MILBOATSTECHMAN/BK-05

VERSION 3

MILITARY EMERGENCY BOAT SERVICE TECHNICAL MANUAL BOOK 05

PATROL BOAT 400 CLASS

PUBLISHED BY DIRECTION OF COMMANDER, NEW YORK NAVAL MILITIA

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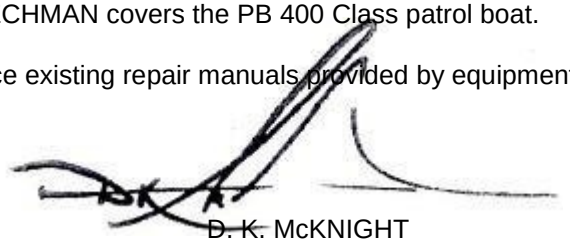
From: Commander, New York State Military Emergency Boat Service

Subj: PROMULGATION OF MILITARY BOATS TECHNICAL MANUAL SERIES
BOOK 5; PB 400 CLASS PATROL BOAT

1. The New York State Military Emergency Boat Service Technical Manuals (MILBOATSTECHMAN) are consolidated information for each class of patrol boat in the boat service. They are intended to provide basic information regarding each class, with an overview on operational parameters, missions, equipment layout, and some basic troubleshooting guides if not provided by commercial owner's manuals.

2. Book 5 of the MILBOATSTECHMAN covers the PB 400 Class patrol boat.

3. This manual does not replace existing repair manuals provided by equipment suppliers.



D. K. McKNIGHT
CDR NYNM

PB 400 at Montrose Point, 2016

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PB 400 CLASS PATROL BOAT
INFORMATION AND OPERATIONAL CAPABILITIES

A. General.

The PB 400 Class patrol boat is a 44 foot boat with twin inboard diesel engines.
The class consists of one boat, built by MetalCraft Marine of Kingston, Ontario. The boat was received in 2003.

1. The model of boat is: Kinston 40 SAR
2. Length: 44 feet, 9 5/16 inches with dive platform
3. Beam: 14 feet 9 inches
4. Hull type: V hull
5. Draft: Vessel: 42 inches
6. Air draft: 20 feet
7. Average weight: 22,000 lbs.
8. Fuel capacity: 400 gallons (diesel)
9. Crew size: 2-3 (Maximum 20 persons)
10. Propulsion: Two Cummins 430 HP diesel engines
    a. Maximum speed: 32 knots
11. The hull, decking, superstructure, and tubing are constructed of marine-grade aluminum.
12. The boat is not capable of being air lifted.

B. Operational Parameters.

The boat capabilities fall within the following parameters:

1. Capable of operating with a wind speed of 30 knots with a sea height of 8 feet.
2. Capable of surviving with a wind speed of 50 knots with a sea height of 16 feet.
3. Capable of operating in air temperatures of 0 – 100 degrees Fahrenheit.
4. Capable of operating in water temperatures of 28 – 95 degrees Fahrenheit.
5. Capable of operating in ice up to 3 inches thick.

C. Missions.

The boat is capable of several missions, including maritime vulnerability assessment and maritime patrol. With an enclosed and heated cabin, it is suitable for year-round operations. The boat is capable of operating on most waters in or contiguous to New York State, with the exception of the smaller

rivers and canals that do not meet the air draft requirement. Specifically, PB 400 would not be capable of transiting the Champlain Canal or the western portions of the Erie Canal (west of the Oswego Canal).

D. Features.

The boat includes the following features and components:

1. Hull:

   a. Aluminum construction, with ¼-inch bottom plate, and 3/16-inch side plate.

   b. Deep V hull

   c. Trim tabs; K-Planes

2. Deck:

   a. Aluminum

   b. Self bailing scuppers

   c. (6) welded cleats, 3 mooring bits

   d. 4-inch aluminum tow posts (3)

   e. Deck hatches (1) aft to lazarette, (1) cabin to fuel tank compartment, (1) bow to anchor locker, (1) aft to engine compartment plus fold up engine compartment covers (2)

   f. Waste connection located port deck amidships

3. Cabin:

   a. Three window windshield with ¼-inch clear, tempered glass

   b. Sliding ¼-inch tinted side windows - Bomon

   c. Windshield wipers (3) - AFI Model MRV 2 speed

   d. Air conditioner –Coleman Mach

   e. Forward berth with head cabin hatch to bow

   f. Overhead and dash grab rails

   g. Heater, electric (2) - Heater Craft 300H

   h. Sink

   i. Carbon monoxide detector

4. Engines:

   a. Cummins 430 hp diesels (2) model 6CTA8.3
   In-line 6 cylinder, 4 stroke turbo-charged/after-cooled 8.3 liter displacement

(1) Ref: Cummins Bulletin No.3666022-04, *Operation and Maintenance Manual B and C Series Marine Propulsion Units Worldwide*; and Cummins Bulletin No. 3381982-003, *C-Series Aftercooled [Family M14TA] Technical File*

(2) Idle speed: 700 rpm (6 knots)

(3) Full speed: 2500 rpm (33+ knots)

(4) On plane: 2000 rpm

(5) Off plane: 1600 rpm

b. Engine Synchronizer - Glendinning automatic twin

(1) Ref: *Glendinning Automatic Twin Engine Synchronizer Guide to Operation – Description – Installation*

(2) Synchronizes dual engine rpms to eliminate vibration, and allow single throttle control of boat speed

c. Engine Controls – Teleflex Morse Marine Twin S model

(1) Ref: Teleflex Morse 9900:055000-049G, *S Control Twin S Control Owner's Manual*

(2) Engine direction controller on left for forward, neutral, and reverse (black knobs)

(3) Engine speed controller on right (red knobs)

(4) Dual station arrangement on helm console in cabin and on flying bridge

5. Transmission:

a. ZF Marine Model 301 IV

(1) Ref: ZF Marine 32.70.301.5012, *Operating Manual ZF 301 Family*

6. Generator:

a. Onan 6.5 KW model MDKUB

(1) Ref: Onan Corporation publications 981-0151B, 981-0262C, and 981-0602B

7. Steering:

a. Jastram Model H24 hydraulic

(1) Ref: Jastram Engineering LTD. Document No. MAN00301

8. Fuel system:

a. 400 gallons (200 gallon tanks port and starboard)

b. Burns gallons/hour diesel (both engines)

(1) 27 gal @ 1800 rpm

(2) 37 gal @ 2500 rpm

c. Fuel tank accesses located port and starboard decks amidships

d. Fuel filters/water separators (2) – RACOR

(1) Located on aft bulkhead of fuel tank compartment

9. Electrical system:

a. 12VDC system with five batteries

b. Battery charger - Guest multiple output 2600 series

c. Electrical breaker panel – Paneltronics 3205

d. Bilge pumps (4) - Rule model 3700, 2000 GPH

(1) One each located forward, mid-ship, engine compartment, and lazarette

10. Lighting:

a. Navigation/anchor lights – Perko 170 series

b. Blue dual strobe lights on mast - Aqua Signal model 50

c. Spotlight, 5-inch - Guest model 298

d. Interior fluorescent and LED lighting including red night lights (4)

e. Hull lights - dual Barnegat Light model QL-60

11. Navigation and electronics:

a. Radar - Furuno model 1712

(1) Ref: Furuno Pub No. OME-34890

b. GPS/Plotter - Furuno model GP-1850 (series) color

(1) Ref: Furuno Pub No. OME 44250

c. Binnacle compass - Ritchie Globemaster

d. VHF radios (2), with hailer - Standard Horizon model GX2355S 25 watt marine and Standard Horizon Quantum GX2360S

e. Depthsounder - Humminbird HDR 600 digital

f. Kenwood TK-690/790 VHF Dual Band radios

12. Gauges:

a. Volt meter - VDO

b. Fuel gauge -Tempo

c. Tachometer – VDO

d. Temperature VDO

e. PSI – VDO

f. Rudder Angle Indicator - Faria

13. Ground tackle:

a. Anchor, 20 lbs Bruce type; 10 feet of chain and 150 5/8-inch anchor line

14. Safety equipment:

a. Fire extinguisher – 10 lb., CO^2

b. Automatic engine interrupt/fire extinguisher - Sea-Fire

c. PDFs (Type 1)

d. Emergency flare kit

e. Ring buoy with light (2)

f. Air horn - AFI FullBlast dual trumpet

g. Smoke Detector - ESL 500 series

15. Trailer: None

16. Other:

a. Microwave oven - Citizen model JM 5619 0.6cu

b. Fridge/freezer

c. Water heater - Atwood marine electric

(1) Located in forward centerline of fuel tank compartment

d. Swim platform aft, with fold down swim ladder

e. Flying bridge with auxiliary control station

f. Below far aft hatch there is a towing harness that affixes above between stern deck steps down to the swim platform.

g. Below far aft hatch there is an emergency tiller arm that attaches on top of the rudder system.

h. Fire alarms are located starboard sides in main cabin and in the engine room aft.

i. Water intakes on main engines: unscrew plastic top; inspect for clogging material; if present use broom handle and push down to clean out.

j. Make certain rudder indicators (main cabin helm and fly-bridge helm) are in sync.

k. 500# manual crane, starboard quarter.

