

Thermopure-2 Waste Treatment System

Installation, Operation, and Maintenance

Concept: THERMOPURE-2 is a Type-I MSD, which means that it may be installed aboard uninspected vessels less than 65-feet in length for the purpose of treatment and direct overboard discharge of waste from toilets.

Treatment is accomplished by macerating the waste while it is in the holding tank, and then pumping it through a separate treatment chamber where sufficient low level heat is introduced to eliminate bacteria. No chemicals or additives are

required, and operation is equally efficient in fresh, brackish, or salt water.

The effluent is free from harmful bacteria and visible solids, and is in complete compliance with current Type-I MSD requirements.

The vessel owner need only monitor system level, and apply AC power (through the vessel's generator or via a shore power connection). All system functions and operation are completely automatic.



USCG Certification Numbers 159.015/983/0

Treatment Capacity:

There is no exact answer to the question: How long does it take to treat a flush? Treatment time and capacity will vary with flush water temperature and volume. Installations where flush water temperature reaches 80°F or higher may realize a treatment capacity as high as 60 gallons per 8-hour day. Significantly colder flush water will result in reduced treatment capacity as low as 40 gallons per 8-hour day. In a typical example with 65°F flush water THERMOPURE-2® has a peak-load treatment capacity of 46 gallons per 8-hour day. Warm-up time (measured from the time when AC power is first applied to when the system is ready to treat and discharge) is approximately 6 minutes. Consult the factory if greater treatment capacity is needed.

Power Consumption:

THERMOPURE-2® requires both AC and DC power. The AC circuit requires 15 amps of power for about 6 minutes to reach treatment temperature, after which maceration, treatment and discharge begins. The DC circuit requires 16 amps of power for the short time during which the pump is running. When the pump is not running, only the control circuit is operating, which draws approximately 150mA. The following values represent power consumption in an 8-hour day.

	Stand-by	During Treatment
AC Circuit	No current draw	12.0 kWh
DC Circuit	1.2 amp-hours	14.7 amp hours

Installation Notes (Figure-1):

■ THERMOPURE-2® is modular. Plumbing and electrical connections are made between the holding tank and the treatment chamber, which may be up to ten feet apart.

■ The treatment chamber may installed horizontally, with the control panel facing up. This installation option may simplify plumbing connections and save several inches in the height required for this component.

- The maximum efficient operating angle of the MSD is 30°.
- The holding tank should be at the same level as the treatment chamber. If this is not possible, or if significant heeling is anticipated (as with sailboats), GROCO® HVL-750 3/4" Vented Loop (not supplied) is required between the holding tank and the treatment chamber, and must be installed at least 12" higher than the top of the treatment chamber.
- The treatment chamber and holding tank may be installed below the waterline, but in this case the vented loops between the toilet(s) and the holding tank, and the treatment chamber and the discharge seacock, must be at least 12" above the waterline. Consider the effects of vessel heeling in locating the vented loops.
- Recommended clearance above the top of the holding tank is 12"; recommended clearance above the top of the treatment chamber is 6".

- Secure the mount straps across the tank top. Fasten the hold-down brackets securely to the floor.

Treatment Chamber:

- In a location not more than 10-feet from the holding tank, fasten the treatment chamber to the floor with (4) 1/4" stainless steel bolts and flat washers (not supplied).
- THERMOPURE-2® treatment chamber may be installed on its back (display panel facing up) to conserve space if desired.

Operator Panel:

- The Operator Panel may be mounted anywhere monitoring of the MSD is desired. A 25-foot cable is supplied for connecting the Operator Panel to the Treatment Module. The panel fits into a 3" x 2" wall cut-out, and requires 1-1/2" clearance behind the wall.

Sweettank™:

- THERMOPURE-2® includes Sweettank™, a patent-pending odor neutralization system. Separate instructions are included for Sweettank™.

Holding Tank:

- Place the holding tank with the toilet inlet fitting on the most convenient side for plumbing connections convenience.

