

VORTEX 7000 MANUAL



Congratulations on your purchase of the **VORTEX MOBILE CLEANING UNIT**. This instruction/parts manual is a guide for operating and servicing your **BLUELINE VORTEX 7000®** mobile cleaning unit.

Proper operation and service are necessary to ensure the outstanding performance of this unit. When properly maintained, your mobile cleaning unit will have a long and trouble-free life.

The following service methods outlined in this manual are detailed in a manner that operation and servicing may be performed properly and safely. Because service levels vary due to the skill of the mechanic, tools and parts availability, ensure that prior to attempting any repair, you are familiar with this equipment and have the proper tools. Any questions regarding the operation, service, or repair of this unit should be directed to your nearest **BLUELINE** dealer.

The headings **WARNING** and **CAUTION** are utilized to warn you that steps must be taken to prevent personal injury or damage to the equipment. Please make sure that you have read and understand these instructions entirely before proceeding with the operation of this unit.

Record your units vehicle identification number here for future reference or if you should need to contact the factory in the future for any reason.

VIN:

This service and operations manual is written specifically for **BLUELINE VORTEX 7000®** mobile cleaning unit manufactured by:

BLUELINE EQUIPMENT LLC

2604 Liberator Drive

Prescott, AZ 86301 USA

The information contained in this document is subject to change without notice and does not represent a commitment on the part of **BLUELINE EQUIPMENT LLC**.

All rights reserved. Copyright 2006 by **BLUELINE EQUIPMENT LLC**. No part of this work may be used or reproduced in any form or means without the express written consent and permission of **BLUELINE EQUIPMENT LLC**.

Published by **BLUELINE EQUIPMENT LLC**.
First printing: October 2006
Printed in USA



VORTEX 7000® MANUAL
PART# 49-027

October 06

LIMITED WARRANTY

BLUELINE warrants your machine to be free of defects in material and workmanship. This warranty shall extend to the designated parts for the specific period of time listed from the date of delivery to the user. If **BLUELINE** receives notice of any defects during the warranty period, **BLUELINE** will either, at its option, repair or replace products that prove to be defective. Any transportation, related service labor, normal maintenance and diagnostic calls are not included.

Vacuum Pump (Through manufacturer or local dealer)	18 months
Water Pump	1 year
Oil Pump	1 year
Waste Pump	1 year
Engine Heat Exchanger	1 year
Wands (Excluding shut off valve and orifices)	1 year
Waste and Water Tanks	1 year
Pressure Regulator	1 year
All Other Components	1 year

This warranty shall not apply to defects caused by improper operation, inadequate maintenance by the customer, unauthorized modification or misuse, improper repair, freezing or damage due to hard water scaling.

Electrical components, disposable filters, belts, hoses, fittings, o-rings and other service maintenance items are not under warranty. Components supplied by **BLUELINE**, but provided by other manufacturers, will only be warranted to the extent that they are warranted to **BLUELINE**.

To receive warranty service, products must be returned to a **BLUELINE** designated service facility. The customer shall prepay shipping charges for products returned to **BLUELINE** for warranty evaluation and **BLUELINE** shall pay for the return of products to the customer.

BLUELINE makes no other warranty, expressed or implied, with respect to this product. **BLUELINE** disclaims the implied warranties of merchantability and fitness for a particular purpose. Any implied warranty of merchantability or fitness is limited to the specific duration of this limited warranty.

This warranty gives the customer specific legal rights, and you may also have other rights that may vary from state to state, or province to province.

The remedies provided herein are the customer's sole and exclusive remedies. In no event shall **BLUELINE** be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Table of Contents

SECTION ONE: GENERAL INFORMATION	1
1. SAFETY	2
<i>Safety, Specifications, Chemical, Water Requirements</i>	
2. RECEIVING YOUR MOBILE CLEANING UNIT	6
<i>Dealer Responsibility, Acceptance of Shipment, Equipment Listing, Optional Equipment</i>	
SECTION TWO: SYSTEMS/OPERATION	8
3. SYSTEMS	11
<i>Water Pumping System, Heat Transfer System, Vacuum System, Chemical System</i>	
4. OPERATION	15
<i>Equipment setup, Instrumentation, Starting Your Unit, Priming the Chemical Pump, Waste Pump, Operation, Cleaning, Upholstery Cleaning, Stair Tool Cleaning, Flood Restoration, Shut Down and Daily Maintenance, Freeze Protection.</i>	
SECTION THREE: MAINTENANCE and SERVICE	24
MAINTENANCE CHART	26
5. MAINTENANCE	27
6. GENERAL SERVICE ADJUSTMENTS	31
7. TROUBLESHOOTING	34
SECTION FOUR: PARTS and ACCESSORIES	39
9. ILLUSTRATED PARTS LISTINGS	40
10. ACCESSORIES	68

SECTION 1:

GENERAL INFORMATION

1. SAFETY

Safety	2
Specifications	5
Chemical requirements	6
Water requirements	6

2. RECEIVING YOUR TRUCK MOUNT UNIT

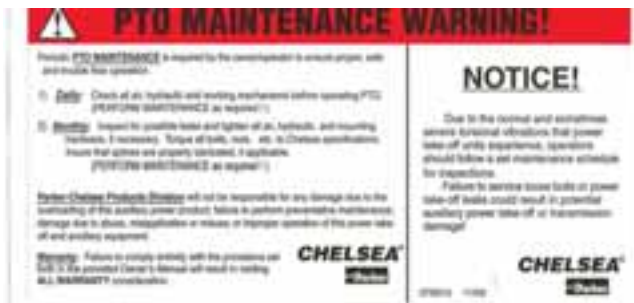
Dealer responsibility	6
Acceptance of shipment	6
Equipment listing	7
Optional equipment	7

1. SAFETY

WARNING For Your Safety!

The following **WARNING** labels are on your VORTEX 7000 mobile cleaning unit. These labels point out important **Warnings and Cautions**, which must be followed at **all** times. Failure to follow warnings could result in personal injury, fatality, to yourself and/or others or property damage. Please follow these instructions carefully!

DO NOT remove these decals.





1. Read the operator's manual before starting this unit.

Failure to adhere to instructions could result in severe personal injury, property damage, or could be fatal.

2. Operate this mobile cleaning only in a well- ventilated area.

Exhaust fumes contain carbon monoxide, which is an odorless and deadly poison that can cause severe injury or death. **DO NOT** run this unit in an enclosed area. **DO NOT** operate this unit where the exhaust may enter a building doorway, window, vent or other opening.

3. DO NOT place hands, feet, hair, clothing or any body parts near rotating or moving parts. Rotating machinery can cause severe injury or death.

4. NEVER operate this unit without belt and safety guards. High speed moving parts, such as belts and pulleys, should be avoided while the unit is running. Severe injury, fatality or damage may result.

5. NEVER service this unit while it is running. High speed mechanical parts as well as high temperature components may result in injury or severed limbs.

6. The engine and other components will be extremely hot from operation. To prevent severe burns, **DO NOT** touch these areas while the unit is running or shortly after the unit is shut off.

7. DO NOT touch the exhaust diverter valve or any part of the exhaust system while the system is running or for 20 minutes after the unit is shut off. Severe burns could result.

8. Water under high pressure at high temperature can cause burns, severe

personal injury, or fatality. Shut down unit, allow to cool down and relieve system of all pressure before removing caps, valves, plugs, fittings, filters or hardware.

9. Battery acid contains sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. Batteries also produce explosive hydrogen gases while charging. To prevent fire or explosion, charge batteries only in a well ventilated area. Keep sparks, open flames, as well as other sources of ignition away from battery at all times. Remove all jewelry prior to servicing batteries. Keep batteries out of the reach of children.

Before disconnecting the negative (-) ground cable, ensure that all switches are in the off position. If on, a spark could occur at the ground connection terminal which could cause an explosion if hydrogen gas or gasoline vapors are present. **ALWAYS** disconnect the negative (-) terminal first.

10. DO NOT exceed your vehicles weight limit. GVW (UD 1400) 14,250 lbs. This will prevent unsafe or hazardous driving conditions.

11. Always keep your vehicle clean and orderly. Wands, tools and accessories must be securely stowed while driving the vehicle.

12. All high-pressure hoses must be rated at 3000 PSI and have a heat rating of 300° F. Thermoplastic hoses do not meet this criteria, and should never be used. Severe burns, damage to property or fatality could result if hoses do not meet these requirements.

13. Ensure that you have received proper training from the distributor that you purchased the unit from prior to operation.

14. This unit produces high pressure and high temperatures. Improper use could result in serious injury or fatality.

15. **DO NOT** modify this unit in any manner.
Any modification could result in serious injury
or fatality.

16. California Proposition 65 Warning: Engine
exhaust from this product contains chemicals
known by the State of California to cause
cancer, birth defects, or other reproductive
harm.

SPECIFICATIONS

Truck	Nissan UD1400C
Allowable Truck Gross Weight	UD 1400C 14,250 lbs.
*Refer to owners' manual for allowable axle load ratings.	
Engine Speed	700-1700 rpm (Manual Control Cleaning Mode) 600-700 rpm (Idle)
Water Pump RPM	1550 rpm
Vacuum Pump RPM	3000 max rpm @ 1,127 cfm
Water Flow Rate	6.5 GPM (maximum) Optional 4.5 GPM
Water Pump Pressure	1750 PSI (maximum) Optional 2750 PSI
Vacuum Relief Valve	17 in. HG
Waste Tank Capacity	110 Gallons at shutoff

TANKS

Fresh Water	220 Gallons.
Waste Recovery	110 Gallons

JET SIZING

BLUELINE recommends that the total floor tool tip size does not exceed .06". Using larger jet sizes on your **VORTEX 7000®** unit may reduce cleaning temperatures.

Example: Four-jet wand uses four 95015 jets. (95 deg. Spray angle w/015 orifice)
 $.015 \times 4 = .06$

When using two wands while cleaning with this unit, **BLUELINE** recommends that the tip size in each tool does not exceed a total of .040".

Example: Four-jet wand uses four 9501 jets. (95 deg. Spray angle w/01 orifice)
 $.01 \times 4 = .04$ $.04 \times 2 \text{ tools} = .08$

Upholstery tool jet size: 80015

Stair tool jet size: 9502

Spray lance jet size: 3.5 GPM maximum

FUEL REQUIREMENTS

Use ultra low sulfur diesel fuel (15ppm) ONLY.
Refer to vehicle owners' manual for use of additives
and bio-diesel recommendations.

ENGINE OIL REQUIREMENTS

Refer to vehicle owners' manual for recommended
oil type and maintenance schedules.

CHEMICAL REQUIREMENTS

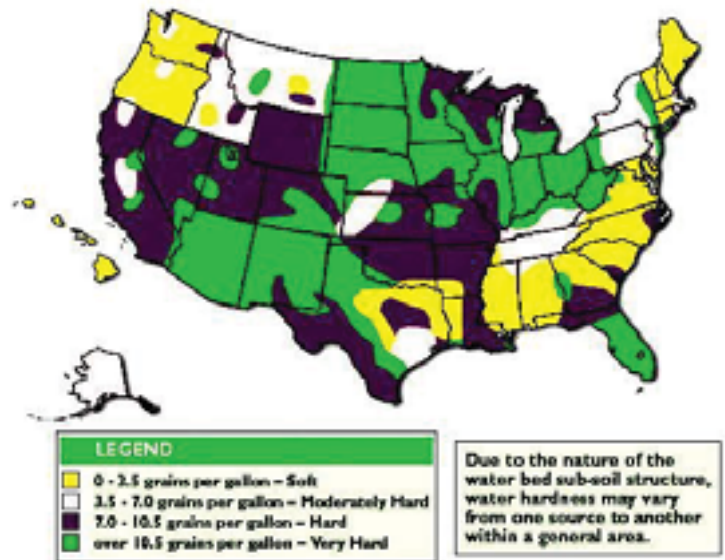
The **BLUELINE VORTEX 7000®** mobile truck
cleaning unit's unique last step chemical injection
system can be used with a wide variety of water
diluted chemical compounds, either acidic or
alkaline, depending on the work to be performed.
We recommend using only the highest quality
chemistry.

WATER REQUIREMENTS

Because hard water deposits will damage the
plumbing and heat exchange systems on this unit,
BLUELINE recommends that a high quality water
softener be used in areas where the water hardness
exceeds 3-1/2 grains. If a water softener is used, it
must have a flow capacity of at least five (5) GPM
or greater, without any hose constrictions.

The use of a water softening system will reduce
maintenance and reduce down time caused by hard
water scaling. It will also enhance the performance
of cleaning chemicals, which will result in greater
efficiency in lower concentrations.

HARD WATER LEVELS THROUGHOUT THE U.S.



2. RECEIVING YOUR TRUCK CLEANING UNIT

DEALER RESPONSIBILITY

THE **BLUELINE** DEALER THAT YOU
PURCHASED THIS MOBILE TRUCK
CLEANING UNIT FROM IS RESPONSIBLE
FOR THE PROPER INITIAL TRAINING OF
YOUR OPERATORS AND MAINTENANCE
PERSONNEL.

ACCEPTANCE OF SHIPMENT

Your **VORTEX 7000®** mobile truck cleaning unit
was thoroughly tested, checked and inspected in its
entirety prior to leaving our manufacturing facility.
**When receiving your mobile cleaning unit, please
make the following acceptance check:**

1. The unit should not show any signs of damage. If
there is damage, notify your dealer immediately.
2. Carefully check your equipment and packing list.
The standard **BLUELINE VORTEX 7000®** unit
should arrive with the following items as well as
any optional accessories:

EQUIPMENT LISTING

- A. Operation and Service manual
- B. Carpet wand
- C. Hose reel
- D. 400 ft. 2" vacuum hose
- E. 220 Gallon fresh water tank
- F. 110 Gallon waste tank
- G. Pre-Filter box with stainless steel strainer.
- H. Waste tank filters.
- I. 2 Chemical solution reels.
- J. 400 ft. of 1/4 in. high pressure solution hose with quick connects
- K. 2 vacuum hose connectors
- L. 50 ft. water supply hose with quick connect
- M. Vortex marketing materials package.

OPTIONAL EQUIPMENT

SECTION 2:

SYSTEMS/OPERATION

3 SYSTEMS/OPERATION

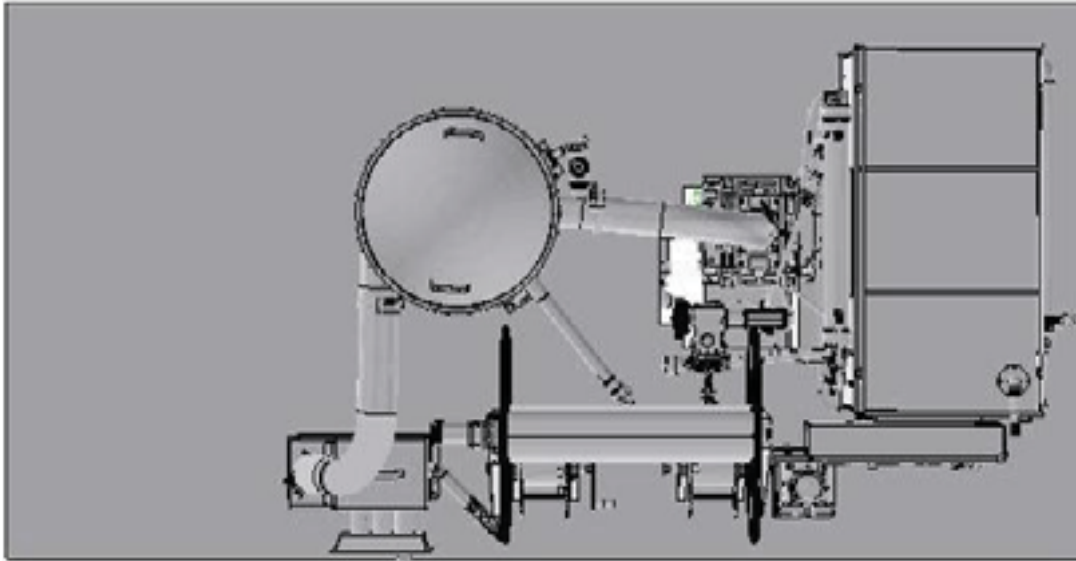
Mobile Truck Unit Layout	9
Battery	10
Fire extinguisher	10

3. SYSTEMS

Water pumping system	11
Heat transfer system	11
Vacuum system	13
Chemical pumping system	14

4. OPERATION

Preparation	15
Starting the unit	19
Priming the chemical pump	20
Automatic waste pump	20
Operation	21
Cleaning	21
Upholstery cleaning	21
Stair tool cleaning	22
Flood restoration/extraction	22
Shut down and daily maintenance	22
Freeze protection	23



BATTERY CONNECTION



Explosive gases, Dangerous gases!
Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. Batteries also produce explosive hydrogen gases while charging. To prevent fire or explosion, charge batteries only in a well ventilated area. Keep sparks, open flames, as well as any other sources of ignition away from batteries at all times. Remove all jewelry prior to servicing batteries. Keep batteries out of the reach of children.

Refer to vehicle owners' manual for specific instructions on the maintenance, removal or replacement of vehicles batteries.

Before disconnecting batteries, ensure that all the mobile cleaning units' switches are in the OFF position. If ON a spark could occur at the ground connection terminal, which could cause an explosion if hydrogen gas, or other explosive vapors are present.

FIRE EXTINGUISHER

BLUELINE, and many government agencies, recommend that a fire extinguisher rated for A, B, and C type fires be installed into any commercial vehicle.

3. SYSTEMS

NOTE: Read and understand this section of the manual entirely before proceeding.

This portion of the manual divides the unit up into systems and describes how each system works. Prior to proceeding into the operations and maintenance sections of this manual it is recommended that you acquire a basic understanding of how the unit functions.

WATER PUMPING SYSTEM

See figures 3-1 and 5-10. Water flows from the fresh water tank, through a wye strainer to the water pump where it is pressurized. The pressurized water is pumped to the pressure regulator, which maintains the desired pressure setting. The pump discharge manifold is equipped with a nitrogen charged accumulator, which helps reduce pressure fluctuations.

Water then flows from the pressure regulator through the E-1 engine coolant heat exchanger and into the E-2 oil heat exchanger.

The water then flows through the metering valve located on the control panel. At this point, the chemical injection takes place.

The hot solution mixture of water and chemicals then flows to the cleaning tool.

HEAT TRANSFER SYSTEM

See figures 3-1 and 5-10. Water is heated through a 3 stage heat exchange system that utilizes engine coolant and engine exhaust.

Stage one and two utilize hot engine coolant, where the temperature is maintained at or near 195°F by the engine thermostat. The engine coolant first flows through a stainless steel coil located inside the fresh water tank preheating the water. The engine coolant then flows through the E-1 heat exchanger further heating the pressurized and pre-heated water supplied by the water pump.

The water then flows to the E-2 heat exchanger where oil heated by the engine exhaust in the E-3 heat exchanger is circulated in a closed loop system heating the water to the desired temperature, set with the oil temperature control located on the control panel.

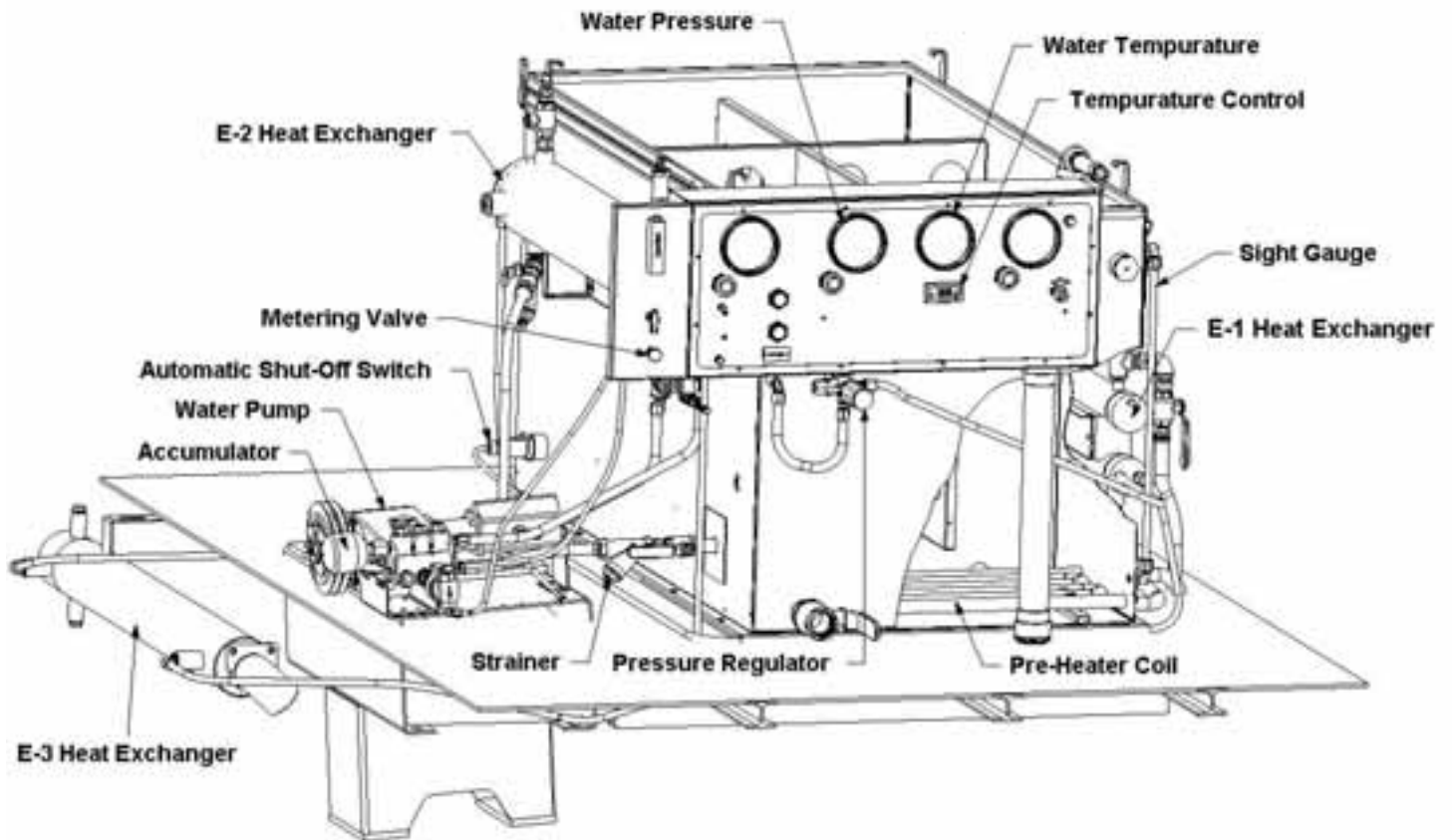


The temperature set point can be changed without displaying the set point. Do not turn the set point control knob unless you want to change the temperature set point.

This unit is equipped with an automatic diverter valve system located behind the engine muffler. This system incorporates an electronic rotary solenoid with an exhaust diverter valve. When the water temperature reaches the desired setting, the solenoid automatically positions the diverter valve into the direct exhaust mode.

The low water level switch located on the water tank will automatically shut off the water pump clutch, disengaging the water pump when the fresh water supply is low.

A wye strainer is located between the E-2 heat exchanger and the oil pump. Inspect and clean or replace filter every 6 months or 300 hours of operation.



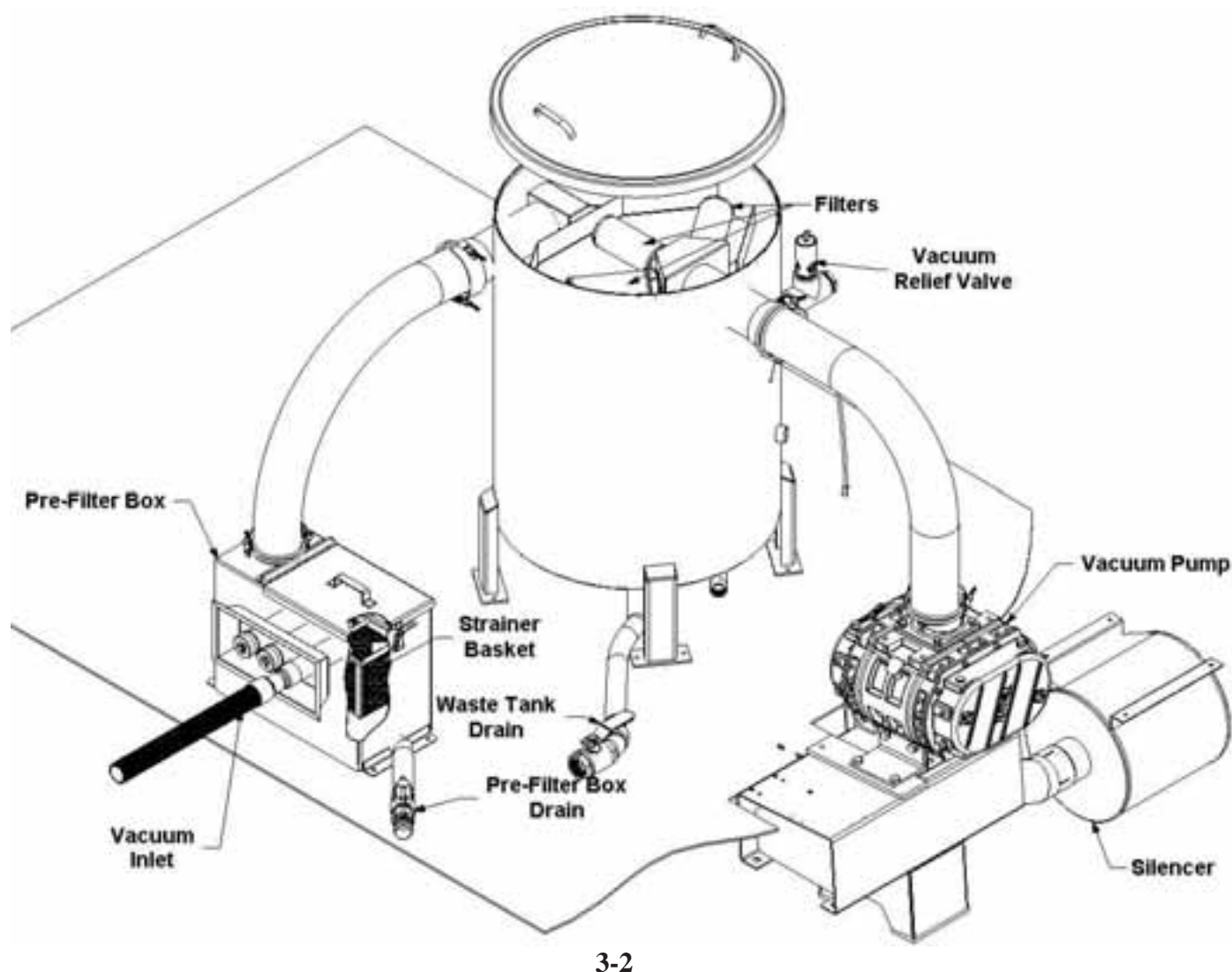
Water System
3-1

VACUUM SYSTEM

See figures 3-2 and 5-20. The vacuum flow is initiated by the vacuum pump, or blower. An air and water mixture is drawn into the vacuum inlet on the side of the truck. The mixture flows through a strainer basket in the pre-filter box, and then into the waste tank. The air exits the waste tank through a 100 mesh filtration system, into the vacuum pump. A vacuum pump relief valve is installed for vacuum pump protection.

The air is discharged from the vacuum pump through a spiral silencer.

A level shut off sensor is located near the top of the waste tank and will shut down the PTO (power take off) unit before the tank is at full capacity. This protects the vacuum pump from water damage. **Note:** Waste tank level shut off will not shut the unit off due to high levels of foam. The use of a quality defoamer is recommended.

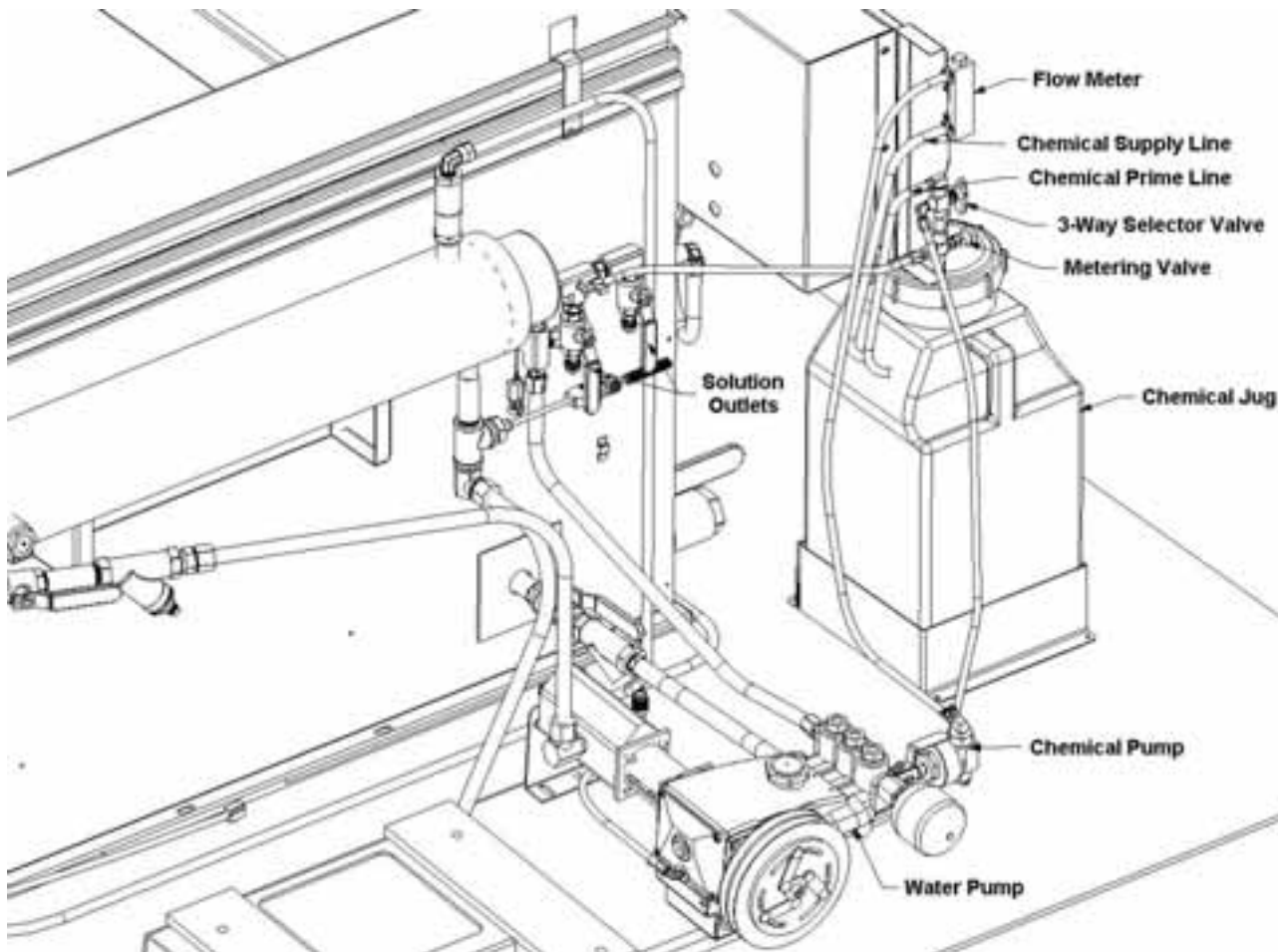


CHEMICAL PUMPING SYSTEM

See figures 3-3 and 5-25. The chemicals are drawn from the chemical jug through a strainer into the flow meter. The flow meter indicates the rate of chemical flow.