E. General Maintenance Requirements.

1. Cummins Inboard Engines:

a. Every 20 hours of operation:
Check marine gear oil levels
Check engine oil levels
Check fuel levels
Drain fuel/water separator
Inspect cooling systems
Check fuel, oil and water system for leaks
Inspect belts and hoses
Record coolant operating temperature
Record oil pressure

b. Every 3 months or 250 hours of operation:
Check all batteries
Check electrical connections
Check mounting bolts for tightness
Check hoses and clamps for integrity and tightness
Change engine oil
Change engine filters
Inspect air system
Inspect wiring
Inspect zinc plugs

c. Every 6 months or 500 hours of operation:
Check antifreeze concentration
Check coolant additive concentrations
Change fuel filters
Change fuel/water separator element
Change coolant filters
Inspect air cleaners

d. Every 12 months or 1000 hours of operation:
Check belt tension
Check belts
Check tensioner bearings
Check turbocharger
Check coolant heaters
Change marine gear oils
Inspect raw water pump and impeller
Flush marine gear oil cooler
Flush heat exchanger
Flush raw water after cooler
Adjust engine valve lash clearances

e. Every 24 months or 2000 hours of operation:
Inspect vibration dampers

Clean/flush cooling systems
Replace coolant

2. Onan Generator:

   a. Every 8 hours of use:
      Check engine oil
      Check coolant level

   b. Every month or 100 hours of operation:
      Inspect belt tension
      Drain water/sediment from fuel filter

   c. Every 6 months or 250 hours of operation:
      Replace engine oil and filter
      Replace fuel filter
      Clean generator assembly
      Check genset brushes

   d. Ever 12 months or 500 hours of operation:
      Flush cooling system

3. ZF Marine Transmission:

   a. Daily
      Check for oil leaks and oil level

   b. Every 6 months or 200 hours of operation:
      Tighten all external threaded fasteners
      Adjust shift control linkage
      Suction filter
      Clean external components
      Lubricate external moving parts

   c. Every 12 months or 500 hours of operation:
      Change oil
      Change oil filter
      Inspect clutch discs
      Inspect gear teeth
      Check instruments and indicators
      Check oil cooler
      Inspect bearings

4. Raw Water Strainer:

   a. Daily
      Inspect and clean as necessary

5. Hot Water Heater:

   a. Daily
      Inspect lines to and from heater

6. Furuno Radar:

a. Every 3 – 6 months:
Check fixing bolts on antenna unit for corrosion and tightness. Replace corroded bolts. Coat new bolts with anti-corrosive sealant.
Check antenna unit for cleanliness. Clean antenna with fresh water cloth. Do not use commercial cleaners.
Check antenna unit for cracks. If crack is found, it should be temporarily repaired by using a small amount of sealing compound or adhesive. The unit should be brought to an authorized dealer for permanent repairs.
Wipe the LCD gently with a soft cloth. Do not use commercial cleaners.

b. Every 6 – 12 months:
Check display connectors for tight connection and corrosion. If corroded, contact dealer for replacement.

7. EPIRB:

a. Yearly:
Replace 9-volt lithium battery pack

b. Every two years:
Replace HRU (see owners manual)

8. VHF Antennas:

a. Every 3 – 6 months:
Check antenna unit cover for cracks. If crack is found, it should be temporarily repaired using a small amount of sealing compound or adhesive. The unit should be brought to an authorized dealer for permanent repairs.

b. Every 6 -12 months:
Check display unit connectors for tightness and corrosion. If corroded, contact dealer for replacement.

9. Hydraulic Steering:

a. Monthly:
Inspect hydraulic fluid reservoir (at top of helm pump) to make certain that fluid level is at full.

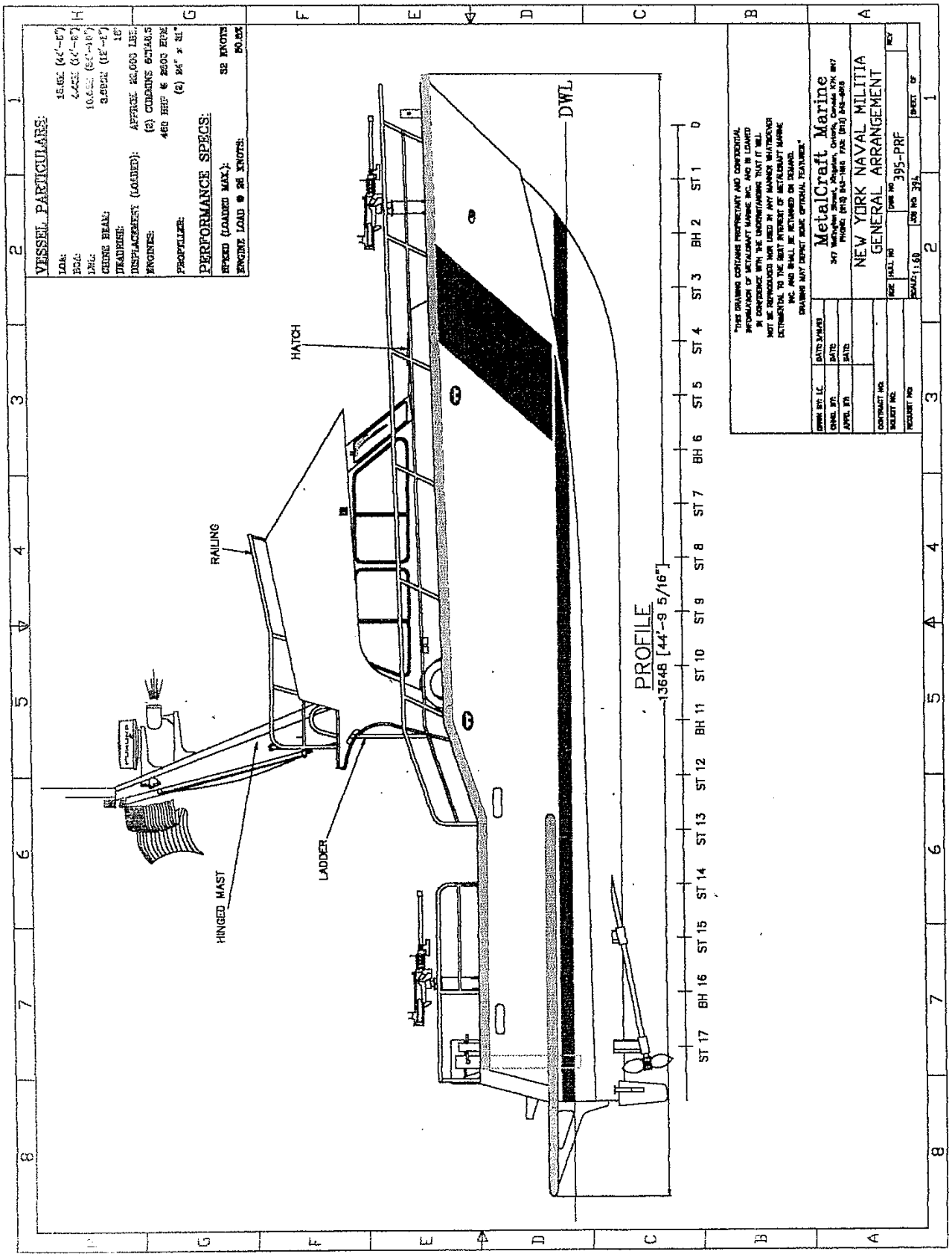
b. Annually:
Remove, clean and grease the support rod with quality marine grease
Replace any hoses showing signs of wear.
Check fittings and seals for leaks and damage. Service as necessary.