HARDWARE INSTALLATION

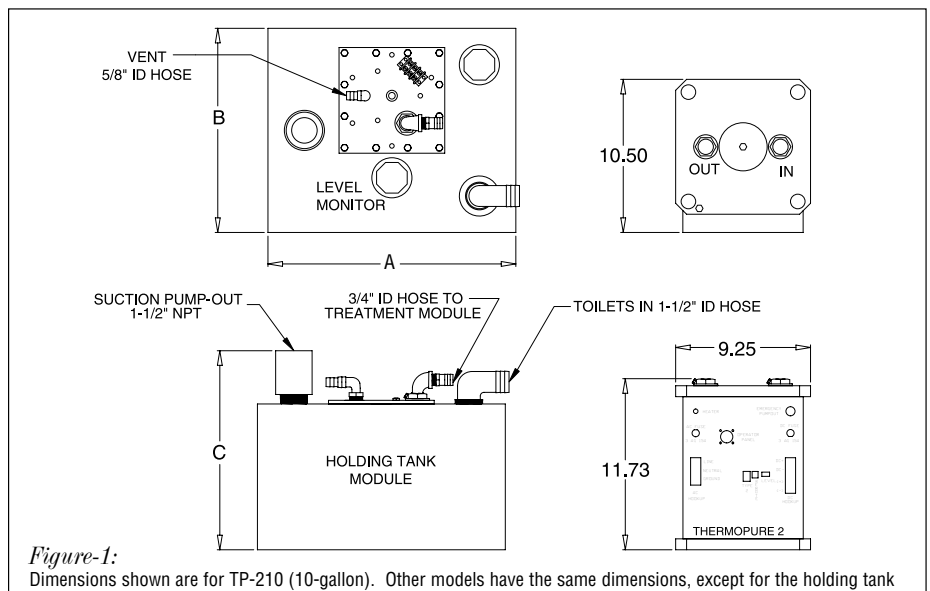


Figure-1:

Dimensions shown are for TP-210 (10-gallon). Other models have the same dimensions, except for the holding tank

Plumbing Notes (Figure-2):

- Vented loops and hoses to and from THERMOPURE-2® are to be installed under the premise that the treatment chamber must remain wetted.
- Avoid running plumbing lines above electronics.
- Secure plumbing connections are essential for safe odor-free operation. Double-clamp all hose connections and use Teflon thread tape on all pipe connections.
- To prevent plumbing-related odors, use only hose which is specifically intended for use with sanitation systems, or use rigid PVC pipe.
- It is essential that the 3/4" ID hoses to and from the treatment chamber be suitable for use with fluids as hot as 250°F.
- THERMOPURE-2® is programmed to enable interface with an remote holding tank which acts as the primary waste storage tank, and which automatically sends waste to THERMOPURE-2® holding tank when there is room. Refer to *Figure-2 Inset*. In this case the remote tank would require its own level monitor and discharge pump, and a power relay or solenoid to carry the pump motor load. A connection is made to the jack marked "Remote" on THERMOPURE-2® Treatment Chamber panel, which instructs the remote pump to send waste to Thermopure-2 if THERMOPURE-2® has less than 10% capacity, and if the remote tank has any level at all. Consult GROCO MSD technical information for additional details.

Atmosphere Vent: The holding tank portion of THERMOPURE-2® must be vented to the atmosphere. Bilateral venting is recommended (venting to both port and starboard). A tee fitting for 5/8" ID hose and two thru-hull vents are supplied for this purpose. The thru-hull vents require a 3/4"

ELECTRICAL

THERMOPURE-2® requires separate AC and DC power circuits. The AC circuit powers the treatment chamber, while the DC circuit powers the macerator/discharge pump and all level monitoring and control circuitry.

AC Circuit:

The AC circuit requires dedicated 115VAC (or 220VAC) 15 amp service. No other AC powered appliances are to share this circuit. Make AC connections to the treatment chamber AC terminal block with #14/3 marine grade stranded copper wire. G=ground, N=neutral, L=line

Overcurrent protection for the AC circuit is provided by a 15-amp 3AG panel mounted fuse on the treatment chamber panel above the terminal block, but additional protection is required by making AC connections to a 15-amp breaker on the vessel's AC power distribution panel.

DC Circuit:

The DC circuit requires a dedicated 25-amp circuit breaker for 12V systems (15-amp for 24V or 32V). As with any electrical system, full input voltage is essential for proper operation.

Select the proper wire size from the enclosed "Wire Size Information" sheet, and make (+) and (-) DC connections to the treatment chamber DC terminal block.

Overcurrent protection for the DC circuit is provided by the panel mounted fuse adjacent to the DC terminal block, but additional protection is required by making DC connections to a 25-amp breaker on the vessel's DC power distribution panel.

