic lines leading to hydraulic pump.
11. Turn on electrical power to the bow thruster control system.
12. Start up propulsion engine and check bow thruster system for proper operation. Check system for leakage and repair if necessary.

6-12.2. **DIRECTIONAL CONTROL VALVE.** The directional control valve is located in the bow thruster area mounted on the bulkhead at frame 6. To replace the control valve proceed as follows:

WARNING

The bow thruster hydraulic system operates at 2500 PSI. Be sure the system has been depressurized before disconnecting hydraulic lines as severe injury may result.

1. Shut down propulsion engine and turn off electrical power to the bow thruster control system.
2. Be sure system is depressurized and disconnect and tag hydraulic lines to the directional control valve. Plug all lines and fittings to prevent system contamination.
3. Remove six (6) screws securing directional control valve to bulkhead and remove valve.
4. Refer to onboard Technical Service Manual S9568-AM-MMC-010 for servicing information.
5. Position valve on bulkhead and secure with attaching hardware.
6. Unplug lines and fittings and connect hydraulic lines according to tags.
7. Turn on electrical power to the bow thruster control system and start propulsion engine.
8. Check system for leakage and proper operation.

6-12.3. **BOW THRUSTER UNIT.** The bow thruster unit is located in the tunnel at frame 5-1/3. Service of the bow

thruster unit will be accomplished when the TWR is in dry dock. To remove the bow thruster unit proceed as follows:

WARNING

The bow thruster hydraulic system operates at 2500 PSI. Be sure the system has been depressurized before disconnecting hydraulic lines as severe injury may result.

1. Turn off power to the bow thruster control system. Tag ELECTRICAL POWER OFF at panel.
2. Remove hardware securing bar guards to tunnel entrance and remove guards both sides.
3. Be sure system is depressurized and disconnect and tag lines and fittings. Plug all lines and fittings to prevent contamination.
4. Remove propeller nut and pull propeller and shaft key carefully off the motor shaft and out of the tunnel.
5. Support bow thruster and remove bolts and washers securing upper mounting block to strut housing.
6. Remove support from bow thruster and lower the unit to allow removal from the starboard side of the tunnel.

NOTE

Repairs to the bow thruster unit should not be attempted by anyone except a qualified serviceman. Component parts of the unit cannot be repaired and must be replaced with new parts.

7. Refer to the onboard Technical Service Manual S9568-AM-MMC-010 for service information.

NOTE

When installing bow thruster unit in tunnel be careful not to damage propeller during procedure.

8. Position the bow thruster in the tunnel so that strut is in place to secure upper mounting block from bow thruster area with mounting screws. Torque bolts to 70 ft./lbs. using loctite 242 on bolt threads.
9. Remove plugs from lines and fittings and connect lines according to tags installed at removal.
10. Install bar guards at tunnel entrances port and starboard and secure with hardware.
11. Turn on power to the bow thruster control system.
12. Inspect system for oil or air leaks at all joints after system has been pressurized to 2500 PSI.

6-12.4. BOW THRUSTER HYDRAULIC RESERVOIR. The bow thruster reservoir is located in the bow thruster area at frame 6, port side of centerline. The reservoir is fitted with a drain, an access cover for cleaning and repair, a temperature/level switch, a liquid level gauge, and return and supply lines to other system components. If damage to the reservoir occurs, it must be drained and flushed before repair is attempted. The reservoir is bolted to a lower plate and two upper mounting pads with 6 bolts, washers and nuts.

WARNING

The bow thruster hydraulic system operates at 2500 PSI. Be sure the system has been depressurized before disconnecting hydraulic lines as severe injury may result.

6-13. HYDRAULIC DECK CRANE.

The arrangement of the deck crane and hydraulic system is shown on NAVSEA drawings 556-6003433 and 185-6003353.

6-13.1. DECK CRANE. The pedestal for the deck crane is welded to the main deck at frame 16, starboard. Repair is best accomplished onboard because of the size and weight of the unit. Refer to onboard Technical Service Manual NAVSEA SG811-A4-MMC-010 for repair instructions.

WARNING

The deck crane hydraulic system is a pressurized system. Be sure that the system has been depressurized before disconnecting or removing lines or other components or serious injury may result. Turn off electrical power to the system at the motor controller at frame 14, port. Tag ELECTRICAL POWER OFF.

NOTE

After depressurizing the hydraulic system, disconnect and tag hydraulic lines as required to repair components. Plug lines and fittings to prevent contamination. Avoid hydraulic fluid spills; clean up if necessary.

6-13.2. CRANE POWER PACK. The power pack is bolted to the main deck at frame 14, port. Repair is best accomplished onboard because of the size and access to the unit. Refer to onboard Technical Service Manual NAVSEA SG811-A4-MMC-010 for repair instructions.