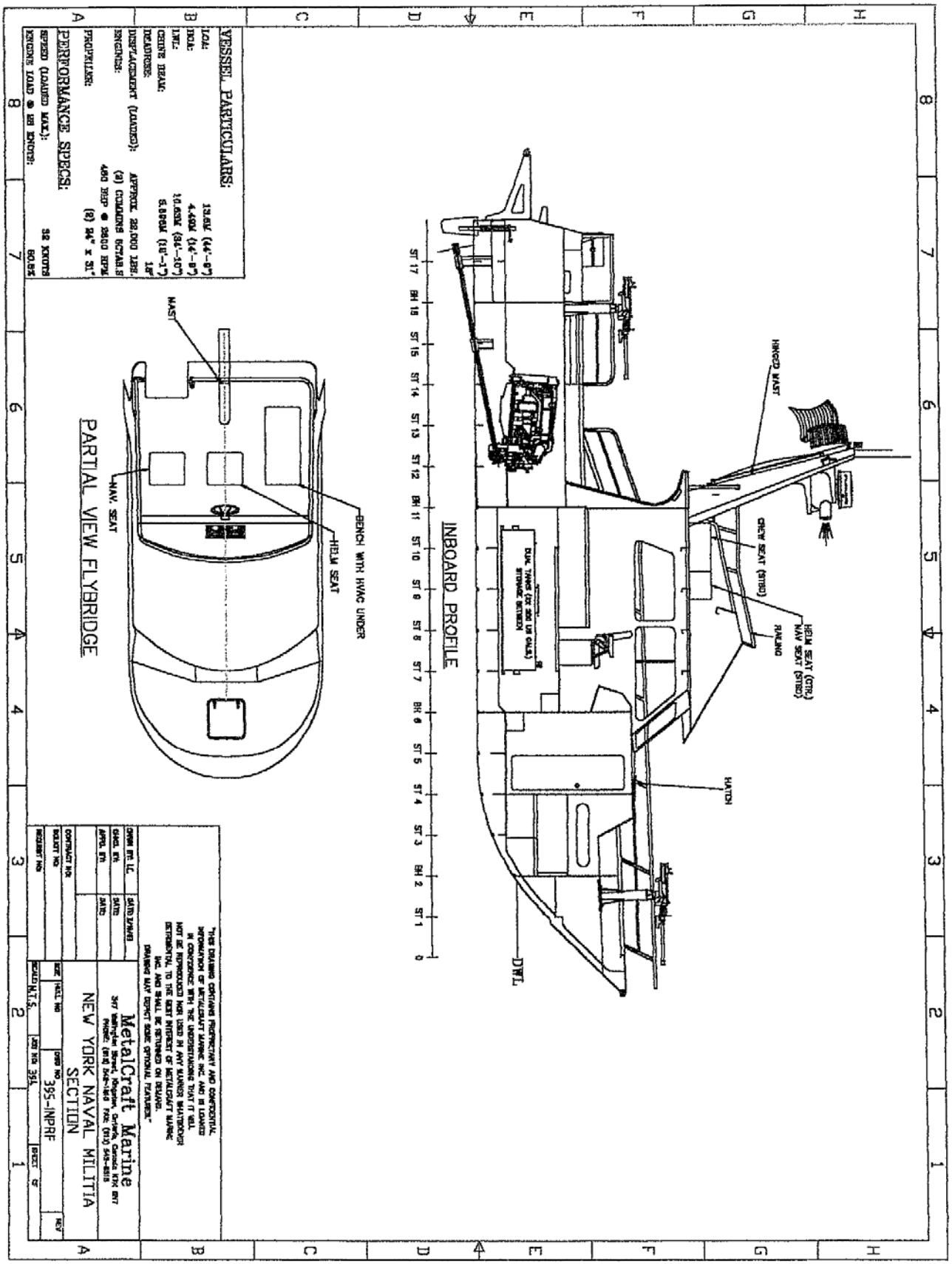
10. Air Conditioning:

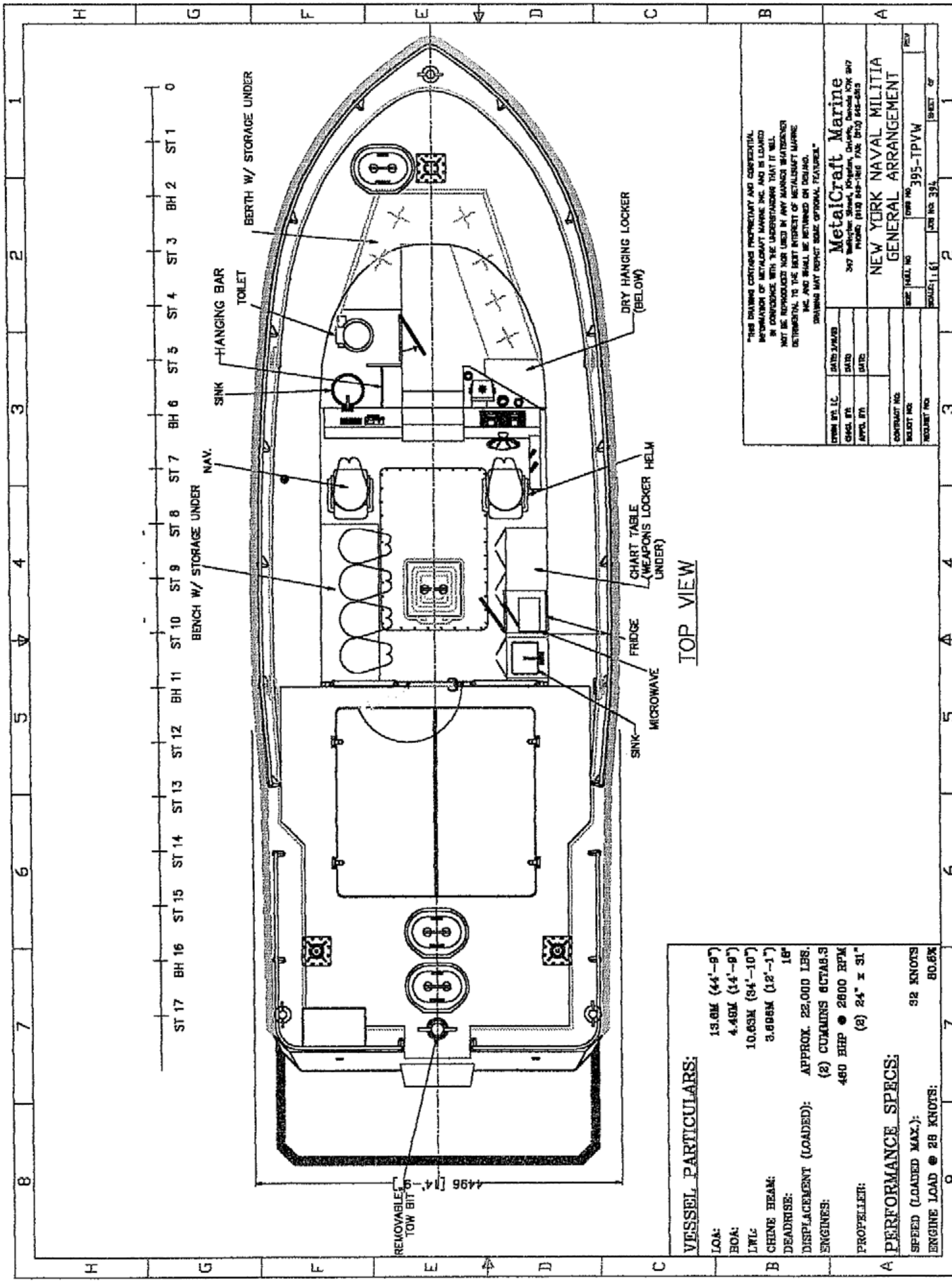
a. Every two weeks, or as needed:
Clean or replace filters when necessary.

