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## BOSS 107 Separator System Installation Manual



BOSS 2.2T/107



BOSS 5T/107



BOSS 11T/107



BOSS 25T/107



BOSS 45T/107

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## 1. Unpacking & Inspection

### A. Testing, Preparation for Shipment and Storage

Prior to delivery the system is tested in the factory to verify that the system is watertight and that all the pumps, valves, instrumentation and controls are operational. A factory acceptance test, hydrotest report and QC checklist are included in the control panel along with an electrical drawing, mechanical drawing and various operational spare parts. Moisture packets are included inside each control panel to prevent moisture damage to electrical components during shipping and storage. Once the system has been checked and tested at the factory it is cleaned and prepared for shipping. After the cleaning process, the system is wrapped in stretch wrap and then crated in a wooden crate that is certified to ISPM 15 international shipping standards.

During the cleaning process all water is blown out of the system so that it can be stored in cold temperatures without risk of freezing damage. The unit can be stored indoor or outdoor at a temperature range of -10 C to 40 C. The unit will be shipped on a wooden pallet specifically designed for the system so it can be moved easily with a forklift. The crate is not designed to stack a lot of weight on top of it. Avoid stacking heavy objects on the crate. It will not support the weight and could cause damage to the top of the separator. The crates will hold up to rain and humidity for a reasonable period of time. Obviously it is better to store the unit inside a warehouse but the unit is also designed to be stored outdoors. No covering or other preservation is required to store the units.

### B. Delivery Inspection & Reporting

When the system arrives at its final destination it should be carefully checked for damage that may have been sustained during shipping. All damage should be noted and reported to the shipping company and to the manufacturer. If replacement parts or components are needed the manufacturer should be informed immediately.

When you are ready to use the separator carefully remove the crate and stretch wrap. The unit can be moved either with a forklift, while it is on the pallet, or by a crane using the lifting lugs on the top of the separator.

### C. Storing After the Unit Has Been Received

If the unit is unpackaged or has been placed in operation and needs to be stored the following should be done to protect the system from freezing or developing bacteria:

#### i. Remove Oil.

If the unit has been in operation and is still in place, force the unit into the fill mode several times by opening the separator vent valve. This will help make sure there is very little oil in the system. The unit can also be forced into fill by disconnecting the level sensor. This is done by opening the control panel and disconnecting the orange plug from the circuit board that controls the level switch. This plug is located on the

bottom left hand corner of the circuit board. Once the system has removed all of the oil from the system, simply install the orange plug back into the circuit board.

ii. **Drain.**

- a. Open the inner and outer separator drains and drain the system into the bilge. This will drain most of the water.
- b. Open the sample valve or cap at the bottom of the pipe where the discharge and recycle valves are located.
- c. Remove the pump plug.
- d. Remove the OCM cap.
- e. Drain the water from the separator into the bilge.
- f. Blow air into the OCM, vent or any other openings to make sure as much water as possible has been removed. Clean the cell with the brush provided using a mild, non-corrosive cleaning agent and rinse with clean water. (See O&M manual or separate OCM manual for cell cleaning instructions.)

iii. **Shrink Wrap.**

Wrap the unit in shrink wrap to protect it.

**C. Verify Fitness for Application**

In order to assure the proper operation of the oily water separator it is important the separator have the options that fit the application. This should have been accomplished prior to the purchase in the specification of the unit. We have found, however, that sometimes critical information regarding the application is not given prior to the sale resulting in a poor fit and performance. Retrofit adaptations could be needed in these situations. The following are some application situations and the options that are recommended for each. If you find that your application meets one of these situations and the applicable option has not been ordered for your separator, you should check with your purchasing people to get a retrofit option that will help the separator meet your needs better.

**D. Application Situations and Recommended Options Associated With Them.**

Refer to Section 6 of the O&M manual or contact the factory or your distributor if you find that any of these situations apply.