If it is necessary to remove the power pack, proceed as follows:

WARNING

The deck crane hydraulic system is a pressurized system. Be sure that the system has been depressurized before disconnecting or removing lines or other components or serious injury may result. Turn off electrical power to the system at the motor controller at frame 14, port. Tag ELECTRICAL POWER OFF.

1. After depressurizing the hydraulic system, disconnect and tag hydraulic lines to the power pack. Plug lines and fittings to prevent contamination. Avoid hydraulic fluid spills; clean up if necessary.
2. Disconnect electrical power to the power pack motor. Tag wires to identify connections.
3. Remove eight (8) bolts, washers and nuts which secure the power pack to the deck foundation.
4. Remove power pack using the deck crane or yard crane and suitable lifting slings.
5. To install the power pack, position the power pack on deck foundation and maintain support. Install eight (8) bolts, washers and nuts to secure the unit.
6. Connect electrical wiring to the power pack motor.
7. Connect hydraulic lines to power pack.
8. Check operation of the deck crane.

6-13.3. CRANE CONTROL STAND. The control stand is bolted to the main deck at frame 15, starboard. Repair is best accomplished onboard because of the size and access to the unit. Refer to onboard Technical Service Manual NAVSEA SG811-A4-MMC-010 for repair instructions. If it is necessary to remove the control stand, proceed as follows:

WARNING

The deck crane hydraulic system is a pressurized system. Be sure that the system has been depressurized before disconnecting or removing lines or other components or serious injury may result. Turn off electrical power to the system at the motor controller at frame 14, port. Tag ELECTRICAL POWER OFF.

1. After depressurizing the hydraulic system, disconnect and tag hydraulic lines to the control stand. Plug lines and fittings to prevent contamination. Avoid hydraulic fluid spills; clean up if necessary.
2. Remove four bolts, washers and nuts which secure the control stand to the deck foundation.

3. Remove control stand using the deck crane or yard crane and suitable lifting slings.
4. To install control stand, position control stand on deck foundation and maintain support. Install four bolts, washers and nuts to secure the unit.
5. Connect hydraulic lines to control stand.
6. Check operation of the deck crane.

6-14. TORPEDO HANDLING SYSTEM:

The arrangement of the torpedo handling system is shown on NAVSEA drawings 556-6003433, 556-6003434, 752-6003470 and 752-6003519.

6-14.1. IN-HAUL WINCH. The in-haul winch is mounted on a welded foundation located at frame 15-1/2, main deck. To remove and replace the in-haul winch proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Turn off power to the hydraulic power unit electric motor at the motor controller located in the bow thruster area at frame 4-1/2 starboard side of centerline. Tag ELECTRICAL POWER OFF.
2. After depressurizing the system, disconnect and tag hydraulic lines to the winch motor. Plug lines and fittings to prevent system contamination.
3. Disconnect in-haul line from U-bolt mounted on hydraulic line guard.

NOTE

In-haul winch weighs approximately 175 pounds. Use suitable lifting device for removal.

4. Remove four nuts, bolts and washers securing in-haul winch to foundation and remove the in-haul winch.
5. Refer to onboard Technical Service Manual SG813-BF-MMC-010 for service information.
6. Position the in-haul winch on the foundation and secure with four bolts, washers and nuts.
7. Attach in-haul winch line to U-bolt on hydraulic line guard.
8. Unplug lines and fittings and connect hydraulic lines according to tags.
9. Turn on power to the system at the controller and pressurize system.
10. Check for proper operation and leakage in the system. Repair as necessary.

6-14.2. TRANSFER WINCH (FORWARD). The forward transfer winch is located aft of frame 16 on the

main deck. To remove and replace the forward transfer winch proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Turn off power to the hydraulic power unit electric motor at the motor controller located in the bow thruster area at frame 4-1/2 starboard side of centerline. Tag ELECTRICAL POWER OFF.
2. Disconnect in-haul winch line from hydraulic line guard. Remove hardware securing line guard to supports and lift line guard up and away from hydraulic lines.
3. After depressurizing the system, disconnect and tag hydraulic lines from the transfer winch. Plug lines and fittings to prevent system contamination.

NOTE

Transfer winch weighs approximately 150 pounds. Use a suitable lifting device for removal.

4. Remove four (4) nuts, bolts and washers securing forward transfer winch to welded deck mounting. Lift transfer winch from mounting.
5. Refer to onboard Technical Service Manual SG813-BF-MMC-010 for service information.
6. Position the forward transfer winch on the foundation and secure to welded deck mounting with four (4) bolts, washers and nuts.
7. Unplug lines and fittings and connect hydraulic lines to the transfer winch according to tags attached at removal.
8. Turn on power to the system at the motor controller and remove tag.
9. Operate the system and build up the pressure in the system. Check winch for proper operation and check for leakage in the system. Repair leakage if noted.
10. Replace hydraulic line guard and secure in-haul winch line to U-bolt.

