

BILGE AND OILY WASTE SYSTEM

INTRODUCTION

The bilge system provides a means to drain all bilge wells and strainer boxes and pump the bilge water to an overboard discharge via an oil detector. Upon sensing the presence of oil, the pumps will be stopped automatically and an ALARM CONDITION will be presented at the Main Control Station Console.

The system consists of bilge wells, strainer boxes, valves and piping and three identical bilge pumps. Each pump is capable of taking suction on each bilge well and strainer box and depending on ship needs, the pumps can be used individually or in combination.

The oily bilge system provides a means to drain bilge wells in the propulsion motor room and main generator room. The system will separate oil and water, sending oil to the oily waste tanks and water to the bilge system overboard at an oil content level consistent with United States Coast Guard regulations for inland waters.

The system consists of an oily water separator, two oily waste tanks, bilge wells and connecting valves and piping. The system is operated automatically by float switches in each bilge well.

The oily waste system will automatically drain the purifier sludge tank. Also, it can manually be used to pump the oily waste tanks to the shore connections, pump the diesel engine lube oil sumps to the oily waste tanks, or pump the aft centerline bilge well to the oily waste tanks.

The system consists of an air driven pump, two oily waste tanks, purifier sludge tank and connecting valves and piping. An additional emergency de-watering capability is provided through a stop check valve and strainer box connected to the diesel engine raw water manifold.

FUNCTIONAL DESCRIPTION

Bilge System

Bilge pump No. 1, which is located in the generator space, is connected to a common suction line with bilge pumps #2 and #3, which are located in the propulsion motor room, lower level. Bilge pump #1 discharges through a check valve to a common discharge line with pumps #2 and #3, which have stop check valves on each of their outlets, to an overboard located in the generator room. The overboard has two (2) checks and a butterfly valve at the skin of the ship.

The common suction line serves four (4) suction manifolds, two (2) in the generator room and two (2) in the propulsion motor room. The forward manifold in the generator room has six (6) stop check valves which serve the following spaces:

X-DC R Trunk 4-31-1
Gen. Room Fwd
Chain Lkr 1-6-1
Chain Lkr 1-6-2
Dplr. Spd. Log Trunk 4-24-1

Bow Thruster Room 2-6-0

The aft generator room manifold has four (4) stop check valves which serve the following spaces:

- Gen. Room Aft Centerline
- Void 4-34-0
- Void 4-34-01
- Prop. Motor Room 3-52-01 Stbd. Fwd.

The propulsion motor room forward manifold has four (4) stop check valves, which serve the following spaces:

- Prop. Motor Room 3-52-01 Port Fwd.
- Prop. Motor Room 3-52-01 Stbd. Fwd.
- Cofferdam 3-52-0
- Gen. Room 3-34-0 Aft Centerline

The propulsion motor room aft manifold has four (4) stop check valves, which serve the following spaces:

- Prop. Motor Room 3-52-01
- Aft Tunnel 3-72-1
- Tunnel 2-86-1
- Steering Gear Room 2-94-0

The propulsion motor room and main generator room bilge well suction are equipped with bell mouth strainers, all others have strainer boxes.

Bilge pump #1 has a simplex suction strainer and pumps #2 and #3 share a simplex suction strainer.

The generator room aft centerline bilge well has two (2) additional bilge wells, located port outboard and stbd. outboard. These additional wells are connected to the centerline well by a pipe in the inner bottom.

The self priming centrifugal pumps are manufactured by Peabody Barnes and are rated at 170 GPM at 29 PSI. They are driven by a 5 H.P. electric motor. Manufactured by Marathon Electric. Motor controllers are located as follows:

- #1 MCC 1A/1B main generator room.
- #2 Main propulsion motor room lower level.
- #3 'MCC 2A/2B main propulsion motor room.

A mode switch on each controller allows for selection of "normal" or "by-pass" modes of operation. When using the "normal" mode, the bilge pump discharge passes through the BA 1 oil detector, manufactured by Separation & Recovery, Inc., which is located in the generator room on the stbd. bulkhead.

If the oil detector senses an oil content level greater than 15 PPM, it will cause the oily discharge controller to secure the bilge pumps) and display an alarm on the M.C.S.C. CRT

"Bilge Pump Discharge Oily". When using the "By-pass" mode, an oil level greater than 15 PPM will activate the M.C.S.C. alarm, but the bilge pumps) will continue to run.