The chemicals then flow into the stainless steel pulsation chemical pump. The chemical pump injects the chemicals to the three way selector valve located on the front panel. This valve may be used to turn the chemical flow to **PRIME**, **OFF**, or **METER**.

The chemicals then flow through the chemical metering valve to the solution outlet. This valve controls the rate of flow of chemical into the cleaning solution, which is indicated on the flow meter.



3-3

5. OPERATION

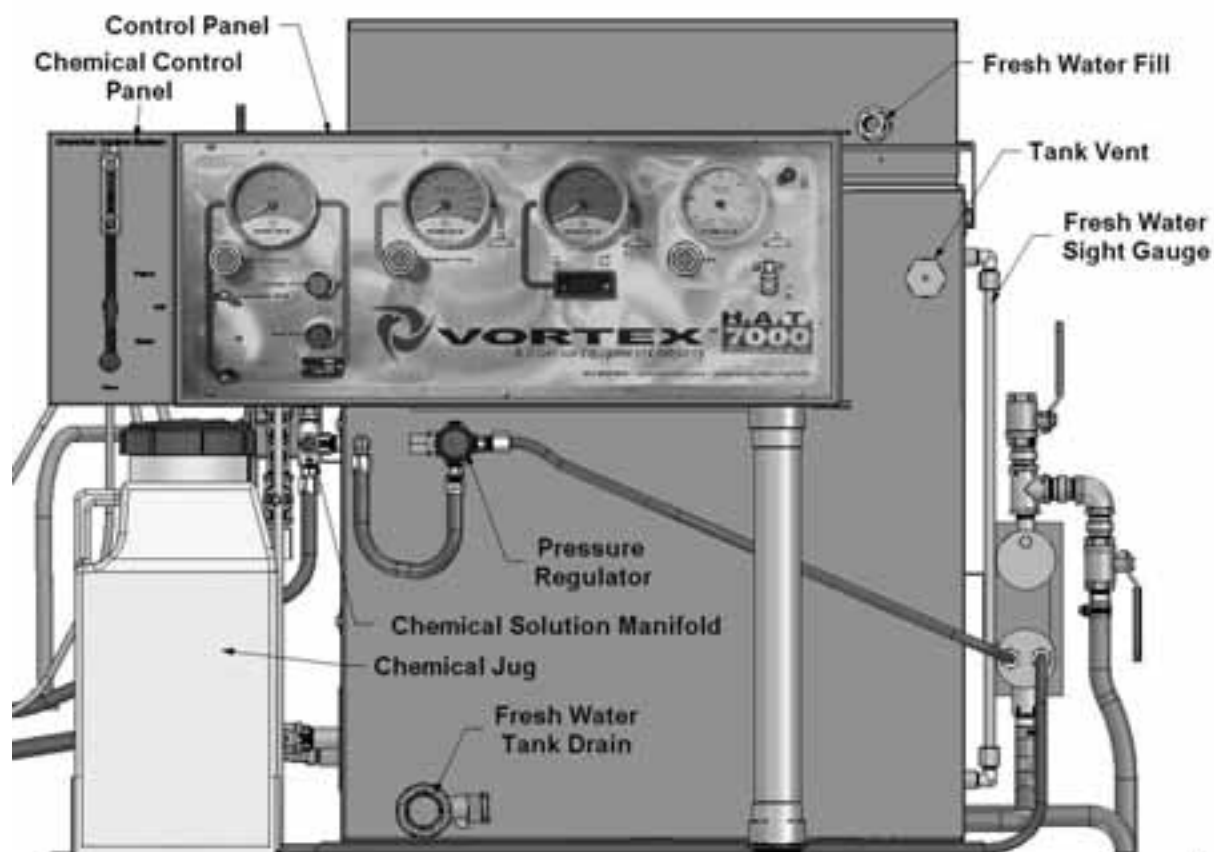
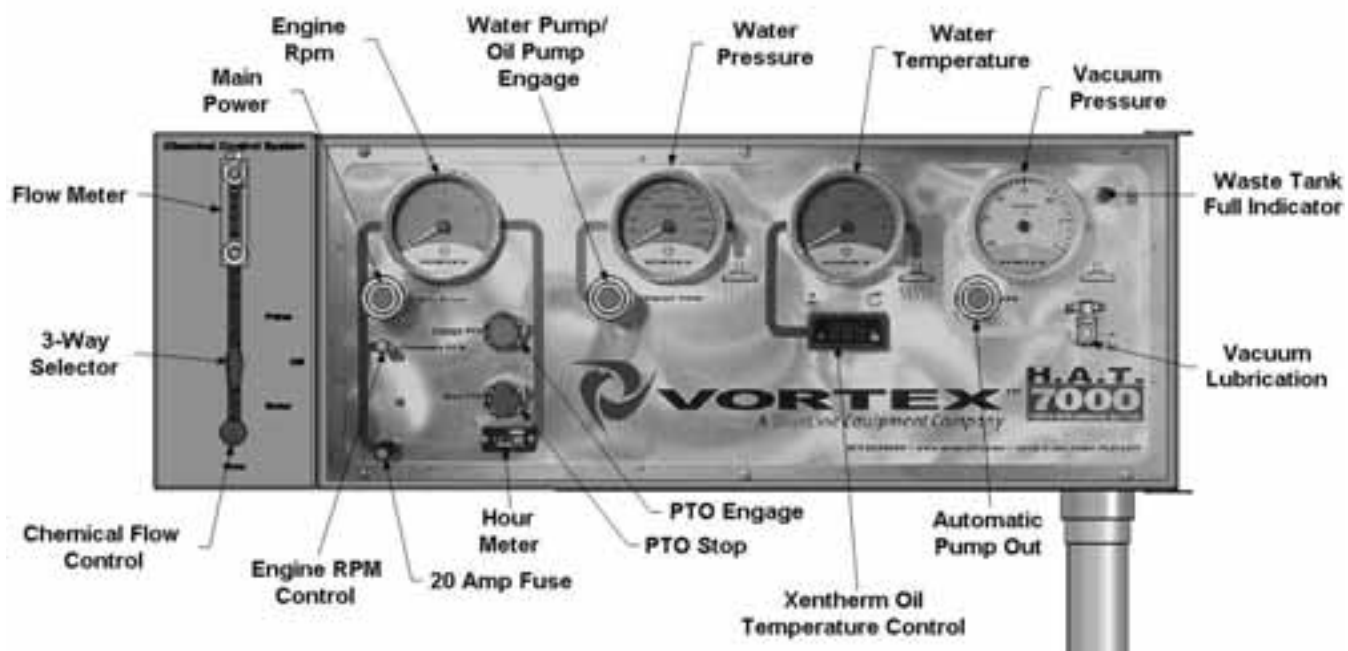
PREPARATION

This section of the operator's manual explains how to prepare, start, operate, shut down and maintain your **BLUELINE VORTEX 7000®** mobile cleaning unit. The **VORTEX 7000®** unit is easy to operate, however only trained operators should proceed.



Operate this unit and equipment only in a well ventilated area. Exhaust fumes contain carbon monoxide, which is an odorless and deadly poison that can cause severe injury or death. DO NOT run this unit in an enclosed area. DO NOT operate this unit where the exhaust may enter a building doorway, window, vent or any other opening.

Water under high pressure at high temperature can cause burns, severe personal injury, or fatality

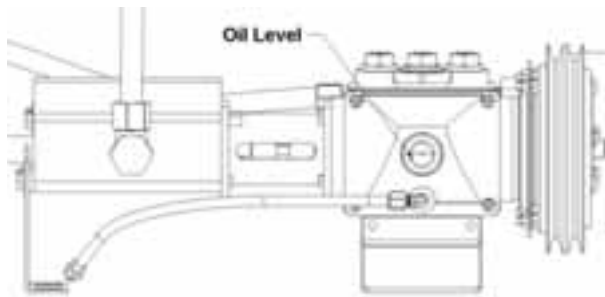


ENSURE THERE IS ADEQUATE FUEL

Check the fuel tank to ensure there is adequate fuel to complete the job and transport the vehicle. This unit consumes approximately 2 gallons of diesel fuel per hour, when operating the engine in the proper RPM range. (Equivalent to normal highway driving speeds of 50 to 55 MPH.)

CHECK WATER PUMP OIL LEVEL

Check the water pump oil **daily** prior to starting the mobile cleaning unit. With the truck on a level surface check the sight gauge on the water pump. Oil level should be in the center of the gauge. If the oil is below the center red dot, add oil and check for leaks. **DO NOT overfill or damage may occur to the pump.** (CAT Pump Crankcase Oil, Part # 13-000)



Water Pump Oil Level

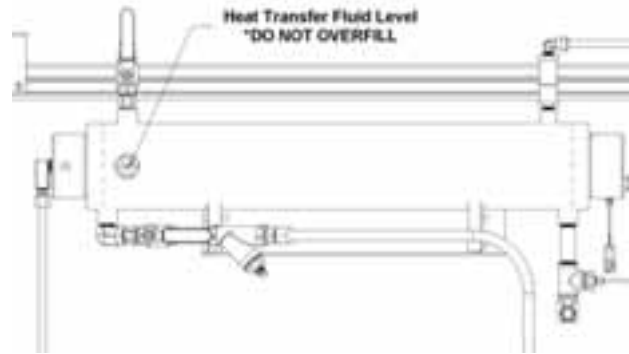
CHECK HEAT TRANSFER OIL LEVEL

With the mobile cleaning unit parked on level ground with the unit off, and the heat exchanger temperature between 60° to 90° F. **NOTE: (Failure to follow the preceding will result in an inaccurate reading.)** Check the oil level on the E-2 heat exchanger sight glass. Normal oil level should be in the center of the sight glass. Add heat transfer oil as needed. **Do not overfill.**



WARNING

Do not overfill heat transfer fluid. The heat transfer fluid will expand as it heats up. Failure to follow these procedures could result in injury and or fatality and damage to property.



E-2 Fluid Level

PRE-FILTER BOX AND WASTE TANK

Clean or replace strainer basket located in the pre-filter box. Inspect and clean or replace filters located inside the waste recovery tank. This will help to prevent damage to the system vacuum pump.

NOTE: To remove the vacuum inlet filters, grip the plastic hexagon section of the filters. Gripping the filters by the screen will collapse or destroy the filters. Replace the filters after cleaning until hand tight.

TRUCK ENGINE OIL/RADIATOR

Check the engine oil and anti-freeze levels. Refer to vehicle owner's manual for recommended fluid levels and maintenance schedule.

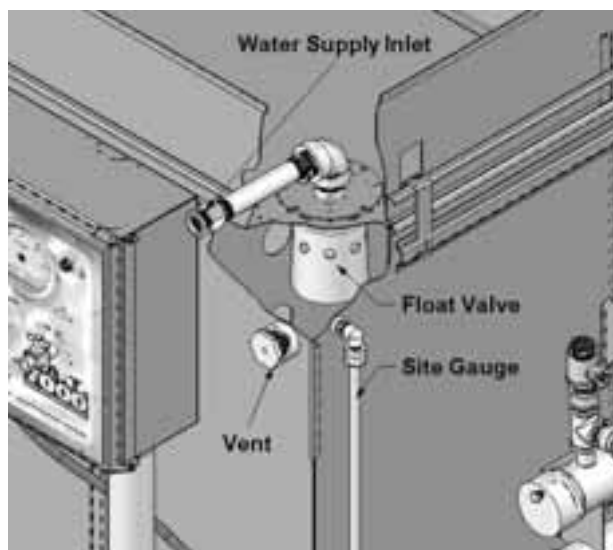
FRESH WATER TANK

Connect the water supply hose to the water inlet quick connector on the top right of the fresh water tank. Connect the hose to the faucet. Turn the water supply faucet on. Fill

the tank to desired water level. Running the truck under normal operating conditions will pre-heat the water in the fresh water tank from 80° to 120° F. Periodically check the operation of the water shut-off float valve located in the fresh water tank. Repair or replace as needed.

NOTE: Prior to connecting your water inlet hose to any supply faucet, flush out the faucet until the water is free of any debris. Also, flush out any debris from your water inlet hose.

NOTE: Never use a waste pump outlet hose as a water inlet hose. Use only clean hoses for water supply.



TOOLS AND EQUIPMENT

Inspect all tools and equipment. Clean repair and or replace as needed.

AT THE JOB LOCATION

REMOVE TOOLS FROM THE VEHICLE

Remove any tools, accessories or hoses from the vehicle that you will require.

WATER SUPPLY

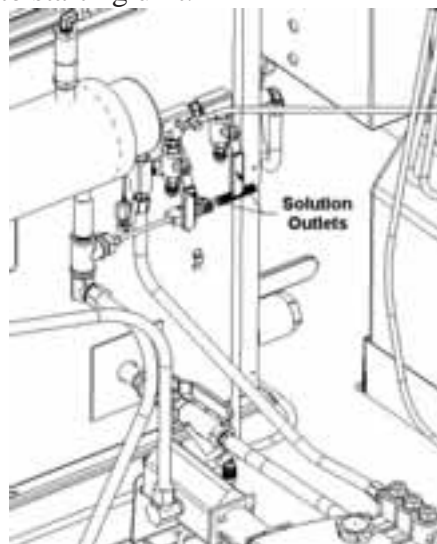
Ensure there is adequate water in the fresh water tank to complete the job.



WARNING!
Water under high pressure at high temperature can cause burns, severe personal injury, or fatality

HIGH PRESSURE HOSE

Before starting the unit, connect the cleaning tool(s) to the opposite end of the high pressure hose(s). Two valves located on the fresh water tank allow operation of one or two high pressure hoses. Verify that valve(s) are open prior to starting unit.



VACUUM HOSE

Connect the vacuum hose(s) to the vacuum inlet connection(s) on the side of the box truck. Connect the opposite end of the vacuum hose(s) to the cleaning tool(s).

JET SIZING

BLUELINE recommends that the total floor tool size does not exceed “.06”. Using larger jet sizes on your **VORTEX mobile cleaning unit** may reduce cleaning temperatures.

Example: Four-jet wand uses four 95015 jets.
(95 deg. Spray angle w/015 orifice)
 $.015 \times 4 = .06$

When using two wands while cleaning with this unit, **BLUELINE** recommends that the tip size in each tool does not exceed a total of “.04”.

Example: Four jet wand uses four 9501 jets.
(95 deg. Spray angle w/01 orifice)
 $.01 \times 4 = .04 \times 2$ tools = .08
Upholstery tool jet size: 80015.
Stair tool jet size: 9502

STARTING THE UNIT

WARNING!

Operate this unit and equipment only in a well ventilated area. Exhaust fumes contain carbon monoxide, which is an odorless and deadly poison that can cause severe injury or death. **DO NOT** run this unit in an enclosed area. **DO NOT** operate this unit where the exhaust may enter a building doorway, window, vent or any other opening.

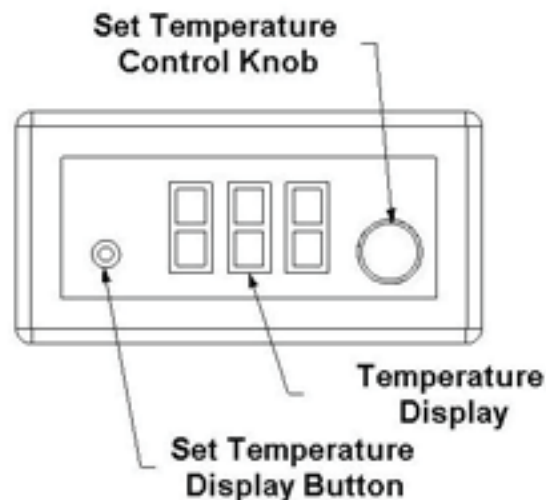
1. With the truck running at idle (approximately 700 RPM) pull the main power switch to energize the control panel.

2. Push the “**ENGAGE PTO**” switch. in, to engage the PTO. The blower pulley will start turning. Allow approximately 30 seconds for the mobile cleaning unit to stabilize at idle speed.

NOTE: Engage PTO with engine at idle speed.

3. Set the oil temperature gauge to the desired cleaning temperature. Press the red button located on the lower left of the oil temperature gauge. Turn the knob located on the right of the gauge to set the temperature. Turn clockwise to increase, counter-clockwise to decrease. When the button is pushed in and

held it displays the oil set temperature. When it is released it displays the oil temperature.



CAUTION!

The temperature set point can be changed without displaying the set point. Do not turn the set point control knob unless you want to change the temperature set point.

The thermostatic control is designed to maintain the solution temperature automatically.

4. To engage the water and oil pump, pull out the “**ENGAGE PUMP**” switch. Allow approximately 30 seconds for the engine to once again stabilize its idle speed. The water pump will circulate water through the pressure regulator back into the fresh water tank. The oil pump will circulate the heat transfer fluid between heat exchanger E-2 and E-3.

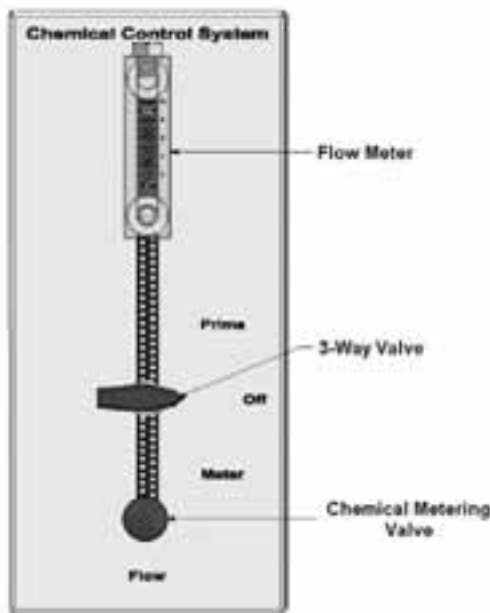
NOTE: If the unit fails to build water pressure after 15 seconds, turn off pump switch and ensure you have adequate water supply. DO NOT RUN PUMP DRY. If there is adequate water supply and all valves are open, see loss of water pump pressure in the “Trouble Shooting” section of your manual.

NOTE: Do not engage water pump if the engine is running at a high RPM. Damage to the water pump clutch may occur.

NOTE: BLUELINE recommends that the chemical pump be primed whenever the water pump is on. This eliminates possible pressure fluctuations and water pump pulsations related with running the chemical pump dry. Pressure regulator must be set below 1000 psi for chemical system to operate. Pressures higher than 1000 psi may damage pump diaphragm.

Allow adequate time for the water temperature to warm up before cleaning.

PRIMING THE CHEMICAL PUMP



1. Insert the chemical prime tube and the chemical inlet tube into the chemical jug.

NOTE: When inserting the chemical tube into the chemical jug, ensure that it stays fully submerged, as the chemical pump will not function if air is allowed to enter the inlet line. **DO NOT** operate the chemical pump without the inlet strainer properly installed.

2. Turn the 3-way chemical selector valve located on the control panel to the **PRIME** position. The chemical will then flow from the chemical jug through the chemical prime tube. If the pump does not prime, then:

Place the chemical prime tube into the vacuum hose and seal off the vacuum hose. The vacuum will quickly draw chemical from the chemical jug. After the flow begins, turn the chemical selector valve to **OFF** position, insert the chemical prime tube back into the jug, and turn the chemical selector valve back to the **PRIME** position and continue the procedure.

Once chemical flow with no air bubbles has been achieved, turn the chemical selector valve from **PRIME** to **METER**. With the cleaning tool open, check the flow meter and adjust the chemical metering valve until the desired rate of chemical flow is achieved.

Pressure regulator must be set below 1000 psi for chemical system to operate. Pressures higher than 1000 psi may damage pump diaphragm.

AUTOMATIC WASTE PUMP

1. If your unit is equipped with an optional automatic waste pump, connect one end of the 5/8 inch or larger garden hose to the pump-out connection and the other end to an acceptable waste disposal.

2. Pull the **APO** (Automatic Pump Out) switch located on the front of the control panel to activate. The waste pump will now operate automatically throughout the cleaning period.

DO NOT use an outlet hose that is smaller than 5/8 in. I.D.

NEVER use a waste pump hose as a water inlet hose.



NEVER dispose of waste water in a storm drain, water way or on ground areas. Always dispose of waste in accordance with Local, State and Federal laws.

OPERATION

After you have completed the previous steps, proceed with the cleaning operation. Adjust the throttle control switch to 1700 RPM for cleaning.

NOTE: Do not engage water pump if the engine is running at a high RPM. Damage to the water pump clutch may occur.

A float shut-off switch is located inside of the waste tank. It will automatically shut down the PTO unit if the tank reaches its full capacity. If this occurs, empty the waste tank before continuing.

NEVER dispose of waste water in a storm drain, water way or on ground areas. Always dispose of waste in accordance with Local, State and Federal laws.

AUTOMATIC DIVERTER SYSTEM

Your **VORTEX 7000®** mobile cleaning unit is equipped with an automatic diverter control system. When the water reaches the desired temperature setting set by the oil thermostat on the front control panel, the diverter solenoid will automatically position the diverter valve into the muffler position. When the water temperature drops slightly below the desired temperature, the diverter solenoid will automatically position the diverter valve into the heat exchange position.

When doing flood extraction, the **ENGAGE PUMP** switch should be in the **OFF** position. This will signal the diverter solenoid to position the diverter valve in the muffler position.

CLEANING

While cleaning, observe the following guidelines:

1. Before cleaning, ensure that the wand nozzles are functioning properly.

- A. Hold the wand approximately one foot above the surface to be cleaned and open the wand valve. A full even spray should emit from the cleaning nozzles.
- B. If the nozzles are not showing a full even spray pattern, adjust, clean, or replace the nozzles, if required.

2. Usually, chemical solution is applied during the push stroke of the wand during cleaning, and extraction is done on the pull stroke. For heavily soiled carpets, the wand may be used in a scrubbing action, with chemical solution applied in both push and pull strokes, provided that the final stroke is a pull stroke with no chemical injection.

UPHOLSTERY CLEANING

1. Upholstery tools have a lower flow rate and smaller orifices. Set the **temperature control** to the desired setting. To maintain proper cleaning temperatures, make certain that the unit has been fully heated up prior to cleaning.

2. Always clean upholstery with a pressure setting below 300 PSI, by adjusting the pressure regulator on the unit.

STAIR TOOL CLEANING

1. Set the **temperature control** to the desired setting. To maintain proper cleaning temperatures, make certain that the unit has been fully heated up prior to cleaning.

FLOOD RESTORATION/EXTRACTION

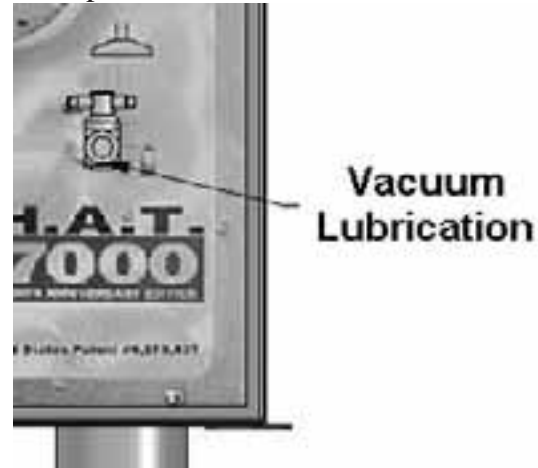
1. Adjust the throttle control on the front control panel to 1700 RPM. Make certain that the **ENGAGE PUMP** switch is in the **OFF** position. Proceed into the extraction process.

SHUT DOWN AND DAILY MAINTENANCE

1. Flush out the chemical system with fresh water to remove any chemical residue.
2. Remove as much moisture from the vacuum hoses as possible. This will prevent spillage of wastewater in your vehicle when returning hoses.
3. Disconnect the vacuum hoses from the pre-filter box inlets.
4. Turn the throttle control switch to the idle position.
5. Turn the thermostat down to 50 deg. F.
6. Allow the unit to run for at least **2 minutes** or until the water temperature is at or below 180 deg. F. This will also help to remove any excess moisture from the vacuum pump.

NOTE: If shutting down for the day: Plug the vacuum inlets on the pre-filter box inlet panel and adjust the throttle control to 1700 rpm. Spray WD-40 (or equivalent) into the **blower lubrication valve**, located on the front of the control panel for **5 seconds**. This will

lubricate the vacuum pump. Next, return the throttle control switch to idle, and continue with step 4.



7. Disengage water pump and PTO.
8. Activate the valves on all cleaning tools. This will relieve any remaining pressure. Disconnect the cleaning tools and solution hoses and return them to the vehicle.
9. Drain the waste tank, disposing of wastewater in a suitable and proper location.



NEVER dispose of wastewater in a storm drain, water way or on ground areas. Always dispose of waste in accordance with Local, State, and Federal laws.

10. Remove the strainer basket from the pre-filter box. Clean out any debris and re-install.

NOTE: Damage may occur to the vacuum pump if strainer basket is damaged or improperly installed.

11. Inspect the vacuum inlet filters inside the waste tank **daily**. Remove and clean the filters if there is any lint or debris present.

Replacement and maintenance of the filters will prevent rust and corrosion from entering the vacuum pump.

NOTE: To remove the vacuum inlet filters, grip the plastic hexagon section of the filters. Gripping the filters by the screen will collapse or destroy the filters. Replace the filters after cleaning until hand tight.

NEVER operate this unit with the filters removed, damaged or improperly installed.

12. At the end of the work day, rinse out the pre-filter box and the waste tank with fresh water. A deodorizer may be added to prevent bacterial growth.

13. Clean the vehicle interior, unit, tools, hoses etc., as needed. Inspect **ALL** equipment and accessories for any damage, leaks, wear, etc.



Water under high pressure at high temperature can cause burns, severe personal injury, or fatality

FREEZE PROTECTION



If the unit is exposed to freezing weather conditions, the water inside of the unit may freeze, resulting in **SERIOUS DAMAGE to the unit. Always park the unit in a heated building when not in use. If a heated building is not available, drain all water from the mobile cleaning unit.**

While in operation, avoid long periods of shut down as the unit generates heat while running. Keep the unit running just prior to leaving for the next job.

SECTION 3:

SERVICE & MAINTENANCE

6. MAINTENANCE

Maintenance Chart	26
Engine	27
Vacuum Pump	27
Vacuum Inlet Filters	28
Water Pump	28
Water Tank	28
Strainer Basket	29
Drive Belts, Pulleys and Hubs	29
Chemical Pump, Chemical Metering System	30
Accumulator	30
Pressure Regulator	30
Vacuum Hoses	30
Temperature Sensor	30
Battery	30
High Pressure Solution Hoses	31

7. GENERAL SERVICE ADJUSTMENTS

Vacuum Relief Valve	31
Vacuum Pump Drive Belts	31
Water Pump Drive Belt	31
Float Valve	32
Chemical Pump	32
Packing Nut Adjustment, Chemical Metering & Selector Valves	32
Pressure Regulator	33
Adding/Draining Engine Coolant	33

8. TROUBLESHOOTING

PTO Will Not Engage	35
Loss of Water Pump Pressure	36
Loss of Solution Volume	36
Loss of Vacuum	37
Water Pump Does Not Engage	37
Excessive Water Outlet Temperature	38
Loss of Water Temperature	38

MAINTENANCE CHART

Engine	Daily	Check engine oil level.** Fill to proper level.
Engine Coolant	Daily	Check coolant level in overflow bottle. Fill to proper level.
Vacuum Pump	Daily	Spray WD-40 (or Equivalent) into the lubrication valve for 5 seconds.
Water Pump	Daily	Check water pump oil level.*** Fill to proper level.
Vacuum Inlet Filters	Daily*	Inspect filters, clean and or replace if required.
Pre-Filter Box Strainer Basket	Daily	Empty and clean stainless steel basket.
Vacuum Hoses	Daily	Rinse with fresh water.
Waste Pump-Out (Optional)	Daily*	Inspect and remove any debris or sediment.
Engine	Weekly	Check air cleaner for damaged, dirty, or loose parts.
Engine	Weekly	Inspect air intake and cooling areas. Clean if required.
Vacuum Pump	Weekly*	Check vacuum pump oil level. Fill to proper level. Do not overfill.
Vacuum Inlet Filters	Weekly	Remove filters and clean.
Water Box	Weekly*	Inspect and clean filter. Replace if damaged.
Bypass Manifold	Weekly	Clean and inspect strainer and orifice.
Battery	Weekly*	Check fluid level. Fill with distilled water only. Do not overfill.
Engine	Monthly	Inspect drive belts for wear. Replace as needed.
Water Box	Monthly	Check float valve for proper operation.
Wye-Strainers	Monthly*	Clean and remove any debris.****
High Pressure Solution Hoses	25 Hours	Inspect for wear, damage, or impending rupture. Replace if damaged.
Engine	100 Hours	Change engine oil and filter.
Pressure Regulator	100 Hours	Lubricate o-rings. Use only o-ring lubricant part # 13-003.
Battery	100 Hours	Clean battery terminals.
Engine	200 Hours	Clean engine air filter.
Chemical Metering System	200 Hours	Inspect packing nut on selector and metering valve. Adjust as needed.
Temperature Solenoid	200 Hours*	Clean hard water deposits from solenoid.
Temperature Probe Packing	200 Hours*	Inspect for leaks and tighten if needed. Do not over tighten
Engine	500 Hours	Change engine coolant.
Engine	500 Hours	Replace in-line fuel filter.*****
Water Pump	500 Hours	Change crankcase oil.***
Pulleys and Hubs	500 Hours	Check pulley and hub set screws for proper torque.*****
Stainless Steel Accumulator	500 Hours	Check pressure. Replace if needed.*****
Vacuum Pump	500 Hours	Drain, flush, and replace oil.*****
Chemical Pump	1000 Hours	Change diaphragm and check valves. Inspect disk.
Check Valve	1000 Hours	Check Teflon seat for abnormal wear or debris. Replace as needed.
Engine	2000 Hours	Replace air filter element.