<b><u>Application Situation</u></b>	<b><u>Recommended Option(s)</u></b>
1- Positive inlet pressure	Option MV on oil discharge REQUIRED
2- Vertical suction lift of > 4-5 meters	Option HL or Option PC
3- Installation outside in harsh environments	Option RO
4- Very infrequent intended use of separator	Dry bilge option to prevent bacteria growth

5- High suspended solids/silt and turbidity	Consider various options, including Option BF, Option CS, Option EP or TD-107 monitor
6- Barite or similar coloration of water	TD-107 monitor
7- Paraffin that coats metal or high emulsions	Option HE
8- Requirement for <5ppm	Option 5P
9- Hazardous area installation	Options X1 or X2
10- Do not like removing the media from the bulk tank	Option CF
11- Want to discharge clean water without going through the separator but you want to certify that it is clean	Option HF or consider a separate stand alone monitor (SAM)
12- Limited space	Options YM or YO

*Table 1: See the Options Section 6 of the O&M manual for more discussion about the options.*

## 2. Installation

The BOSS Oil Water Separator is a self-contained system that is fully tested and operated under normal operating conditions without oil at the factory. Each function of the system is tested and verified. Within the system no piping or wiring will be necessary unless the separator and polisher are to be mounted separate from each other. A FAT report is provided with the unit to show what test procedures were performed.

Installation normally involves the following:

- Move separator into place and mount the separator to the deck. This is accomplished by using minimum 1.125" (28mm) grade 5 or better bolts or a minimum of 4" of ¼" weld for each foot pad.
- Make the necessary piping connections to your application. All piping connections to the system are listed in the table in Attachment 1.

**BOSS 2, 5, and 11 Units:** The BOSS 2, 5 and 11 systems come fully piped as the standard.

**BOSS 25 & 45 Units:** The BOSS 25 and BOSS 45 and larger units are shipped with the polishing unit separate from the separator unless the skid option is ordered. These polishing units can be installed in a separate location from the separator if needed or desired. These units require the installer to install piping to connect the separator and the polisher together. The inlet and outlet on these units are clearly marked. The polisher can only be piped up one way, as marked on the unit.

**All Units:** It is critical that the connecting pipe runs are sized to permit unrestricted operation of the unit. Piping that is undersized can impair the operation of the system. To

facilitate service and testing procedures it is highly recommended that the customer install isolation valves at all piping connections to the separator unit.

- The unit has been set up for the proper voltage requirements at the factory as specified by your purchasing department. Please insure that the voltage you are supplying matches the voltage that the unit is designed to operate on. This voltage is shown on the electrical drawing. This schematic is found inside the control panel, as well as within the attachment section of the operating manual. The power connections to the main power disconnect are shown on the electrical schematics attached. . In the event that the electrical drawing is lost or damaged, please contact the factory or your distributor and we can supply you with an electronic copy of it.
- If the unit is in a hazardous area and has an Ex-p purge control system you will need clean instrument quality air for the purge control. Refer to the purge control manual for the proper volume and pressure of the air. No air is required for a non hazardous area.

### 3. Startup & Commissioning

#### A. Factory Startup and Acceptance Test Procedures

A factory acceptance test and hydrotest is performed on every system prior to shipping. A factory authorized technician is available to come on site for a field startup, commissioning and acceptance test if desired. This is not required for the system, however, it is a good idea and one that we highly recommend. The following procedures are those that a factory authorized technician will perform. If the customer does their own startup they will need to follow these same procedures. If the customer initially elects to do their own startup and then changes their mind the factory startup can be done at any time. Contact your representative or the factory for the associated costs. The factory startup can also be performed by your distributor if they have a factory trained technician. Check with your distributor to determine if they have a factory trained technician. The fee charged by the distributor's technician will be determined by the distributor.

The general steps for startup are listed here. More details are provided in the text.

1. Verify that the installation of the system is complete before applying power.
2. Verify proper voltage to the system.
3. Connect power to the separator and test the rotation of the motor.
4. Turn main power on and initiate clean water fill.
5. Before filling you must verify the pump rotation direction.
6. Fill the separator and piping completely with water.
7. Purge the air out of the system.
8. If you want to pressurize the separator, polisher and piping make sure you remove the vacuum gauge first and plug the hole. The vacuum gauge is not designed for more than 15 psig pressure. Replace the vacuum gauge after the pressure test has been completed.
9. Verify suction integrity & repair any air leaks.
10. Verify operation of the OCM (OCM power on, PPM reading, 3-way valve operation).