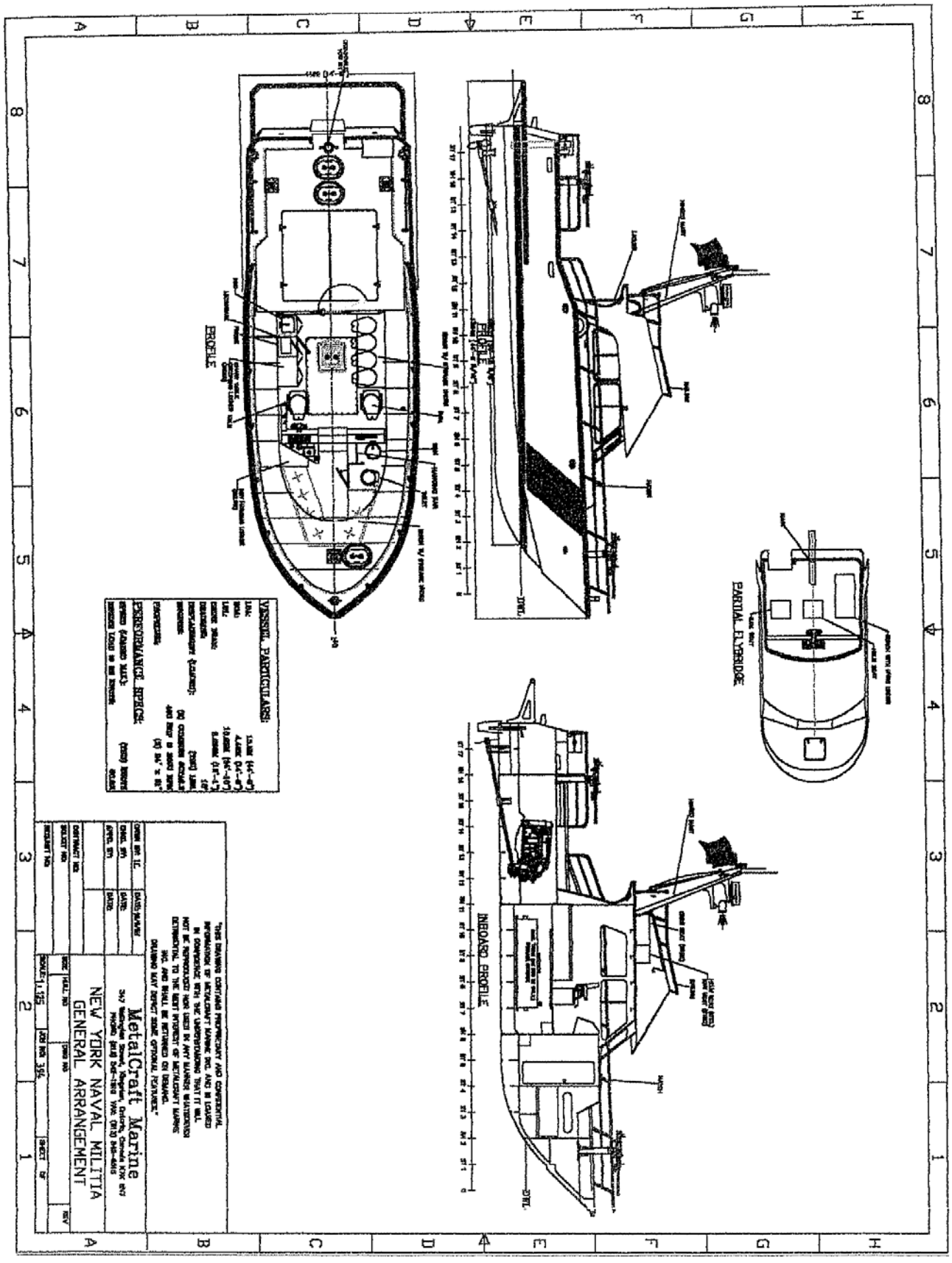
11. Fire Extinguishers:

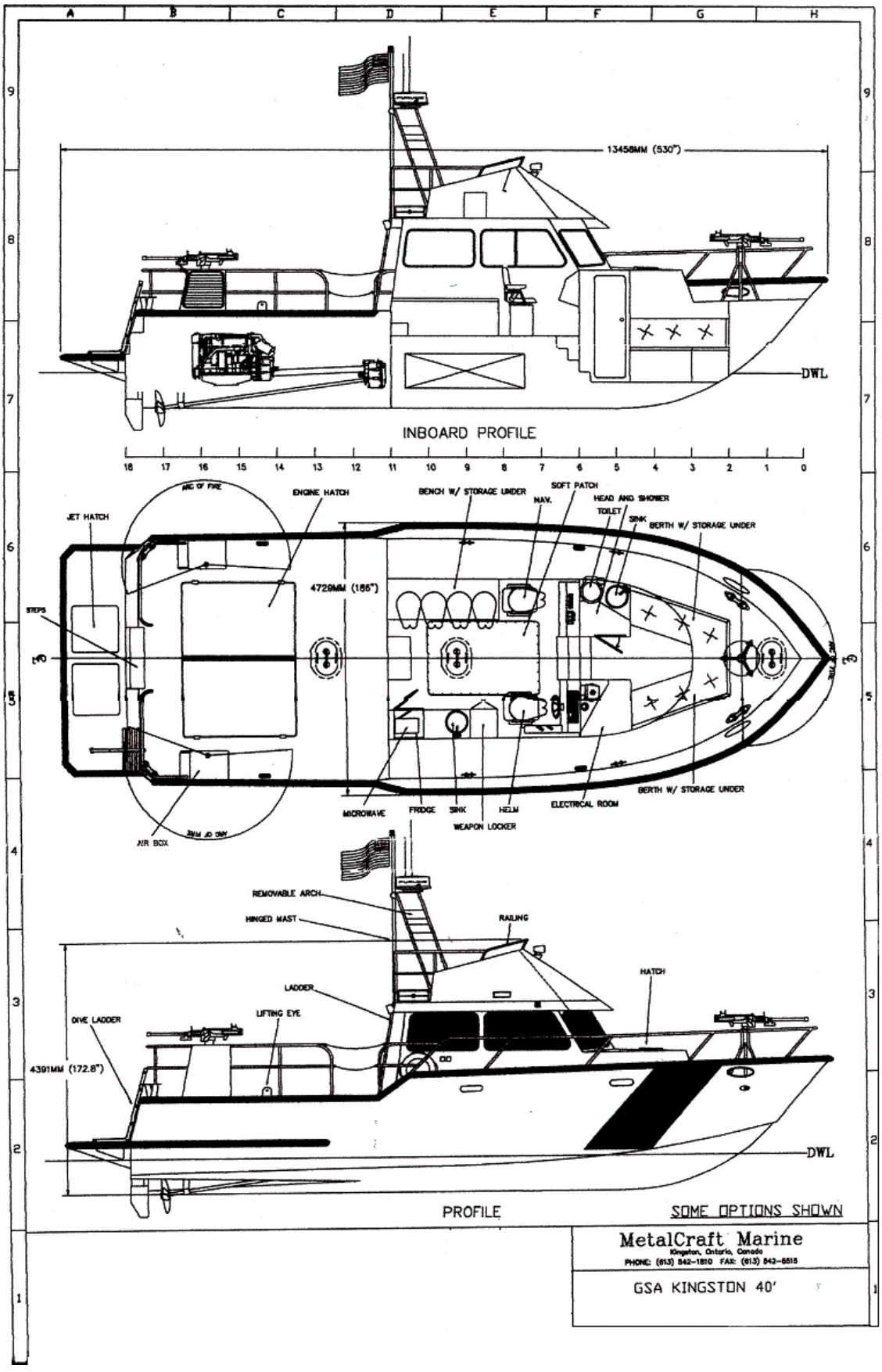
a. Annually:
Check and either refill or replace.
Check brackets for corrosion, and repair or replace as needed.