OILY BILGE SYSTEM

The oily bilge system is designed to automatically operate as the primary bilge system in the main engineering spaces. Three (3) bilge wells in the propulsion motor room and two (2) bilge wells in the main generator room are equipped with float switches, screened foot valves and solenoid valves to isolate the suctions. Piping from the wells are connected to an oily water separator through a duplex strainer. The Hayward #50 duplex strainer has 40 micron baskets with a delta pressure gauge across the inlet and outlet to indicate basket condition. The Sarex VGS-2 oily water separator, located in the generator room aft lower level, is rated at 2 GPM at 17 PSI and is manufactured by Separation & Recovery Systems, Inc.

The systems auto controller is located in the main generator room aft upper level and is fed from L-128-5P. Pressing the start button on the auto controller provides power to the float switches and the Separator's control box. Placing the AUTO/OFF/MANUAL switch on the Separator's control box to AUTO sets the system up for automatic operation.

A high level condition in a bilge well will cause the upper float switch to complete a circuit energizing the suction solenoid valve "open" and starting the water pump on the separator. The water pump inlet is connected to the bottom of the first stage vessel of the separator, which operates under a vacuum. The first stage vessel which functions as a gravity separator, has its inlet at the top and is equipped with a series of inclined absorption plates, which act as collection surfaces for separated oil droplets. The first stage is where the primary separation of oil and water occurs. The water pump discharges to the bottom of the second stage vessel, which is a coalescer stage and contains the replaceable filter elements. The filter provides a surface upon which very small droplets of non-soluble oil dispersed in the water attach and combine with other oil droplets. When the oil droplets grow to sufficient size, they are forced off the exterior surface of the filter by fluid flow. A small line from the top of the second stage to the inlet of the first stage provides a path for the oil separated by the second stage. When the oil level in the first stage reaches sufficient height to close the oil level float switch, the oil pump runs until the level is reduced and the oil float switch is opened. The oil pump discharges to the oily waste tanks through oily waste system piping. The outlet of the second stage is routed through the separator's oil detector, which senses the oil content of the water passing through. The display for the oil detector is located in the generator room aft upper level and reads out in parts per million (PPM). When the level of oil content is below 15 PPM, the separator's "overboard" solenoid valve is energized open, allowing the clean water to be pumped over the side via the bilge system overboard.

When the oil content is at or above 15 PPM, the overboard solenoid remains closed, and the recirculate solenoid valve is energized open. The oily water is pumped to the main generator room aft bilge well, located next to the separator. When the level of oily water reaches sufficient height to close the upper level switch in the main generator room aft bilge well, the suction solenoid will be energized open. The separator can recirculate the oily water until it has reduced the oil content to less than 15 PPM and then pump the clean water overboard and the oil to the waste tanks. An "oily waste pump excess operation" alarm will activate on the M.C.S.C. if the separator pumps run for more than approximately eight (8) minutes.

OILY WASTE SYSTEM

The oily waste system utilizes a Warren Rupp Co. Model 5T1-A, pneumatic actuated, diaphragm type, pump rated at 10 GPM at 51 PSI. The pump is located in the main generator room aft lower level with its controller on the upper level directly above. The controller is fed from Panel P-122-1 located in the generator room. The pump is supplied with ship's service compressed air through a pressure regulator, solenoid valve and automatic oiler.