6-14.3. TRANSFER WINCH (AFT). The aft transfer winch is located forward of frame 28, starboard side of centerline. To remove the aft winch proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Turn off power to the hydraulic power unit electrical motor at the motor controller located in the bow thruster area at frame 4-1/2, starboard side of centerline.
2. Remove hydraulic line guard mounted over winch lines.
3. After depressurizing the system, disconnect and tag hydraulic lines at the winch. Plug all lines and fittings to prevent system contamination.

NOTE

Transfer winch weighs approximately 150 pounds. Use a suitable lifting device for removal.

4. Remove four (4) nuts, bolts and washers securing aft transfer winch to welded deck mounting. Lift transfer winch from mounting.
5. Refer to onboard Technical Service Manual SG813-BF-MMC-010 for service information.
6. Position the aft transfer winch on the foundation and secure to welded deck mounting with four (4) bolts, washers and nuts.
7. Unplug lines and fittings and connect hydraulic lines to the transfer winch according to tags removed.
8. Turn on power to the system at the motor controller and remove tag.
9. Operate the system until pressure has built up and check winch operation. Check for leakage at winch connections and repair if necessary.
10. If winch is operating properly install line guard over the winch hydraulic lines.

6-14.4. HYDRAULIC CYLINDERS. The hydraulic cylinders are located on the main deck on frame 19 and 20 port side of the transfer carriage. To remove the hydraulic cylinders proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Shut down the torpedo handling system and depressurize the system. Tag SYSTEM DOWN.
2. Disconnect and tag hydraulic lines and cylinder fittings. Plug lines and fittings to prevent contamination.
3. Remove the cotter pin and pivot pin from the hydraulic cylinder base.
4. Remove the cotter pin and clevis pin securing the hydraulic cylinder clevis to the lifting arm assembly. Lift hydraulic cylinder from mounting.
5. Position new or repaired hydraulic cylinder on the lifting arm assembly securing clevis with clevis pin and cotter pin.

6. Secure cylinder to cylinder base using pivot pin and cotter pin.
7. Unplug lines and fittings and connect to hydraulic cylinder.
8. Turn on system and check for proper operation. Check for system leakage and repair if necessary.

6-14.5. **HYDRAULIC MOTOR.** The hydraulic motor for the transfer carriage is located at frame 19-1/2 on the centerline of the track. To remove the hydraulic motor proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Shut down the torpedo handling system and make sure system is depressurized. Tag **SYSTEM DOWN**.
2. Disconnect and tag lines and fittings from the hydraulic motor. Plug lines and fittings to prevent contamination.
3. Remove four (4) bolts and washers securing motor to coupling and slide motor shaft out of coupling.
4. Carefully slide motor shaft into coupling and secure with bolts and washers.
5. Unplug lines and fittings and connect according to tags.
6. Start up torpedo handling system and check for leakage and proper operation.

6-14.6. **CONTROL VALVE.** The control valve is mounted in the torpedo control console just forward of frame 16 on the main deck, starboard side of centerline. To replace the control valve proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Shut down the system and make sure the system is depressurized. Tag **SYSTEM DOWN**.
2. Disconnect and carefully tag all lines and fittings in the control valve. Lines must be properly installed or control valve will not function.
3. Remove knobs and levers from control valve and tag for reassembly.
4. Remove three (3) bolts securing the control valve to the stand and lift valve out of the console.
5. Refer to onboard Technical Service Manual SG813-BH-MMC-010 for service information.

6. Position control valve in the console and secure with three bolts.
7. Install levers and knobs on control valve.
8. Unplug all lines and fittings and connect lines to the valve according to tags.
9. Start up the system. When system is up to pressure, check for proper operation and leakage. If leakage is observed, repair as necessary.

6-14.7. **HYDRAULIC POWER UNIT PUMP.** The hydraulic power unit pump is located in the bow thruster area mounted on the hydraulic reservoir and coupled to the 25 HP motor. The complete unit is mounted on supports welded to the bulkhead at frame 6. To replace the hydraulic pump proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Turn off electrical power to the pump unit electrical motor at the motor controller located on the bulkhead at frame 4-1/2 in the bow thruster area. Tag **ELECTRICAL POWER DOWN**.
2. Shut down and depressurize the system before removal procedure is started.
3. Close the supply valves to the control valve which are located at frame 6 above the power unit.
4. Disconnect the outlet fitting and the inlet fitting to the pump. Plug all fittings to prevent contamination.
5. Pull pump shaft out of flexible coupling on motor.
6. Refer to onboard Technical Service Manual SG700-AH-MMC-010 for service information.
7. Install new or repaired pump into flexible coupling. Check for proper alignment.
8. Unplug hydraulic fittings and connect inlet and outlet fittings to the pump.
9. Open supply valves to control valve.
10. Turn on electrical power at the controller and operate the system.
11. Check for leakage and proper system operation. Repair any leakage.