To maximize the operating life and performance, use only recommended oils, filters and greases.

*Or as often as required.

Change engine oil and oil filter after **first 50 hours of operation.

***Change water pump crankcase oil after **first 50 hours** of operation

****Inspect after **first week** of operation, and remove any debris present. Inspect again after **2 to 4 weeks**.

*****Check pulley and hub set screws after **first 50 hours** of operation, and again at **100 hours** of operation.

*****Or every **6 Months**. Whichever comes first.

*****Or **Yearly**. Whichever comes first.

6. MAINTENANCE

This section of the operator's manual contains the service and maintenance information for the **VORTEX 7000®** mobile cleaning unit. A planned preventative maintenance program will ensure that your **BLUELINE VORTEX 7000®** has optimum performance, long operating life, and a minimum amount of down time.



DO NOT attempt to service this unit while it is running. High speed parts as well as high temperature components may result in severe injury, severed limbs, or fatality.

Note: When operating your mobile power unit, the engine will operate at 1400 to 1700 rpm's. This is equivalent to 50 to 55 miles of highway use per hour. The hour meter on your unit's control panel should be factored in when scheduling regular maintenance intervals.

ENGINE

Refer to the owner's manual for specific instructions.

1. Check the engine and transmission oil levels daily. Ensure that the proper oil level is maintained. **NEVER** overfill. Check transmission and PTO (power take off) hoses and lines for leaks. During the first 50 hours of operation, check the mounting hardware on the PTO and the PTO drive line to ensure it is securely tightened (see **drive belts and pulleys** for hub torque specifications). After 50 hours of use, periodic inspection of the PTO oil lines and mounting hardware should be performed. Maintenance of the PTO should be performed at the same intervals as the transmission. Refer to vehicle owner's manual for recommended oil types and regular maintenance schedule.

2. Check the engine antifreeze coolant daily. Inspect hoses and pipes daily for leaks. Refer to owner's manual if coolant levels are low for recommended fluids and fluid levels.

NOTE: Additional engine service information can be obtained from the vehicle owners' manual. If service or repair is required, contact an authorized service center.

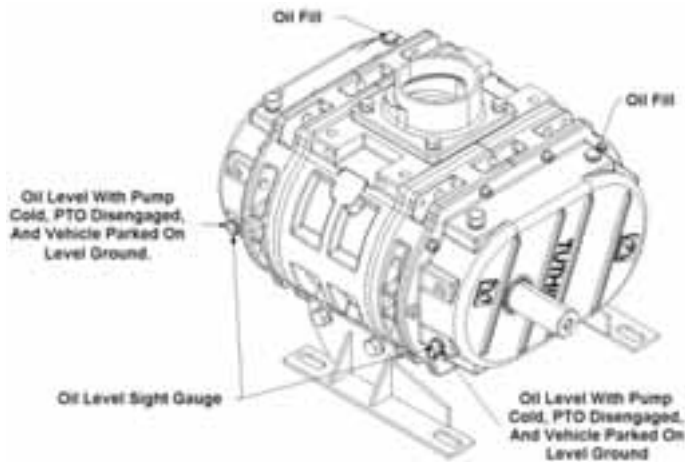
VACUUM PUMP

NOTE: Refer to the provided Vacuum Pump Operation and Service Manual for specific instructions.

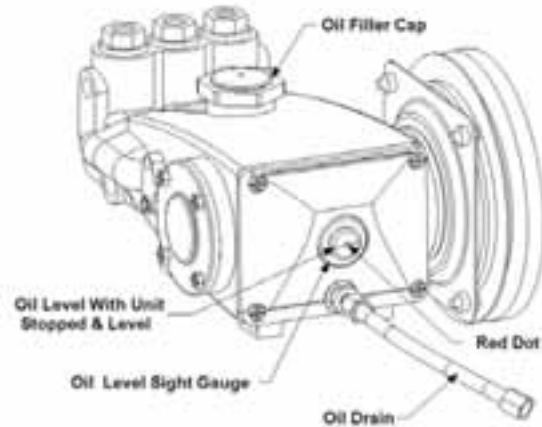
Lubrication: **BLUELINE** recommends that you use only PNUELUBE synthetic blower lubricant in the gear ends of the vacuum pump for all operating temperatures. PNUELUBE is formulated specifically for positive displacement blower service to provide maximum blower protection at any temperature. One filling of PNUELUBE will last a minimum of twice as long as a premium mineral oil.

NOTE: PNUELUBE (Part # 13-017) is the only oil that **BLUELINE** puts in the vacuum pump at the factory. Adding petroleum oil to synthetic oil is **NOT** recommended.

1. Check the oil level **daily** to ensure the proper level. Too little oil will damage and ruin the bearings and gears. Too much oil will result in overheating.



1. Check the crankcase oil level **daily** to ensure the proper level. If the level has dropped, check for the source of leakage and repair.



2. A lubrication valve has been provided on the front of the console, to prevent rust from building up inside of the vacuum pump.

Run the unit for at least **2 minutes** to remove any excess moisture from the vacuum pump. Then, spray WD-40 (or Equivalent) into the lubrication valve for **5 seconds** while the unit is running and the vacuum inlet ports are sealed. This procedure should be done at the end of **every working day**.

2. After **50 hours** operation, change the crankcase oil with CAT Pump Crankcase Oil, (Part # 13-000). Change the crankcase oil every **500 hours** thereafter.

3. Drain, flush and replace the oil every **500 hours** or **yearly, whichever comes first**.

WATER TANK

1. The float valve should be checked at least **monthly** for proper operation. If overfilling is noted, check the plunger for proper seating.

2. A wye strainer is located between the water tank and water pump it should be inspected and cleaned on a **weekly** basis. Replace, if damaged.

NOTE: Prior to removing strainer, close ball valve located behind the wye strainer. After cleaning or replacing filter open ball valve. Failure to do so could result in **damage to the water pump**

VACUUM INLET FILTERS

1. The vacuum inlet filters in the waste tank should be inspected **daily**. Remove and clean filters if there is any lint or debris present. The filters will last for a long period of time if this is done.

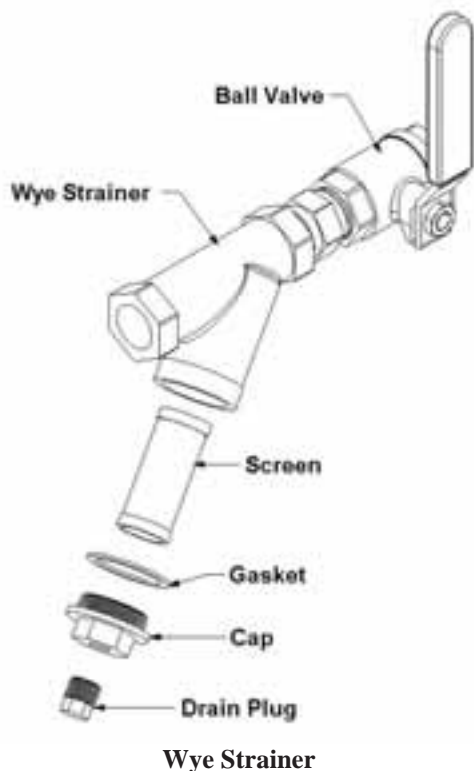


When removing the vacuum inlet filters, grip the plastic hexagon section of the filters. Grasping filters by the screen will damage or destroy the filters.

WATER PUMP

Refer to the provided Water Pump Operation Manual for specific instructions.

SECTION 4



PRE-FILTER BOX STRAINER BASKET

The strainer basket located in the pre-filter box should be emptied and cleaned on a **daily** basis.

DRIVE BELTS, PULLEYS & HUBS

1. Check pulley set screws and hub screws after the first **50 hours** of operation and again at **100 hours**. Re-torque these screws with a torque wrench. Follow the torque values on the following table. Check pulley set screws and hub screws every **500 hours** thereafter.

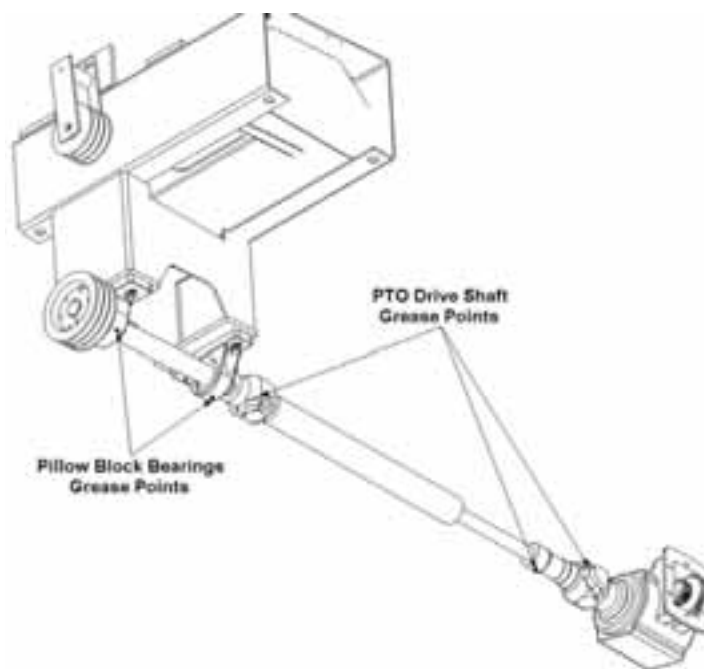


CAUTION!
Ensure that when you re-torque the screws, you use a clockwise pattern and continue until the proper torque is achieved.

TORQUE VALUES		
Component	Inch/lbs	Foot/lbs
Vacuum Pump Hub	72	6
PTO Shaft Hub	120	10

The **VORTEX 7000®** mobile cleaning unit features an adjustable belt tensioning system. Belts and pulleys should be cleaned and inspected after the first 25 hours for wear and pulley alignment and regularly after that. If wear or glazing is discovered, replacement is recommended.

Grease PTO drive shaft u-joints and bearings every 50 hours of operation. Use Penzoil™ ULTRA EPI tacky lithium or Penzoil™ SPL2 grease.



HEAT TRANSFER SYSTEM

If the engine is not properly maintained, the exhaust gases will deposit carbon on the inside of the E-3 heat exchanger exhaust tubes. If this occurs the E-3 heat exchanger will lose efficiency, and the mobile cleaning unit will not produce heat as designed. Regularly inspect the E-3 heat exchanger and if carbon build up is noted, manually clean the exhaust tubes with a wire brush. Proper maintenance of the truck engine (regular tune-ups

and use of proper fuels) will help prevent excessive carbon build up.

If excessive carbon build up is occurring, inspect and clean exhaust diverter valve to ensure proper operation.

Maintain proper engine coolant levels. Refer to vehicle owner's manual for recommended fluid types and levels.

Replace heat transfer fluid every **6 months** or **300 hours** of operation. Failure to do so will result in reduced heating capacity, and will eventually coat the insides of the E-2 and E-3 heat exchangers with a lacquer like substance. This will reduce efficiency and result in irreparable damage to the E-2 and E-3 heat exchangers.

CHEMICAL PUMP

The chemical pump should be rebuilt every **1000 hours**. This involves changing the diaphragm, check valves, and inspecting the disk.

CHEMICAL METERING SYSTEM

Check and inspect the packing nut on the chemical selector and metering valves every **200 hours**. Keeping the valve packings properly adjusted will prevent leaks and add to the overall life of the valve.

STAINLESS STEEL ACCUMULATOR

Sealed 250 pound nitrogen accumulator. Change every 2000 hours or as needed.

PRESSURE REGULATOR

Lubricate the o-rings in the pressure regulator every **100 hours**.
Use only o-ring lubricant (Part # 13-003).

VACUUM HOSES

To ensure maximum hose life, **BLUELINE** recommends that you wash out the hoses with fresh water **daily**.

TEMPERATURE SENSOR

Hard water deposits should be removed from the temperature sensor every **200 hours**, or as often as required.

BATTERY



Explosive gases, Dangerous acid!
Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. Batteries also produce explosive hydrogen gases while charging. To prevent fire or explosion, charge batteries only in a well ventilated area. Keep sparks, open flames, as well as any other sources of ignition away from batteries at all times. Remove all jewelry prior to servicing batteries. Keep batteries out of the reach of children.

Refer to vehicle owners' manual for specific instructions on the maintenance, removal or replacement of vehicles' batteries.

Before disconnecting batteries, ensure that all the mobile cleaning units' switches are in the OFF position. If ON a spark could occur at the ground connection terminal, which could cause an explosion if hydrogen gas, or other explosive vapors are present.

Keep cables, terminals and external surfaces of the battery clean and dry. A buildup of corrosive acid or grime on the external surfaces could cause the battery to self-discharge.

HIGH PRESSURE SOLUTION HOSES

Inspect your high-pressure solution hoses for wear after the first **100 hours**. Thereafter, inspect every **25 hours**. If the hoses show any signs of damage or impending rupture, replace the hoses.



NEVER attempt to repair high-pressure solution hoses. Repairing high-pressure solution hoses may result in severe burns and serious injury, damage to property or fatality.

All high-pressure solution hoses must be rated for 3000 PSI at 300 deg. F. Thermoplastic hoses do not meet this requirement and should not be used. Severe burns and serious injury, damage to property or fatality may result if the hoses do not meet these requirements.

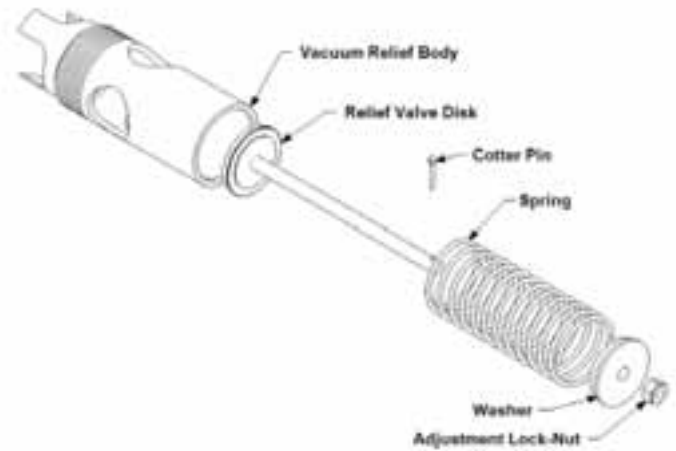
7. GENERAL SERVICE ADJUSTMENTS



DO NOT attempt to service this unit while it is running. High speed parts as well as high temperature components may result in severe injury, severed limbs, or fatality.

VACUUM RELIEF VALVE

With the unit running at full RPM, block off the airflow at the vacuum inlet ports and read the vacuum gauge. If adjustment is required, disengage the PTO (power take off) unit, and adjust the tension with the locking nut on the vacuum relief valve. Reengage the PTO unit and read the vacuum gauge. Repeat this process until the vacuum relief valve opens at 15" to 17" Hg.



VACUUM PUMP DRIVE BELTS

The **VORTEX 7000®** mobile truck unit is equipped with an adjustable belt tensioning system. Check belts for proper tension (approximately 1/2" deflection) and wear. Adjust or replace as needed.

Proper alignment of vacuum pump pulley, belt tensioner pulley and PTO drive pulley should be checked and adjusted in the first 25 hours of operation, and whenever belts are removed or replaced.

Place a straight edge between vacuum pump pulley and belt tensioner pulley, and ensure full contact of straight edge on both the right and left side of each pulley. Repeat procedure on the PTO and belt tensioner pulley. Adjust vacuum pump and or PTO drive as needed and ensure all bolts are properly tightened.

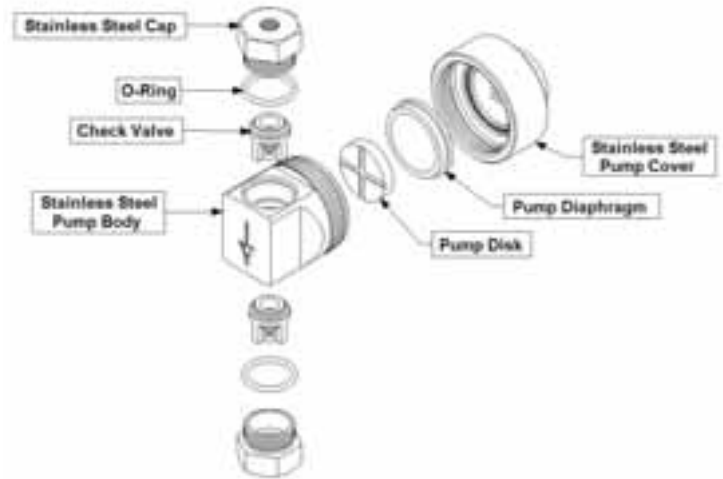
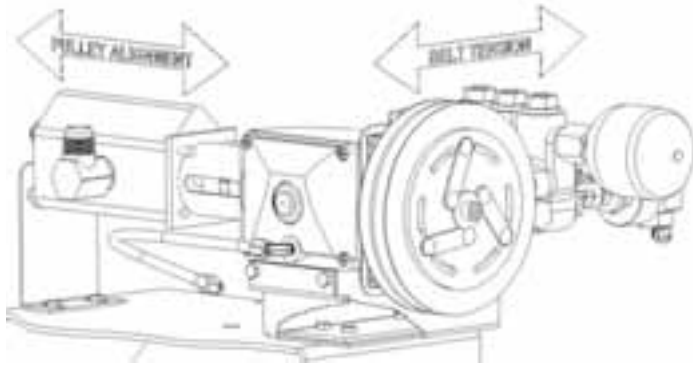
WATER PUMP DRIVE BELT

To tighten the water pump belt:

1. Loosen the bolts, which hold the water pump and oil pump to the frame base.
2. Adjust the position of the belt tensioning adjusting bolt until the proper belt tension is

achieved. (1/2" deflection in the center of the belts, half way between the pulleys).

3. While checking the pulley alignment, tighten the nuts that hold the water pump and oil pump to the base.



PACKING NUT ADJUSTMENT

CHEMICAL

METERING/SELECTOR VALVES

FLOAT VALVE (WATER TANK)

If the water tank is overflowing, remove and check the float valve for damage, or debris.

CHEMICAL PUMP

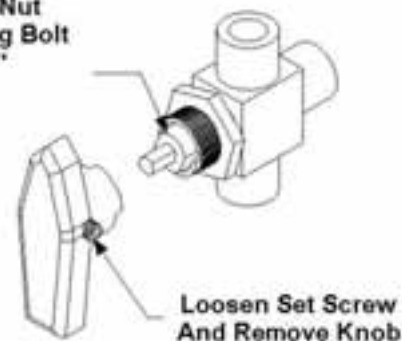
The **VORTEX 7000®** mobile cleaning unit features a stainless steel chemical pump and metering system. The chemical pump requires only the replacement of the diaphragm and check valves. To replace the diaphragm, unscrew the cover from the body. When replacing the diaphragm, lube the outer edges of the diaphragm with o-ring lubricant (Part #13-003) and reassemble.

To replace the check valves, remove the check valve caps, replace the check valves and reassemble using new o-rings. **DO NOT** attempt to reuse o-rings after the check valves have been removed.

Inspect the packing nut for proper tension on the chemical metering and chemical selector valves every **200 hours**. When turning the knob, there should be some resistance. If not, slightly tighten the packing nut. **DO NOT** over-tighten. Keeping the packing properly adjusted will eliminate possible leaks and will add to the overall life of the valves.

Chemical Prime Valve

Adjust The Packing Nut
By Turning The Packing Bolt
Clockwise In 1/16"
Increments.



Chemical Metering Valve



PRESSURE REGULATOR

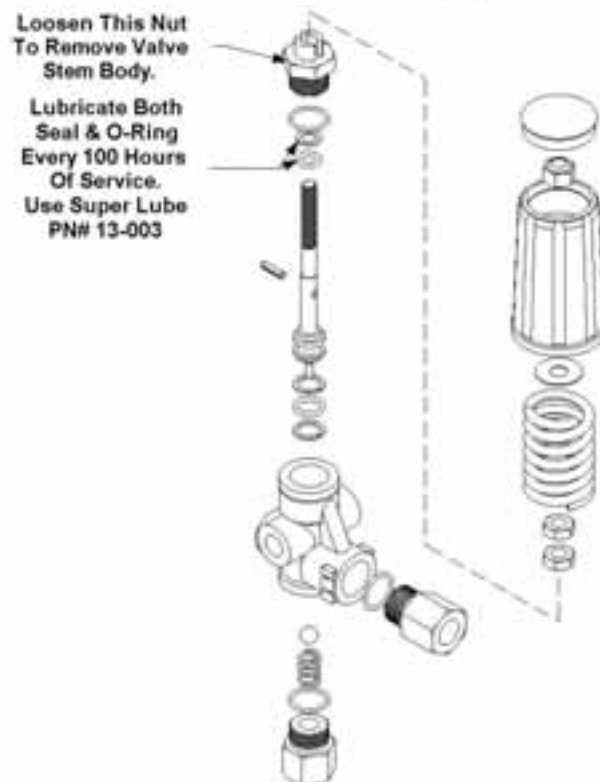
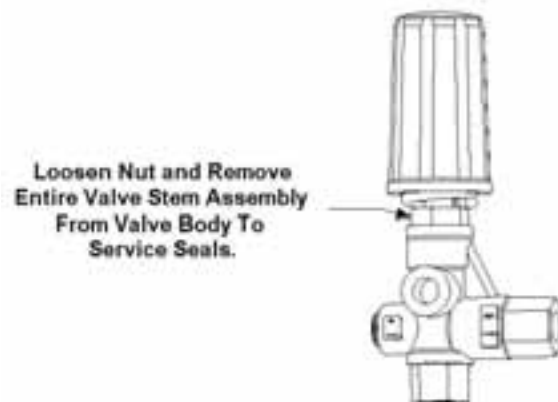
The pressure regulator holds water pressure at a preset point and bypasses this water back to the water box.

To adjust:

1. With the unit running, close the cleaning tool valve. Check the pressure gauge. Open the tool valve. Set the pressure regulator so that the pressure gauge reads 350 PSI with the tool valve open.

With the tool valve open, there should be a normal drop of approximately 100-PSI, in pressure. **If the drop is greater than 100 PSI, it may be necessary to lubricate the pressure regulator o-rings.**

2. To adjust the pressure regulator, turn the adjusting knob (while observing the pressure gauge on the control panel) until you reach the desired pressure.



ADDING/DRAINING ENGINE COOLANT

Refer to vehicle owners' manual for recommended engine coolant types and temperature ranges.

8. TROUBLESHOOTING



DO NOT attempt to service this unit while it is running. High-speed parts as well as high temperature components may result in severe injury, severed limbs or fatality.

This section of the operator's manual describes how to look for and repair malfunctions, which may occur.

Accurate troubleshooting is based on a thorough and complete understanding of the **WATER, CHEMICAL, VACCUM, HEAT TRANSFER, SAFETY** and **WIRING** systems featured in this unit.

If there are malfunctions occurring on this unit which you do not understand, refer back to the **OPERATION** section of this manual and review **SYSTEM**

SECTION 4**PTO Will Not Engage (Truck engine running at idle speed.)**

Probable Cause	Corrective Action
Truck not at Idle speed	Check that throttle control knob is turned to the idle position (counter-clockwise). Check throttle control solenoid for proper operation.
Main fuse on control panel is burned out.	Inspect electrical system for cause of failed fuse. Repair electrical system and start unit.
Loose or corroded battery terminals.	Clean tighten, or replace terminals and cables.
Defective START or STOP push buttons.	Test push buttons. If there is power going in but not out of buttons replace push buttons.
Defective PTO solenoid.	Check power supply to solenoid. Inspect ground wire for proper contact. Test solenoid for proper operation. Replace if necessary.
Defective PTO relay.	Check PTO relay for proper operation replace if necessary.
Recovery tank full.	Drain recovery tank.
Defective recovery tank float level switch.	Check float level switch for proper operation. Replace if necessary.
Clogged screen on PTO pressure line.	Remove screen and clean. Replace screen if necessary. Check screened fitting on high pressure line from transmission to PTO solenoid valve. Clean or replace as needed.

PTO Will Not Run at Idle

Probable Cause	Corrective Action
Defective throttle control.	Check throttle control for proper operation. Repair or replace throttle control.

Loss of Water Pump Pressure

Probable Cause	Corrective Action
Improper pump speed.	Using a tachometer check engine speed. Engine should operate at 1400-1650 RPM.
Pressure regulator has worn o-rings.	Check o-rings. Replace if necessary.
Pressure regulator is dirty, stuck open or improperly adjusted.	Clean, repair or replace pressure regulator. Adjust to working pressure. Lubricate o-rings.
Low pump volume. Measure the amount of water being pumped. With discharge hose disconnected from the pressure regulator. With pump operating at 1300 RPM, it should fill a gallon container every 17 seconds.	Inspect the check valves, plunger caps and cylinder head on the water pump. Repair or replace as required.
Defective water pressure gauge.	Replace water pressure gauge.
Orifice (spray nozzle) in the cleaning tool is worn or defective.	Replace spray nozzle.
Debris or calcium build up clogging water lines and water inlet strainer.	Clean and replace as needed.

Loss of Solution Volume at Cleaning Tool Orifice

Probable Cause	Corrective Action
Plugged orifice (spray nozzle) in the cleaning tool.	Clean or replace spray nozzle.
Defective quick-connect on one of the high pressure hoses.	Replace defective quick-connect(s) on high pressure hose(s).
Cleaning tool valve is malfunctioning.	Repair or replace valve.
Hose inner lining is constricted.	Remove restriction or replace hose.
Heat exchanger(s) is scaled.	De-scale tubes, and install a water softener if necessary to protect the equipment. If water hardness exceeds 5 grains, a water softener is required.

Loss of Vacuum

Probable Cause	Corrective Action
Vacuum hose is damaged, causing a vacuum leak.	Inspect vacuum hose(s). Repair or replace vacuum hose(s).
Recovery tank gasket not sealing properly, or not positioned properly.	Inspect gasket, repair or replace as needed. Reposition tank lid.
Debris and lint is obstructing vacuum line between cleaning tool and waste recovery tank.	Locate obstruction and remove.
Plugged vacuum line to vacuum gauge,	Unplug or replace vacuum line.
Pre-filter box strainer basket is plugged.	Clean or replace pre-filter basket.
Loose vacuum blower drive belts.	Tighten the drive belts.
Waste recovery tank drain valve is damaged or left open, causing loss of vacuum pressure.	Drain the recovery tank. Close drain valve if open. Inspect valve for proper operation and replace in necessary.
Vacuum relief valve requires adjustment.	Re-adjust the vacuum relief valve. If vacuum pressure does not increase, remove and inspect the relief valve. Repair or replace valve.
Vacuum blower is worn out.	Replace the vacuum blower

Water Pump Does Not Engage

Probable Cause	Corrective Action
Fresh water tank is at low level.	Check water level in fresh water tank. Low water level will activate low level switch. Check low level switch for proper operation or loose wire connections. Replace switch if needed.
Defective water pump clutch.	Check power at the clutch. If power is supplied to the clutch, but the clutch does not operate, replace the defective clutch.
Defective electrical connection in the control panel wiring or defective switch.	Examine switch, electrical connections and wiring. Repair any defective connections. If power is going to the switch but does not come out. Replace the defective switch.

Excessive Water Outlet Temperature

Probable Cause	Corrective Action
Instrument settings.	Check temperature control setting. Lower temperature if required.
Temperature control is set at a high temperature.	Turning temperature control counter clock-wise will lower temperature setting.
Temperature control is not responding.	Inspect temperature control for proper operation. Repair or replace if necessary.
Flow restriction caused by hard water scaling.	De-scale unit, repair or replace damaged plumbing as necessary. Install a water softener.

Loss of Water Temperature

Probable Cause	Corrective Action
Exhaust by-pass valve is in the normal exhaust position.	Check the exhaust by-pass valve for proper operation.
Temperature control is set at a low temperature.	Set temperature control to a higher setting.
Vacuum relief valve set to low.	Re-adjust vacuum relief valve to 15" Hg.
Low heat transfer fluid level.	Normal level of heat transfer fluid should be in the middle of the sight gauge located on the E-2 heat exchanger. Add fluid if required. Note: DO NOT OVERFILL
Temperature controller not responding.	Test controller. Replace if necessary.
Engine RPM is low.	Check engine RPM. See system specifications in this manual.
Temperature sensor is not responding.	Inspect sensor for proper operation. Clean or replace as needed.
Temperature gauge is not responding.	Test gauge and replace if necessary.
E-3 exchanger is coated on the inside of the exhaust tubes.	Clean exhaust heat exchanger tubes.
E-2 heat exchanger tubes are coated with hard water deposits.	De-scale and flush entire system.