VESSEL PARTICULARS:
LOA:
BOA:
DRAFT:
CREW BEAM:
DEADRISE:
DISPLACEMENT (LOADED):
ENGINES:
PROPELLER:
PERFORMANCE SPECS:
SPEED (LOADED MAX.):
ENGINE LOAD @ 26 KNOTS:
32 KNOTS
80.8%
HATCH
RAILING
HINGED MAST
LADDER
DWL
PROFILE
13648 [44'-9 5/16"]
MetalCraft Marine
NEW YORK NAVAL MILITIA
GENERAL ARRANGEMENT
395-PRF

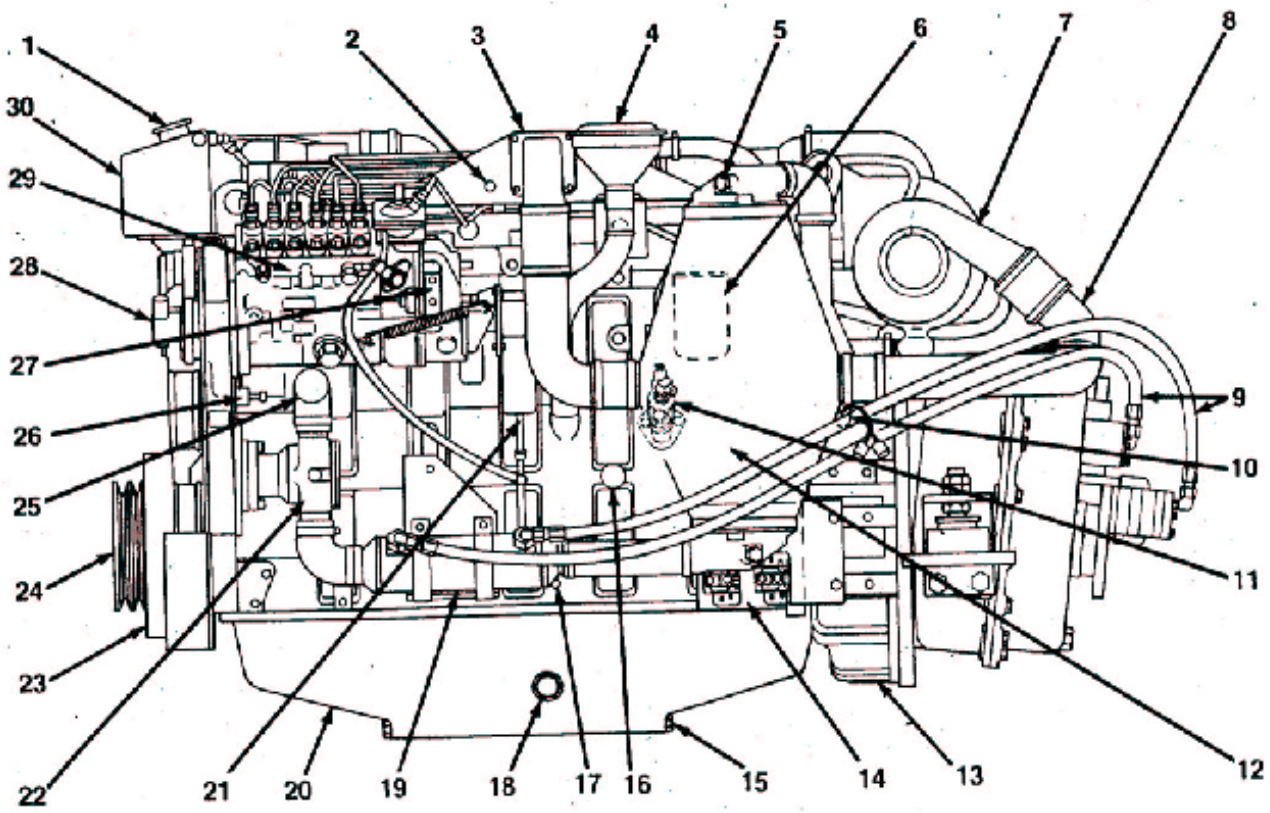

VESSEL PARTICULARS:
PERFORMANCE SPECS:
INBOARD PROFILE
PARTIAL VIEW FLYBRIDGE
HINGED MAST
CREW SEAT (STBD)
HELM SEAT (CTR.)
NAV SEAT (STBD)
RAILING
HATCH
DWL
MAST
NAV. SEAT
HELM SEAT
BENCH WITH HVAC UNDER
MetalCraft Marine
NEW YORK NAVAL MILITIA
SECTION
395-INPRF


TOP VIEW
BERTH W/ STORAGE UNDER
HANGING BAR
TOILET
SINK
NAV.
BENCH W/ STORAGE UNDER
DRY HANGING LOCKER (BELOW)
HELM
CHART TABLE (WEAPONS LOCKER UNDER)
FRIDGE
MICROWAVE
SINK
REMOVABLE TOW BIT
4496 [14'-9"]
0
ST 1
BH 2
ST 3
ST 4
ST 5
BH 6
ST 7
ST 8
ST 9
ST 10
BH 11
ST 12
ST 13
ST 14
ST 15
BH 16
ST 17
VESSEL PARTICULARS:
LOA: 13.6M (44'-9")
BOA: 4.49M (14'-9")
LWL: 10.63M (34'-10")
CHINE BEAM: 3.698M (12'-1")
DEADRISE: 18°
DISPLACEMENT (LOADED): APPROX. 22,000 LBS.
ENGINES: (2) CUMMINS 6CTA8.3 450 BHP @ 2600 RPM
PROPELLER: (2) 24" x 31"
PERFORMANCE SPECS:
SPEED (LOADED MAX.): 32 KNOTS
ENGINE LOAD @ 28 KNOTS: 80.6%
MetalCraft Marine
NEW YORK NAVAL MILITIA
GENERAL ARRANGEMENT
395-TPVW


PROFILE
PARTIAL FLYBRIDGE
INBOARD PROFILE
VESSEL PARTICULARS:
PERFORMANCE SPECS:
MetalCraft Marine
NEW YORK NAVAL MILITIA
GENERAL ARRANGEMENT