6-14.8. **ELECTRIC MOTOR.** The hydraulic power unit electric motor is located in the bow thruster area mounted on the hydraulic reservoir. To replace the electric motor proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Turn off electrical power to the motor at the controller located on the bulkhead at frame 4-1/2 in the bow thruster area. Tag **ELECTRIC POWER DOWN**.
2. Depressurize the system before component removal.
3. Refer to paragraph 6-14.7 and remove the pump.
4. Disconnect lead to electric motor at the conduit box.

WARNING

Motor is extremely heavy. Do not lift the motor unless a suitable lifting device is available.

5. Attach lifting device to the motor and remove four screws and washers securing motor base to the reservoir.
6. Refer to onboard Technical Service Manual SG700-AH-MMC-010 for service information.
7. Using the lifting device, position motor on reservoir and secure with bolts and washers.
8. Connect lead to conduit box on motor.
9. Refer to paragraph 6-14.7 and install pump.
10. Turn on electrical power at controller and operate system.
11. Check for proper system operation. Check for leakage. If leakage is observed, repair as required.

6-14.9. IN-LINE SUCTION FILTER. The in-line suction filter is located in the reservoir on the end of the pump suction pipe. To replace the in-line suction filter proceed as follows:

WARNING

The torpedo handling system is a pressurized system. Be sure system has been depressurized before removing components or serious injury may result.

1. Refer to paragraph 6-14.7 and remove the pump.
2. Remove hardware attaching split flange to reservoir top and pull suction pipe and filter out of reservoir.
3. Unscrew filter from pipe and clean in suitable cleaner.
4. Check suction pipe threads and screw filter onto pipe.
5. Install suction pipe with filter into reservoir and secure with split flange and hardware.
6. Refer to paragraph 6-14.7 and replace the hydraulic pump.

NOTE

If filter replacement is required, be sure to use the original equipment manufacturer's recommendations for the proper strainer element to be used.

6-14.10. RETURN LINE FILTER. The return line filter is mounted in the hydraulic piping above the hydraulic power unit in the bow thruster area at frame 6. To replace the filter proceed as follows:

1. Close isolation valves located on both sides of the filter.
2. Drain filter into a suitable container before disconnecting fitting.
3. Disconnect and plug fittings on both sides of filter to prevent system contamination.
4. Remove bolts securing filter to mounting bracket and remove filter from bulkhead.
5. Refer to onboard Technical Service Manual SG700-AH-MMC-010 for service details.
6. Unplug lines and install filter into return line.
7. Secure to mounting bracket with two bolts.
8. Open isolation valves and operate system. Check for leakage and repair if necessary.

6-15. ANCHOR HANDLING SYSTEM.

The arrangement of the anchor handling system is shown on NAVSEA drawing 581-6003440. Maintenance on the components in this system should be accomplished onboard ship because of good access to equipment and size and weight of the units.

6-15.1. ANCHOR WINDLASS. For repair information on the anchor windlass refer to onboard Technical Service Manual NAVSEA S9581-A2-MMC-010/76727. Special attention should be given to the safety precautions included in the onboard manual to prevent serious injury to personnel.

WARNING

If major repairs to the windlass are required, care must be taken to assure the anchor has been hauled and the devils claw secured to prevent serious injury to personnel if chain should play out.

6-15.2. CHAINS AND ANCHORS. Damage to anchor or anchor chains may require replacement of parts or complete units. Repair or replace as necessary. Refer to NAVSEA drawings 801-6003297, 801-6003298 and 801-6003299 for welding detail information.

NOTE

Anchor chain for the starboard side is 75 fathoms in length; the port side chain is 60 fathoms long.

6-16. SEWAGE SYSTEM.

The arrangement of the sewage system is detailed on onboard NAVSEA drawings 528-6003423 and 593-6003443.

WARNING

This space may contain dangerous gases or lack of oxygen for life. Before entering, space must be certified gas free by engineer.

6-16.1. SEWAGE PUMP. The sewage pump is located in the pump room at frame 13-1/2. To remove and replace the sewage pump proceed as follows:

WARNING

Voltages dangerous to life are present when the system is operating. Use extreme caution when servicing the equipment. Do not work alone. Observe all safety precautions. Contact with live circuit may cause serious injury or death.

WARNING

Do not eat, drink or smoke during maintenance of the sewage plant.

WARNING

The centrifugal pump weighs 200 pounds. Lifting gear is required to remove or install the pump unit, otherwise injury and/or equipment damage may result.

CAUTION

Personnel engaged in handling of sewage must wear protective rubber gloves, rubber boots and overalls to prevent sewage from touching the skin. Infection may result if cuts or open wounds are present on the skin.