11. Verify operation of the recycle valve (valve is open when PPM > 15, closed when PPM < 15).
12. Verify operation of the discharge valve (valve is open when PPM < 15, closed when PPM > 15).
13. Open the vent valve to force the system into fill mode. Verify operation of the fill valve and oil out MOV (if applicable) (MOV is open when the fill valve is open, closed when the fill valve is closed).
14. Turn the separator on and set the designed flow rate with the manual flow control valve.
15. Simulate alarm and warning conditions to verify that they function properly.
16. Make any adjustments that are appropriate.

## B. Before applying Power

Before applying power to the unit, be sure all isolation valves to and from the system are closed with the exception of the oil out valve after CV-102.

Verify that there is a foot valve. If there is no foot valve in the sump the system will drain every time it is shut off and will have a difficult time priming.

Verify that the power is at the voltage and frequency indicated on the electrical drawing and connected as shown on the electrical drawing. There are 2 copies in the electrical enclosure. One copy should be kept there.

If your system is wired for 115 or 240 VAC SINGLE PHASE operation the following procedure is NOT required. Follow this procedure ONLY if your system is wired for **3 PHASE** operation. Connect power to the L1, L2 and L3 terminals on the combination motor starter as shown on the electrical drawings. Do not remove the other wires on these terminals.

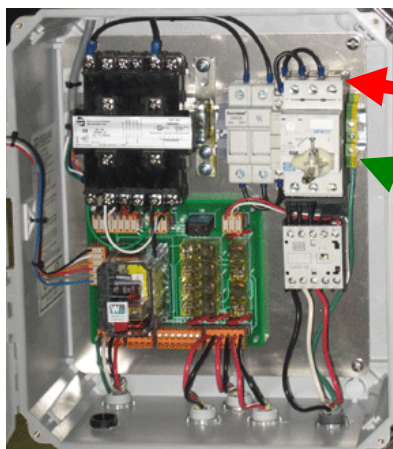
## C. Power Test:

After the installation of power and **BEFORE ANY WATER IS PUT IN THE SYSTEM** the pump should be checked for proper direction of rotation. If pump rotation is checked after the system is filled, starting the pump in the incorrect direction can cause the pump impeller to rotate off the motor shaft. If this should occur remove the pump head and re-attach the impeller to the shaft.

**WARNING!!**

**An experienced and trained electrician or controls technician should do this procedure, as potentially lethal voltages are present in the control panel.**

Check rotation by manually energizing the pump. Open the control enclosure and turn the power on by turning the disconnect shaft counterclockwise 90 degrees. Momentarily push the contactor button with a pencil or other non-metallic item. At the same time, watch the direction of the fan on the rear of the pump. It should rotate in a clockwise direction as viewed from the back end of the motor (see figure 2). After testing rotation turn the disconnect off and close the enclosure door.



**Figure 1**

Power Connections

Ground

Watch the direction of the fan on the rear of the pump. It should rotate in a clockwise direction as viewed from the back end of the motor.



**Figure 2**

The unit is now ready to run by turning the disconnect to the On position and turning the ON-OFF-REM selector switch to the desired position.

The “REM” position of the BOSS selector switch is for remote on/off control. This would be for a remote controller or for a remote level switch in the bilge sump. The unit comes from the factory with a jumper on the REM position so that the system will operate the



same at the “ON” or “REM” positions. For any remote operation, the customer will need to connect to the terminals provided. When the power disconnect on the BOSS unit is turned on, the power light should come on. The OCM monitor on the unit should power up and perform its self test mode

#### D. Pump Voltage

The pump has been supplied at the voltage that was specified when the system was ordered. Check the pump voltage that was supplied to make sure that it agrees with the voltage that is required. If the voltage supplied does not agree with what is required then it is possible to change the voltage or frequency. The table below explains how to change the voltage or frequency. In some cases the change can be made simply by changing some wire to different taps. In some cases the change will require different components such as an overload or impeller or different size motor. Contact the factory or your distributor if you need different components or have any questions.

