Congratulations on your purchase of the **MODEL PRO-1200®** Direct Drive cleaning unit. This instruction/parts manual is a guide for operating and servicing your **SAPPHIRE SCIENTIFIC** Direct Drive unit.

Proper operation and service are necessary to ensure the outstanding performance of this unit. When properly maintained, your Truck-mount 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 **SAPPHIRE SCIENTIFIC** 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.

THIS UNIT MUST BE INSTALLED BY THE DEALER THAT YOU PURCHASED IT FROM IN ACCORDANCE WITH THE SAPPHIRE SCIENTIFIC INSTALLATION PROCEDURES.

BE SURE TO FILL OUT THE WARRANTY CARD ONLINE AT WWW.**SAPPHIRESCIENTIFIC**.COM

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

S/N: _____

This service and operations manual is written specifically for **SAPPHIRE SCIENTIFIC MODEL PRO-1200®** Direct Drive Cleaning units manufactured by:

SAPPHIRE SCIENTIFIC
2604 Liberator
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 **SAPPHIRE SCIENTIFIC.**

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MODEL PRO-1200® MANUAL PART# 49-074

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GENERAL INFORMATION

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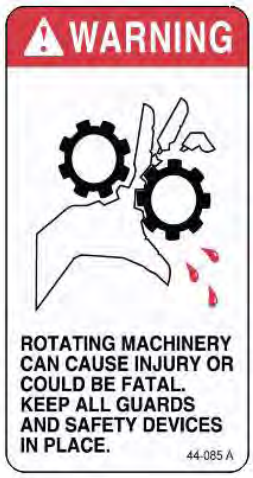
1. SAFETY

WARNING For Your Safety!

The following **WARNING** labels are on your **MODEL PRO-1200**® console. These labels point out important **Warnings** and **Cautions,** which must be followed at **all** times. Failure to follow warnings could result in personal injury or fatality to yourself and/or others or property damage. Please follow these instructions carefully! **DO NOT remove these decals.**



⚠ WARNING!

1. **Read the operator's manual before starting this unit.**
Failure to adhere to instructions could result in severe personal injury or could be fatal.

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

3. **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.

4. **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.

5. Blower exhaust 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.

6. **DO NOT** touch 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.

7. **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.

8. **DO NOT** damage the vehicle in any way during the installation. When routing fuel lines **DO NOT** configure the hose in any locations where the hose or vehicle could be damaged. Avoid contact with moving parts, hot surfaces, brake lines, fuel lines, catalytic converters, exhaust pipes, mufflers or sharp objects.

9. **DO NOT** exceed your vehicles weight limit. The console with waste tank and accessories weighs approximately 705 pounds. Make certain that the vehicle has the correct axle rating. This will prevent unsafe or hazardous driving conditions.

10. High back seats are required for all vehicles that units are to be installed for head and neck protection. Metal partitions between the seats and equipment are strongly recommended.

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 250 degrees F. Thermoplastic hoses do not meet this criterion and should never be used. **Severe burns and other injuries 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.**

15. **DO NOT** modify this unit in any manner. Any modification could result in serious injury or fatality. This includes the use of any open ended hoses

SPECIFICATIONS

Van Engine Speed (Low)…….. 1100 RPM (no load)
Van Engine Speed (Medium)……1300 RPM (no load)
Van Engine Speed (High).....1500 RPM (no load)
Water Pump RPM…… .1025 RPM
Vacuum Pump RPM……..2350 RPM
Water Flow Rate……5.0 GPM (maximum)
Water Pump Pressure……1200 PSI (maximum)
Vacuum Relief Valve……....14 in. Hg
Waste Tank Capacity……145 gal
Waste Tank Shut-Off……100 gal
Console Weight……..480 lbs
Console Weight (with waste tank
& accessories) Approximately……...705 lbs.

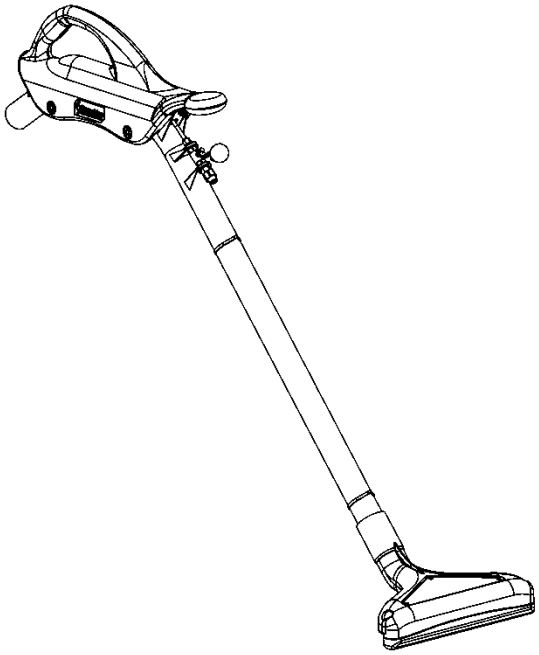
TORQUE VALUES

Pulley Hub 180 inch/lbs. (15 ft/lbs)

JET SIZING

SAPPHIRE SCIENTIFIC recommends that the total floor tool tip size be #4 min.