1. Turn off power to the sewage system at the engine room power panel P401 located at frame 16, port side. Tag ELECTRICAL POWER OFF.
2. Close the pump suction isolating valve located in the line between the tank base and the pump volute casing.

NOTE

The standpipe will contain some fluid which will leak out when pipe is removed from the pump. Take precautions during removal to prevent spillage.

3. Disconnect and remove the standpipe between the pump outlet flange and the ejector. Disconnect the manual discharge valve.

4. Disconnect the pump inlet gate valve flange joint.
5. Remove cover from motor electrical box and disconnect wiring. Identify, mark and record positions prior to disconnection.
6. Attach a suitable lifting device to the pump, remove mounting bolts and lift pump clear.
7. Refer to onboard Technical Service Manual S9593-BP-MMC-010 for maintenance details.
8. Check mating faces of gate valve and pump to be sure surfaces are clean and not damaged.
9. Lift pump into position on base frame and align the inlet flanges. Install a new gasket on the flange and install flange bolts and nuts.
10. Secure pump to base with mounting bolts.
11. Install standpipe using new gaskets and reconnect the inlet flange to the manual discharge valve. Make sure discharge valve is closed.
12. Check that water level is above the low level float switch and open the suction gate valve.
13. Connect the electrical leads and install the cover. Check to be sure pump rotation is correct.
14. Check all pipe joints for signs of leakage.

6-16.2. SUMP PUMP. The sump pump is located in the pump room aft of frame 12, port side. The pump is mounted on the potable water tank. To remove and replace sump pump proceed as follows:

1. Turn off electric power to the sump pump at the engine room lighting panel L103. Tag ELECTRICAL POWER OFF.
2. Close globe check stop valve at the sump tank.
3. Disconnect and tag electrical leads to the sump pump.
4. Disconnect inlet and outlet fittings to the sump pump.
5. Support pump and remove hardware securing pump to supports. Remove pump from mounting.
6. Refer to onboard Technical Service Manual S6225-BQ-MMC-010 for maintenance information.
7. Position pump and connect inlet and outlet fittings.
8. Install pump on supports and secure with attaching hardware.
9. Connect electrical leads to the pump motor.
10. Open globe check stop valve at the sump tank.
11. Turn on electrical power at lighting panel L103. Remove tag.
12. Start pump and check for proper operation. Check for leakage and repair if leakage is present.

6-16.3. SEWAGE TANK. The sewage tank is located in the pump room at frame 13. The tank is fitted with containment coaming and a drip pan located under the manual discharge valve.

WARNING

Personnel engaged in sewage transfer or handling of sewage must wear protective rubber gloves, rubber boots and overalls to prevent the possibility of sewage contact with skin. Contact of this nature could cause serious illness.

WARNING

Sewage spills, sewage hose connections and solids on the hose exterior must be washed down with warm water containing a stock detergent.

NOTE

If repairs or maintenance are required on the sewage tank, refer to onboard Technical Service Manual S9593-BP-MMC-010 for complete details and safety precautions.

6-17: HEATING, VENTILATION AND AIR CONDITIONING SYSTEM.

The arrangement of the heating, ventilation and air conditioning system is detailed on onboard NAVSEA drawings 512-6003415 through 512-6003418 and 512-6003518.

6-17.1. EXHAUST FANS. Exhaust fans are mounted as follows:

1. Lazarette — Aft of frame 27.
2. Pump Room — Aft of frame 14.
3. Bosun's Stores — Frame 4-1/2.
4. Electric Equipment Room — Frame 7.
5. Galley Gooseneck — Bridge deck forward of frame 12.

The exhaust fans can be replaced as follows:

WARNING

Disconnect electrical power to unit(s) before attempting repair to prevent the possibility of serious injury or death.

1. Remove hardware securing fan to the mounting flanges.
2. Remove fan from ductwork and disconnect electrical leads. Tag to facilitate installation.
3. Refer to onboard Technical Service Manual S9512-BM-MMC-010 for maintenance details.
4. Connect electrical leads according to tags.
5. Position fan in ductwork and secure with attaching hardware.
6. Turn on electrical power to the fan. Check operation.

6-17.2. SUPPLY FAN. The engine room supply fan is located at frame 15 on the main deck below the ventilator. To remove and replace the supply fan proceed as follows:

WARNING

Disconnect electrical power to unit before attempting repair to prevent the possibility of serious injury or death.

1. Turn off power to the supply fan at the motor controller located at frame 16 in the engine room. Lock controller in OFF position.
2. Remove access cover at frame 14 in the shelter deck area.
3. Disconnect and tag electrical leads to the fan motor.

WARNING

Supply fan weighs approximately 425 pounds. Be sure to use a lifting device of sufficient capacity when removal is necessary.