From:	To:	Tap change	Motor change	Motor Starter	
440-480/3Ph/60Hz	220-240V/3ph/60Hz	Yes	Rewire Motor Leads	Change	
	220-240V/3ph/50Hz	Yes	Rewire Motor Leads	Change	
	208V/3ph/50Hz	Yes	Rewire Motor Leads	Change	
	380-415V/3ph/50Hz	Yes	BOSS 2&5 no change	No Change	
				BOSS 11&25 Impeller Change	
	any single Phase	Not Recommended - New Control box & motor			
380-415/3Ph/50Hz	220-240V/3ph/60Hz	Yes	Rewire Motor Leads	Change	
	208V/3ph/50Hz	Yes	Rewire Motor Leads	Change	
	440-480/3Ph/60Hz	Yes	No Change	No Change	
				BOSS 45 change motor	
	any single Phase	Not Recommended - New Control box & motor			
220-240V/3ph/60Hz	208V/3ph/50Hz	Yes	No Chang	No Change	
	380-415V/3ph/50Hz	Yes	Rewire Motor Leads	Change	
	440-480/3Ph/60Hz	Yes	Rewire Motor Leads	Change	
				BOSS 45 change motor	
	any single Phase	Not Recommended - New Control box & motor			
208V/3ph/50Hz	220-240V/3ph/60Hz	Yes	No Change	No Change	
	380-415V/3ph/50Hz	Yes	Rewire Motor Leads	Change	
	440-480/3Ph/60Hz	Yes	Rewire Motor Leads	Change	
				BOSS 45 change motor	
	any single Phase	Not Recommended - New Control box & motor			
208-240V/1ph/60Hz	208-240V/1ph/50Hz	Yes	Change Spring	No Change	
	110-120V/1ph/60	Bypass	Rewire Motor Leads	Change	
	110-120V/1ph/50	Bypass	Rewire Motor Leads & Spring	Change	
				BOSS 45 change motor	
	any 3 Phase	Not Recommended - New Control box & motor			
208-240V/1ph/50Hz	208-240V/1ph/60Hz	Yes	No Change	No Change	
	110-120V/1ph/60	Bypass	Rewire Motor Leads	Change	
	110-120V/1ph/50	Bypass	Rewire Motor Leads	Change	
				BOSS 45 change motor	
	any 3 Phase	Not Recommended - New Control box & motor			
110-120V/1ph/60Hz	208-240V/1ph/60Hz	Yes	Rewire Motor Leads	Change	
	208-220/1ph/50Hz	Yes	Rewire Motor Leads & Spring	Change	
	110-120V/1ph/50	NA	Change Spring	No Change	
				BOSS 45 change motor	
	any 3 Phase	Not Recommended - New Control box & motor			
110-120V/1ph/50Hz	208-240V/1ph/60Hz	Yes	Rewire Motor Leads	Change	
	208-220/1ph/50Hz	Yes	Rewire Motor Leads	Change	
	110-120V/1ph/60	NA	No Change	No Change	
				BOSS 45 change motor	
	any 3 Phase	Not Recommended - New Control box & motor			

#### E. Power ON & Initial Water Filling:

Before the initial filling and testing, isolate the supply of oily water. It is important that the system is tested **BEFORE** any oily water is admitted into the separator. Verify that the clean water source has been turned on. It is recommended that the pressure of the clean water should not exceed 15 psig (the vessel design pressure). The next step is to fill both the separator and the filter.

Fill the separator by turning the system switch to ON. The separator will automatically start to fill and the Fill & Oil Discharge light should be on. Open the separator vent valve

(V001) at the top of the separator. When the separator is full the fill valve and oil discharge valve (MOV-101) will close (if your unit has the MOV option) and the pump will come on. The primary separator is now full. When the pump comes on it will automatically fill the polisher. With the inlet isolation valve closed the pump will pull from the separator to fill the polisher. It will go into the fill mode several times during this process but it will fill the polisher with clean water. In the normal mode air will be trapped in the top of the filter. To evacuate the air you will need to switch the backwash valves (V-106—polisher inlet-- and V-107—polisher outlet) to the backwash position for a short while. Open the vent valve on the polisher to allow air to evacuate. This will push the air out of the polisher. When water starts coming out the backwash valve then the entire system is filled and the system is ready to run.

**IMPORTANT:** If the polisher is not completely filled the OCM monitor will have problems due to air in the polisher interfering with the oil ppm reading.