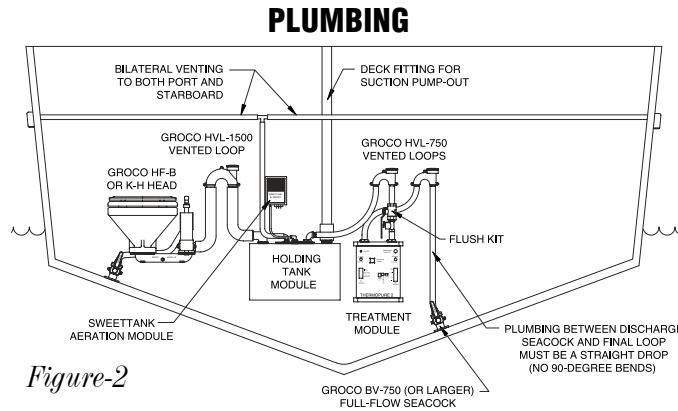
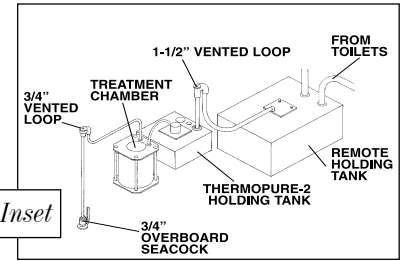


Figure-2



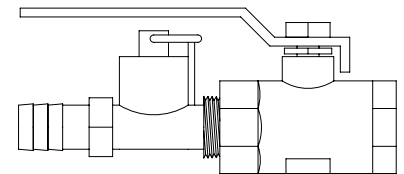
satisfactory if it is functioning properly. If a discharge seacock larger than 3/4" is used, reducing bushings will enable you to reduce the top plumbing connection to 3/4" to accept the 3/4" ID

discharge hose line from the treatment chamber.

Dockside Suction Pump-out: A 1-1/2" port is provided on top of the holding tank for connection to a deck waste fitting. If the dockside suction pump-out feature is not desired, this port must be securely capped.

Flush Kit: A Flush Kit is included, which simplifies winterization and maintenance, and provides an access port to clear a blockage, should one occur. Install the Flush Kit with the quick-release plug facing up, between the holding tank and the treatment chamber, higher than either component. The valve must face the holding tank so when it is closed and the flush function is utilized, the flushing pressure is directed away from the holding tank and through the treatment chamber. Plumb the Flush Kit with heavily reinforced 3/4" ID hose. Refer to the Maintenance section for more information.

Flush Kit



ELECTRICAL *Continued from previous page*

CABLES

25-foot cable (Operator Panel to Holding Tank):

The holding tank-to-operator panel connection is made with the 25-foot cable assembly supplied. Fasten the end with the pre-fitted connector to the holding tank jack marked "Operator Panel". The other end of the cable has nine (9) wires which are to be securely fastened to the clamp-type terminal block on the back of the operator panel in strict observance of the color coding sequence indicated in Figure-3.

10-foot cable (Pump flange to Treatment Module):

Pump and level sensor connections are made between the terminal block mounted on the pump flange, and the electric panel on the treatment module with the 10-foot harness provided. The red, yellow, black, and white light gauge wires are for the level detector. On the treatment module push the snap-in plug (with release mechanism facing up) into the receptacle marked "Level". Connect the large gauge orange (+) and black (-) wires to the "DC Hookups" terminal block positions marked "Pump +" and "Pump -".

Conversion to a Type-II MSD:

The Holding Tank panel is equipped with a telephone jack-type interface port for use with add-on equipment (available soon from GROCO®) which will convert your Type-I MSD to a Type-II MSD. Contact the GROCO® MSD Technical Service department for information regarding design and availability.