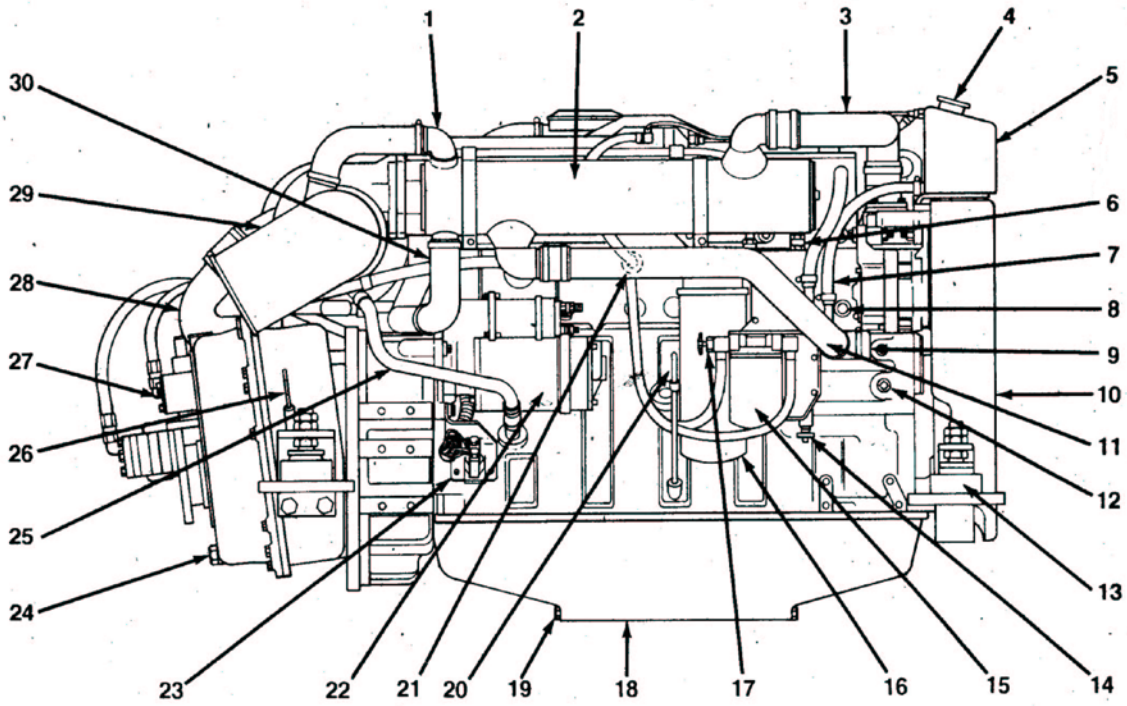

13458MM (530")
DWL
INBOARD PROFILE
18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
ARC OF FIRE
ENGINE HATCH
BENCH W/ STORAGE UNDER
SOFT PATCH
MAV.
HEAD AND SHOWER
TOILET
SINK
BERTH W/ STORAGE UNDER
JET HATCH
4729MM (186")
STEPS
MICROWAVE
FRIDGE
SINK
HELM
WEAPON LOCKER
ELECTRICAL ROOM
BERTH W/ STORAGE UNDER
AIR BOX
REMOVABLE ARCH
HINGED MAST
RAILING
HATCH
LADDER
DIVE LADDER
LIFTING EYE
4391MM (172.8")
DWL
PROFILE
SOME OPTIONS SHOWN
MetalCraft Marine
Kingston, Ontario, Canada
PHONE: (613) 542-1810 FAX: (613) 542-5515
GSA KINGSTON 40'

Fuel Pump Side View of 6CTA8.3M2



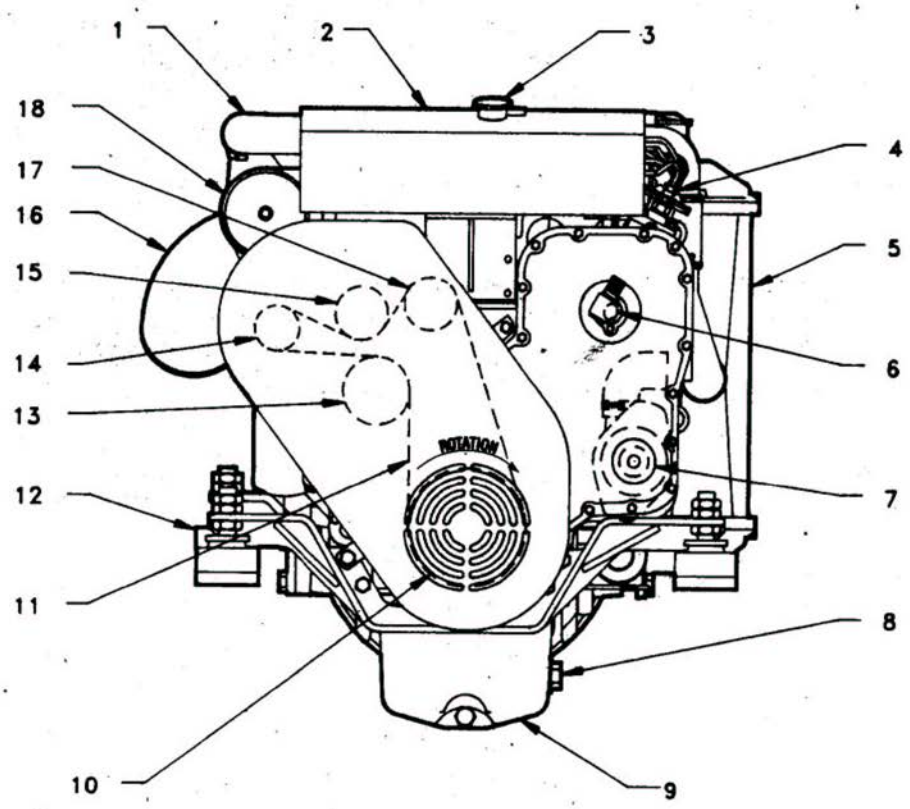
1. Coolant Expansion Tank
2. Air Heater Thermistor
3. Air Heater
4. Blowby Separator
5. Zinc Plug (2 Shown In Aftercooler)
6. Fuel Filter
7. Turbocharger
8. Inlet Air Crossover Tube
9. Marine Gear Oil Lines
10. Magnetic Pickup
11. Fuel Lift Pump
12. Aftercooler (Raw Water Type)
13. Flywheel Housing
14. Air Heater Control
15. Oil Drain Plug
16. Oil Pressure Sending Unit
17. Raw Water Drain Plug
18. Oil Pan Heater Location
19. Marine Gear Oil Cooler
20. Oil Pan
21. Dipstick (Engine Oil)
22. Raw Water Pump
23. Vibration Damper
24. Accessory Drive Pulleys
25. Raw Water Pump Inlet
26. Engine Timing Pin
27. Throttle Level
28. Mechanical Tachometer Drive
29. Fuel Pump
30. Coolant Expansion Tank

Exhaust Side View of 6CTA8.3M2



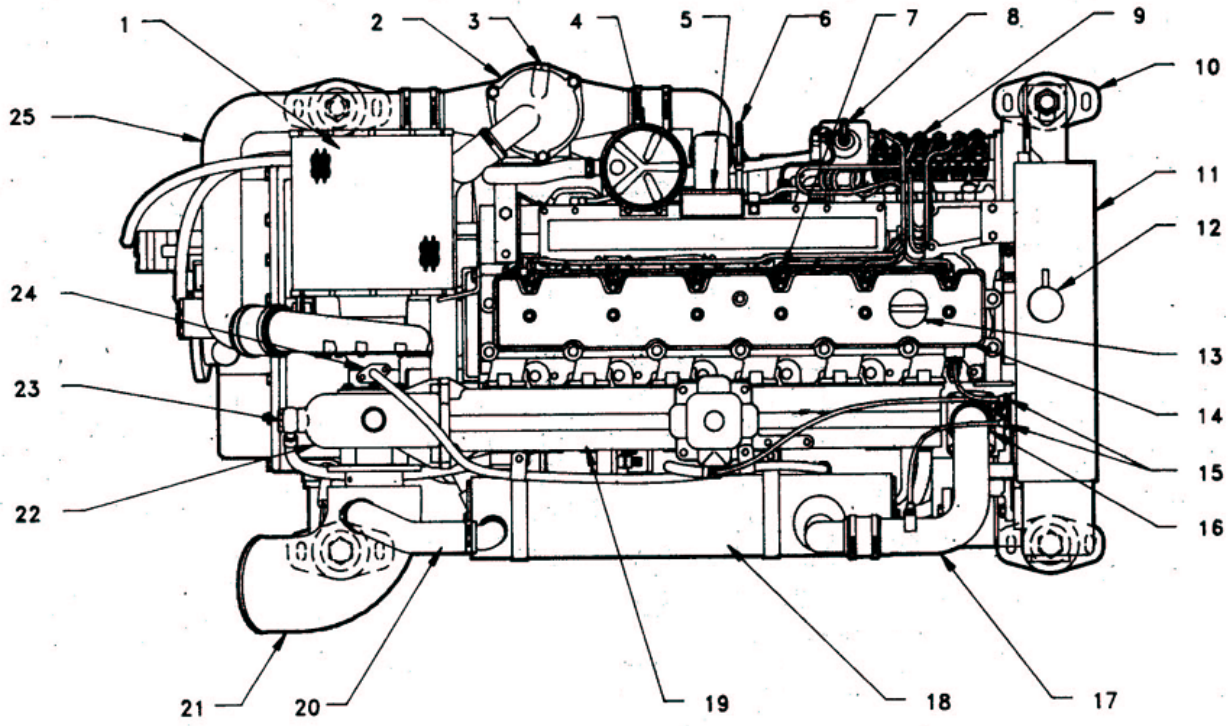
1. Heat Exchanger Raw Water Outlet
2. Heat Exchanger
3. Heat Exchanger Coolant Inlet
4. Coolant Pressure Cap
5. Coolant Expansion Tank
6. Zinc Plug (Heat Exchanger)
7. Coolant Fill Line
8. Coolant Temperature Sensor
9. Engine Water Pump Inlet
10. Belt Protective Cover
11. Heat Exchanger Coolant Outlet Tube
12. Engine Water Pump Outlet Pressure
13. Engine Mount
14. Coolant Drain Petcock
15. Coolant Filter
16. Engine Oil Filter
17. Coolant Filter Shutoff Valve (Return)
18. Oil Pan
19. Drain Plug (Engine Oil)
20. Dipstick (Engine Oil)
21. Coolant Filter Shutoff Valve (Supply)
22. Starter
23. Starter AMS (Auxiliary Magnetic Switch)
24. Drain Plug (Marine Gear Oil)
25. Turbocharger Oil Drain
26. Dipstick (Marine Gear Oil)
27. Marine Gear
28. Inlet Air Crossover Tube
29. Exhaust Elbow
30. Heat Exchanger Raw Water Inlet