Sapphire Scientific recommends using the **Stryker Cleaning and Extraction Wand:**



* Roto-molded ergonomic handle provides balanced handling and substantially reduces operator fatigue.
* Stainless steel extraction tube for rugged service and long life
* Roto-molded head resists dents and scratches and doesn't readily gouge molding or furniture
* Purge valve for easy cleaning
* Classic S-shape makes reaching under objects or furniture easy
* Roto-molded 14" head with full-width high pressure injector and two-way extraction glide provides maximum coverage and extraction
* Forged brass valve, centrally positioned for right- or left-handed operation
* Glide assembly is easy to replace when worn

INSTALLATION REQUIREMENTS

Prior to beginning the installation, read the ENTIRE "Installation" section of this manual. Since the **MODEL PRO-1200**® Direct Drive unit weighs (with waste tank and accessories) approximately 705 lbs., please adhere to the following recommendations prior to installing the unit.

1. The unit should **NOT** be installed in any motor vehicle rated less than 3/4 ton capacity.

CAUTION!

The console and waste tank with accessories must NOT exceed the vehicle's axle weight limit.

2. The vehicle tires must have a load rating in excess of the combined unit and vehicle weight.

3. **SAPPHIRE SCIENTIFIC** does not recommend using any type of flooring materials that absorb water. This condition will result in rust and corrosion of the vehicle floor.

4. Insulation under rubber mats should be removed prior to installation of the unit.

CHEMICAL REQUIREMENTS

The **SAPPHIRE SCIENTIFIC MODEL PRO-1200** ® Direct Drive 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 **SAPPHIRE SCIENTIFIC** brand chemistry.

WATER REQUIREMENTS

Because hard water deposits will damage the plumbing and heat exchange systems on this unit, **SAPPHIRE SCIENTIFIC** recommends that a high quality water softener be used in areas where the water hardness exceeds 3½ 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.

2. RECEIVING YOUR DIRECT DRIVE UNIT

DEALER RESPONSIBILITY

THE **SAPPHIRE SCIENTIFIC** DEALER THAT YOU PURCHASED THIS DIRECT DRIVE CLEANING UNIT FROM IS RESPONSIBLE FOR THE PROPER INSTALLATION OF THIS MACHINE. THE DEALER IS ALSO RESPONSIBLE FOR THE PROPER INITIAL TRAINING OF YOUR OPERATORS AND MAINTENANCE PERSONNEL.

ACCEPTANCE OF SHIPMENT

Your **MODEL PRO-1200®** Direct Drive cleaning unit was thoroughly tested, checked and inspected in its entirety prior to leaving our manufacturing facility. **When receiving your unit, please make the following acceptance check:**

1. The unit should not show any signs of damage. If there is damage, notify the common carrier immediately.

2. Carefully check your equipment and packing list. The standard **SAPPHIRE SCIENTIFIC MODEL PRO-1200®** unit should arrive with the following items as well as any optional accessories:

EQUIPMENT LISTING

- SAPPHIRE SCIENTIFIC MODEL PRO-1200® console.
- Operation and Service Manual
- Installation mounting plates and bolt down kit.
- Hose clamps for vacuum hoses.
- Waste tank with shutoff switch.
- Waste tank filter and stainless steel strainer basket.
- Two sections of 2 in. x 50 ft. vacuum hose
- One section of 2.5 in. x 50 ft. vacuum hose.
- Two 50 ft. sections of high pressure solution hose
- Two vacuum hose connectors.
- Two hose-reducing cuffs to 2 in.
- 50 ft. water supply hose with quick connect.

OPTIONAL EQUIPMENT

A. Additional lengths of vacuum hose
Part # 18-003
B. Additional vacuum hose connectors
Part # 21-003
C. Additional high-pressure solution hoses
Part # 18-000
(With shutoff valve Part # 18-001)
D. Automatic waste pump kit
Part # 68-003
E. Demand pump system
Part # 68-002
F. ASSY, WASTE PUMP OUT
Part #68-158

SECTION 2: INSTALLATION

3. INSTALLATION

3. INSTALLATION

⚠ WARNING!!!