SECTION 4:

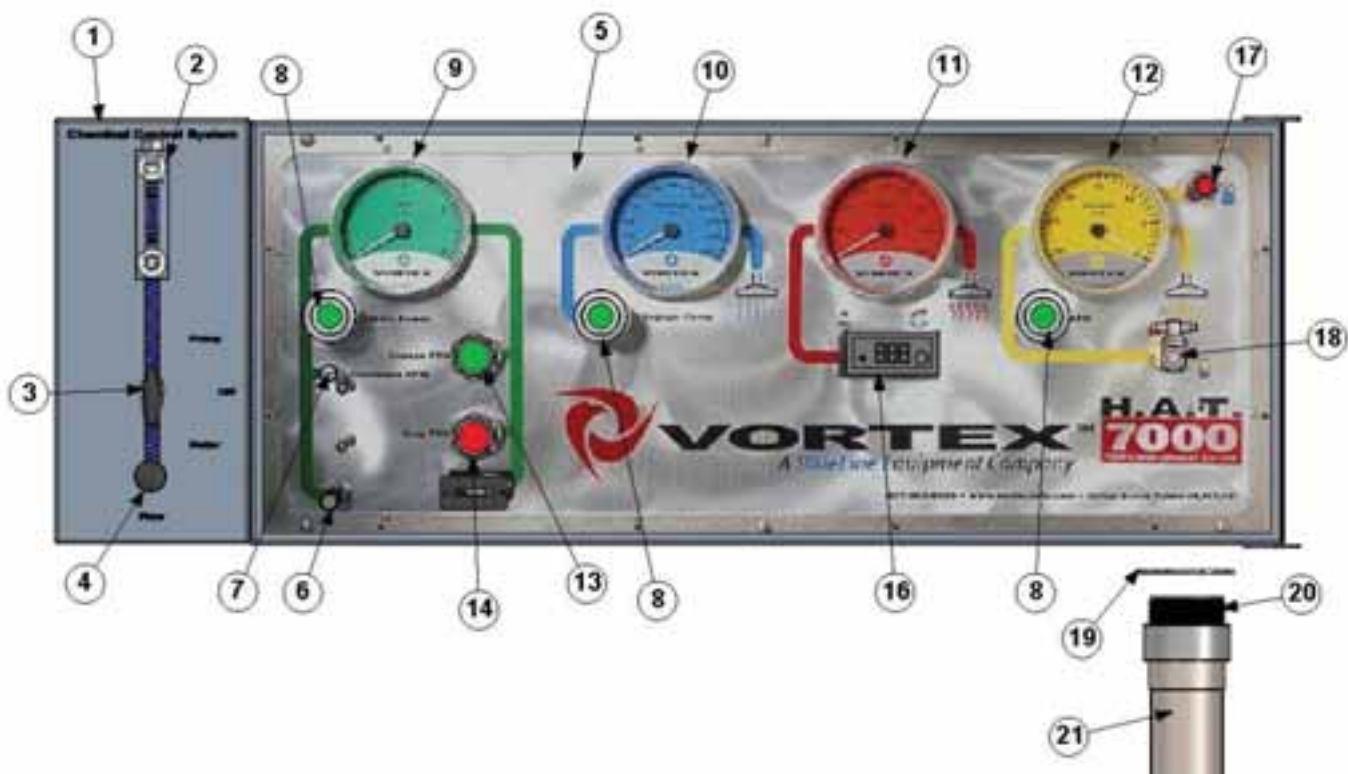
PARTS & ACCESSORIES

9. ILLUSTRATED PARTS LISTINGS

Unit/Chemical Control Panel	40
Water System	43
Vacuum System	50
Chemical System	55
PTO Drive	57
Diverter Valve/Exhaust	60
Decals	63
Electrical Diagrams	64
Optional Equipment	66

10. ACCESSORIES

Accessories	68
-------------	----



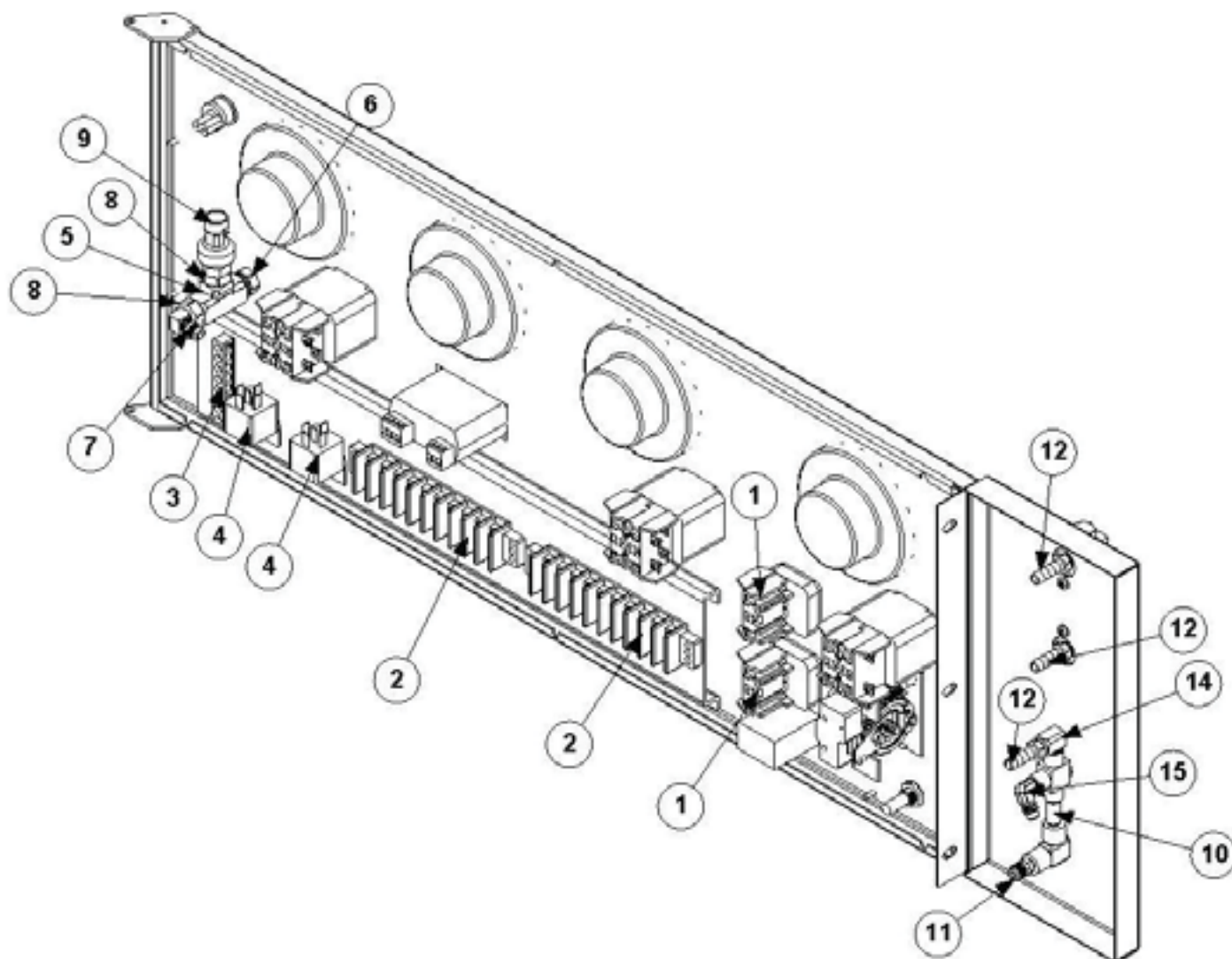
5-1

Control Panel Gauges

Item No.	Part Number	Qty	Description
1	58-185	1	PNL, CONTROL SIDE VORTEX
2	26-003	1	FLOWMETER, 1/8P
3	23-027	1	VLV, 3-WAY BALL 1/8 FP SS
4	23-028	1	VLV, MET 1/8FP (CHEM) RT ANG SS
5	58-184	1	PNL, INSTRUMENT CONTROL VRTX
6	31-162*	1	BODY, FUSE HOLDER PANEL MNT
7	69-103	1	ASSY, THROTTLE CONTROL VORTEX
8	29-033	3	SWITCH, PUSHBUTTON GREEN
9	26-013	1	GAUGE, 4IN TACH 0-4K GREEN DIAL
10	26-015	1	GAUGE, 4IN WTR PRSR 0-3000 BLUE
11	26-014	1	GAUGE, 4IN WTR TMP 140-300F RED
12	26-016	1	GAUGE, VAC 0-30 IN/HG YELLOW
13	29-035	1	SWITCH, OPERATION GREEN
14	29-036	1	SWITCH, OPERATION RED
15	26-018	1	GAUGE, HOUR METER VORTEX
16	26-017	1	GAUGE, TEMP VORTEX
17	30-031	1	LIGHT, PTO VORTEX
18	23-001	1	VLV, BALL 1/4FP BS
19	11-054	2	NUT, 2" CONDUIT METAL LOCK
20	30-032	2	CONDUIT ADAPTOR, 2" PVC MALE
21	64-031	1	TBG, 2-1/4 SS CONDUIT VORTEX

*30-028 FUSE, 20 AMP

SECTION 5



5-2

Control Panel Fittings

Item No.	Part Number	Qty	Description
1	29-034	2	SWITCH, CONTACT BLOCK
2	30-027	2	BLOCK, TERMINAL 10 POSITION
3	30-029	0.5	BLOCK, GROUNDING BAR KIT
4	34-010	2	RELAY, ENG.SHUTDWN12V20/30AMP
5	21-041	1	TEE, 3/8 IN. BRASS
6	21-052	1	NIP, 3/8 X 1/4 HEX BRASS
7	21-011	1	ELL, 1/8 P X 1/4 POLY BR
8	21-200	2	BUSHING, 3/8 X 1/8 IN BRASS
9	34-021	1	SENSOR, VAC GAUGE 0-30HG VRTX
10	21-255	1	NIPPLE, 1/-NPT X 1-1/2 SS
11	21-256	1	CONNECTOR, 1/8NPT X 1/4T HEX SS
12	21-007	3	FTTG, BRB 1/8 PX 5/16 H BR
13	21-026	1	NIP, 1/4 HEX BR
14	21-038	1	ELL, STREET 1/8 IN. BRASS
15	21-066	1	ELL, 1/8 P X 1/4 T SS

*Not Shown

*29-042

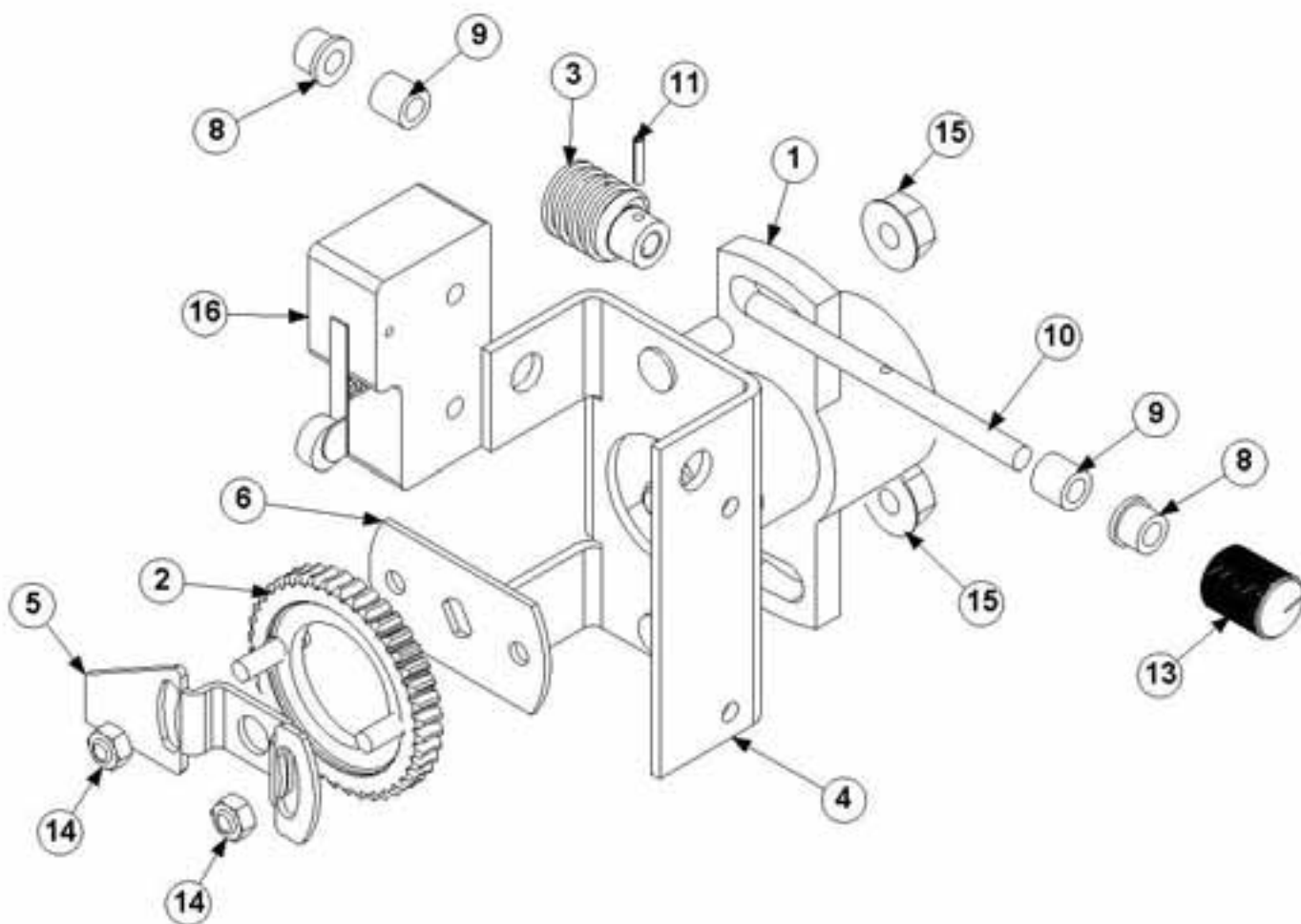
1

SWITCH, PTO TOGGLE

*47-049

1

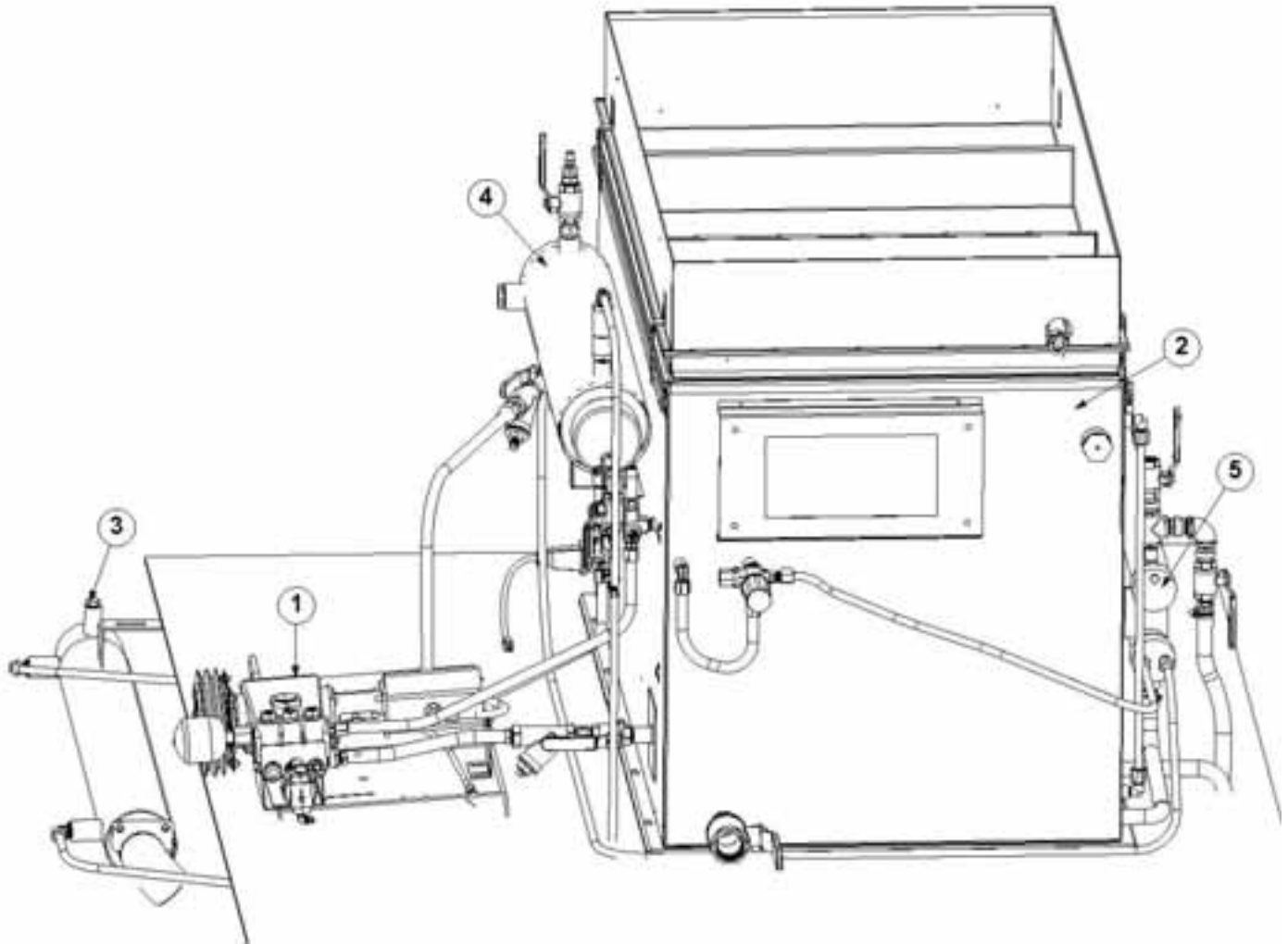
HARNESS, SPEED CONTROL



5-3

69-103 THROTTLE CONTROL VORTEX

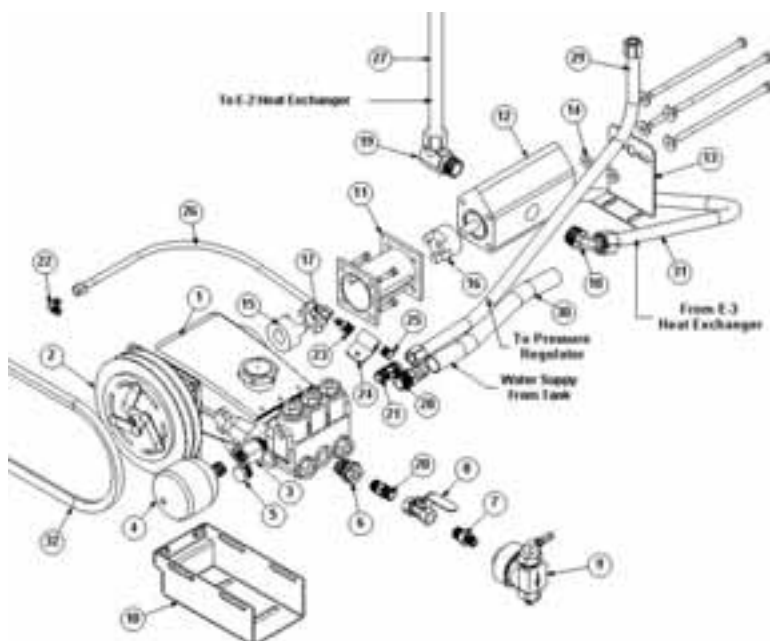
Item No.	Part Number	Qty	Description
1	29-041	1	SWITCH,ROTARY SPEED POT VRTX
2	66-147	1	GEAR, WORM 40 TOOTH 1" BORE
3	39-020	1	GEAR, RH WORM NYLON
4	58-204	1	BRKT, THROTTLE CONTROL VRTX
5	58-205	1	PLT,THROTTLE ACTUATOR VRTX
6	58-206	1	PLT,WORM GEAR MOUNT VRTX
7	10-101	2	STUD, 8-32 X 5/8 PRESS IN
8	39-026	2	BEARING,NYLON 3/16ID 5/16OD 1/4LG
9	55-086	2	TBG,GAROLITE 5/16 OD X 3/16 ID X 40
10	66-167	1	ROD, THROTTLE CONTROL VORTEX
11	15-023	1	PIN, SPRING, 5/64 X 3/8 SS
12	10-102	2	STUD, 1/4-20 X 5/8 PRESS IN
13	66-148	1	KNOB, CONTROL 3-16 BORE
14	11-047	2	NUT, 8-32 SS NYLOK
15	11-050	2	NUT, 1/4-20 SS FLANGE LOCK
16	29-040	1	SWITCH,SHORT HINGE ROLLER



Water Transfer System

5-4

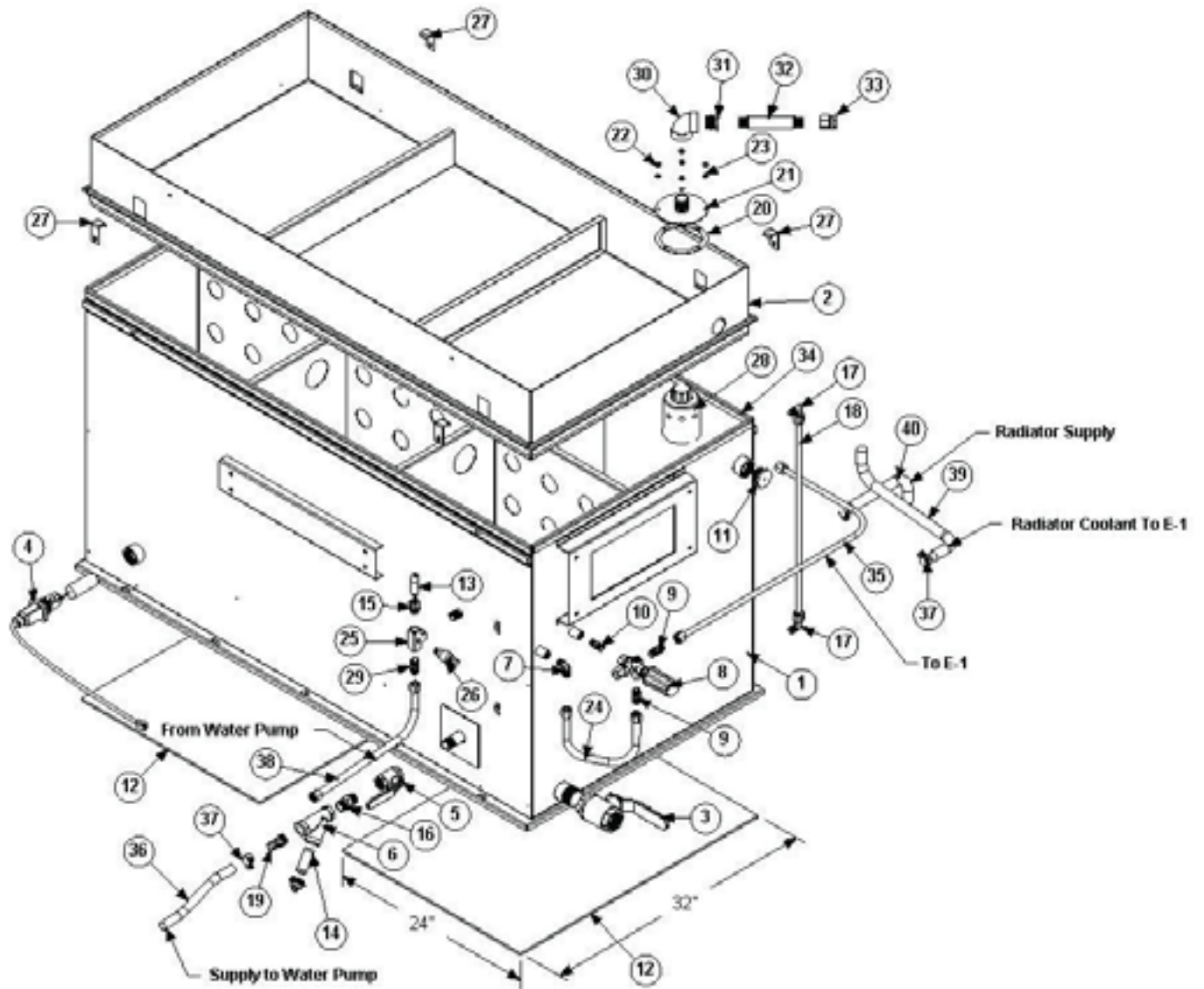
Item No.	Part Number	Qty	Description
1	69-104	1	ASSY, WATER PUMP VORTEX
2	69-105	1	ASSY,FRESH WATER TANK VORTEX
3	69-106	1	ASSY,E-3 EXHAUST HEAT EXCHANGER
4	69-107	1	ASSY,E-2 HEAT EXCHANGER
5	69-108	1	ASSY,E-1 HEAT EXCHANGER



5-5

69-104 ASSY, WATER PUMP VORTEX

Item No.	Part Number	Qty	Description
1	46-032	1	PUMP, WTR CAT 5CP6120-3
2	35-005	1	CLUTCH, ELECT CAT 5CP 2 GROOVE
3	21-232	1	ADAPTOR, 3/8M X 1/2F SS NPT
4	46-045	1	ACCUMULATOR, CAT 6028
5	21-065	1	PLUG, 1/2 SOLID BRASS HEX HD
6	66-166	1	ADAPTOR, WATER PUMP VORTEX
7	21-231	1	NIPPLE, 1/4 X 3/8 SS NPT
8	23-053	1	VLV, 3/8" SS BALL 760T02
9	46-012	1	PUMP, CHEMICAL STAINLESS STEEL
10	59-704	1	BRKT,WTR PUMP MNT VORTEX
11	61-252	1	ASSY, OIL PUMP STANDOFF VRTX
12	46-044	1	PUMP, SPUR GEAR
13	58-188	1	BRKT,OIL PUMP SUPPORT VORTEX
14	58-213	2	PLT,PUMP MOUNT SPACER VORTEX
15	38-038	1	HUB, 20MM SHAFT COUPLING
16	38-039	1	HUB, 1/2" SHAFT COUPLING
17	38-040	1	HUB, SPIDER HYTREL L075
18	21-251	1	ELBOW, 3/4 MNPT X 1/2 FJIC
19	21-248	1	ELBOW,3-4MPT X 3-4JIC 90 DEG
20	21-053	1	NIP, 3/8 HEX SS
21	21-057	1	CONN, 3/8 P X 1/2 T BRASS
22	21-064	1	ELL, 1/4 P X 1/4 T BRASS
23	21-050	1	CONN, 1/4 P X 1/4 T BRASS
24	61-018	1	BRKT, FIN FUEL RETURN THERMAL
25	21-049	1	PLUG, 1/4 IN. BRASS
26	18-016	1	HOSE, 3/16 X 16-1/2 1/4FT X 1/4FT
27	18-119	1	HOSE,3/4 BRAIDED SS X 28" VRTX
28	21-032	1	FTTG, BARB 1/2 P X 3/4 H BRASS
29	18-131	1	HOSE, 1/2T X 1/2T X 26 NO CVR
30	16-004	12	HOSE, WTR. 3/4 IN HRZ. 500FT BULK
31	18-117	1	HOSE,1/2 BRAIDED SS X 42" VRTX
32	37-050	1	BELT, AX54



5-3

69-105 ASSY, FRESH WATER TANK VORTEX

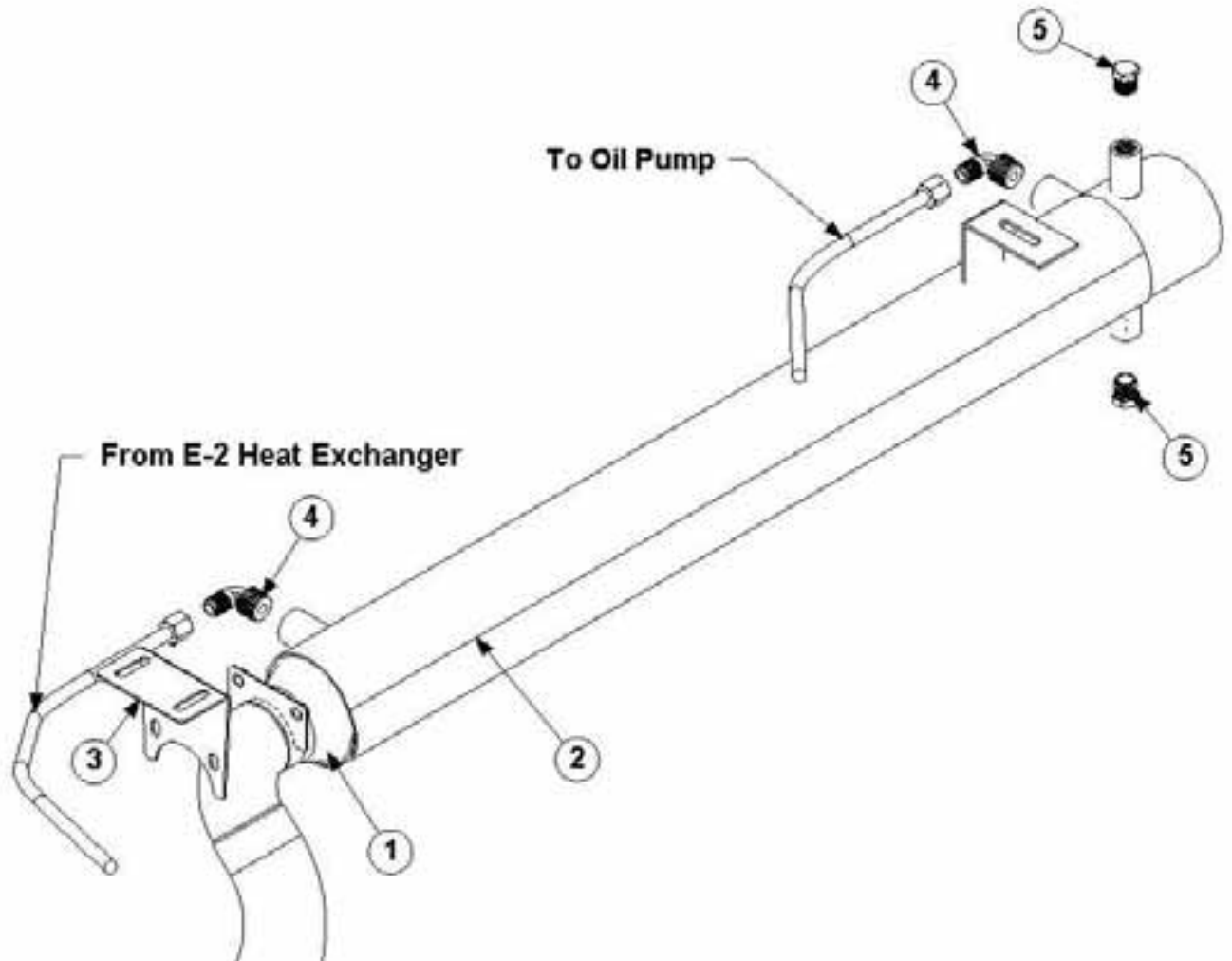
69-105 ASSY, FRESH WATER TANK VORTEX

5-3

Item No.	Part Number	Qty	Description
1	61-265	1	ASSY,WATER TANK 220 GAL VORTEX
2	61-267	1	ASSY,COVER WATER TANK VORTEX
3	23-050	1	VLV,1-1/2" SMITH-COOPER BRASS BALL
4	69-113	1	ASSY,LEVEL SENSOR WTR TNK
5	23-051	1	VLV,3/4" SMITH-COOPER BRASS BALL
6	23-054	1	VLV,3/4" BRASS WYE STRAINER 145T04
7	21-061	1	ELL, 3/8 P X 1/2 T BRASS
8	23-021	1	Pressure Regulator
9	21-057	2	CONN, 3/8 P X 1/2 T BRASS
10	21-046	1	NIP, 3/8 IN. HEX BRASS
11	66-162	1	VENT, 1-1/2" PVC PLUG VORTEX
12	52-037	4	SHT, 1/2 INCH POLY PRO 48X96
13	23-047	1	VLV, RELIEF VORTEX
14	20-025	1	SCREEN, 3/4" WYE STRAINER
15	21-233	1	BUSHING,REDUCE 1-2 NPT X 1/4 NPT
16	21-237	1	NIPPLE, 3/4 MPT X 3/4 MPT BRASS
17	21-207	2	ELBOW, POLYPRO 3/8 MPT X 1/2 HOSE
18	16-056	22	HOSE, 1/2 OD X 3/8 ID CLEAR
19	21-009	1	FTTG, BRB 3/4 PX 3/4 H BR
20	41-048	1	GASKET, 1/16 NEOPRENE X 5"OD
21	61-283	1	ASSY,COVER FLOAT FRESH WAT VRTX
22	11-001	4	NUT, 1/4-20 SS
23	12-003	4	LKWSR, 1/4 IN SS
24	18-126	1	HOSE,1/2X15 1/2FTX1/2FT NO COVER
25	66-146	1	TEE, 1/2 F W- 1/4-18 NPT PORT
26	34-020	1	SENSOR,WTR PRESS 0-3000 PSI VRTX
27	58-181	4	BRKT, LOCK CLAMP WATER TANK
28	23-058	1	VLV,1" FPT H-TEMP FLOAT HUDSON
29	21-012	1	CONN, 1/2 PX 1/2 T
30	21-252	1	ELL, 1" FNPT SS
31	21-253	1	BUSHING, 1"MNPT X 3/4"FNPT SS
32	21-242	1	NIPPLE, 3/4" X 6" SS
33	21-254	1	CONNECTOR,3/4 FNPT X 3/4 G HOSE
34	16-058	179	TRIM,1B150B2 X 1/8 C 250 FT
35	18-130	1	HOSE, 1/2T X 1/2T X 45 NO CVR
36	16-004	12	HOSE, WTR. 3/4 IN HRZ. 500FT BULK
37	14-006	3	CLAMP, HOSE #20
38	18-131	1	HOSE, 1/2T X 1/2T X 26 NO CVR
39	16-063	24	HOSE, 3/4" HEATER HOSE
40	16-063	96	HOSE, 3/4" HEATER HOSE