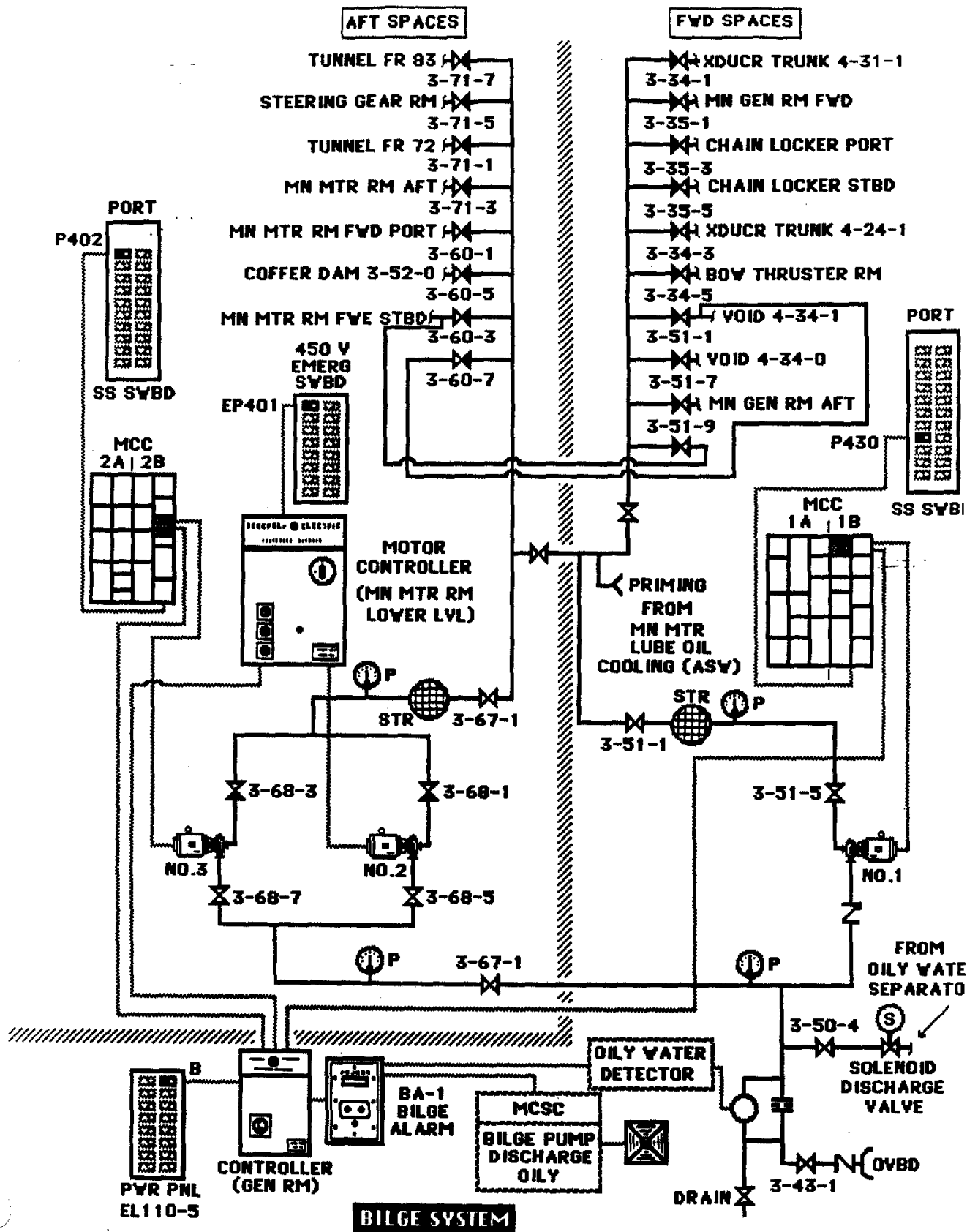
The normal operation of the oily waste system is automatic pumping of the purifier sludge tank to the oily waste tanks. Level switches in the purifier sludge tank will operate the solenoid air valve activating the oily waste pump when the auto mode is selected at the controller. If, due to a system malfunction, the level continues to rise. A "sludge tank high level" alarm will activate at the M.C.S.C. when the tank level reaches eighty-five percent (85%).