This unit must be bolted to the floor of the vehicle by an authorized SAPPHIRE SCIENTIFIC DISTRIBUTOR.

LIFTING THE UNIT INTO THE VEHICLE

Because the **SAPPHIRE SCIENTIFIC MODEL PRO-1200®** console weighs approximately 480 lbs., a forklift is necessary to place the unit into the vehicle. Place the forks under the unit. Using two "C" clamps, secure the console to the forks. Move the unit into desired position.

POSITIONING THE UNIT INTO THE VEHICLE

MODEL PRO-1200® is designed for a rear door installation and must properly align with the drive shaft.

The complete unit with waste tank and accessories **MUST NOT** exceed the vehicle's axle weight limit.

FASTENING DOWN THE UNIT AND WASTE TANK

⚠ CAUTION!!!

Prior to drilling any holes in the vehicle floor, ensure that while drilling, you will not damage the fuel tank, fuel lines, or any other vital components which could affect the safety or operation of the vehicle.

A. The console and waste tank mounting holes will serve as a template. Drill four (4) $^{13}/_{32}$ in. diameter holes for the console and eight (8) $^{13}/_{32}$ in. diameter holes for the waste tank.

B. Using the provided mounting hardware kit:

1. Insert four (4), grade 5, ⅜-16 × 4 in. hex head cap screws with flat washers through the **MODEL PRO-1200®** console mounting holes, and eight (8),grade 5, ⅜-16 × 4 in. hex head cap screws with flat washers through the waste tank mounting holes.

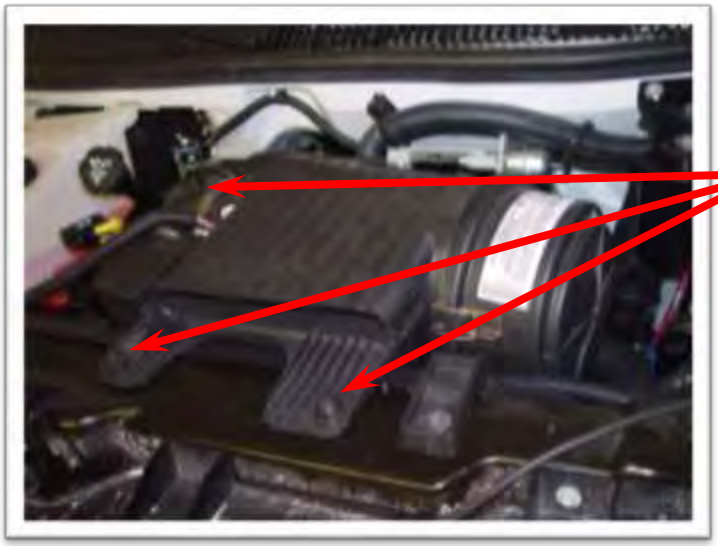
2. Install the provided mounting plates underneath the vehicle floor.

3. Screw the provided ⅜-16 hex head lock nuts on to the mounting bolts and tighten until the console and waste tank are firmly attached to the vehicle floor.

FRONT END PREPARATION

1. Put the vehicle in park on level ground. Remove the negative battery cable.

2. Remove anti-freeze overflow tank by un-screwing the 10mm bolt. Set aside and take care not to let flow out of the overflow, lid or hose.