Use with a remote (upstream) holding tank:

Refer to Figure-4 on Page 6. The head(s) on your boat may already be plumbed to a serviceable holding tank. If you wish to use this tank as the primary receiving tank, THERMOPURE-2® may be plumbed and wired to work in conjunction with the upstream tank. The upstream tank must have:

1. A level indicator (GROCO® TLM series or equal)
2. A macerator/discharge pump
3. A vented loop between the upstream tank and THERMOPURE-2® holding tank

Here's how it works:

*Waste is received by the upstream tank.
*Waste is pumped from the upstream tank to the THERMOPURE-2® tank if:

1. the level in THERMOPURE-2® is less than 10%, and
2. there is level present in the upstream tank (as determined by the upstream level monitor)

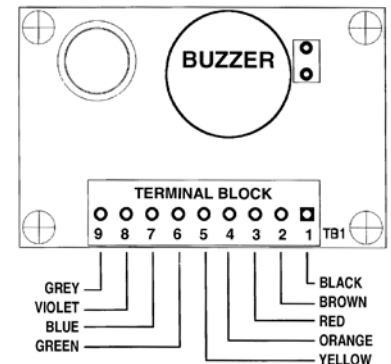
*The upstream pump will stop pumping if:

1. the level in THERMOPURE-2® reaches 75%, or
2. level is no longer sensed in the upstream tank

NOTE: Because pumping from the upstream tank is controlled by the level monitor employed, some level of waste is likely to remain in the upstream tank. You may wish to pump out the upstream tank completely if the system will be left unused for an extended period. For this reason, a Momentary Switch (shown in Figure-4) may be employed for the purpose of emptying the upstream tank completely.

NOTE: Sweetank™ may be installed in the upstream tank to keep it odor-free.

Figure-3
Back View of Operator Panel Circuit Board



OPERATION

Operation:

Operation requires no user interface. Turn on AC and DC power and use the toilet normally, remembering that **only human waste and toilet tissue is to be flushed into the toilet.**

Operator Panel Indications and Controls

- 10% Tank Level
Yellow light indicates 10% level and initiates treatment and discharge if adequate temperature is present in the treatment chamber. It may take several flushes to reach 10%.
- 75% Tank Level -
Flashing yellow light and audible alarm.
- AC power "on" indication
- DC power "on" indication
- Auto/Hold Switch -
Disables the treatment and discharge cycle if the vessel is temporarily operating in a no-discharge zone. Level indications continue to be displayed.

■ Mute Switch -

The audible 75% alarm can be silenced by placing this switch in the up position. The visual 75% indication will continue to be displayed.

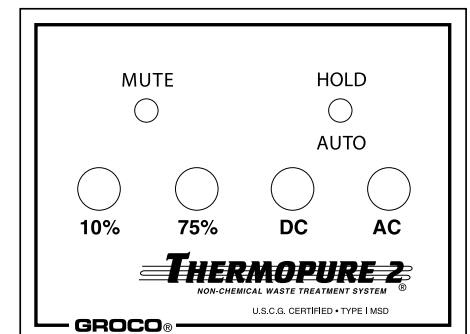
■ System Failure Alarm-

Audible (buzzer) and visual (blinking LEDs) indications from the operator panel indicate a system problem. If this should occur, refer to the troubleshooting guide on Page 5. If the system failure alarms continue consult GROCO® MSD technical service.

Important Start-up Note: Before using THERMOPURE-2® to process sewage, fill the treatment tank to 10% with fresh flush water. Then actuate the Emergency Discharge button on the front of the Treatment Chamber. Carefully check for plumbing leaks. This exercise also primes the treatment chamber, and assures that it will not attempt a dry heat-up cycle when the system is first used.

Extended Periods of Non-use:

During periods of non-use of more than twenty-four hours the treatment chamber should be flushed with fresh or salt water containing no solid waste or paper. This can be done manually by filling the tank to 75% capacity (by flushing the toilet) or by utilizing the flush kit as shown on Page 2 and then allowing the system to process and discharge normally.



Operator Panel

EMERGENCY DISCHARGE

It is illegal to discharge untreated waste.

Utilize the Emergency Discharge feature only when beyond the "three-mile limit" or in extreme emergency. The Emergency Discharge push button is located on the treatment chamber panel.

WINTER OPERATION AND STORAGE

Winter Operation:

Freezing will damage your Holding Tank and Treatment Chamber.

If you will be using THERMOPURE-2[®] in sub-freezing conditions it is imperative to maintain AC power to the system at all times to prevent the Treatment Chamber from freezing.

The contents of the holding tank must be kept from freezing. Agitation from flushing toilets will be sufficient to prevent freezing in most cases, but if extended periods of non-use are anticipated (such as overnight) it is recommended that a small amount of "environmentally friendly" antifreeze be flushed through the toilet on the final flush.