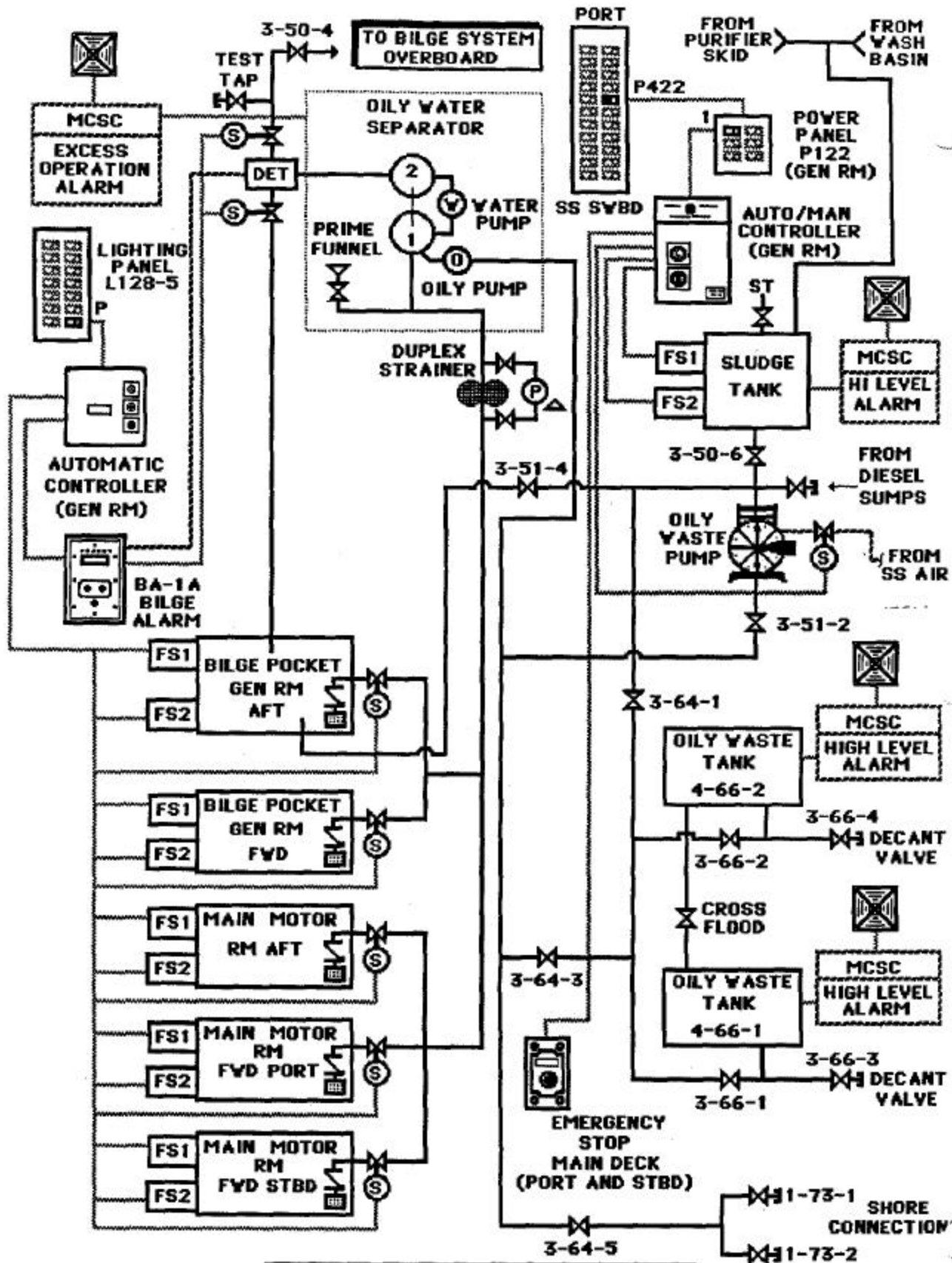
With the use of the hand mode and proper valve line-ups, the various other capabilities of the oily waste pump can be utilized. Pumping the diesel engine lube oil sumps to the waste tanks or shore connections. Pumping the generator room aft bilge well to the oily waste tanks.

Pumping the oily waste tanks to the shore connections. Emergency stop pushbuttons are located adjacent to the shore connection cutout valves on the main deck aft, bulkhead 72. The stop pushbutton can be used to secure the oily waste pump in the event of oil escapement. As long as the button is held in, the pump will not operate. When released, the pump will resume.

The capacity of the purifier sludge tank at 100% is 100 gallons. The capacity of the oily waste tanks at 98% is 4,921 gallons each. Both oily waste tanks have level switches that will activate a single alarm at the M.C.S.C. "oily waste tank level high".

WT BULKHEAD





OILY BILGE AND WASTE OIL SYSTEMS

OIL DETECTOR

WARNING

"Detergents should not be used in the bilges for cleaning purposes as the emulsifying effects of such compounds seriously affect the operation of the equipment. Particulate matter can also have a detrimental effect on equipment performance".

OIL DETECTOR

The bilge system and oil bilge system on T-AGOS Class ships utilize similar oil content meters and detectors. The bilge system has a model BA-1 bilge alarm. The oily bilge system has a model BA-1A bilge alarm as an integral part of the oil-water separator. Both oil detectors are manufactured by Separation and Recovery Systems, Inc. and have been certified in accordance with the Inter-Governmental Maritime Consultive Organizations (IMCO) Resolution A-393(x) of 1977. The oil detectors have also been approved and certified under the United States Coast Guard No. 162-050/1003/0 and 162-050/3001/0.