4. Remove flange bolts at upper and lower flange of supply fan.
5. Position a hand truck forward of frame 14 in the deck shelter area. The lift forks must be slightly below the lower supply fan flange.
6. Push supply fan, from main deck area, onto lift forks until it clears the supply trunk base.
7. Refer to onboard Technical Service Manual S9512-BM-MMC-010 for maintenance details.
8. Install supply fan and secure with flange bolts at upper and lower flange.
9. Checking tags, connect electrical leads from the fan motor. Install access cover.
10. Unlock controller and turn on electrical power to the supply fan. Check operation.

6-17.3. CONVECTION HEATERS. The convection heaters are located in the washrooms on the main deck and the first platform. The heaters are bulkhead mounted. To remove the heaters proceed as follows:

WARNING

Disconnect electrical power to unit(s) before attempting repair to prevent the possibility of serious injury or death.

1. Turn circuit breaker OFF at galley lighting panel L102 located in galley for main deck washroom or at engine room lighting panel L103 located in engine room for hold washroom. Tag circuit breaker.
2. Disconnect and tag electrical leads at heater.
3. Remove four mounting bolts and lift convection heater from bulkhead.

4. Refer to onboard Technical Service Manuals S9511-AR-MMC-010 or S9511-AW-MMC-010 for service information.
5. Position convection heater on bulkhead and secure with four mounting bolts.
6. Connect electrical leads.
7. Proceed to the correct lighting panel and turn circuit breaker ON. Remove shutdown tag.

6-17.4 FORCED AIR HEATERS. There are two forced air heaters: one is located in the engine room at frame 23, port side of centerline and the other is in the lazarette at frame 25, port side. To remove and replace the forced air heaters proceed as follows:

WARNING

Disconnect electrical power to unit(s) before attempting repair to prevent the possibility of serious injury or death.

1. Turn off power to the heater(s) at the engine room power panel P402. Tag to prevent turn on.
2. Disconnect and tag wiring at connection box.
3. Remove hardware securing heater to two angles welded to bulkhead and remove heater from support.
4. Refer to onboard Technical Service Manuals S9511-AU-MMC-010 (3 Kw) or S9511-AV-MMC-010 (2 Kw) for maintenance details.
5. Position heater on support and secure to two bulkhead mounted angles with attaching hardware.
6. Connect electrical leads at connection box.
7. Remove tag at engine room power panel P402 and turn on power to the heater.

6-17.5. GALLEY HOOD FAN. The galley hood exhaust fan is located at frame 12 on the bridge deck. To remove the exhaust fan proceed as follows:

WARNING

Disconnect electrical power to unit before attempting repair to prevent the possibility of serious injury or death.

1. Turn off power to the exhaust fan at the galley power panel P403. Tag to prevent turn on during service.
2. Disconnect and tag lines at connection box on exhaust fan.
3. Remove flange bolts on upper flange of exhaust fan and lift off gooseneck.
4. Remove lower flange bolts and lift exhaust fan from silencer.
5. Remove bolts securing silencer to deck if removal of silencer is necessary.
6. Refer to onboard Technical Service Manual S9533-AX-MMC-010 for maintenance details.

7. Install silencer if removed and position galley exhaust fan on top of silencer. Secure with flange bolts.
8. Position gooseneck on top of exhaust fan and secure with flange bolts.
9. Connect electrical leads at connection box.
10. Remove tags at power panel and turn on power. Check to be sure fan is operational.

6-17.6. AIR HANDLER. The air handler is located in the air handler room between frames 8 and 10, starboard side. To remove components of the air handler proceed as follows:

WARNING

Disconnect electrical power to unit(s) before attempting repair to prevent the possibility of serious injury or death.

1. Turn off power to the air handler at the galley power panel P403. Tag to prevent turn on while service is being performed.
2. Remove access door and remove filters. Clean filters with low pressure air, steam or water. Replace with new filters if damaged.
3. Disconnect and tag electrical leads to fan motor. Remove drive belt guard and drive belts from motor.
4. Remove hardware securing motor to supports and lift motor from air handler.
5. Refer to onboard Technical Service Manual S9514-B5-MMC-010 for maintenance details.
7. Position motor on supports and secure with attaching hardware.
8. Assemble drive belts to motor and install belt guard.
9. Install clean filter and access door on air handler.
10. Turn on power to the air handler.

6-17.7. AIR CONDITIONING UNIT. The air conditioning unit is located in the engine room on centerline at frame 19. Refer to onboard Technical Service Manual S9511-B5-MMC-010 for removal and installation of major components. For system arrangement refer to onboard NAVSEA drawings 514-6003419 and 514-6003420.

WARNING

Disconnect electrical power to unit before attempting repair to prevent the possibility of serious injury or death.

6-18. COMPRESSED AIR SYSTEM.