5-4

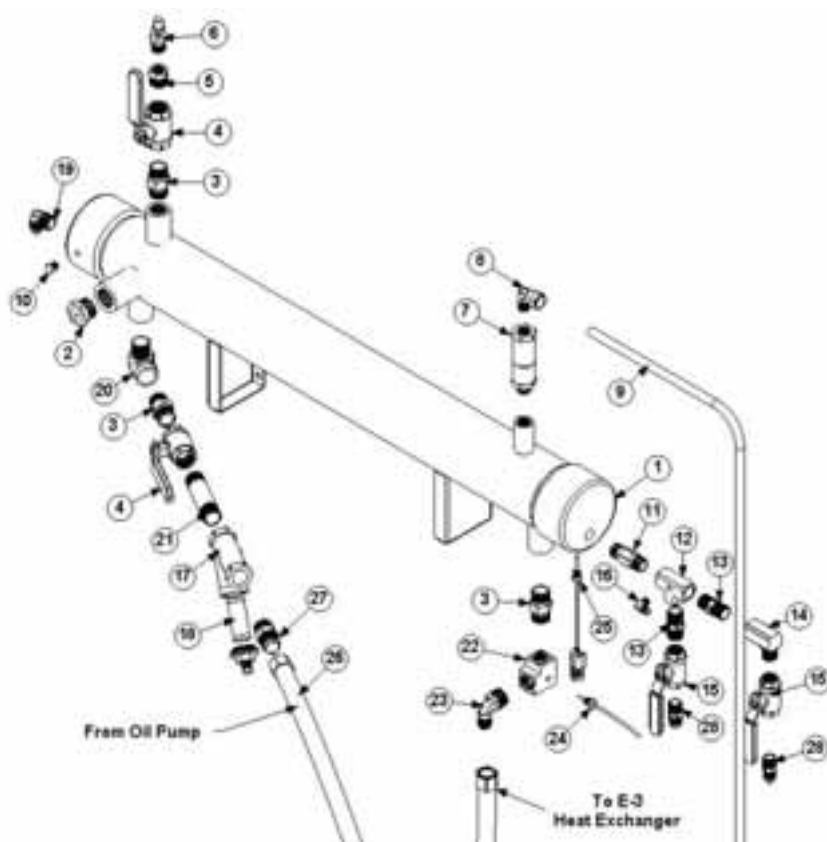
SECTION 5



5-5

69-106 ASSY,E-3 EXHAUST HEAT EXCHANGER

Item No.	Part Number	Qty	Description
1	63-073	1	ASSY,E-3 FIN HEAT EXCH VORTEX
2	43-006	1	INSULATION, HEAT EXCH E-3 VRTX
3	58-214	1	BRKT, E-3 MOUNT SUPPORT
4	21-074	2	ELL, 3/4 P X 1/2 T BRASS
5	21-065	2	PLUG, 1/2 SOLID BRASS HEXHD

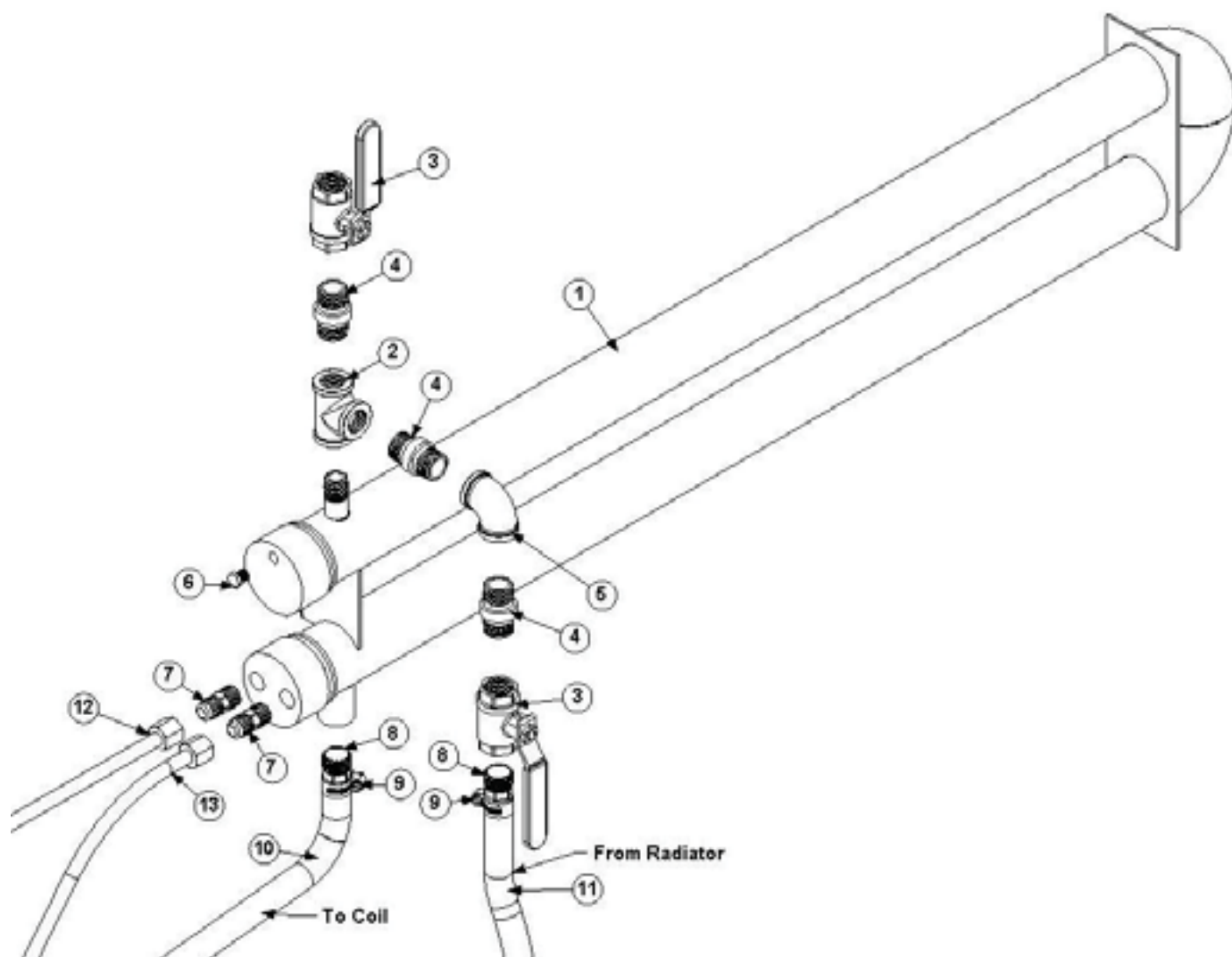


5-5

69-107 ASSY, E-2 HEAT EXCHANGER

Item No.	Part Number	Qty	Description
1	63-074	1	ASSY, E-2 HEAT EXCH VORTEX
2	28-004	1	SIGHT GLASS, ELECTRO SEAL 1" MPT
3	21-237	3	NIPPLE, 3/4 MPT X 3/4 MPT BRASS
4	23-051	2	VLV, 3/4" SMITH-COOPER BRASS BALL
5	21-131	1	BUSHING, 3/4M X 1/2F IN BRASS
6	23-055	1	VLV, 1/2" SS MPT PURGE SS-4PM8
7	23-057	1	VLV, RELIEF 1/2" BRASS PORTS VRTX
8	21-234	1	ELL, 1/2M X 1/2 TUBE 90DEG SS
9	64-032	1	TBG, E-2 PRESSURE OVERFLOW
10	21-215	1	PLUG, 1/8 NPT 304SS
11	23-056	1	VLV, 1/2" MPT CHECK B-8CP 2-10
12	66-145	1	TEE, 1-2 W- 1-8 27 NPT PORT
13	21-047	2	NIP, 1/2 IN. HEX BRASS
14	21-034	1	ELL, STREET 1/2 BRASS
15	23-052	2	VLV, 1/2" SS BALL 760T03
16	21-066	1	ELL, 1/8 P X 1/4 T SS
17	23-054	1	VLV, 3-4 BRASS WYE STRAINER 145T04
18	20-025	1	SCREEN, 3/4" WYE STRAINER
19	21-015	1	ELL, 1/2 P X 1/2 T BRASS
20	21-245	1	ELL, 3/4 90 DEG STREET SS
21	21-171	1	NIPPLE, 3/4" PIPE X 4" SS
22	66-168	1	ELBOW, 3/4FP X 3/4FP X 1/8-27FP
23	21-074	1	ELL, 3/4 P X 1/2 T BRASS
24	34-024	1	THERMOCOUPLER VORTEX
25	34-019	1	SENSOR, WTR TEMP 140-300F VRTX
26	18-119	1	HOSE, 3/4 BRAIDED SS X 28" VRTX
27	21-247	1	NIPPLE, 3/4 MPT X 3/4 JIC
28	21-012	2	CONN, 1/2 PX 1/2 T

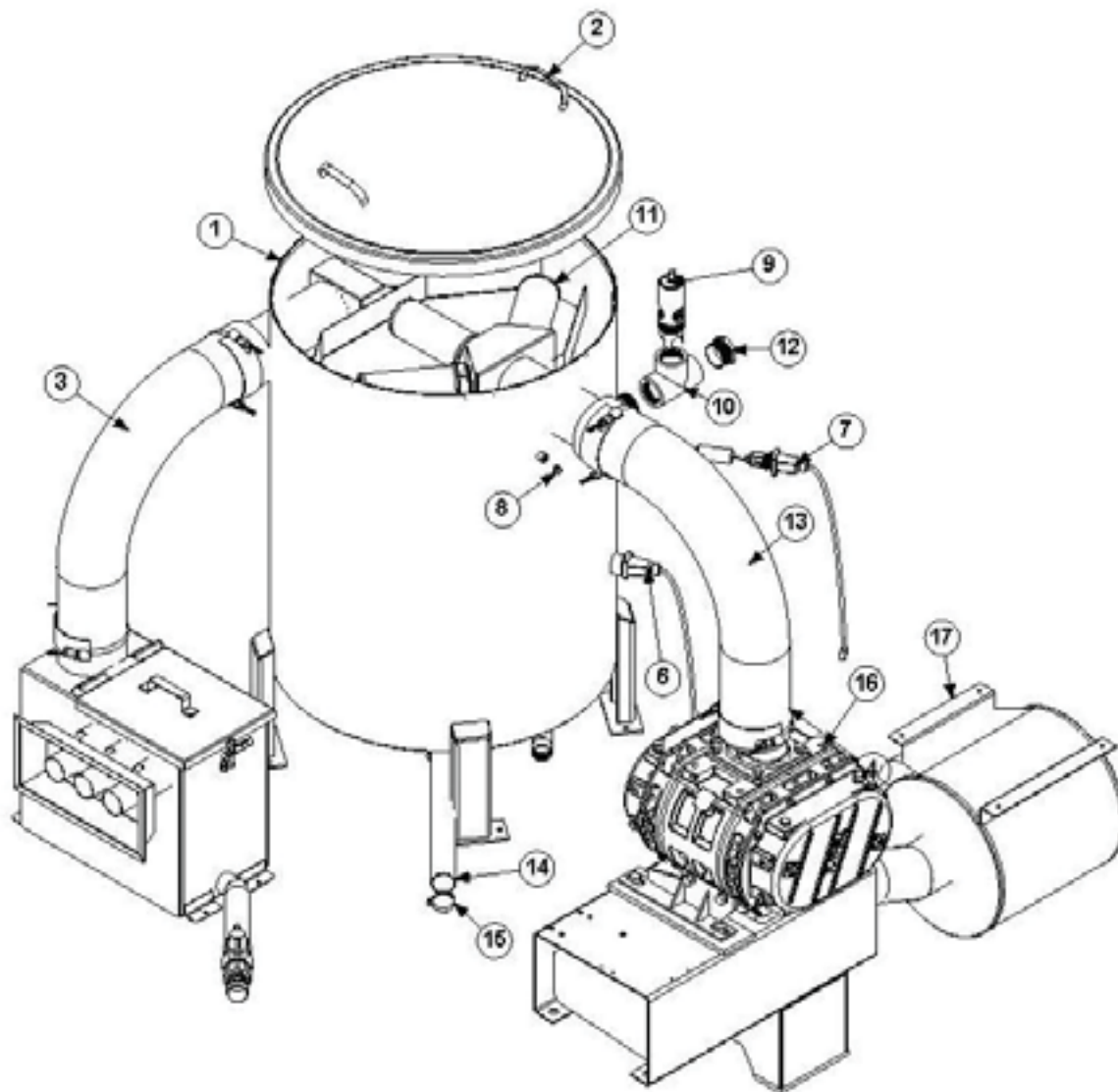
SECTION 5



5-6

69-108 ASSY, E-1 HEAT EXCHANGER

Item No.	Part Number	Qty	Description
1	63-075	1	ASSY,E-1 HEAT EXCH VORTEX
2	21-236	1	TEE, 3/4 NPT BRASS
3	23-051	2	VLV,3/4" SMITH-COOPER BRASS BALL
4	21-237	3	NIPPLE, 3/4 MPT X 3/4 MPT
5	21-238	1	ELBOW, 3/4 FPT X 3/4 FPT
6	21-215	1	PLUG, 1/8 NPT 304SS
7	21-012	2	CONN, 1/2 PX 1/2 T
8	21-009	2	FTTG, BRB 3/4 PX 3/4 H BR
9	14-006	2	CLAMP, HOSE #20
10	16-063	24"	HOSE, 3/4" HEATER HOSE
11	16-063	90"	HOSE, 3/4" HEATER HOSE
12	18-130	1	HOSE, 1/2T X 1/2T X 45 NO CVR
13	18-129	1	HOSE, 1/2T X 1/2T X 115 NO CVR

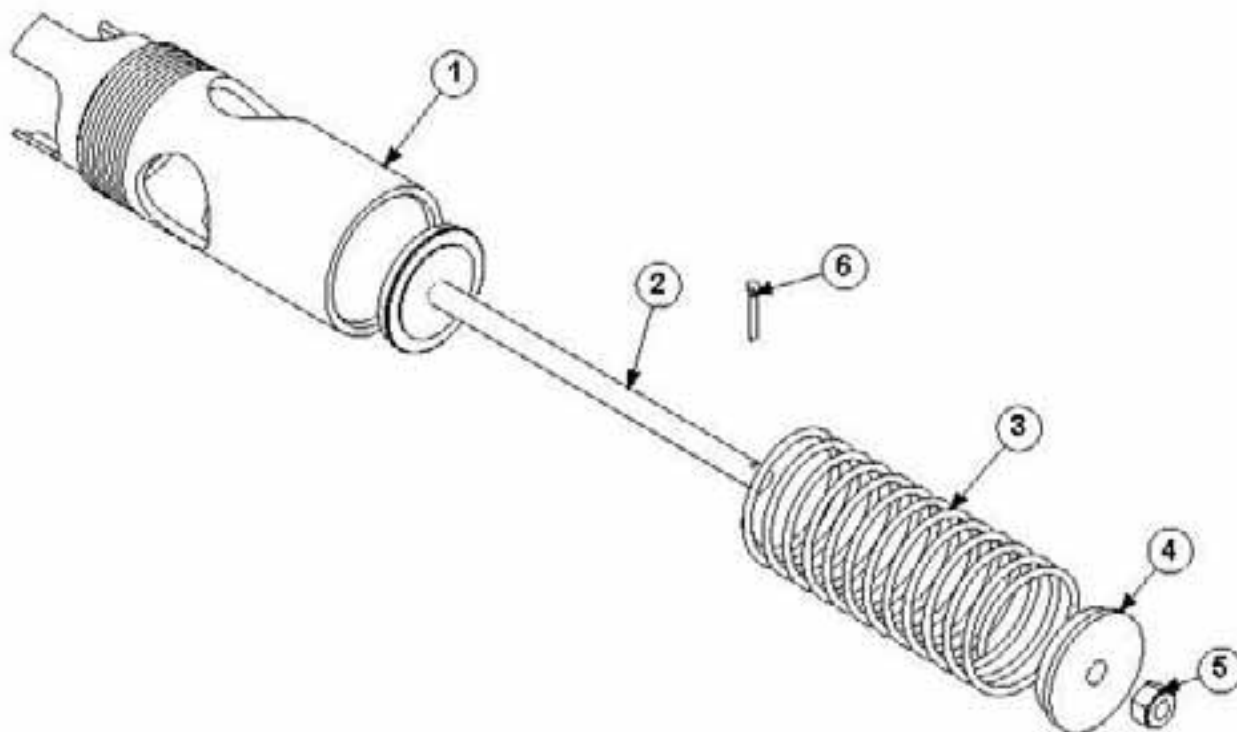


5-7

69-109 ASSY, WASTE RECOVERY VORTEX

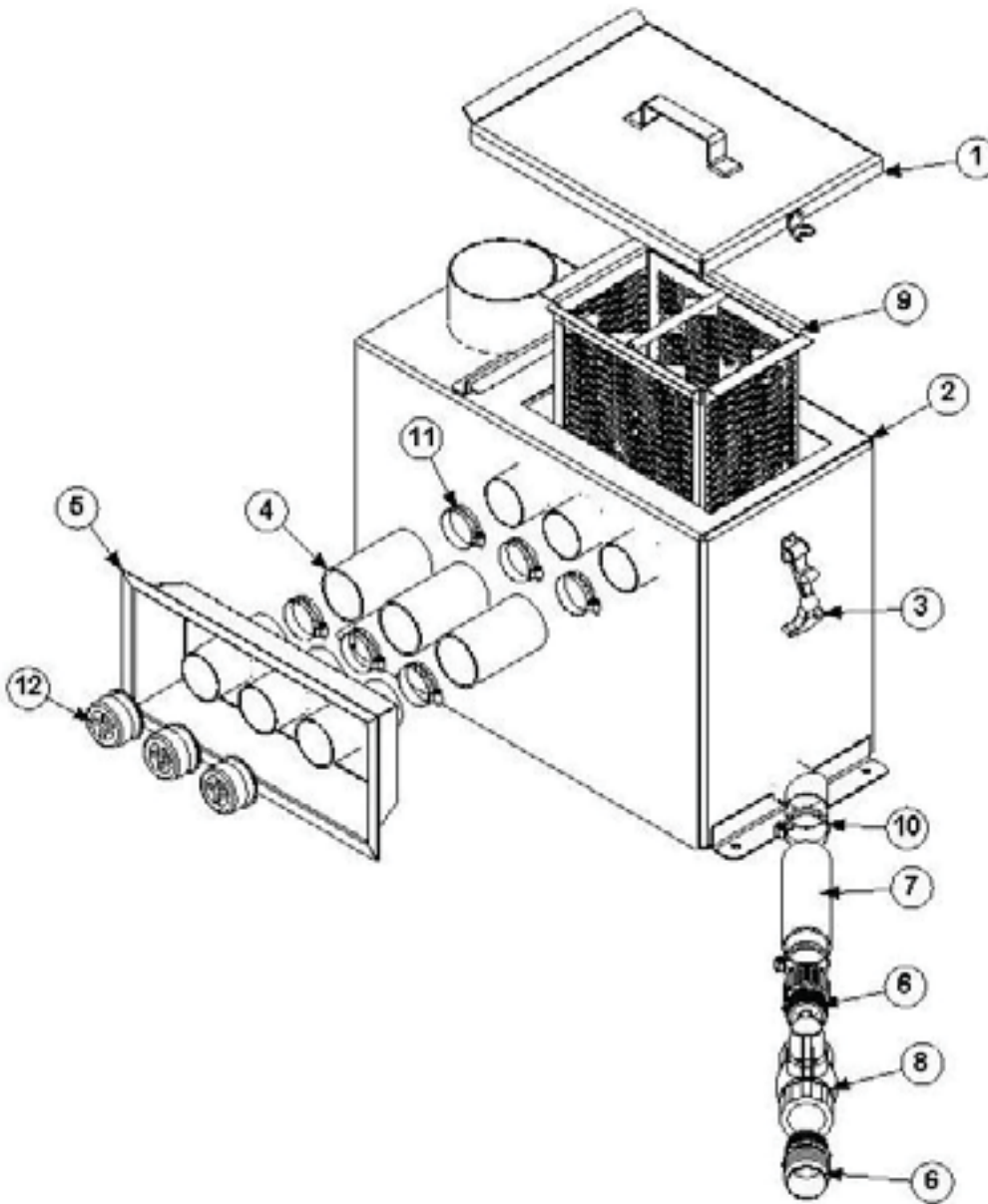
Item No.	Part Number	Qty	Description
1	61-274	1	ASSY,WASTE TANK VRTX W/PREFILTER
2	61-284	1	ASSY, LID WASTE TANK VORTEX
3	16-060	55"	HOSE,5" KANAFLEX 180 R
4	14-034	4	CLAMP, HOSE TWIN RING 5.5 TO 5.7
5	68-108	1	ASSY, VORTEX PRE-FILTER BOX
6	69-002	1	ASSY, LVL SENSOR SHTOFF WASTE PMP
7	69-000	1	WIRING , LEVEL SENSOR SHUTOFF
8	21-146	1	PLUG, 3/8 NPT BRASS
9	69-100	1	ASSY, VAC RELIEF VALVE VORTEX
10	21-214	1	TEE, 2 X 2 SCH 80 PVC
11	20-021	3	STRAINER, FILTER BLUEWAVE
12	21-198	1	PLUG, 2INCH MPT SCHD 40 PVC
13	16-060	55"	HOSE,5" KANAFLEX 180 R
14	16-009	36"	HOSE, INT VAC 2 IN.
15	14-010	2	CLAMP, HOSE #32
16	46-033	1	VACUUM PUMP TI-850-46L2-4322
17	63-072	1	MUFFLER, VAC EXHAUST VORTEX

*48-023 VORTEX WASTE TANK LID SEAL KIT



69-100 ASSY, VAC RELIEF VALVE VORTEX

Item No.	Part Number	Qty	Description
1	66-132	1	BODY, VACUUM RELIEF VORTEX
2	61-262	1	ASSY,VACUUM RELIEF DISK
3	15-016	1	SPRING,VAC RELIEF VORTEX
4	66-133	1	WASHER, RELIEF VALVE VORTEX
5	11-019	1	NUT,3/8-16 NYLOK
6	14-032	1	PIN, COTTER 7/64 X 3/4 SS



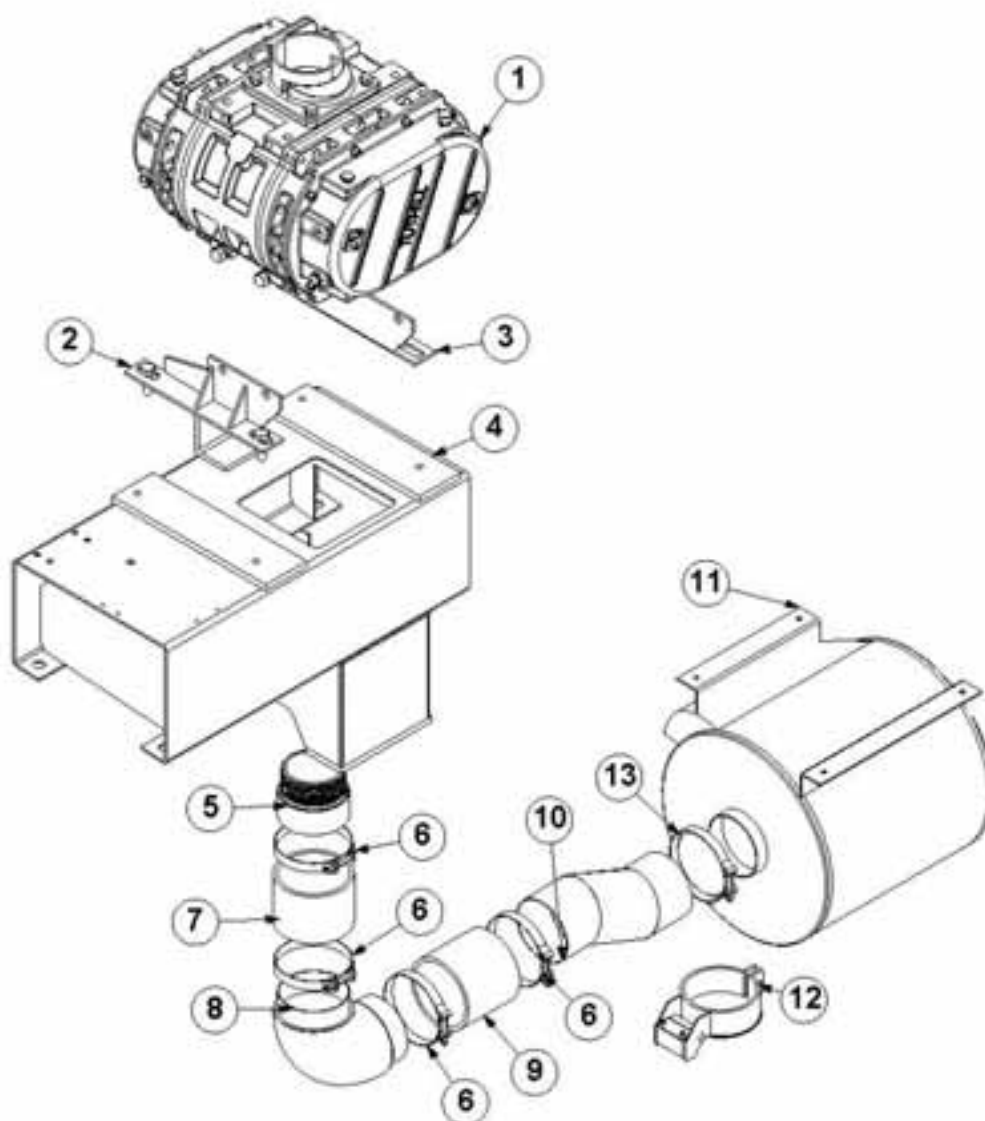
5-8

68-108 ASSY, VORTEX PRE-FILTER BOX

Item No.	Part Number	Qty	Description
1	61-273**	1	ASSY,LID PRE-FILTER BOX VORTEX
2	61-272	1	ASSY,PRE-FILTER BOX VORTEX
3	40-003	1	LATCH, PRE-FILTER BOX
4	16-010	3	HOSE, INT VAC 2-1/2 IN 50 FT BULK
5	61-285	1	ASSY, VACUUM INLET PORTS VRTX
6	21-094	2	FTTG, 1-1/2 P X 2 H DRAIN
7	16-009	1	HOSE, INT VAC 2 IN.
8	23-022	1	VLV, BALL 1-1/2 FP PVC DUMP
9	61-002	1	BASKET, STRAINER WASTE TANK
10	14-010	2	CLAMP, HOSE #32
11	14-024	6	CLAMP, HOSE #48
12	19-013	3	CAP, WASTE TNK INLET VORTEX