#### F. OCM Test:

While the system is running on clean water the OCM needs to read zero. If the OCM is not reading zero this may be caused by air in the sample lines or turbidity in the water. After a few minutes of running with clean water the air will work itself out of the system and any turbidity from the system should be eliminated. It is possible you may need to clean the cell with the brush. When the unit returns with a display of “0” PPM the unit is ready for operation.

If the monitor continues to read  $> 0$  it may need to be reset. For further explanation of the OCM see the vendor O&M manual.

#### G. Introduce Process Water & Set Flow Rate:

Once the system is filled with water and the OCM has been set to zero, turn the system on if it was turned off from the filling process or if it is still on open the isolation valve to allow oily water into the system. Establish proper flow by adjusting the flow control valve until the flow indicator shows the proper system flow rate. Observe the pressure gauge located on the pump outlet because it will serve as a baseline pressure to indicate when it is time to change out the polishing media. It is normally not necessary to adjust the flow rate during operations once it has been set.

#### H. Verify Suction:

Check the suction by reading the vacuum gauge on the inlet pipe. If the suction pressure reads 0 there are most likely leaks in the piping. If the suction pressure is  $> 12$  inches Hg there are either restrictions in the suction piping or the suction lift may be starting to get too high. If you have removed all restrictions and the vacuum gauge still reads  $> 12$  inches Hg the system could have difficulty achieving the design flow rate. See the O&M manual for a more complete discussion of high negative suction lift. With most new installations there is a significant amount of debris in the suction line that gets caught in the pre filter. as a general rule clean the inlet strainer within the first hr of normal oily water processing.

observe the gauge pressure when the screen is clean. any rise in suction pressure or reduction in positive pressure would indicate that the strainer is becoming clogged again.

## I. Simulate Alarm Conditions for Inspector or Verification of Valve Operation

The 107(49) monitors are factory calibrated by law and so no calibration is needed on startup.

When the inspectors come to verify the operation of the oil water separator, they will want to see that the monitor will open the discharge valve when less than 15ppm (or 5 ppm) and that the recycle valve will activate when over the limit.

There is no reason to put oil in the system to verify its operation. If you were to introduce oil to the oily water inlet, it would only be absorbed by the filter and would not demonstrate anything, but would instead use up some of the capacity of the filter without showing any results. If you put oil directly into the monitor it will take a while to purge the oil out of the system once you start up and it will be harder to demonstrate the switching back and forth between the no alarm and alarm modes.

The proper operation of the monitor can be demonstrated by simulating the alarm conditions. This is accomplished on the Brannstrom monitor by holding the back arrow key for 4 seconds. This will simulate what happens when the unit is above its set point. The discharge valve will close and the recycle valve will open.

This can be demonstrated on the Deckma Monitor by turning the cleaning water valve to the right while the unit is running and the discharge and recycle valves can be checked.

This can be demonstrated on the Rivertrace monitor by pressing and holding down on the cleaning plunger located on the top of the monitor for 2 to 3 seconds. The screen on the monitor will read “warning! Plunger down” and will force the unit into recycle for several seconds. There will be enough time to check the operation of the valves.

This can be demonstrated on the TD-107 monitor by turning the clean water valve handle to the right (similar to the Deckma monitor). The recycle valve will be forced open for as long as the handle is in the horizontal position.

You can check that the valves are actuating by shutting off the isolation valves (customer supplied) and observing the pressure gauges on the separator. For example if the discharge is isolated and the recycle is not, you will have pressure when it is trying to discharge and no pressure when it is recycling.

The monitor can also be forced into alarm by emptying the cell by using the brush to push all the water out. Then when you turn the separator on the air in the monitor will cause the alarm to go above set point for a short period. This will show that above 5 ppm reading that the alarm works.

You can also simulate an alarm condition by using WD-40. This is done by turning the three position selector switch to the “OFF” position, removing the plastic tubing line that is for the sample inlet and spraying the WD-40 into the line. After spraying the WD-40 inside the line, reconnect the line to the plastic fitting and turn the system back on. The monitor will read zero for a few seconds but as the WD-40 (which is an oil based product) passes through, the PPM level will raise and then lower as the WD-40 runs out.

You can cause the system to go into the fill mode to demonstrate the level control by opening the vent valve while the system is running. This will pull air into the head of the separator and force the water down until the level probe no longer senses water. This will cause the level control to think there is oil in the oil reservoir and will cause the system to go into the fill mode.