Note: In order to protect the pump motor, System Failure mode will be initiated if the system temperature falls below -5°C. If this occurs refer to the trouble-shooting guide on Page 5.

Winter Storage:

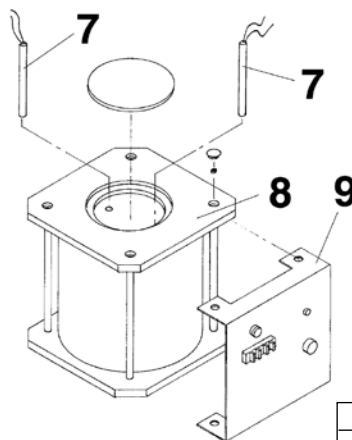
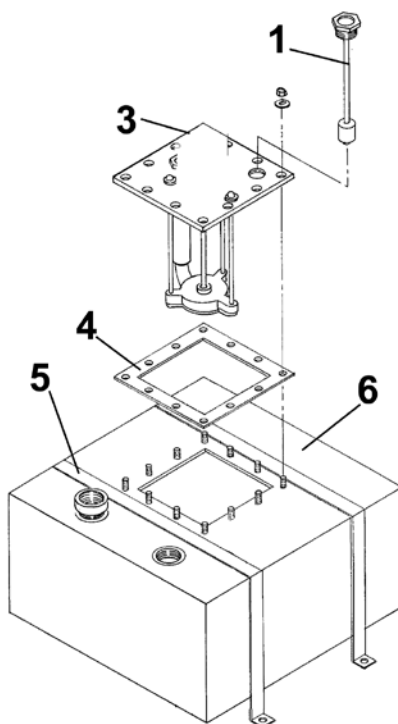
Step-1: Flush fresh water into the toilet to flush the system. Allow THERMOPURE-2[®] to process normally until complete, or use the flush kit (see Maintenance for more information).

Step-2: Flush enough "environmentally-friendly" antifreeze through the toilet and into THERMOPURE-2[®] to activate the 10% level indication. Allow the pump to pump the antifreeze through the treatment chamber. When pumping is complete, disconnect AC and DC power to THERMOPURE-2[®] at the vessel power distribution panel. Enough Antifreeze will remain in the holding tank and the treatment chamber to prevent the system from freezing.

THERMOPURE-2[®] is designed to be low maintenance, but these "preventive maintenance" steps are recommended:

- Weekly - Flush the system by filling the Holding Tank to 75% capacity with fresh water. Allow THERMOPURE-2[®] to process normally. Or, utilize the flush kit (see below).
- Monthly - Remove the cap from all of the vented loops in your system. Ensure that there are no solids or paper blocking the loop, and ensure that the flapper is not sticking, as this will prevent the vacuum from being broken, and may cause system alarms to trigger.
- Monthly - Clean the level sensor. Disconnect it electrically and unscrew it from the tank top. Gently rinse the floats, apply fresh TFE thread tape and screw into tank top hand tight only.
- Annually - shut off AC and DC power to THERMOPURE-2[®] and remove the pump from the holding tank for inspection and cleaning. Note that the bottom of the pump is fitted with a sharp cutting blade. Be aware of its presence when servicing the pump.
- Annually - Utilize the flush kit to flush accumulated solids from the treatment chamber. First, shut off all power and close the flush kit ball valve. Remove the quick-release plug (1/4-turn counter-clockwise) and insert the service adaptor (1/4-turn clockwise). Connect a garden hose and pump fresh water through the treatment chamber for several minutes.
- As necessary - With mild soapy water and a soft cloth or sponge clean the exterior surfaces of the Treatment Chamber and Holding Tank. Do not use abrasives or harsh chemicals.

NOTE: The EPA standards state that in freshwater lakes, freshwater reservoirs or other freshwater impoundments whose inlets or outlets are such as to prevent the ingress or egress by vessel traffic subject to this regulation, or in rivers not capable of navigation by interstate traffic subject to this regulation, marine sanitation devices certified by the U.S. Coast Guard installed on all vessels shall be designed and operated to prevent the overboard discharge of sewage, treated or untreated, or of any waste derived from sewage. The EPA standards further state that this shall not be construed to prohibit the carriage of Coast Guard-certified flow-through marine sanitation devices which have been secured so as to prevent such discharges. They also state that waters where a Coast Guard-certified marine sanitation device permitting discharge is allowed include coastal waters and estuaries, the Great Lakes and interconnected waterways, freshwater lakes accessible through locks, and other flowing waters that are navigable interstate by vessels subject to this regulation (40 CFR 140.3).