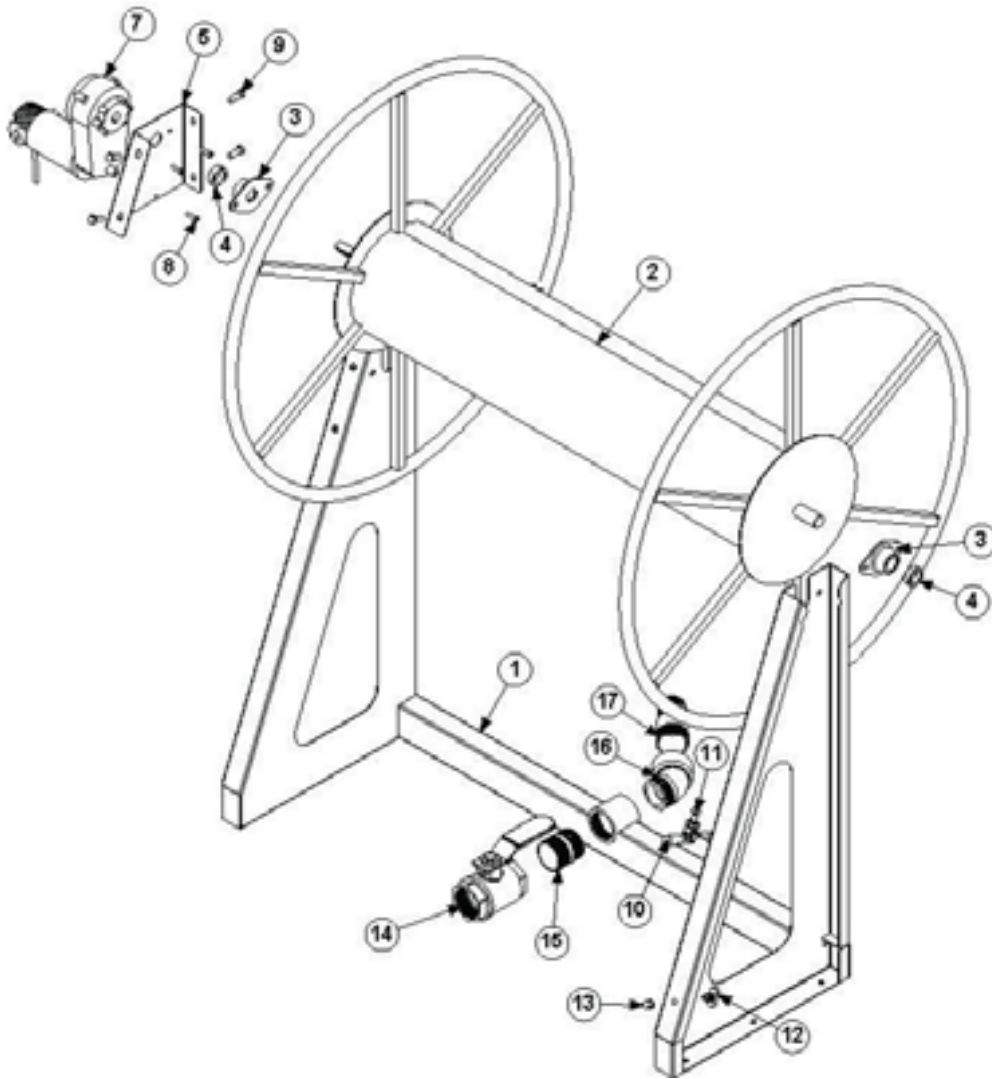
*REDUCER, 2-1/2" TUBE - 2" HOSE #19-014

**1 IN SPONGE GASKET #41-018



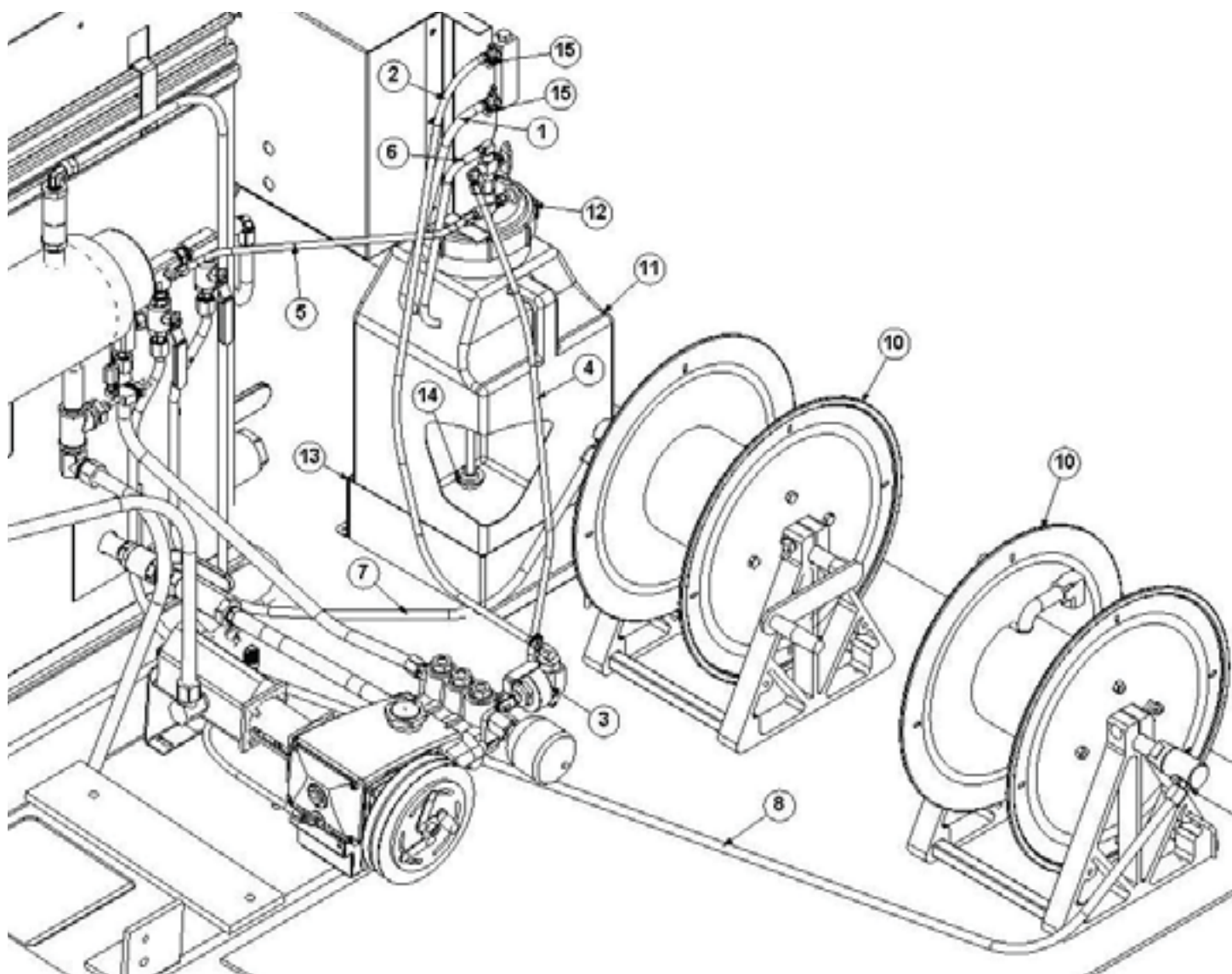
VACUUM PUMP EXHAUST

Item No.	Part Number	Qty	Description
1	46-033	1	VACUUM PUMP TI-850-46L2-4322
2	61-271	1	ASSY,BLOWER MOUNT VORTEX
3	61-271	1	ASSY,BLOWER MOUNT VORTEX
4	61-261	1	ASSY,BLOWER MOUNTING BRACKET
5	61-281	1	ASSY,ADAPTOR VAC OUTLET VORTEX
6	14-026	4	CLAMP,HOSE #80
7	16-061	1	HOSE,5"ID X 12-1/2FT W/REINFORCED
8	61-282	1	ASSY,ADAPTOR VAC 90 OUT VORTEX
9	16-061	1	HOSE,5"ID X 12-1/2FT W/REINFORCED
10	61-288	1	ASSY,CONNECTOR EXHST VORTEX
11	63-072	1	MUFFLER, VAC EXHAUST VORTEX
12	69-110	1	ASSY,VAC EXHAUST FLAP VORTEX
13	14-039	1	CLAMP, 5" T-BOLT



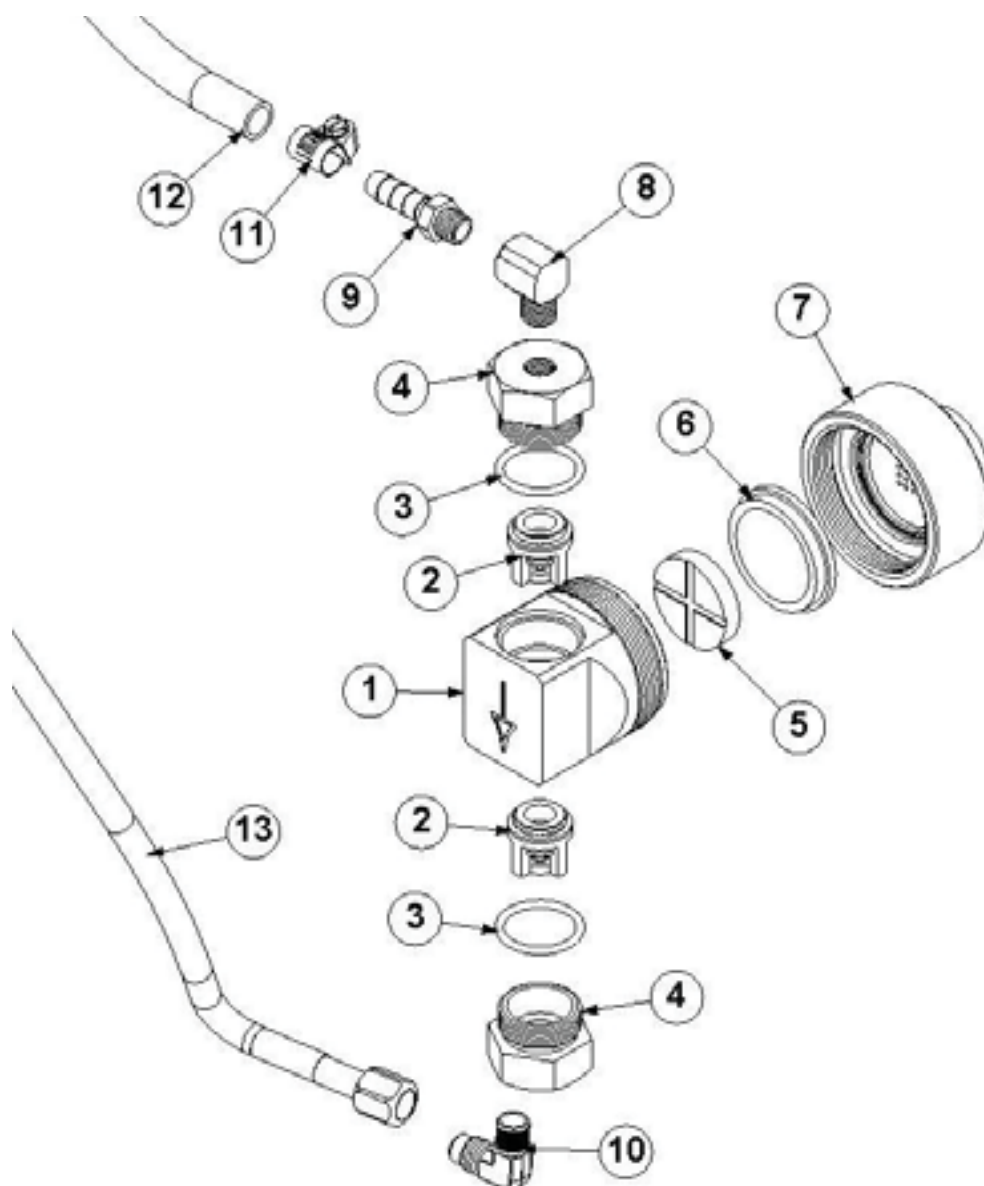
68-103 ASSY, SS HOSE REEL VORTEX

Item No.	Part Number	Qty	Description
1	61-276	1	ASSY,BASE HOSE REEL VORTEX
2	61-277	1	ASSY, 34-1/2" SS REEL VORTEX
3	39-003	2	FLANGE, BEARING SOL HOSE REEL
4	39-002	2	COLLAR, 1 IN SHFT SOL HOSE REEL
5	59-801	1	PNL,GEAR MOTOR MOUNT VORTEX
6	10-020	1	SCREW, MACH 1/4-20 X 3/4 HXHD SS
7	45-017	1	MOTOR, VORTEX HOSE REEL
8	10-021	3	SCREW, MACH 1/4-20 X 3/4 SOCHD SS
9	10-029	4	SCREW, MACH 3/8-16 X 1 HXHD
10	40-016	1	CLAMP, PUSH/PULL
11	15-020	1	BUMPER, 5/16-18 POLYURETHANE
12	29-037	1	SWITCH, PUSH BUTTON SELECTA
13	29-038	1	SWITCH, BOOT PUSH BUTTON
14	23-049	1	VLV,2" SMITH-COOPER BRASS BALL
15	21-220	1	NIPPLE, 2 IN SCHD 40 CLOSED
16	21-222	1	ELL, 2" 45 DEG STREET ABS
17	21-225	1	BARB, 2" MPT X 2" HOSE ZINC



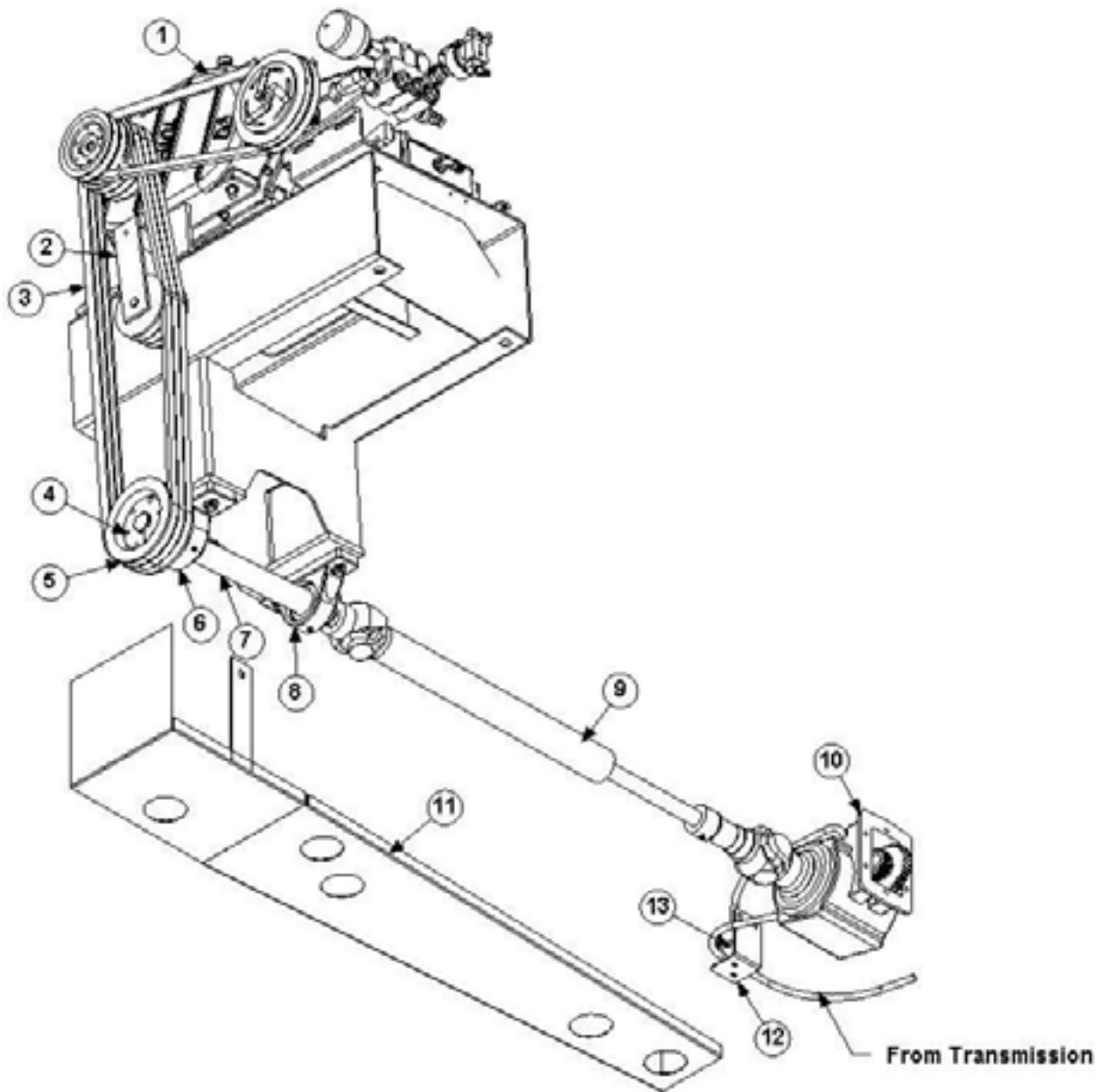
CHEMICAL SYSTEM

Item No.	Part Number	Qty	Description
1	16-017	60"	TUBING, IMPOLENE 250FT
2	16-017	45"	TUBING, IMPOLENE 250FT
3	46-012	1	PUMP, CHEMICAL STAINLESS STEEL
4	18-102	1	HOSE, 3/16X 37 X 1/4FT
5	18-016	1	HOSE, 3/16 X 16-1/2 1/4FT X 1/4FT
6	16-017	60"	TUBING, IMPOLENE 250FT
7	18-131	1	HOSE, 1/2T X 1/2T X 26 NO CVR
8	18-132	1	HOSE, 1/2T X 1/2T X 88 NO CVR
9	21-012	2	CONN, 1/2 PX 1/2 T
10	68-097	2	ASSY, 8" STAINLESS HOSE REEL
11	51-013	1	MOLDING LARGE MOUTH JUG
12	21-025	1	CAP, 5 IN. WATER BOX/TANK BLACK
13	68-014	1	ASSY, SINGLE 5 GAL JUG HOLDER
14	20-002	1	STRAINER, SUCTION END 1/8FP
15	14-007	2	CLAMP, HOSE # 4



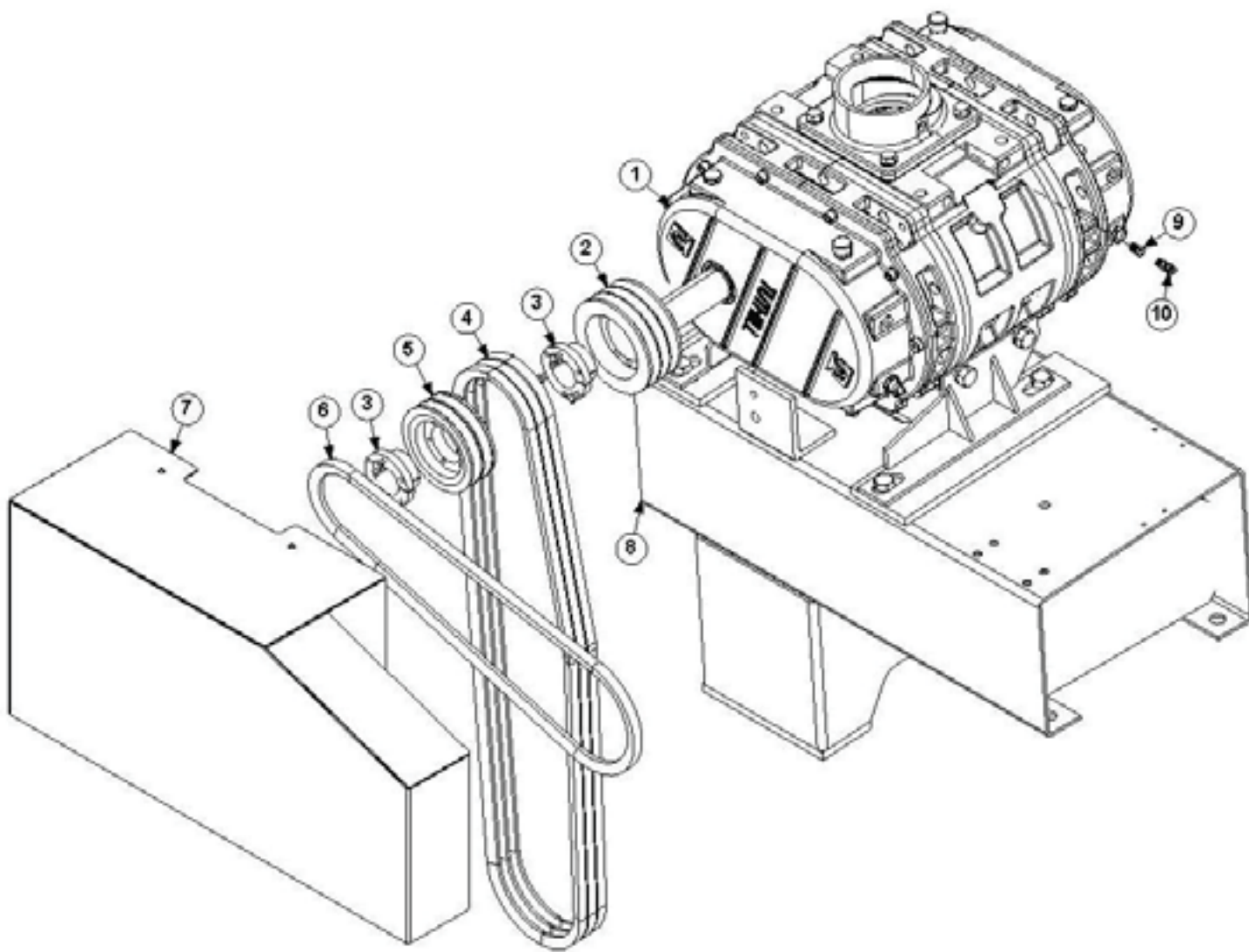
CHEMICAL PUMP

Item No.	Part Number	Qty	Description
1	66-008	1	BODY, CHEMICAL PUMP STAINLESS
2	36-004	2	VLV, CHECK HYPRO
3	41-007	2	ORING, 7/8 ID 1-1/16 OD
4	66-006	2	CAP, CHECK VALVE CHEM PUMP SS
5	36-003	1	DISC, CHEM PUMP
6	36-000	1	DIAPHRAGM, CHEMICAL PUMP
7	66-007	1	COVER, CHEMICAL PUMP STAINLESS
8	21-038	1	ELL, STREET 1/8 IN. BRASS
9	21-007	1	FTTG,BRB 1/8 PX 5/16 H BR
10	21-066	1	ELL, 1/8 P X 1/4 T SS
11	14-007	1	CLAMP, HOSE # 4
12	16-017	45"	HOSE, BRAIDED 5/16 IN. 300FT BULK
13	18-102	1	HOSE, 3/16X 37 X 1/4FT



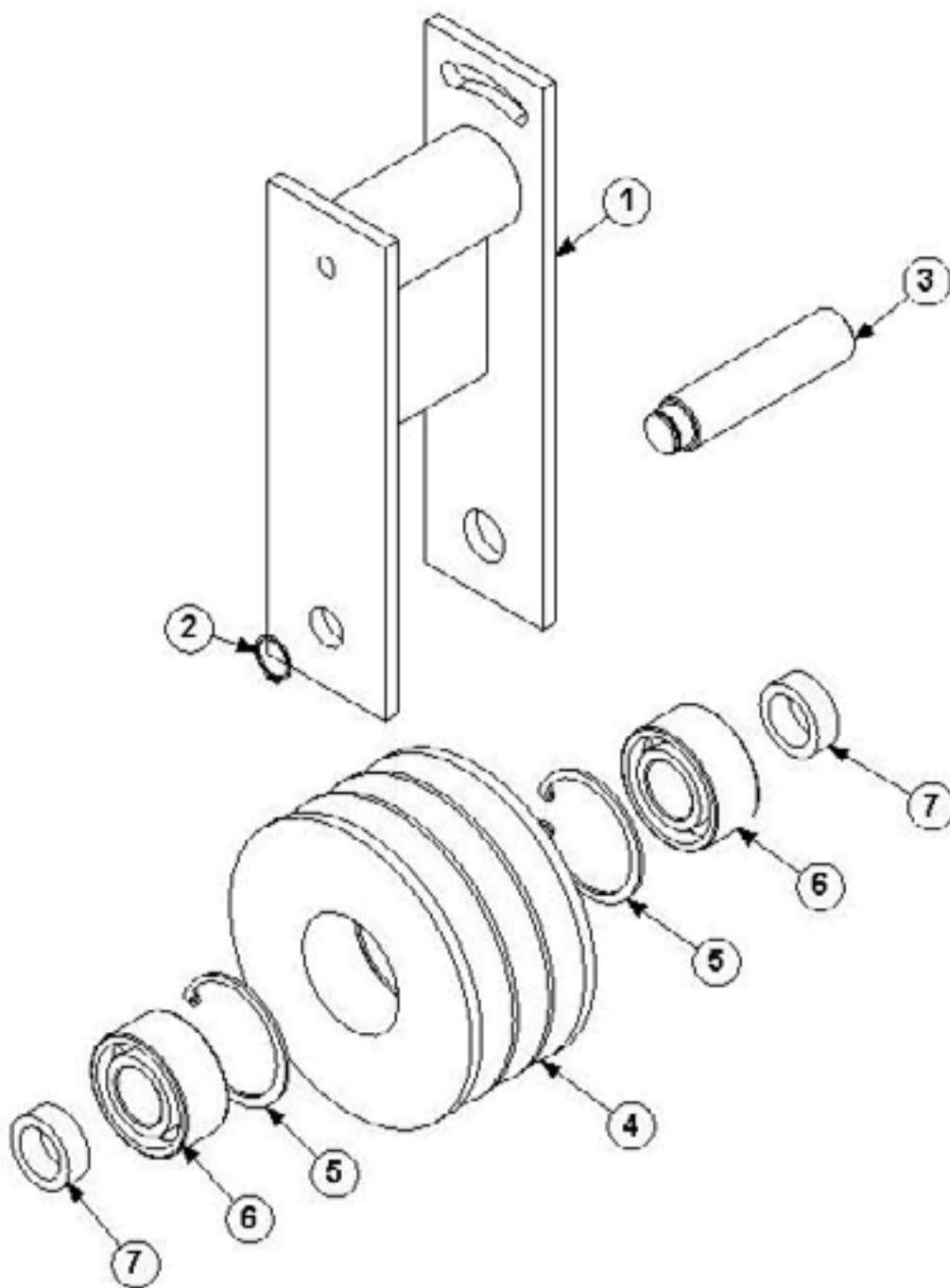
PTO-DRIVE SHAFT ASSEMBLY

Item No.	Part Number	Qty	Description
1	46-033	1	VACUUM PUMP TI-850-46L2-4322
2	69-099	1	ASSY, BELT TENSIONER VORTEX
3	37-053	3	BELT, 5VX 830
4	38-042	1	HUB, SK 1-1/2
5	38-041	1	PULLEY, 5V6.3 SK 3G
6	39-022	1	BEARING, PILLOW 1-1/2 IN
7	66-137	1	SHAFT, BLOWER DRIVE VORTEX
8	39-023	1	BEARING, PILLOW 1-7/16 IN
9	39-025	1	SHAFT, DRIVE LINE VORTEX
10	45-015	1	PTO, AISIN TRANSMISSION A45043L
11	61-296	1	ASSY, PTO SHAFT GUARD VORTEX
12	58-216	1	BRKT, SOLENOID HYDRAULIC VRTX
13	23-060	1	VLV, SOLENOID PTO VORTEX



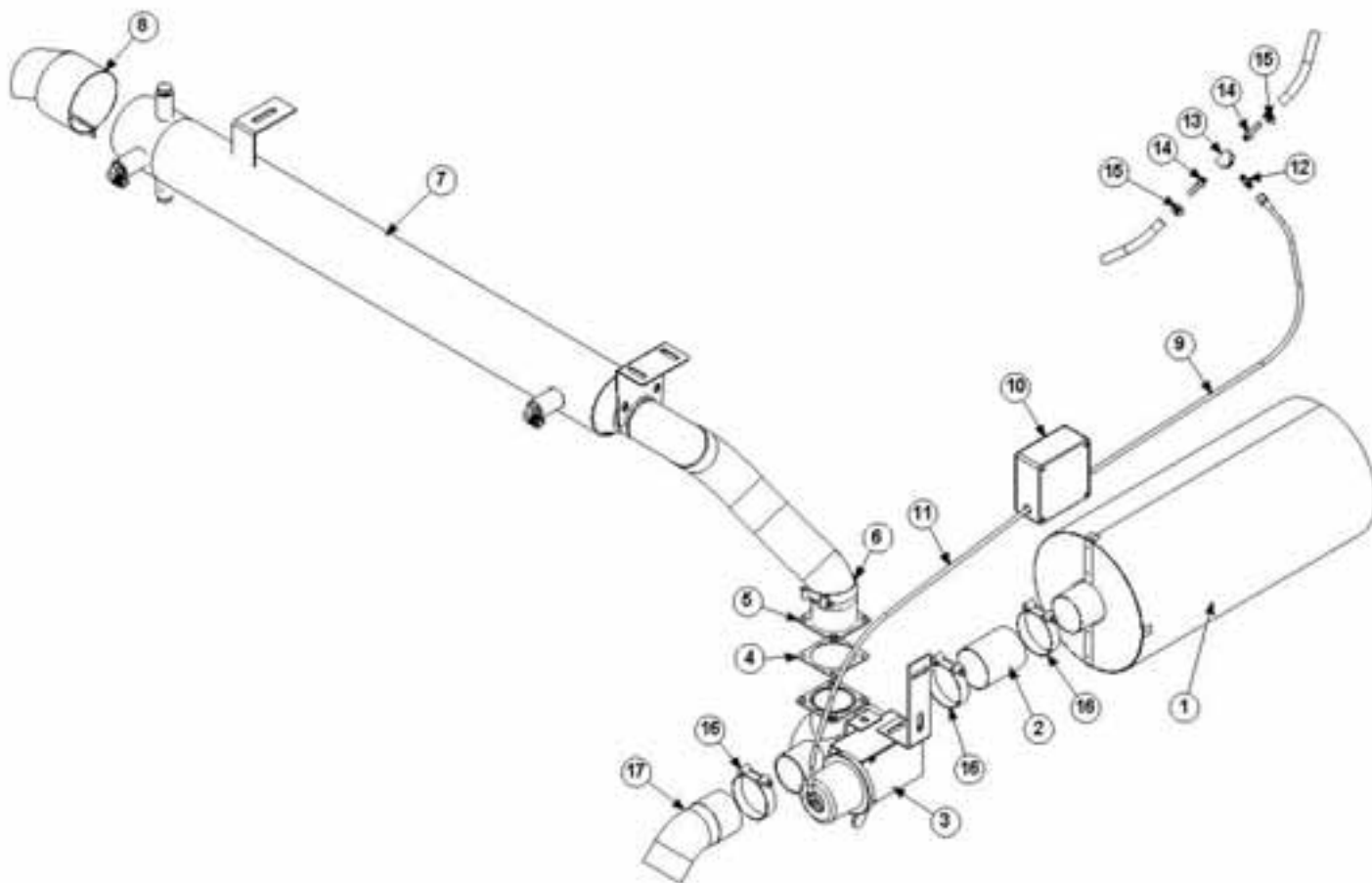
VACUUM PUMP

Item No.	Part Number	Qty	Description
1	46-033	1	VACUUM PUMP TI-850-46L2-4322
2	38-043	1	PULLEY, 5V5.5 SDS 3G
3	38-044	2	HUB, SDS 1-3/4
4	37-053	3	BELT, 5VX 830
5	38-045	1	PULLEY, 2B50 SDS
6	37-050	1	BELT, AX54
7	61-253	1	ASSY, BELT GUARD VORTEX
8	61-261	1	ASSY,BLOWER MOUNTING BRACKET
9	21-076	1	BUSHING, 1/4 M X 1/8 F BRASS
10	21-028	1	CONN, 1/8 P X 1/4 POLY