J. Checklist and Commissioning Report



**BOSS Oil Water Separator  
Commissioning Report**

<b>Distributor:</b>	<b>Technician:</b>	<b>Date:</b>
<b>Customer:</b>	<b>Location:</b>	<b>Vessel:</b>
<b>Model No:</b>	<b>Serial No:</b>	

<b>BEFORE APPLYING POWER TO THE SYSTEM FOR THE FIRST TIME</b>		<b>O.K.</b>	<b>Remarks</b>
1	Verify the installation connections to the right locations and proper sizing per installation drawing		
2	Make sure isolation valves are installed before and after the unit and a foot valve in the sump/bilge.		
3	Verify power connection is correct including voltage per electrical drawing.		
4	Before applying power to the unit, be sure all isolation valves to and from the system are closed with the exception of the oil out valve after CV-102.		
5	For 3 Phase power systems, check pump rotation as outlined in the installation manual.		

<b>STARTING AND TESTING THE SYSTEM</b>		<b>O.K.</b>	<b>Remarks</b>
6	Turn the system power switch to the ON position		
7	The system will automatically fill with clean water. Make sure no oily water is allowed into the system.		
8	Open the separator vent valve (V001)		
9	Close the discharge and recycle isolation valves so the system will pressurize. This is to help evacuate the air from the system.		
10	Evacuate all air from the system. This may require running the pump one or more times.		
11	Open the isolation valves.		
12	Set the design flow rate as described in the installation manual.		
13	Verify proper vacuum as described in the installation manual. Fix any piping leaks or remove any obstructions.		
14	Open the valves to the TPH and verify proper operation of the TPH as outlined in the installation manual.		
15	The system is now ready for full operation and the oily water isolation valve can be opened and normal operations can commence. Turn 3 position switch to ON or REM (if using a remote on/off switch)		
16	Operate the system at design conditions for the required test period.		
17	Observe several cycles of the system. You can shorten the cycle time by opening the separator vent valve. This will pull air into the oil chamber and cause the system to go into the fill mode.		
18	Simulate alarm and warning conditions to verify that they function properly as outlined in the installation manual.		
19	Make any adjustments that are appropriate.		

We certify that this unit is operational and fit for service.

Technician Signature:

Customer Signature:



## Installation Manual

## ATTACHMENT 1 - PIPING CONNECTIONS

<b>Connection/min pipe size</b>	<b>2.2T/107</b>	<b>5T/107</b>	<b>11T/107</b>	<b>25T/107</b>	<b>45T/107</b>
<b>Oily Water Inlet</b>	<b>¾"/1"</b>	<b>1"/1"</b>	<b>1"/1.25"</b>	<b>1 ½"/1.5"</b>	<b>2"/2"</b>
<b>Fresh Water In</b>	<b>½"/3/8"</b>	<b>½"/3/8"</b>	<b>½"/1/2"</b>	<b>½"/1/2"</b>	<b>¾"/1/2"</b>
<b>Oil Out Discharge</b>	<b>½"/1/2"</b>	<b>½"/1/2"</b>	<b>¾"/3/4"</b>	<b>¾"/3/4"</b>	<b>¾"/3/4"</b>
<b>Water Out Discharge</b>	<b>½"/3/4"</b>	<b>¾"/1.0"</b>	<b>¾"/1.0"</b>	<b>1 ¼"/1.5"</b>	<b>1 ½"/2.0"</b>
<b>Water Recycle</b>	<b>½"/1/2"</b>	<b>½"/1/2"</b>	<b>½"/1/2"</b>	<b>¾"/3/4"</b>	<b>1"/1.0"</b>
<b>Separator Center Drain<sup>1</sup></b>	<b>¾"/na</b>	<b>1"/na</b>	<b>1"/na</b>	<b>1 ½"/na</b>	<b>1 ½"/na</b>
<b>Separator Outer Drain<sup>1</sup></b>	<b>¾"/na</b>	<b>1"/na</b>	<b>1"/na</b>	<b>1 ½"/na</b>	<b>1 ½"/na</b>

<sup>1</sup> Not used during operation

## Installation Manual

### ATTACHMENT 2 – INSTALLATION DRAWINGS