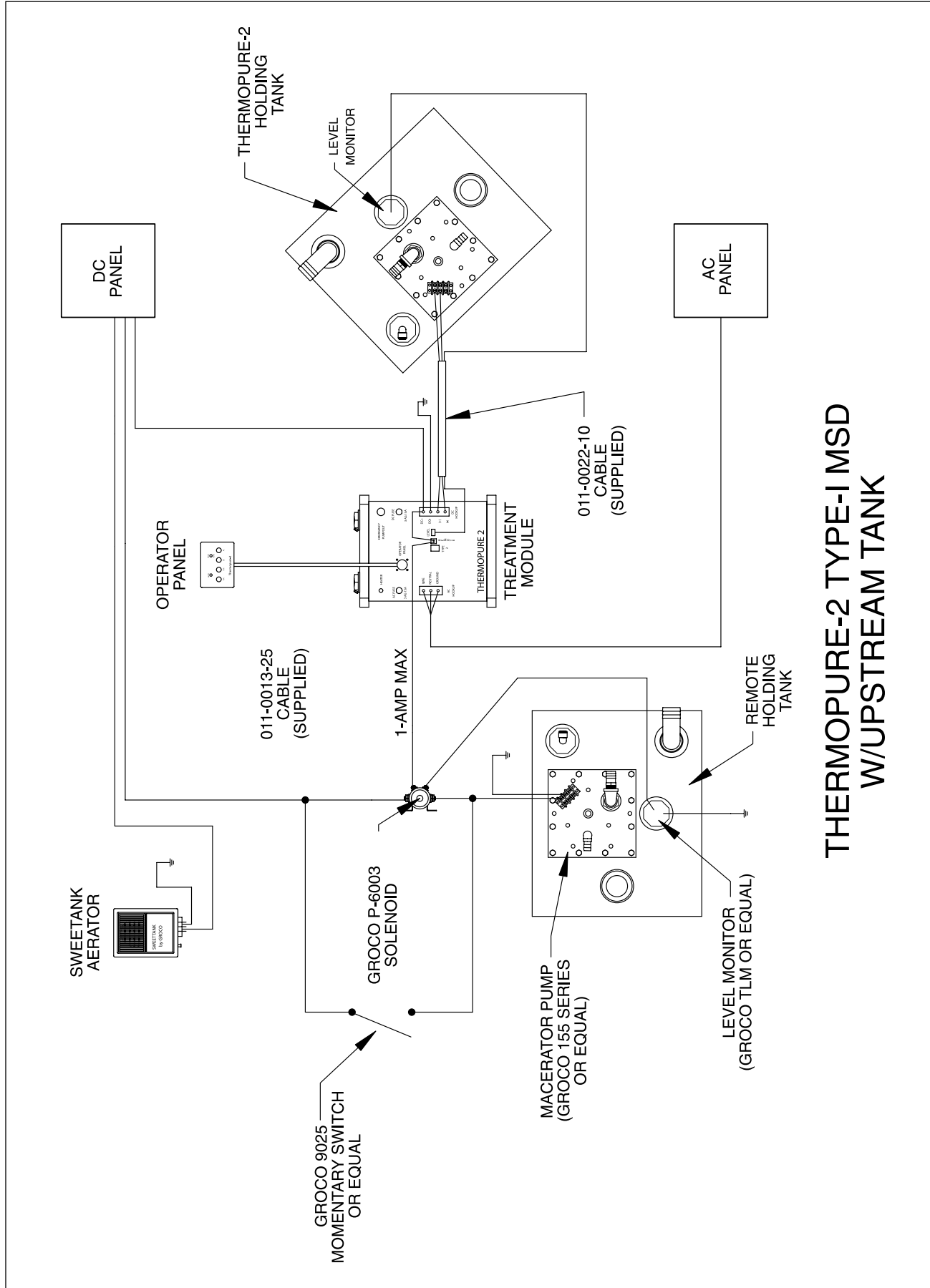
ITEM	PART NO.	DESCRIPTION	QTY.
1	08-0004-02	Level Sensor Assy.	1
NS	(Voltage)-C-MPS	Motor	1
3	155-6110-(volts)	Macerator Pump	1
4	001-0001-50	Gasket	1
5	099-0029-00	Mounting Strap	2
6	005-2010-00	Holding Tank	1
7	EE-1	Treatment Element	2
8	152-0612-11	Treatment Module	1
9	027-0012-00	Treatment Module Electric Assy.	1