69-099 ASSY, BELT TENSIONER VORTEX

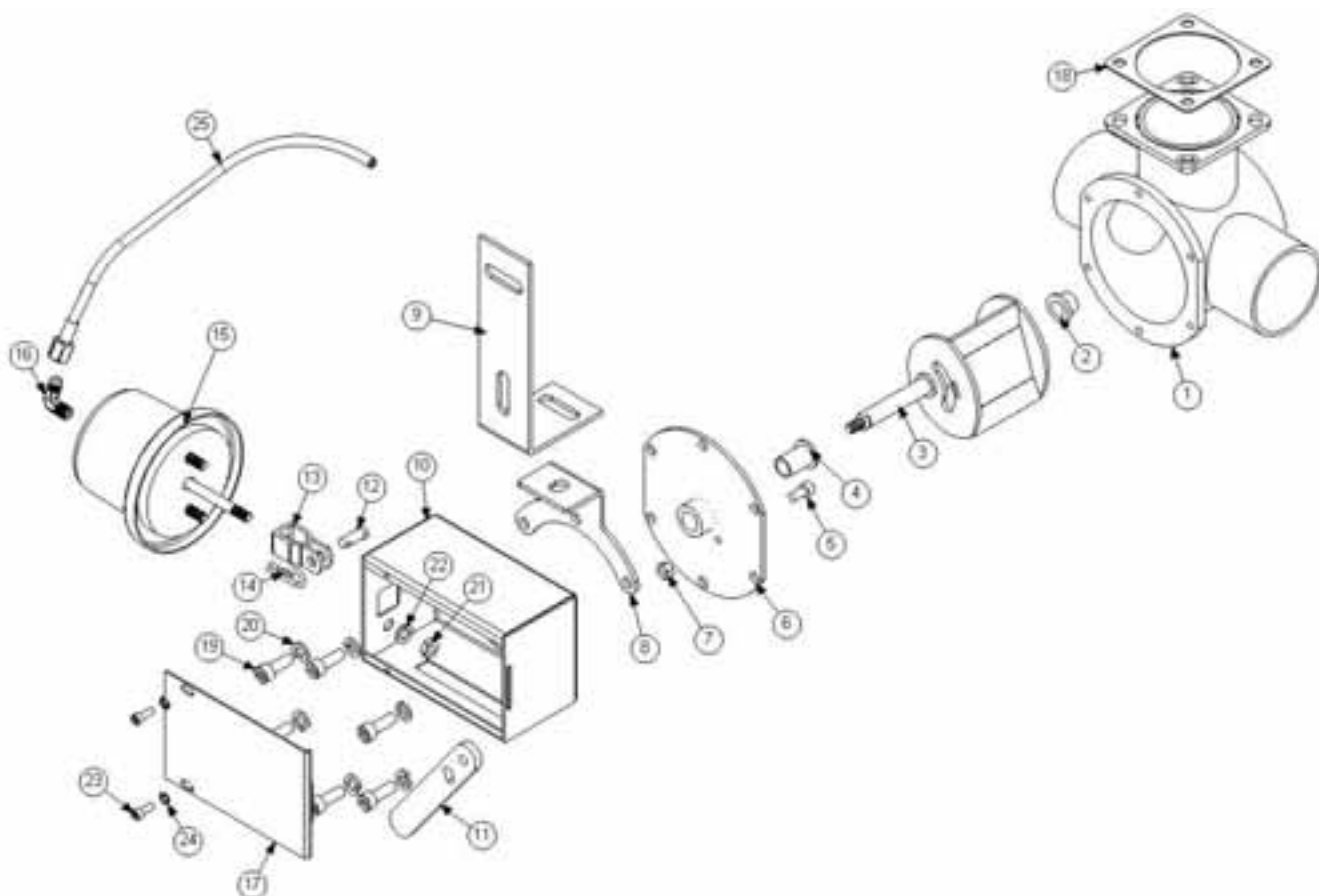
Item No.	Part Number	Qty	Description
1	61-260	1	ASSY,BELT TENSIONER BRACKET
2	15-021	1	SNAP RING, 5/8" SHAFT RETAINER
3	66-151	1	SHAFT, BELT TENSIONER VORTEX
4	66-153	1	PULLEY, TENSIONER VORTEX
5	15-022	2	SNAP RING, 1-7/8" INTERNAL
6	39-024	2	BEARING, 20MM X 47MM X .8125
7	66-150	2	LOCK RING, BELT TENSIONER VRTX



Exhaust Diverter Valve Assembly

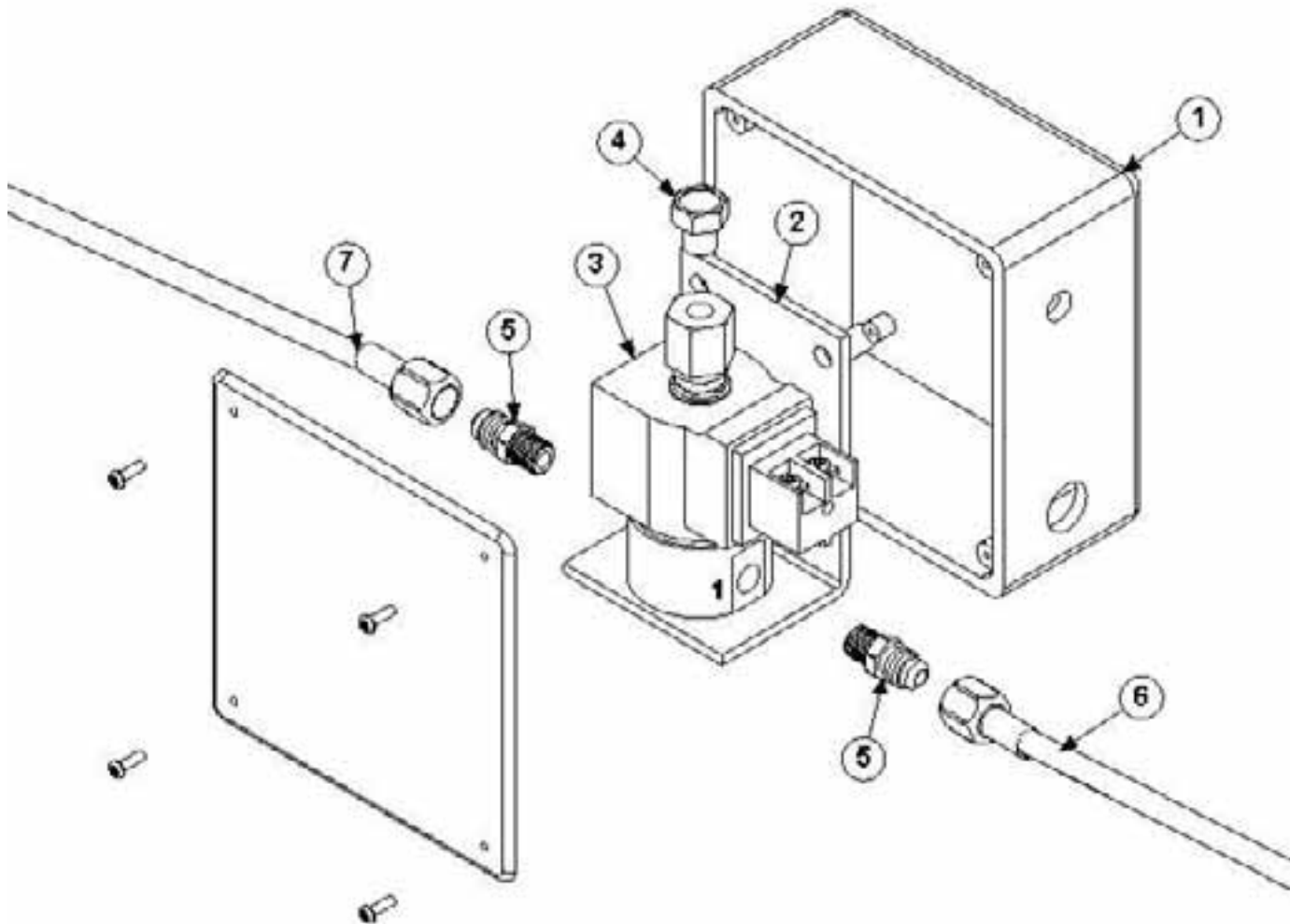
Item No.	Part Number	Qty	Description
1	63-067	1	MUFFLER, ENGINE EXHST VORTEX
2	55-034	1	TBG, EXHAUST 3 IN X 10 FT
3	69-101	1	ASSY, DIVERTER VALVE VORTEX
4	41-043	1	GASKET,EXHAUST BY-PASS VALVE
5	61-307	1	ASSY, EXST FLANGE ADAPTOR VRTX
6	14-036	1	CLAMP,HOSE 2-3/4 TO 3-5/8 HD SS
7	69-106	1	ASSY,E-3 EXHAUST HEAT EXCHANGER
8	61-263	1	ASSY,EXHAUST DEFLECTOR VRTX
9	18-122	1	HOSE,3/16 X 65 X 1/4T NO COVER
10		1	DIVERTER SOLENOID HOUSING
11	18-123	1	HOSE,3/16 X 20 X 1/4T NO COVER
12	21-001	1	CONN, 1/8 P X 1/4 T BR
13	21-240	1	TEE, 1/8 NPTF BRASS
14	21-007	2	FTTG,BRB 1/8 PX 5/16 H BR
15	14-011	2	CLAMP, HOSE FUEL #6
16	14-035	3	CLAMP,HOSE 2-1/4 TO 3-1/8 HD SS
17	61-291	1	ASSY, EXHAUST ELBOW VORTEX

SECTION 5



69-101 ASSY, DIVERTER VALVE VORTEX

Item No.	Part Number	Qty	Description
1	61-279	1	ASSY,DIVERTER BODY VORTEX
2	66-160	1	BUSHING, DIVERTER BODY VORTEX
3	61-278	1	ASSY,DIVERTER VALVE VORTEX
4	66-159	1	BUSHING,CVR DIVERTER VORTEX
5	10-007	1	SCREW, MACH 1/4-20 X 1/2 SOCHD SS
6	66-158	1	COVER,DIVERTER HOUSING VORTEX
7	11-001	1	NUT, 1/4-20 SS
8	58-210	1	BRKT, DIVERTER MOUNT VORTEX
9	58-217	1	BRKT, DIVERTER BOX VORTEX
10	59-809	1	PNL,DIVERTER BOX VORTEX
11	58-202	1	PLT, LEVER DIVERTER VORTEX
12	15-024	1	PIN, 5/16 X 3/4 CLEVIS
13	15-026	1	CLEVIS,DIVERTER VLV VORTEX
14	15-025	1	PIN, 1/8 X 1/2 COTTER
15	36-233	1	VACUUM POD, NISSAN UD
16	21-064	1	ELL, 1/4 P X 1/4 T BRASS
17	58-218	1	CVR, DIVERTOR BOX VORTEX
18	41-043	1	GASKET,EXHAUST BY-PASS VALVE
19	10-117	6	SCREW,5/16-18 X 7/8 SS SHCS
20	12-030	6	WASHER, 5/16 NORD LOCK
21	11-036	2	NUT, M8 X 1.25 HEX JAM
22	12-033	2	WASHER, LOCK M8 SS
23	10-078	2	SCREW, 10-32 X 1/2 SHCS ZINC
24	12-026	2	LKWSR, #10 INT EXT
25	18-123	1	HOSE,3/16 X 20 X 1/4T NO COVER



DIVERTER SOLENOID HOUSING

Item No.	Part Number	Qty	Description
1	30-030	1	BOX, UTILITY 2.37 X 4.6
2	58-198	1	BRKT, EXHAUST SOLENOID
3	23-048	1	VLV, SOLENOID EXHAUST VORTEX
4	20-024	1	BREATHER STONE, 1/8 NPT SS VRTX
5	21-001	2	CONN, 1/8 P X 1/4 T BR
6	18-122	1	HOSE, 3/16 X 65 X 1/4T NO COVER
7	18-123	1	HOSE, 3/16 X 20 X 1/4T NO COVER

PTO MAINTENANCE WARNING!

Periodic **PTO MAINTENANCE** is required by the owner/operator to ensure proper, safe and trouble free operation.

- Daily:** Check all air, hydraulic and wiring mechanisms before operating PTO. (PERFORM MAINTENANCE as required.)
- Monthly:** Inspect for possible leaks and tighten all air, hydraulic and mounting hardware, if necessary. Torque all bolts, nuts, etc. to Chelsea specifications. Insure that spines are properly lubricated, if applicable. (PERFORM MAINTENANCE as required.)

Parker-Chelsea Products Division will not be responsible for any damage due to the overloading of this auxiliary power product, failure to perform preventative maintenance, damage due to abuse, misapplication or misuse, or improper operation of this power take-off and auxiliary equipment.

Warranty: Failure to comply entirely with the provisions set forth in the provided Owner's Manual will result in voiding ALL WARRANTY consideration.

CHELSEA®
Dated

NOTICE!

Due to the normal and sometimes severe torsional vibrations that power take-off units experience, operators should follow a set maintenance schedule for inspections.

Failure to service loose bolts or power take-off leaks could result in potential auxiliary power take-off or transmission damage!

CHELSEA®
Dated

379819 11/02

LOCATE NEAR P.T.O. CONTROL. PLACE THIS PART OF LABEL ON SUN VISOR 37986-2

**POWER TAKE OFF OPERATION
POWER SHIFTED P.T.O.'S**

I. MANUALLY SHIFTED TRANS.

1) ENGAGE P.T.O. WITH ENGINE AT IDLE SPEED.

II. AUTOMATIC TRANSMISSION

1) ENGAGE P.T.O. WITH ENGINE AT IDLE SPEED.

WARNING:
DURING EXTREMELY COLD WEATHER 230, 231, 236, 242, 243, 244, 250, 251, 270, 271, 277, 278, 800, 852, 859 AND 885 SERIES POWER TAKE OFFS MAY MOMENTARILY TRANSMIT POWER EVEN THOUGH IT IS DISENGAGED! CONSULT YOUR OWNERS MANUAL FOR FURTHER EXPLANATION.

IMPORTANT:
This vehicle is equipped with a POWER TAKE-OFF. READ OWNERS MANUAL LOCATED IN THE GLOVE BOX. SEE SUN VISOR FOR OPERATING INSTRUCTIONS.

CHELSEA®
Dated

11-01 11-01

WARNING

ROTATING SHAFTS ARE DANGEROUS

YOU CAN SNAG CLOTHES, SKIN, HAIR, HANDS, ETC THIS CAN CAUSE SERIOUS INJURY OR DEATH.

- EXPOSED ROTATING SHAFTS MUST BE GUARDED.
- DO NOT WORK ON OR NEAR AN EXPOSED SHAFT WHEN ENGINE IS RUNNING.
- SHUT OFF ENGINE BEFORE WORKING ON POWER TAKE-OFF OR DRIVEN EQUIPMENT.

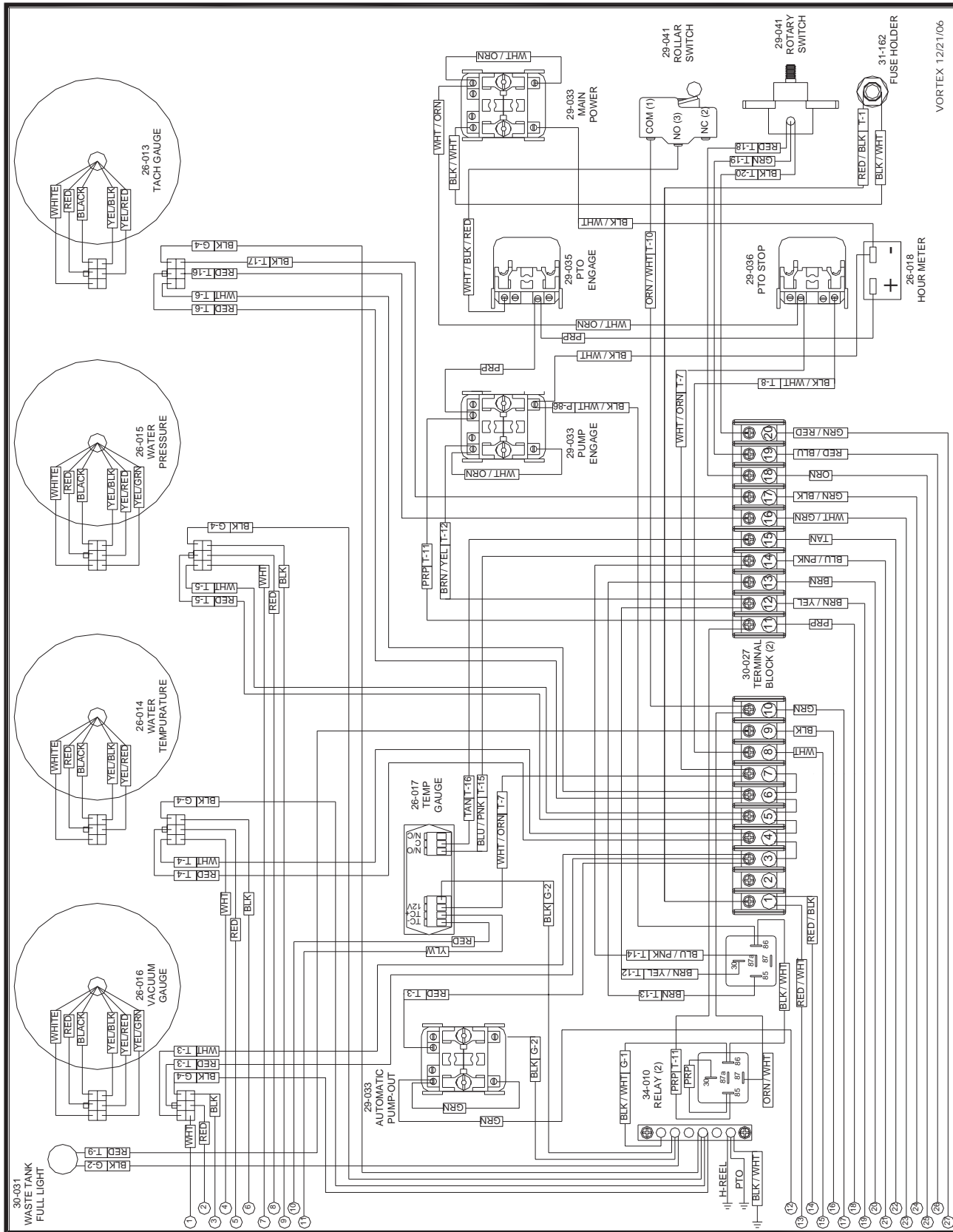
DO NOT PAINT OVER THIS LABEL !

READ P.T.O. OWNERS MANUAL FOR MORE SAFETY INFORMATION

379274 6/93

**CAUTION
HOT**

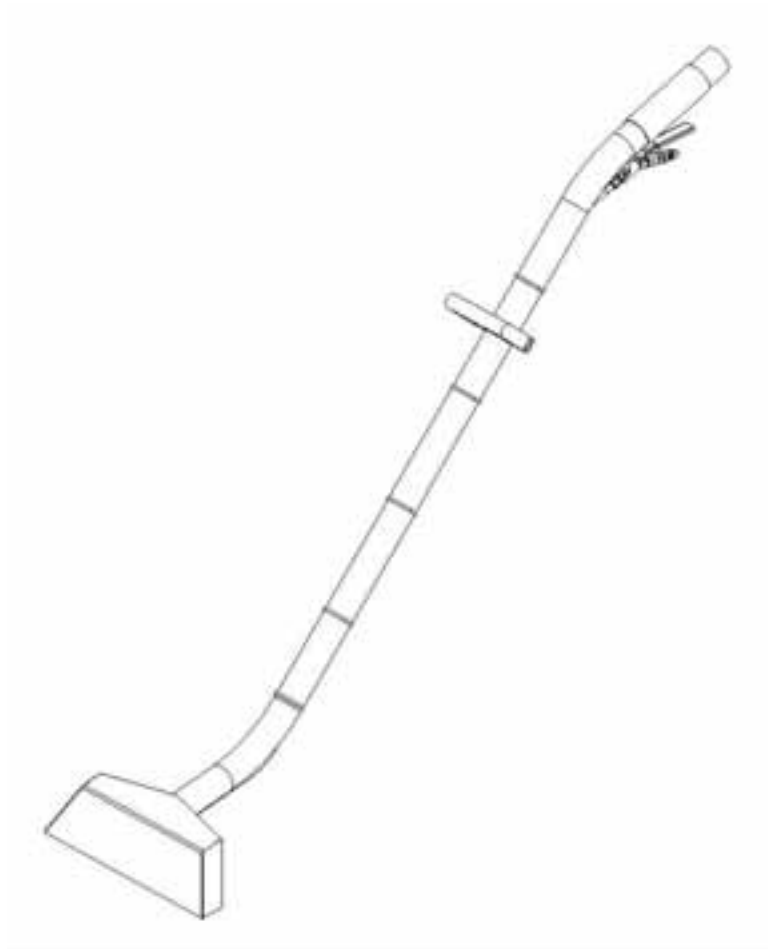
ELECTRICAL DIAGRAM



VORTEX 1221/06

5-XX

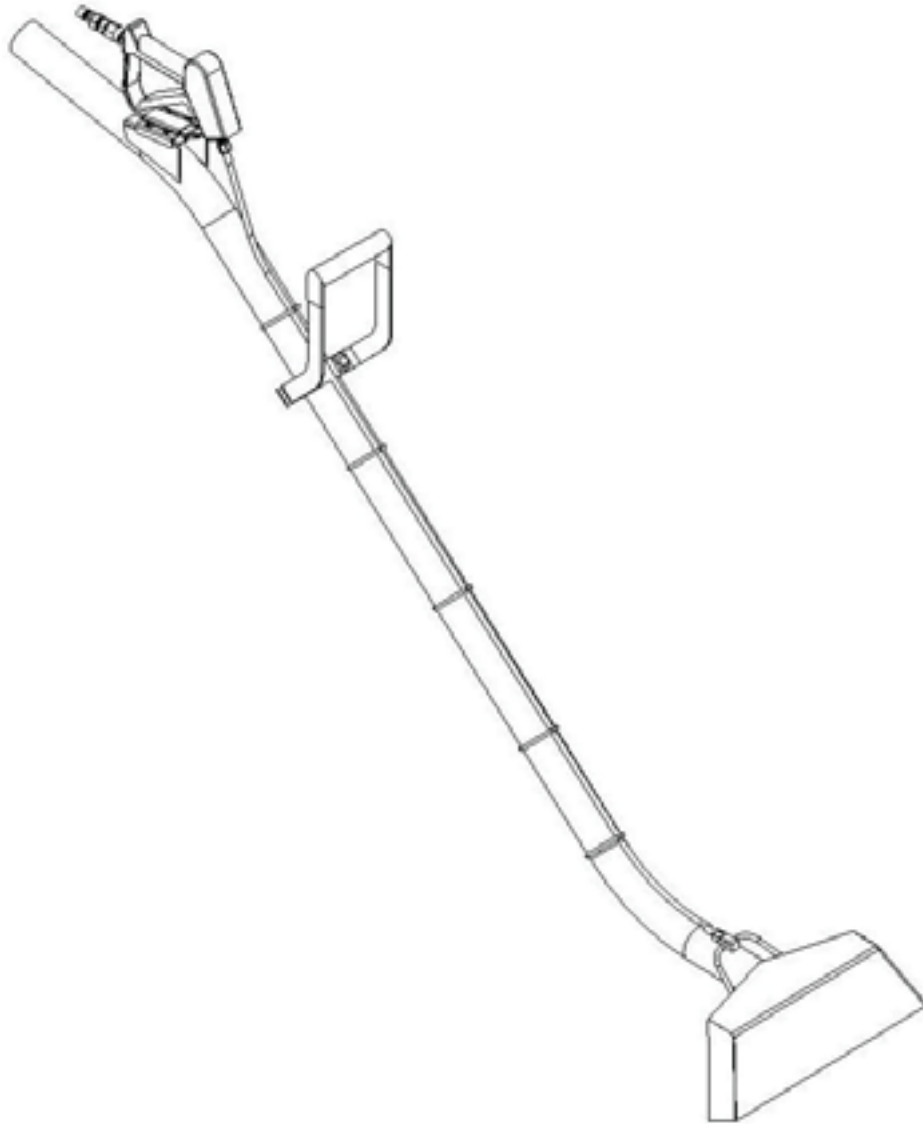
VORTEX 7000 WIRING LEGEND		
1	WHT	Vacuum Sensor
2	RED	Vacuum Sensor
3	BLK	Vacuum Sensor
4	WHT	*Not Used*
5	RED	Water Temperature Sensor
6	BLK	Water Temperature Sensor
7	WHT	Water Pressure Sensor
8	RED	Water Pressure Sensor
9	BLK	Water Pressure Sensor
10	RED	Thermo-Coupler "K" Terminal
11	YLW	Thermo-Coupler "+" Terminal
12	GRN	Pump-Out Float Switch (COM)
13	RED/WHT	Power to Hose Reel
14	RED/BLK	Main Power From Battery
15	WHT	Waste Tank Float Switch (COM)
16	BLK	Waste Tank Float Switch (NO)
17	GRN	Waste Tank Float Switch (NC)
18	PRP	PTO Solenoid
19	YEL/BRN	Water Tank Float Switch (COM)
20	BRN	Water Tank Float Switch (NC)
21	BLU/PNK	Water Pump Clutch Power
22	TAN	Diverter Solenoid Power
23	WHT/GRN	Tach Sensor
24	GRN/BLK	Tach Sensor
25	ORG	Computer Module (In Truck Cab)
26	BLU/RED	Computer Module (In Truck Cab)
27	GRN/RED	Computer Module (In Truck Cab)



5-31

67-001 WAND, LOW PROFILE 2 IN.

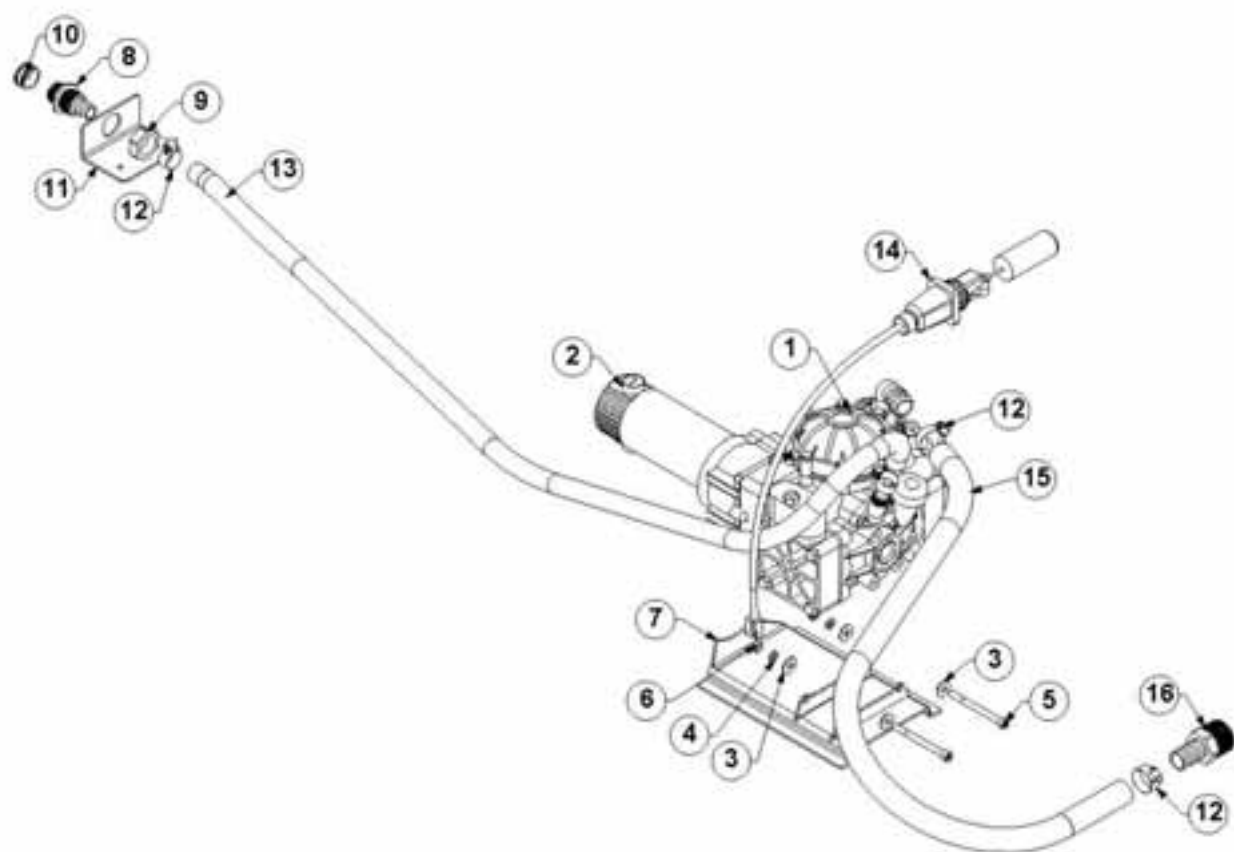
Item No.	Part Number	Qty	Description
1	67-001	1	WAND, LOW PROFILE 2 IN
2	25-000	1	DSC, 1/4M X 1/4FP BR
3	27-013	1	VLV, WAND CMP
4	21-050	1	CONN, 1/4 P X 1/4 T BRASS
5	18-021	1	HOSE, 3/16 X 51 1/4FT X 1/4FT
6	24-000	4	TIP, SPRAY 95015X1/8P SST



67-003 WAND, ERGONOMIC W-SPRAYER

Item No.	Part Number	Qty	Description
1	67-003	1	WAND,ERGONOMIC W /SPRAYER
2	25-000	1	DSC, 1/4M X 1/4FP BR
3	23-035	1	VLV,SPRAYER HYPRO 3381-0032
4	21-050	1	CONN, 1/4 P X 1/4 T BRASS
5	18-021	1	HOSE, 3/16 X 51 1/4FT X 1/4FT
6	24-000	4	TIP, SPRAY 95015X1/8P SST
7	40-009	1	HANDLE, ERGO WAND COATED