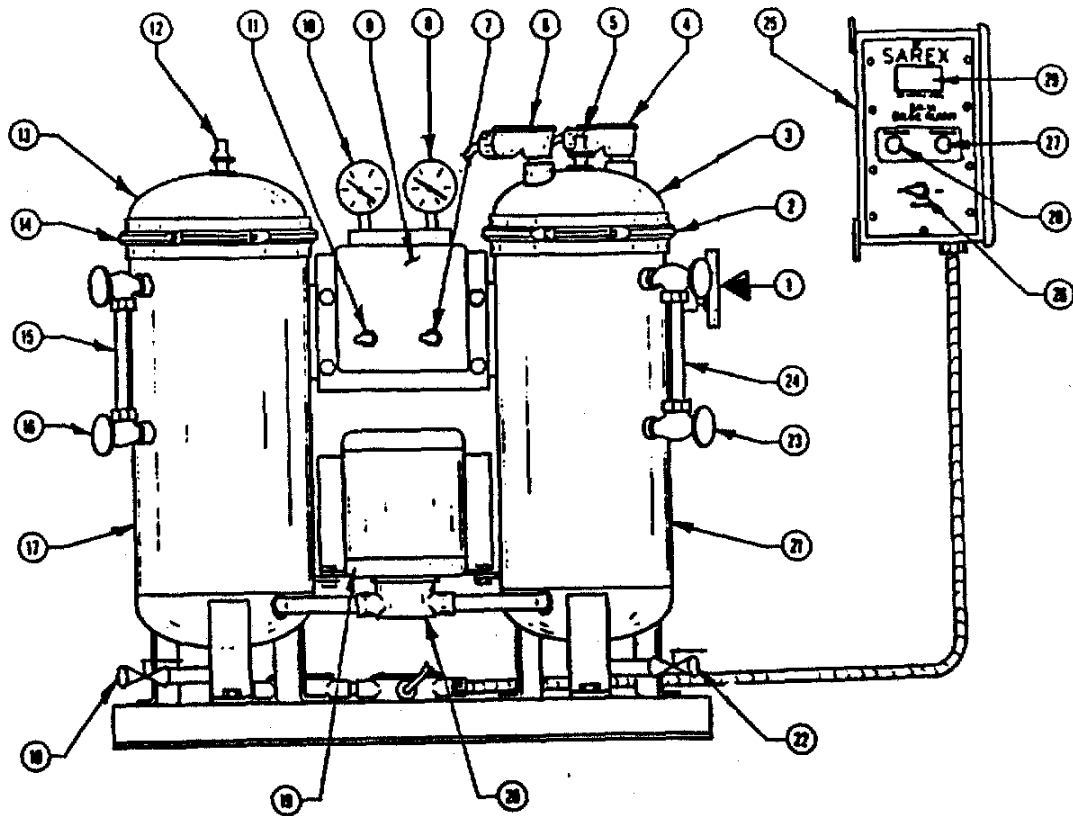
FUNCTIONAL DESCRIPTION

The BA-1 bilge alarm used in the bilge system monitors a sample portion of the bilge pump discharge by use of a "slipstream". By piping the bilge alarm sensor in parallel with the bilge pump discharge and inserting an orifice in the pump discharge parallel run, a sample portion of the entire flow passes through the sensor. The BA-1 A bilge alarm used on the oil-water separator has the entire flow passing through the sensor.