Front View of 6CTA8.3M2



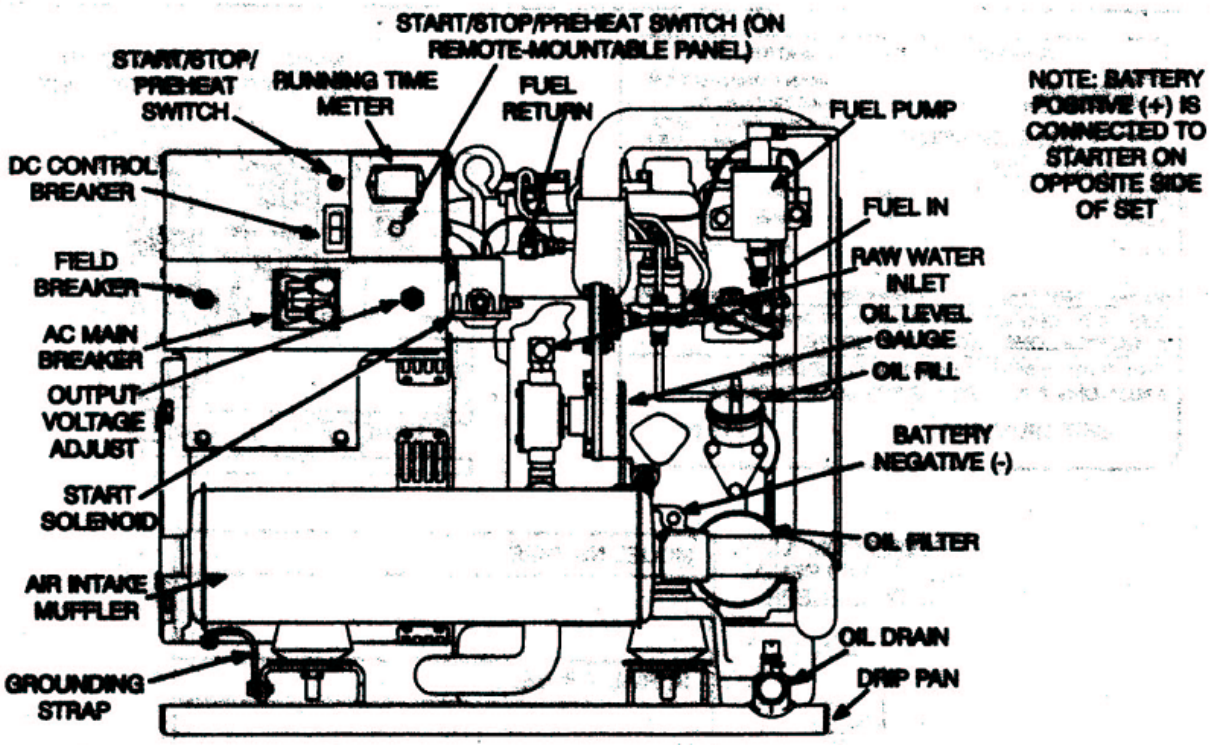
1. Heat Exchanger Coolant Inlet
2. Coolant Expansion Tank
3. Coolant Pressure Cap
4. Fuel Pump
5. Aftercooler (Raw Water Type)
6. Mechanical Tachometer Drive
7. Raw Water Pump
8. Oil Pan Heater Location
9. Oil Pan
10. Vibration Damper
11. Drive Belt
12. Engine Mount
13. Coolant Water Pump
14. Alternator
15. Belt Tensioner
16. Exhaust Elbow
17. Idler Pulley
18. Heat Exchanger

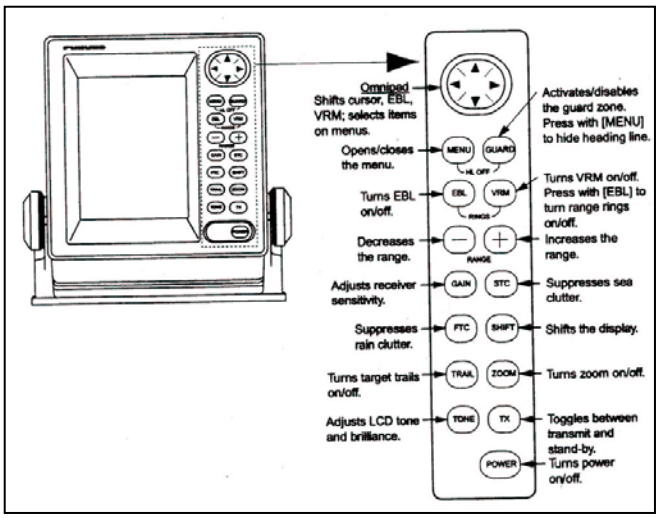
Top View of 6CTA8.3M2



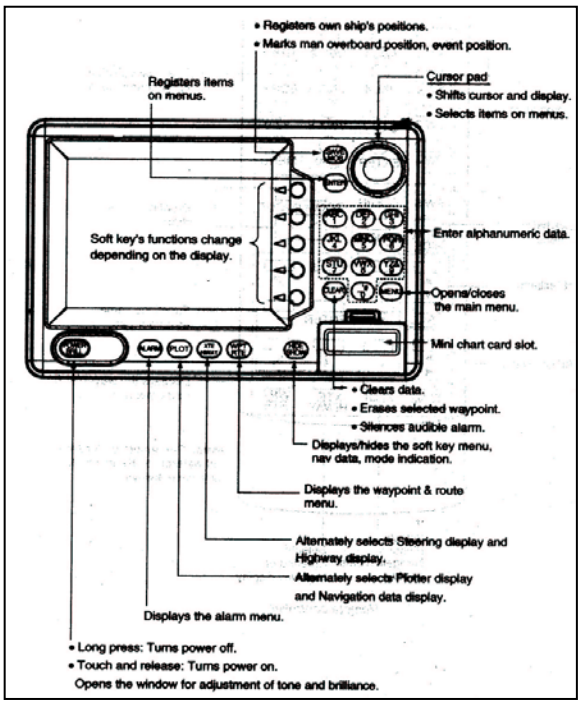
1. Air Filter
2. Aftercooler (Raw Water Type)
3. Zinc Plug (Aftercooler)
4. Blowby Separator
5. Air Heater
6. Dipstick (Engine Oil)
7. Fuel Injector
8. Fuel Pump Boost Control
9. Fuel Pump
10. Engine Mount
11. Coolant Expansion Tank
12. Coolant Pressure Cap
13. Engine Oil Fill Cap
14. Valve Cover
15. Coolant Vent Line Connections
16. Coolant Thermostat Location
17. Heat Exchanger Coolant Inlet
18. Heat Exchanger
19. Exhaust Manifold (Water Cooled)
20. Heat Exchanger Raw Water Outlet
21. Exhaust Elbow
22. Turbocharger (Water Cooled)
23. Turbocharger Coolant Inlet
24. Turbocharger Oil Inlet
25. Inlet Air Crossover Tube