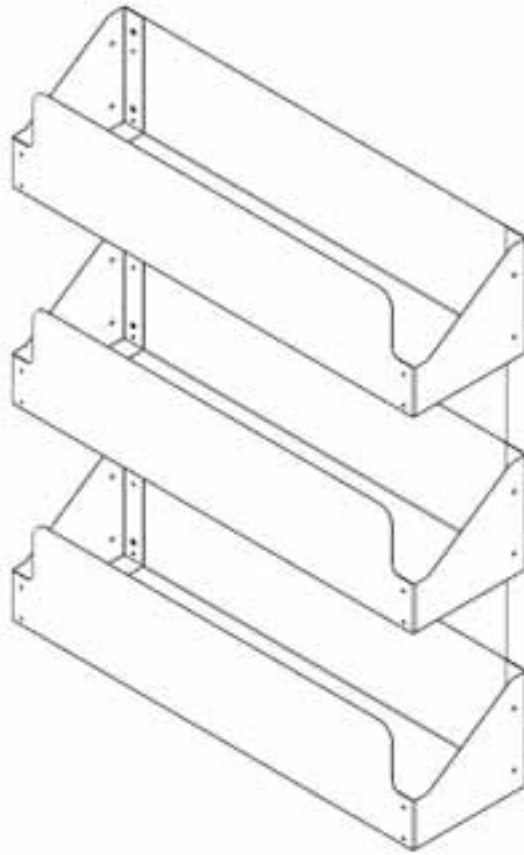
10. ACCESSORIES



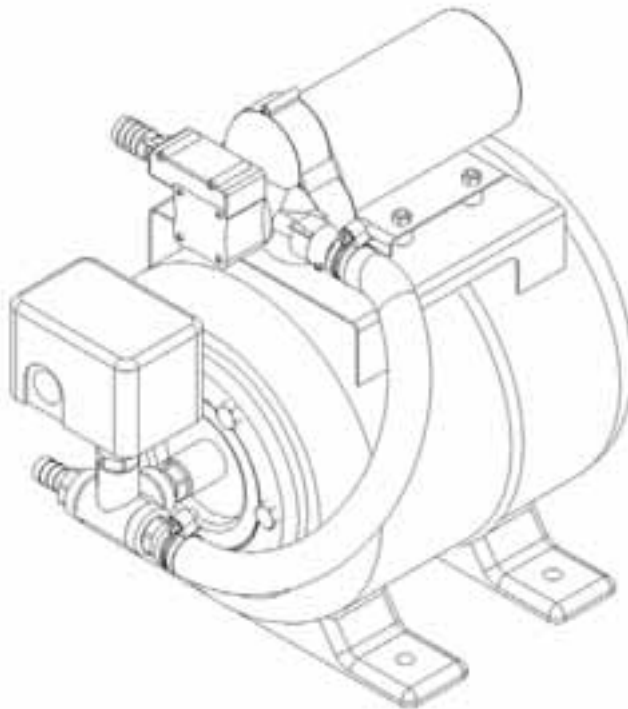
5-34

68-003 KIT, WASTE PUMP EXTERNAL

Item No.	Part Number	Qty	Description
1	46-016	1	PUMP, DIAPHRAGM, PUMP OUT
2	45-008	1	MOTOR, GEAR BISON PUMPOUT
3	12-017	4	WASHER, FLAT 5/16 SAE
4	12-016	2	LKWSR, 5/16 ZINC
5	10-040	2	SCREW, MACH 5/16-18 X 3-1/2 SOCHD
6	11-005	2	NUT, 5/16-18 ZINC
7	61-003	1	MOUNT, EXTERNAL PUMPOUT
8	66-022	1	ADAPTOR, HOSE WASTE PUMP
9	66-023	1	NUT, ADPTR. HOSE WASTE PUMP
10	21-071	1	CAP, GARDEN HOSE 3/4 BRASS
11	58-006	1	BRKT, HOSE CONN WASTE PUMP
12	14-006	4	CLAMP, HOSE #20
13	16-004	72"	HOSE, WTR. 3/4 IN HRZ. 500FT BULK
14	69-000	1	WIRING , LEVEL SENSOR SHUTOFF
15	16-018	24"	HOSE, WTR. 1 IN HRZ. 100FT BULK
16	21-036	1	FTTG, BRB 1-1/4 P X 1 IN. BARB

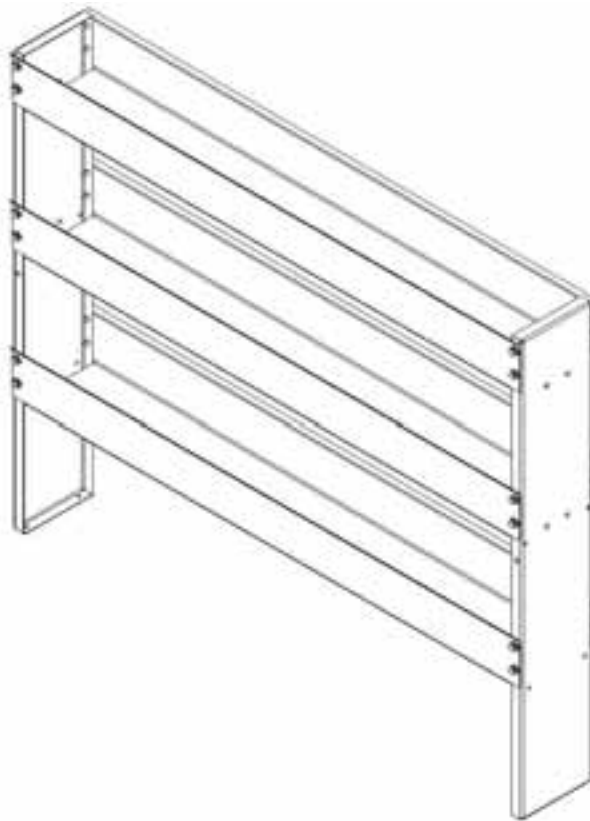


68-102 KIT, VORTEX STORAGE RACKS



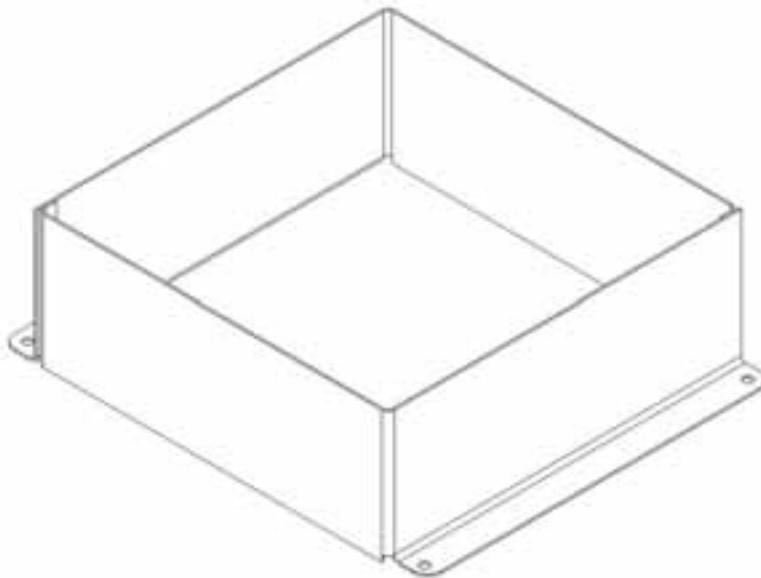
5-39

68-002 KIT, DEMAND PUMP W/PLUMBING SS



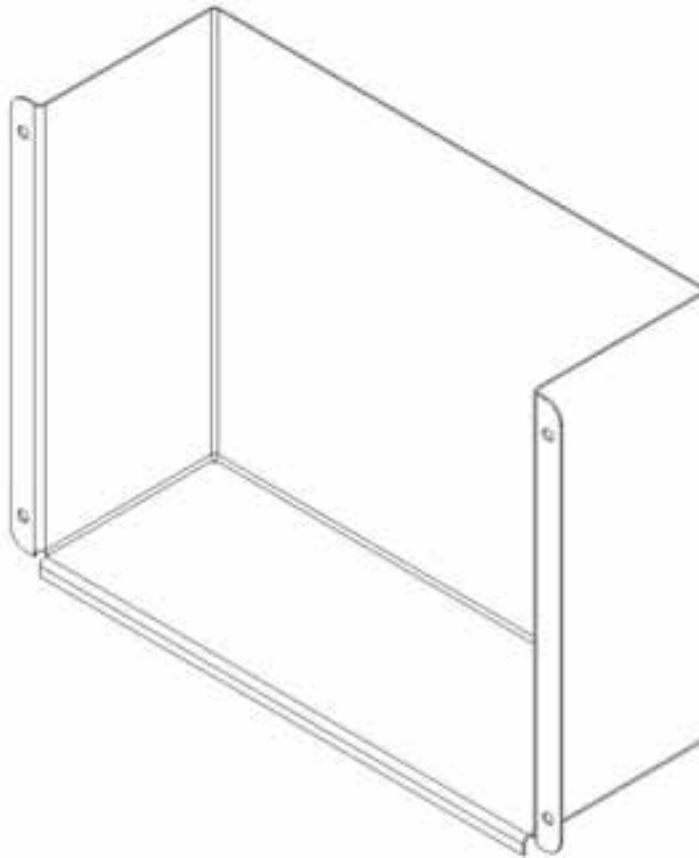
5-40

68-013 ASSY, VAN STORAGE UNIT SS



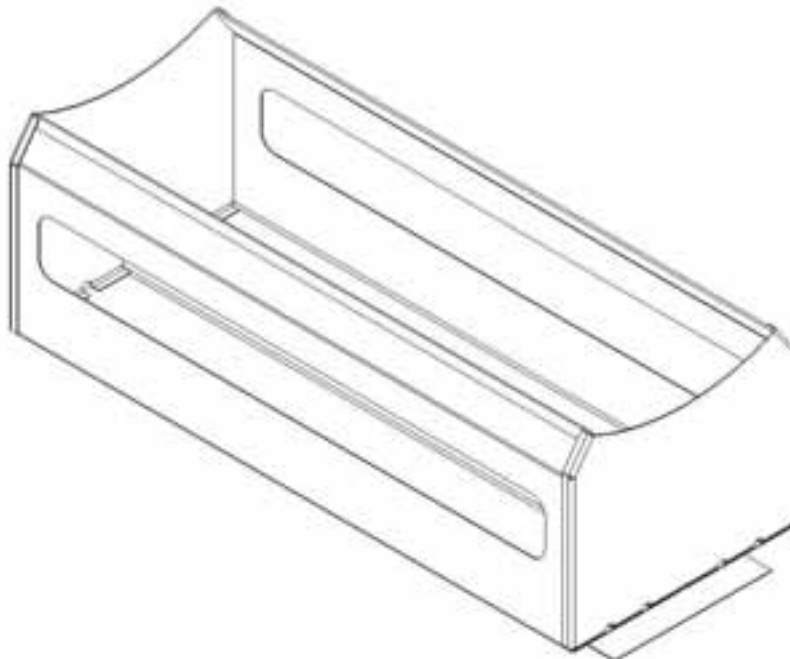
5-41

68-014 ASSY, SINGLE 5 GAL JUG HOLDER



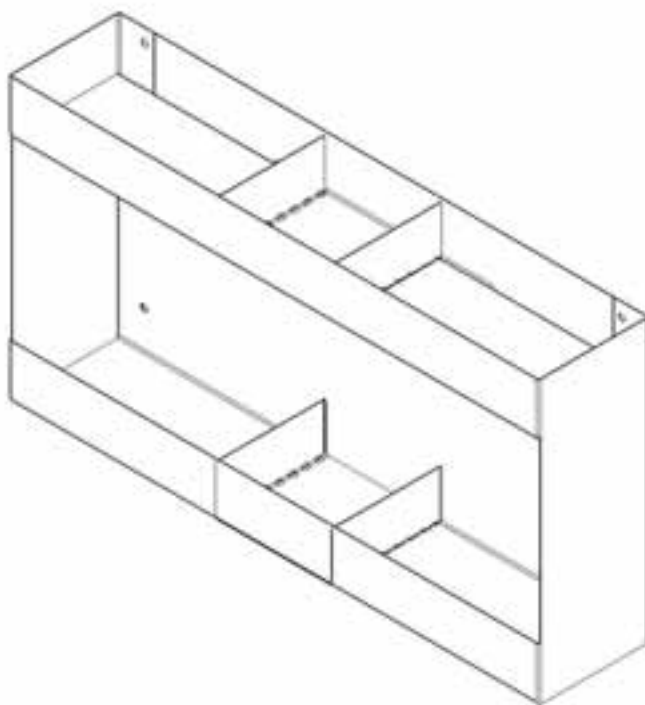
5-42

68-015 ASSY, FURN BLOCK HOLDER SS



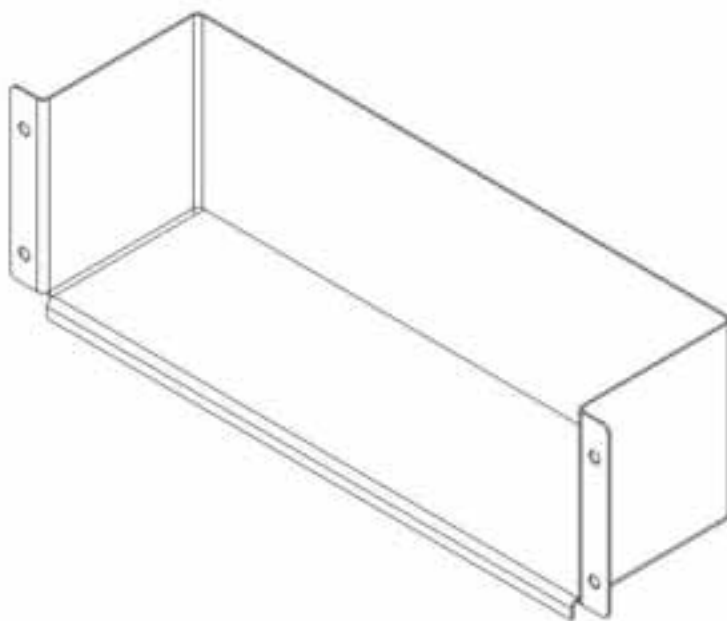
5-43

68-016 RACK, DOUBLE CHEMICAL



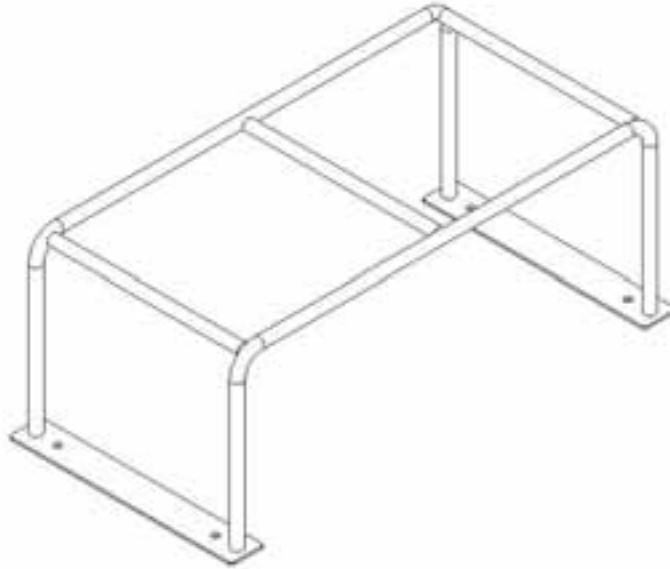
5-45

68-018 ASSY, 10 GAL CHEM RACK S.S.



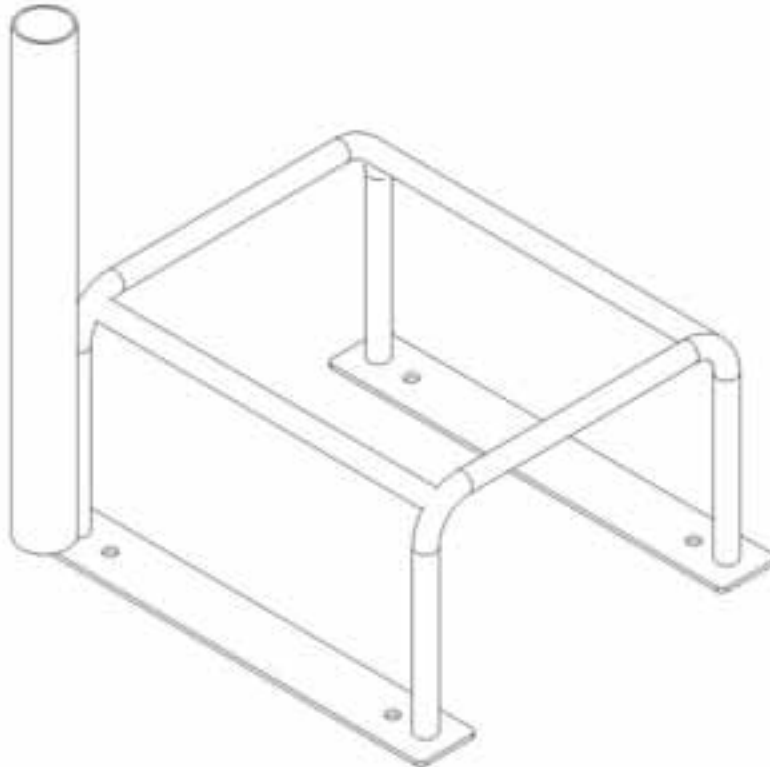
5-46

68-019 SPRAY BOTTLE HOLDER SS



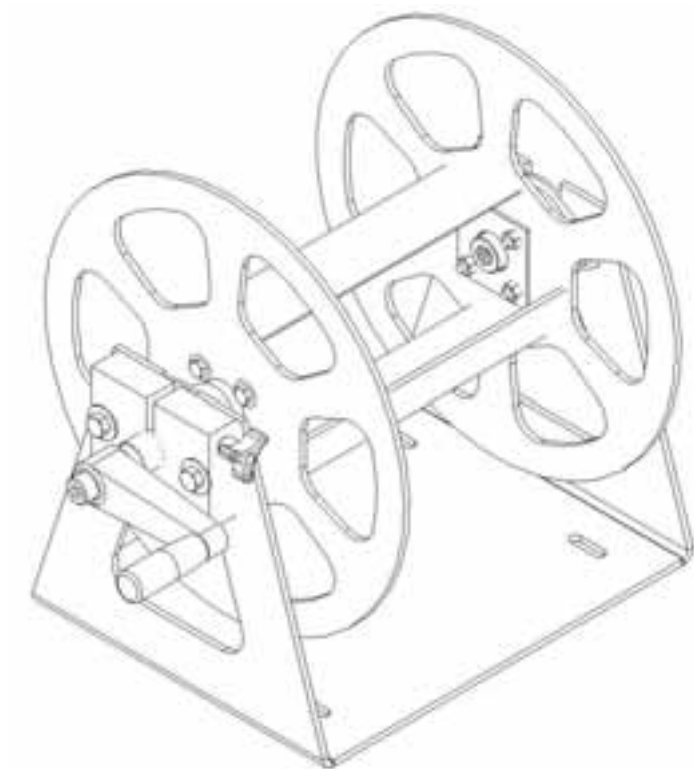
5-47

68-022 ASSY, DBL PMP UP SPRAY RK, SS



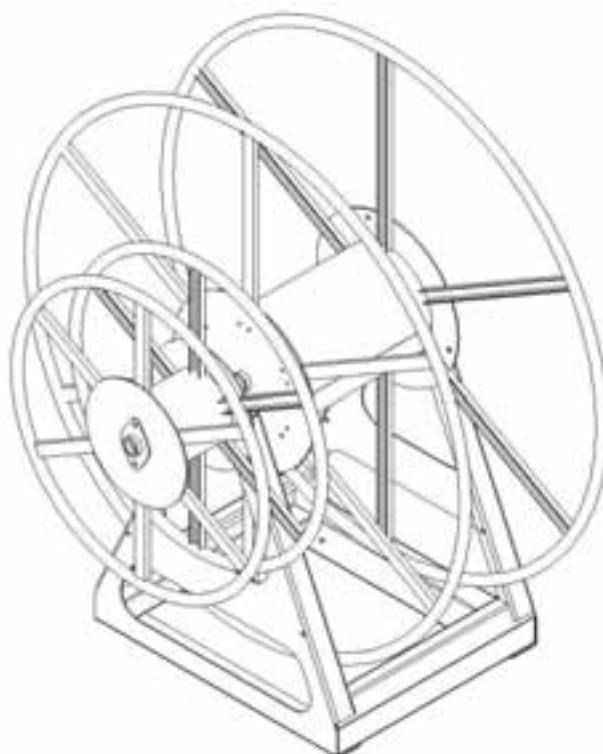
5-48

68-024 ASSY, SNG PMP UP SPRAY RK, SS



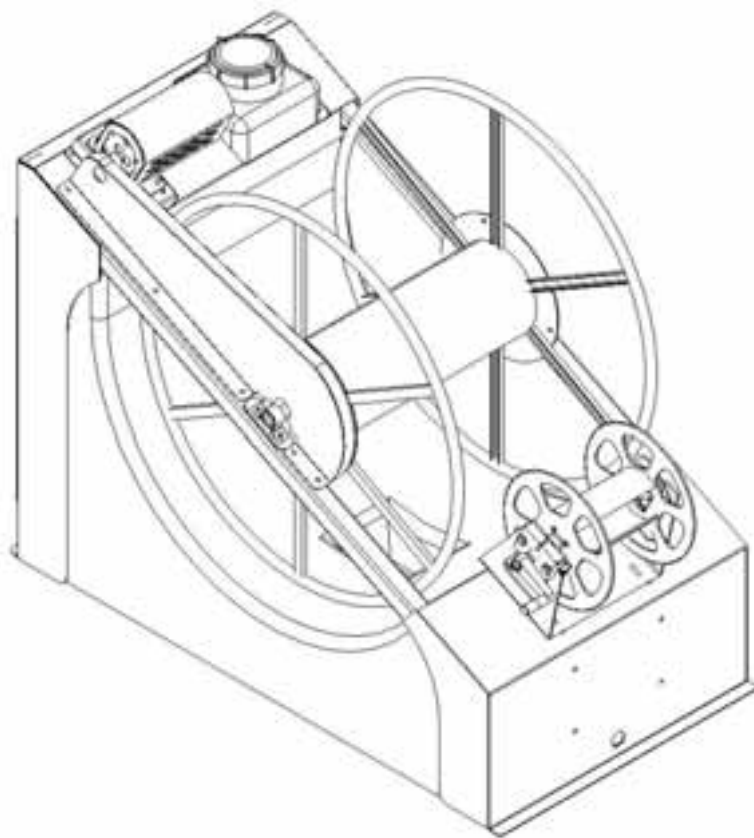
5-49

68-023 ASSY, REEL HP SOLUTION

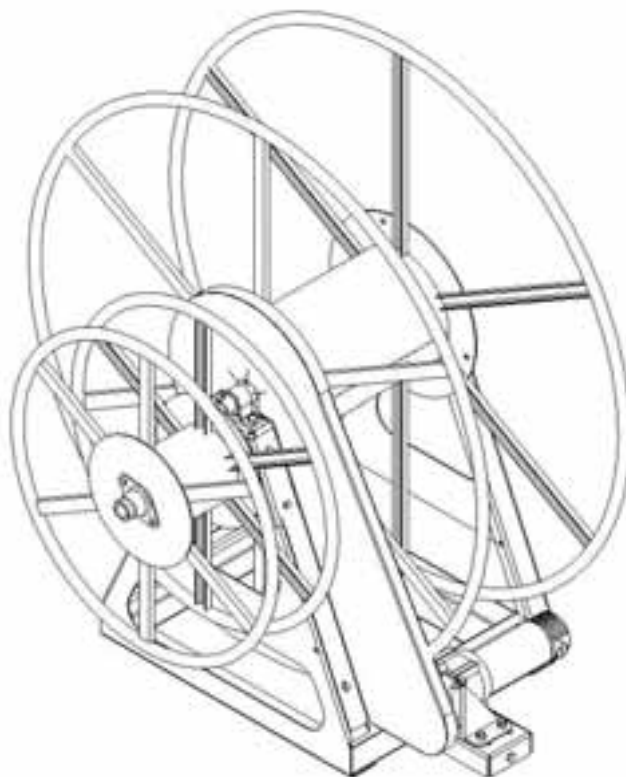


5-50

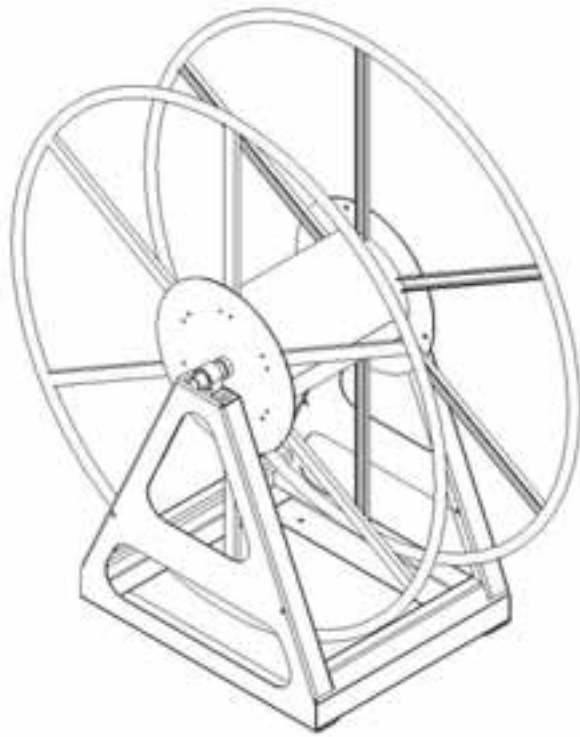
68-025 ASSY, HOSE REEL HIGH PROFILE



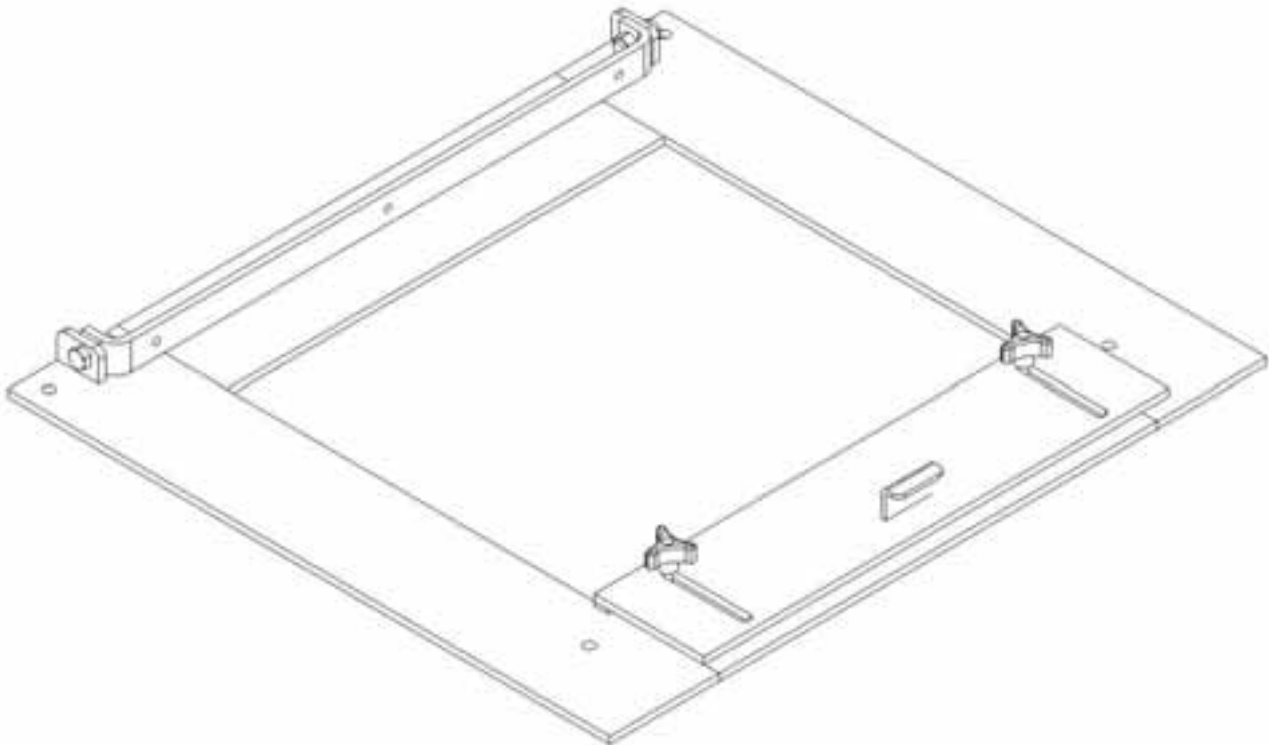
68-032 ASSY, H-REEL MOTORIZED W-H2O TNK



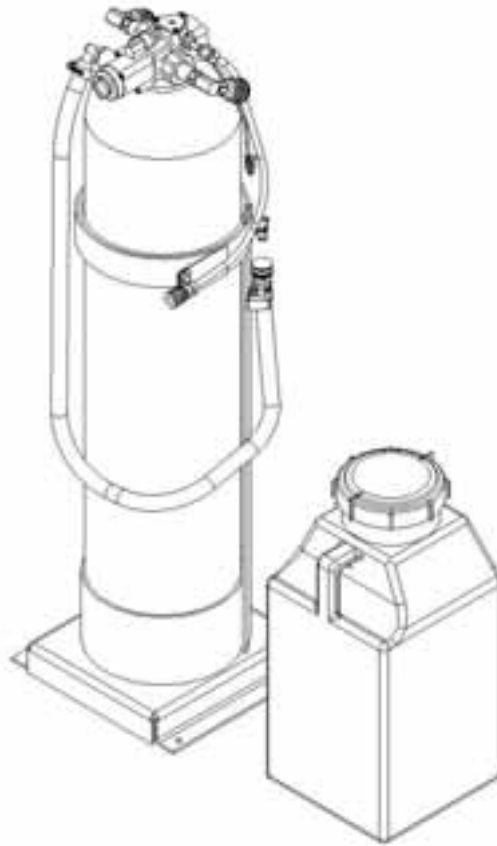
68-033 ASSY, HOSE REEL H. PROFILE W-MTR



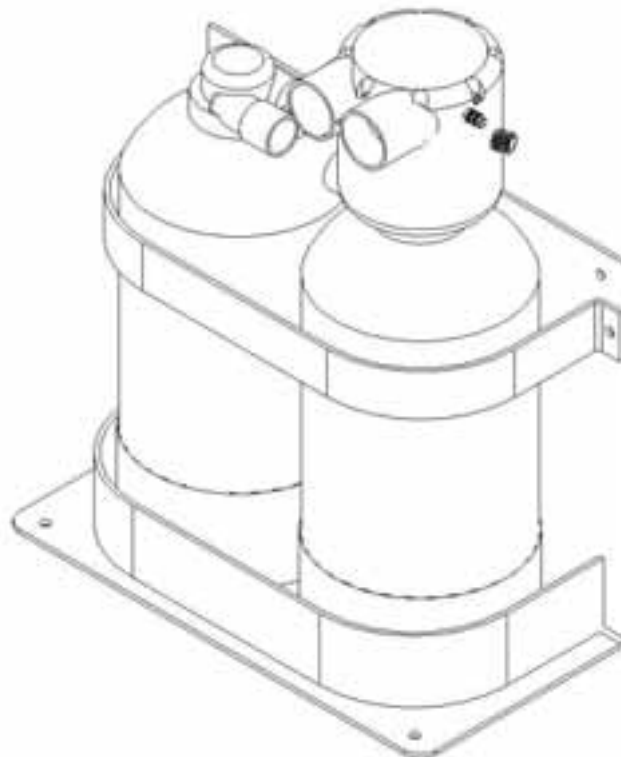
68-037 ASSY, HOSE REEL VAC ONLY



68-043 ASSY, HOSE REEL LAY DOWN KIT



68-045 ASSY, WATER SOFTENER



68-109 ASSY, KIT WATER SOFTENER VRTX