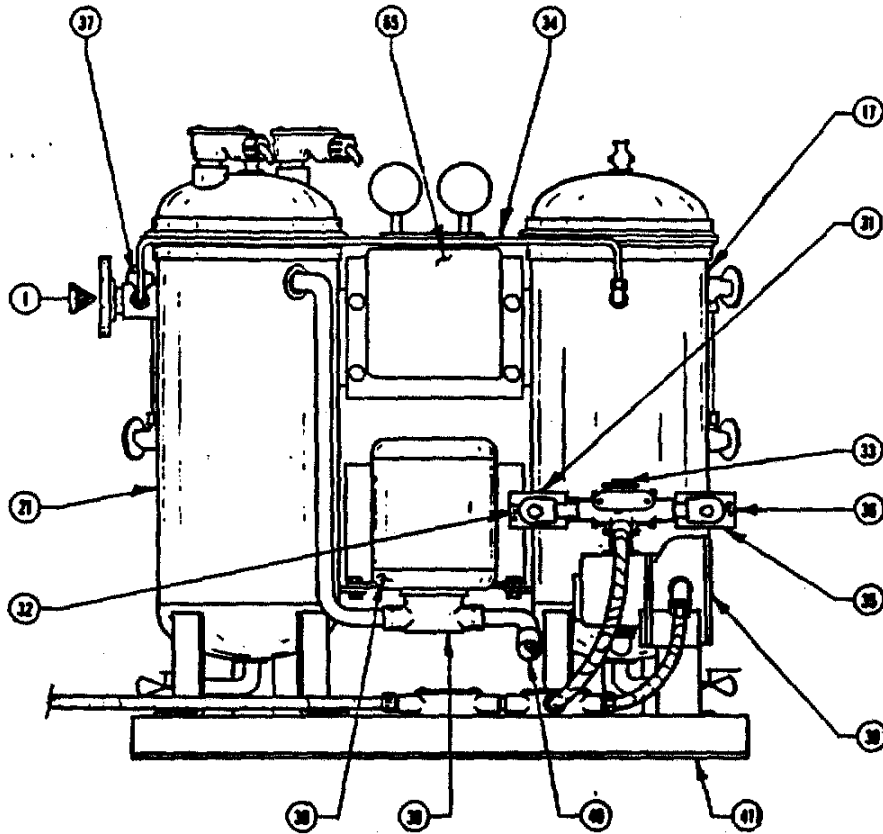
Water flows through the sensor and in front of sealed optical pressure windows where a comparative measurement is made. A pre-focused incandescent lamp unit generates an optical beam which passes across the water flow. A photo diode detector measures the light scattered at 90° to the direction of the light beam by particles in the water. An electrical signal from the detector is sent via cable to control module where it is computed and displayed on the digital readout in PPM.

The control module houses the electronic circuitry for the unit's internal power supply and for amplifying signals from the sensing module, displays oil content levels and activates and de-activates the alarm circuit. The two digit display on the BA-1 indicates readings up to 99 and then flashes the readings over two digits. The BA-1A for the oil-water separator has a three digit display.

Indicator lights on the control module show that the system is in a: green light = overboard, or red light =recirculate, mode of operation. The indicator lights will change state at the alarm set point which is adjustable from within the control module. When the system enters a recirculate mode and remains in this mode (even though a sample of the discharge appears clean), it is an indication that the sensor windows may require cleaning. Suitable clean-out piping arrangements have been provided on both systems and a bristle bottle brush is recommended for use in the cleaning procedure.



<u>Component Number</u>	<u>Component Description</u>
1	System Inlet
2	Cover Retainer Clamp - First Stage Separator
3	Cover - First Stage Separator
4	Pulling Elbow - Float Switch
5	Bleed Valve - First Stage Separator
6	Pulling Elbow - Float Switch
7	Pump Selector Switch
8	Vacuum Gauge - First Stage Separator
9	Control Module - Separator
10	Pressure Gauge - Second Stage Separator Inlet
11	System Selector Switch
12	Bleed Valve - Second Stage Separator
13	Cover - Second Stage Separator
14	Cover Retainer Clamp - Second Stage Separator
15	Sight Glass - Second Stage Separator
16	Sight Glass Shutoff Valve - Second Stage Separator
17	Second Stage Separator
18	Sample/Drain Valve - Second Stage Separator
19	Water Pump Motor
20	Water Pump
21	First Stage Separator
22	Sample/Drain Valve - First Stage Separator
23	Sight Glass Shutoff Valve - First Stage Separator
24	Sight Glass - First Stage Separator
25	Control Module - Bilge Alarm
26	Power Switch - Bilge Alarm
27	Recirculate Light
28	Water Discharge Light
29	Digital Display - Bilge Alarm



<u>Component Number</u>	<u>Component Description</u>
1	System Inlet
17	Second Stage Separator
21	First Stage Separator
30	Bilge Alarm Sensing Module
31	Solenoid Valve
32	Solenoid Operated Recirculating Valve
33	Sensing Module Cleanout Plug
34	Oil Return Line
35	Solenoid Valve
36	Solenoid Operated Water Discharge Valve
37	Metering Valve
38	Oil Pump Motor
39	Oil Pump
40	Oil Discharge Line
41	Skid
65	Time Delay Relay Enclosure