Onan Generator Set

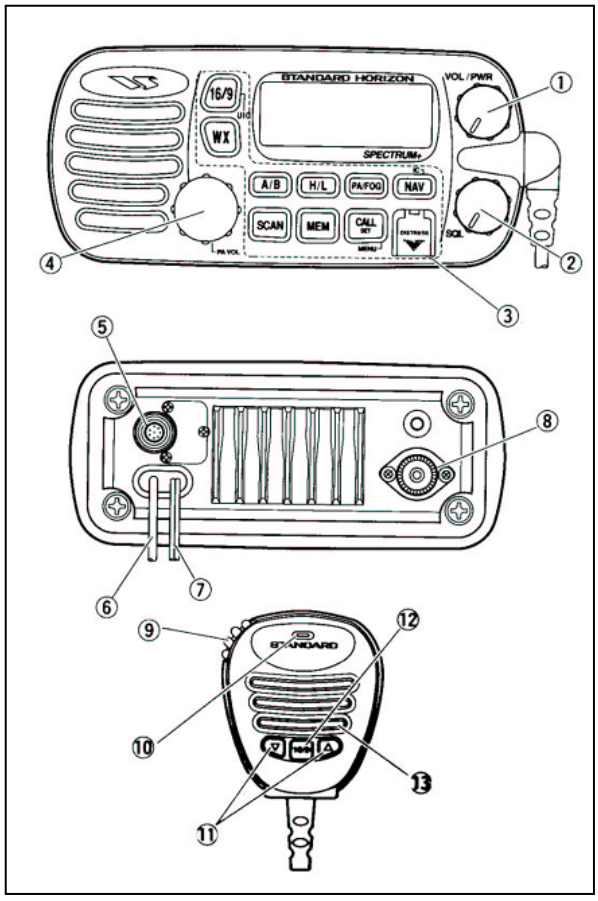




Furuno Radar Display



Furuno GPS Plotter



1) Power switch/volume control
2) Squelch control
3) Key pad
4) Channel selector knob
5) Ram mic connector
6) Accessory connection cable
7) DC input cable
8) Antenna jack
9) Push to talk (PTT) switch
10) Clear voice noise cancelling speaker mic
11) Up and Down keys
12) 16/9 key
13) Microphone speaker

Standard Horizon
Spectrum+ GX2355S 25 watt VHF/FM Marine Radio

(PB 400 bow view)

(PB 400 stern view)

(PB 400 cabin)

(PB 400 V berth)

(Mast assembly)

(Anchor locker)

(Helm console)

(Flying bridge console)

(Helm gauges)

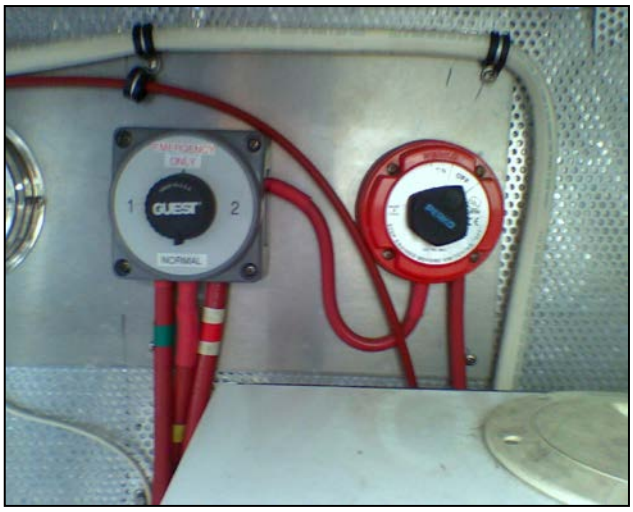
(Electrical breaker panel)

(Electrical switch panel)

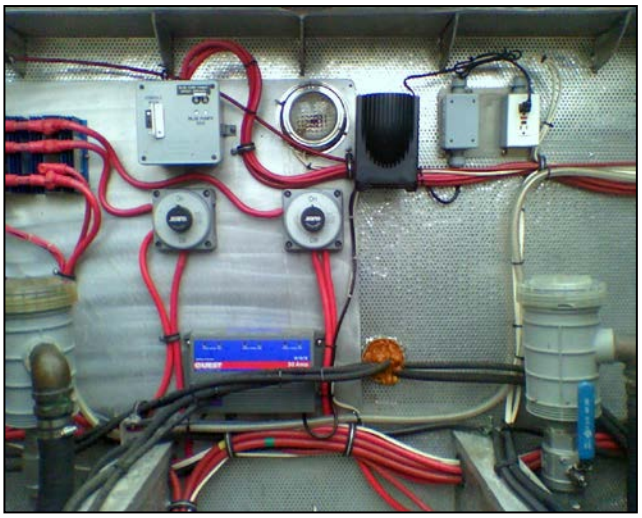
(Bilge pumps panel)

(Engine compartment view aft)

(Engine compartment fire suppression)



(Battery isolator switch engine compartment)



(Engine compartment forward wall)

(Lazarette starboard corner)

(Lazarette port corner)

Operations Checklist/PB 400 Class

1) Pre-operations

a) Engine checks:

Engine water coolant strainers are located on the front of both engines which are towards the bow:
1) Close the large valve next to the strainer (place at a 90o angle).
2) Remove plastic cover. Do not move or remove strainer. Using a flashlight, inspect strainer for debris and remove any found.
3) Replace cover hand tight ensuring cover has made contact with the rubber gasket.
4) Return shut off valve to upright (in-line) position

Generator water coolant strainer:
1) Visually check to see if free of debris. If debris is found shut the valve, remove cover, remove debris, replace cover, return valve to upright position
2) Remove cover and check oil

b) Engine oil levels: dip stick is located on the center of each engine

c) Transmission:
   a. Start engines and run for one minute.
   b. Shut off engines and immediately check fluid levels. Dip stick is located on each side of each engine closest to the bow of the boat. (ensure water is discharging from under rear platform)

d) Fuel line checks (water separator):
   a. Open the large access door in the main cabin. Towards the aft section of the boat are two fuel filter water/separators. Shut off the valve (blue handle) to each separator which are next to the shut offs with orange handles. Do not mistake for the lower shut offs with blue handles.
   b. Using the waste container provided, open the drain valve on the bottom of each filter and let the water/fuel drain into the container until it drains clear, shut off the valve.
   c. ensure the valves are returned to the in-line position

NOTE: if the engines will not start, you may have to prime the fuel for the engines. Each engine has a primer located on the starboard side of both engines, towards the back. Push the primer in several times until fuel pressure is restored and start the engines.

2) Engine start:

a. Start both engines by turning the key and pushing the start button. Ensure both engines are discharging water underneath the platform of the aft section of the boat.

b. Check the engine voltage meters for each engine. If they are not indicating 12 or more volts, you will have to excite the alternator. This is done while the transmissions are in neutral and by accelerating the port/starboard engine.

c. turn on the 100 amp breaker and all appropriate breakers (located at the helm)

d. ensure that all of the following are on and/or functional:

   i. horn,
   ii. wipers,
   iii. radars,

iv. radios,
v. lights
vi. fuel gauge

e. oil pressure gauges should read 30 psi

f. water temperature should read between 130-180 degrees

g. Before departing, ensure the rudder angle is centered.

h. Ensure the wheel cover is off the upper deck controls.

3) Generator start-up:

a. see port side diesel genset controls

b. push preheat for no more than 20 seconds

c. flip the toggle switch on the right up and push the start button

d. ensure that coolant water is discharging

e. flip the 50 amp generator breaker switch to on (see panel by the door)

f. to turn off generator, flip the toggle switch down

4) Connecting to shore power:

a. plug in two shore cables into the outlets located on the starboard side of the boat by the door

b. plug in the cables to the power source

c. turn on “shore 1 30 amps” and “shore 2 30 amps” breakers

d. turn on “engine heater port” for “bus a” and “engine heater stdb” for “bus b”

e. “battery charger” may be turned on

f. turn on “outlets” breaker if a separate heater is to be plugged in

5) Adjusting radios:

a. turn squelch and volume to off

b. turn volume up until you hear noise and stop

c. turn squelch up until the noise stops

d. turn volume up

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