The arrangement of the compressed air system is shown on NAVSEA drawings 551-6003523 and 551-6003524.

6-18.1. AIR COMPRESSOR. The air compressor is located in the engine room aft of frame 16, starboard side. To remove and replace the air compressor proceed as follows:

WARNING

Before repairing the air compressor be sure that electric power has been disconnected and that compressor internal system has been vented of all pressure or serious injury may result.

1. Turn off power to the air compressor at the motor controller located in the engine room at frame 16, starboard. Tag ELECTRIC DOWN.
2. Vent the internal system of all pressure.
3. Disconnect and tag electrical leads to the compressor.
4. Disconnect all piping to the compressor. Tag for reassembly.

WARNING

Air compressor weighs 190 pounds. Use a suitable lifting device to prevent injury to personnel.

5. Install a suitable lifting device and remove hardware securing air compressor to supports.
6. Refer to onboard Technical Service Manual S6220-CZ-MMO-010 for maintenance details.
7. Lift air compressor into position and secure with attaching hardware.
8. Connect all piping to the compressor.
9. Connect all electric leads following wire tags installed at removal.
10. Remove POWER OFF tag. Turn on electrical power and run compressor. Check for air leaks and proper operation.

6-18.2. AIR HORN. The air horn is mounted on the main mast at frame 9-1/2 on the pilothouse roof. Refer to onboard NAVSEA manual 0970-LP-002-5010 for maintenance information.

6-19. FIRE EXTINGUISHING SYSTEMS.

6-19.1. HALON SYSTEM. The arrangement of the Halon fire extinguishing system is shown on onboard NAVSEA drawings 555-6003431 and 555-6003432. Field maintenance involving repair is limited to the control panels, the solenoid valve assemblies and the cylinder and valve assemblies. All other components require factory maintenance or complete replacement. Refer to onboard Technical Service Manual S9555-BH-MMC-010 for other maintenance information.

WARNING

All power to the Halon system must be shut down before proceeding with repair or serious injury may result.

6-19.1.1. Control Panel. The control panel is located in the pilothouse at frame 7-1/2, port side.

1. Turn off power to the Halon system at the 24VDC rectifier located at frame 7-1/2, starboard side of the main deck.
2. Indicator lamps can be replaced by removing the colored housing of the appropriate indicator light assembly.
3. Toggle switches, switch guards and test switches can be replaced by removing the attaching hardware and replacing the defective switch with a new one.
4. Turn power on to Halon system.

6-19.1.2. Cylinder and Valve Assembly.

CAUTION

Do not attempt any repair on a filled cylinder and valve assembly as damage to or destruction of the equipment could result.

1. Turn off all power to the Halon system.
2. To replace ball valve remove from threaded bushing using a wrench on the lower body of the valve. Replace new ball valve using Loctite primer, part number 47-56, and Loctite sealant, part number 54 on the threads.
3. To replace pressure relief valve unscrew and remove pressure relief valve from nipple and thread new valve into place using Loctite primer, part number 47-56 and Loctite sealant, part number 54 on the threads.

NOTE

Pressure relief valve is of two-piece construction. Do not apply torque to outer section.

4. Turn on power to the system.

6-19.1.3. Solenoid Valve Assembly. To replace the coil housing proceed as follows:

1. Turn off power to the Halon system.
2. Disconnect electrical connector from coil housing assembly.
3. Unscrew attaching hex nut and lift coil housing assembly straight up off the tapered shaft.
4. Slide new coil housing on shaft and secure with hex nut.
5. Connect electrical connector to coil housing assembly.
6. Turn on power to the Halon system.

6-19.2. GALLEY FIRE EXTINGUISHER SYSTEM. Refer to onboard Technical Service Manual for repair instructions.

6-20. ELECTRICAL POWER SYSTEM.

All repairs to wiring shall conform to IEEE Standard No. 45. Refer to applicable onboard drawings listed in Table 1-2 for wiring diagrams of electrical power systems. Refer to onboard commercial manual for repair of diesel generator sets and NAVSEA S9324-BH-MMC-010 for repair of electric plant control panel P400.

WARNING

To prevent accidental injury or death, disconnect electrical power to electrical wireways, components and equipment before attempting any repair. Disconnect electrical power at disconnect switch, controller and/or circuit breakers as applicable. Tag disconnect point with suitable sign to alert personnel of repair condition.

WARNING

The disconnect switch in the radar power circuit is normally closed to operate the radar system. This switch must be opened when maintenance is being performed on the radar, antenna or other mast components to prevent accidental injury due primarily to radar antenna movement or radiation.

6-20.1. DIESEL GENERATORS. Refer to the onboard commercial Technical Service Manual for the diesel generator service and repair instructions. Repair of the diesel generators may or may not be performed aboard the craft depending on the extent of repair. If it is necessary to remove the diesel generators from the craft, the deck above the engine room must be cut out to permit removal. Refer to paragraph 6-24 for removal instructions.