TROUBLE SHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	CORRECTIVE STEPS
<ul style="list-style-type: none"> 10% and 75% level indicators are flashing, and the audible alarm is sounding. The motor continuous run time has exceeded 45-seconds. 	<ul style="list-style-type: none"> Low voltage 	<ul style="list-style-type: none"> Check battery and wire size to system.
<ul style="list-style-type: none"> 10% level indicator is on but pump will not operate. 	<ul style="list-style-type: none"> AC power is not on AC fuse has blown AC breaker is tripped 	<ul style="list-style-type: none"> Turn on generator or plug in shore power Check AC fuse on treatment module Check AC circuit breaker
<ul style="list-style-type: none"> 10% level indicator is on, AC power is applied, but pump will not operate 	<ul style="list-style-type: none"> Treatment Chamber is not hot "Hold" switch is on 	<ul style="list-style-type: none"> Wait 10-minutes Turn off DC power, switch to "Auto", then turn on DC power.
<ul style="list-style-type: none"> 10% level in tank, Treatment Chamber is hot (on for more than 10-minutes), pump is operating, but system is not emptying. 	<ul style="list-style-type: none"> Blockage in the Treatment Chamber 	<ul style="list-style-type: none"> Use System Flush Kit
<ul style="list-style-type: none"> 10% level indicator stays on after system is empty, causing system shut-down (see fatal errors). 	<ul style="list-style-type: none"> Level sensor is stuck 	<ul style="list-style-type: none"> Remove and rinse level sensor.
<ul style="list-style-type: none"> Level and power indications do not operate properly 	<ul style="list-style-type: none"> Fuses are blown Breakers are tripped 	<ul style="list-style-type: none"> Check AC and DC Fuses Check AC and DC Breakers
<ul style="list-style-type: none"> Heater light on Treatment Module stays on continuously but system does not pump out. 	<ul style="list-style-type: none"> Dry start-up has caused the Thermal Switch on Treatment Module to open. 	<ul style="list-style-type: none"> Contact GROCO.

In the unlikely event of a "Fatal System Error" the audible alarm on the Operator Panel will sound, and signals the type of error that has occurred. Shut off AC and DC power to the system, and identify the cause of the problem. Once corrected the AC and DC power may be turned back on, which re-initializes the control.

ERROR CONDITION	PROBABLE CAUSE	CORRECTIVE STEPS
<ul style="list-style-type: none"> 10% and 75% level indicators flash rapidly, accompanied by simultaneous beeping of the audible alarm. 	<ul style="list-style-type: none"> The pump has exceeded the 45-second maximum allowable continuous running time. 	<ul style="list-style-type: none"> Clean the level sensor. Use the Flush Kit to clear any obstruction in the Treatment Chamber.
<ul style="list-style-type: none"> 75% level indicator is blinking briefly every 2-seconds, and the audible alarm beeps simultaneously. 	<ul style="list-style-type: none"> Treatment Chamber Thermal Switch has opened. Heater Control has been removed 	<ul style="list-style-type: none"> Contact GROCO.
<ul style="list-style-type: none"> 75% level indicator is blinking briefly every 2-seconds, and the audible alarm beeps simultaneously. 	<ul style="list-style-type: none"> Low DC Voltage 	<ul style="list-style-type: none"> Check DC Power
<ul style="list-style-type: none"> 10% level indicator is blinking briefly every 2-seconds, and the audible alarm beeps simultaneously. 	<ul style="list-style-type: none"> No AC power in a cold climate Heater Control is disconnected. 	<ul style="list-style-type: none"> Apply AC power Check connection in side of Treatment Chamber block.
<ul style="list-style-type: none"> 10% level indicator is off and 75% level indicator is flashing. The audible alarm sounds a continuous tone and cannot be silenced. 	<ul style="list-style-type: none"> 75% float is stuck in the up position with tissue paper or hair. 	<ul style="list-style-type: none"> Clean the level sensor.



**THERMOPURE-2 TYPE-I MSD
 W/UPSTREAM TANK**