6-20.2. DISTRIBUTION PANELS AND CONTROLLERS. All repair of electrical controllers and distribution panels shall be performed by qualified technical personnel. In most cases repair can be done aboard ship. Refer to appropriate onboard Technical Service Manuals for repair information (Table 1-3).

6-21. NAVIGATION SYSTEMS.

All repair of navigation equipment shall be performed by qualified technicians. Refer to appropriate onboard Technical Service Manuals for repair information (Table 1-3).

6-22. COMMUNICATION SYSTEMS.

All repair of communication equipment shall be performed by qualified technicians. Refer to appropriate onboard Technical Service Manuals for repair information (Table 1-3).

6-23. ALARM, MONITORING AND CONTROL SYSTEM.

All repair of alarm panels, monitoring devices and controls shall be performed by qualified technical personnel. Refer to appropriate onboard Technical Service Manuals for repair information (Table 1-3).

6-24. REMOVAL OF PROPULSION ENGINES AND DIESEL GENERATORS.

Major equipment removal from the craft shall be performed at a certified facility or area. Such removal is necessary when major overhaul and repair is required. A part of the main deck must be cut out with gas torch equipment and removed to permit removal of the equipment.

6-24.1. DECK CUTOUTS. The following is a list of deck cutouts required for major equipment removal, port or starboard:

1. Generator and engine:
 - a. 1 ft. outboard of centerline.
 - b. 4-1/2 ft. outboard of centerline.
 - c. 2 ft. aft of frame 20.
 - d. 2 ft. aft of frame 22.
2. Generator only:
 - a. 1 ft. outboard of centerline.
 - b. 4-1/2 ft. outboard of centerline.
 - c. 1-1/2 ft. aft of frame 21.
 - d. 1 ft. aft of frame 22.
3. Main engine (block only):
 - a. 2-1/2 ft. outboard of centerline.
 - b. 8-1/2 ft. outboard of centerline.
 - c. 3 ft. aft of frame 16.
 - d. 3-1/2 ft. aft of frame 18.
4. Main engine and reduction gear:
 - a. 2-1/2 ft. outboard of centerline.
 - b. 8-1/2 ft. outboard of centerline.
 - c. 3 ft. aft of frame 16.
 - d. 2 ft. aft of frame 20.
5. Reduction gear (M.E.):
 - a. 3 ft. outboard of centerline.
 - b. 8 ft. outboard of centerline.
 - c. 3-1/2 ft. aft of frame 18.
 - d. 2 ft. aft of frame 20.

6-24.2. DECK CUTOUT REMOVAL.

WARNING

Before deck cutout removal, the main deck cutout area must be cleared of all obstructions and components. Secure torpedo handling system and remove rollers from deck. Move transfer carriage aft. All electrical, hydraulic, fuel and air lines and cables must be disconnected and removed to clear the area underneath the deck cutout area before cutout removal. Take care to prevent spills of flammable materials in the cutout area.

1. Weld padeyes to upper surface of deck cutout to be removed.
2. Attach sling of sufficient strength to padeyes.
3. Using dockside crane with sling attached, raise crane to take up slack and support deck cutout area.
4. Cut out deck with gas torch equipment. Refer to paragraph 6-24.1. for size.
5. Lift deck cutout with crane and sling and place cutout in appropriate area.

6-24.3. EQUIPMENT REMOVAL. Refer to system diagrams in chapter 2 for disconnection points.

WARNING

Clean up spills of flammable material and other foreign matter to prevent the possibility of fire or accidental injury.

1. Place halon system in MANUAL mode.
2. Shut off all fuel and sea water valves to the equipment to be removed. Disconnect and remove fuel, sea water and electrical lines. Tag lines as needed. Drain fuel, water and lube oil lines.
3. Disconnect and remove exhaust system components as required to clear the space around the equipment.
4. Attach sling of sufficient strength to equipment. Connect sling to dockside crane and raise to remove slack and support equipment.

CAUTION

Before breaking propulsion shaft from reduction gear, block up shaft at reduction gear end to prevent damage to shaft.

5. Remove mounting hardware to disconnect propulsion shaft from reduction gear at coupling.
6. Disconnect generator or marine reduction gear from diesel engine as required.
7. Remove mounting hardware for equipment.
8. Use crane and sling to raise equipment, align with deck cutout, and lift clear of the craft. Place equipment in appropriate area for transfer to repair facility.

6-24.4. EQUIPMENT INSTALLATION. Installation of overhauled equipment and related systems shall be done in accordance with applicable onboard drawings (Table 1-2). The propulsion engines and propulsion shaft must be aligned in accordance with onboard test report 243-3, Propulsion Train Alignment.