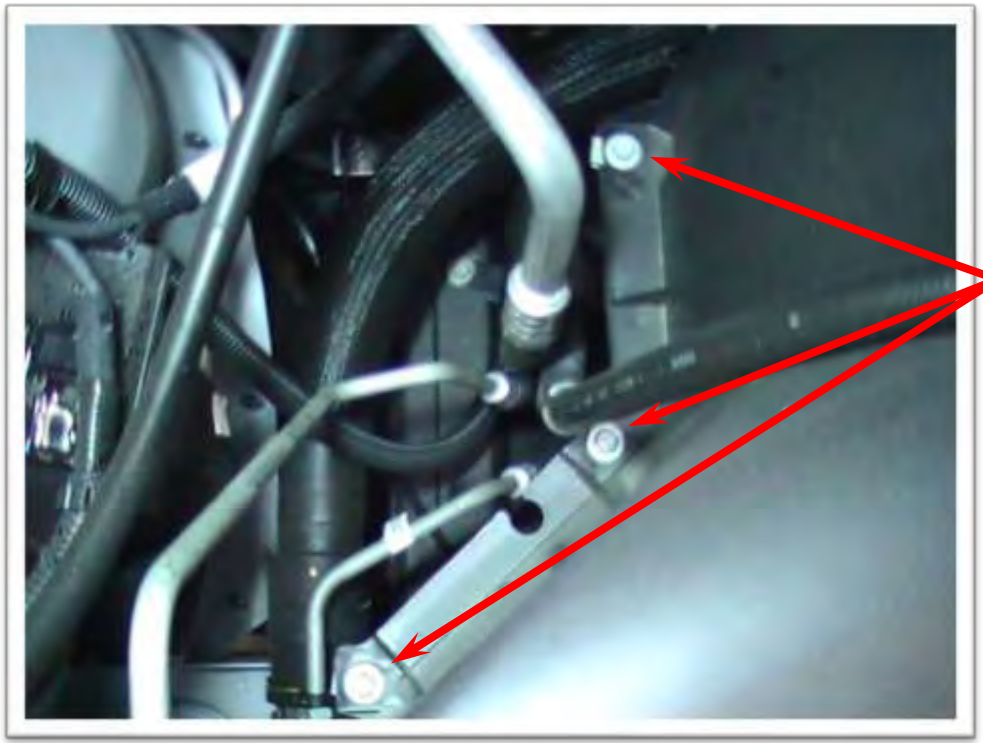


3. Remove air intake tube by un-screwing the two 10mm bolts and removing the MAF sensor connector.

4. Loosen clamps and remove air tube.

5. Remove the clamp from the upper radiator hose with a flathead screwdriver.

6. Remove bolt holding oil fill tube with 13mm socket to make room to remove the upper radiator fan shroud.



7. Remove these bolts with a 10mm socket from both sides of the upper fan shroud then remove upper shroud. **Caution! Take care not to damage the radiator fins.**

8. Remove the fan. Use a thin 36mm wrench. Note: Keep the belt on for tension; it may be necessary to add more tension to keep the belt from slipping.

9. Remove the seats using an 18mm socket on 4 bolts. Make sure to disconnect the wire from under the driver's seat.

10. Remove these panels on the instrument panel with a 10mm socket.

11. Remove the center glove box by popping it out of the console.

12. Remove the cup holders by removing the 4 10mm bolts

13. Detach the 4 latches to remove the dog house from around the engine.

FRONT END KIT INSTALLATION

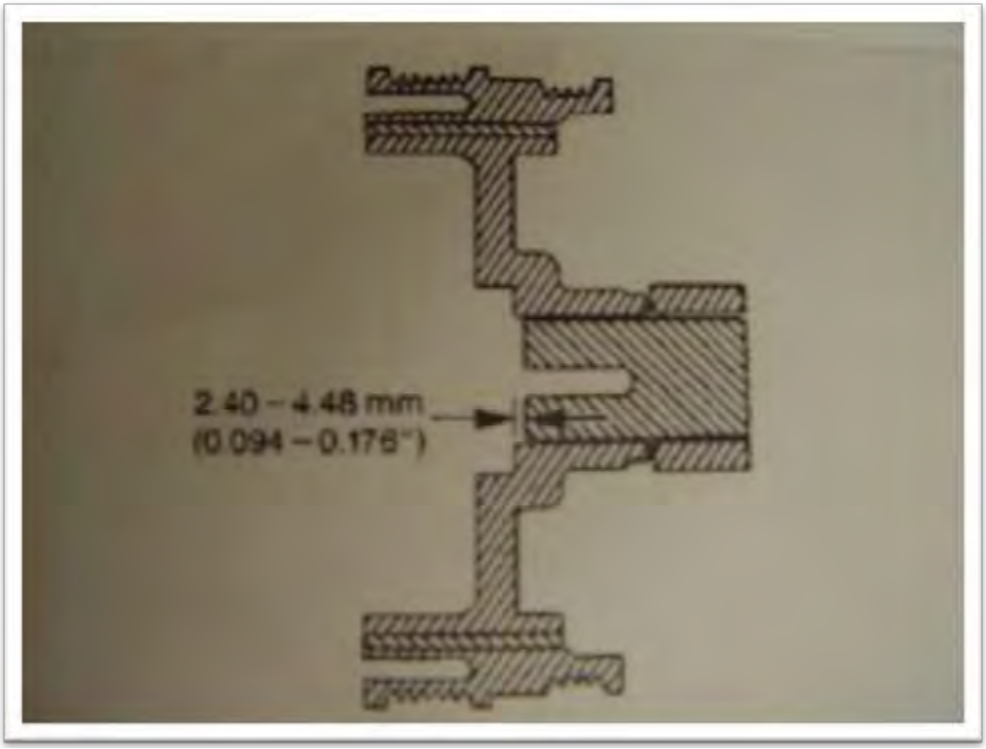
14. Remove balancer bolt (right handed thread) after installing flywheel holding tool. **(DO NOT DISCARD BOLT)**. You will need a heavy duty impact gun or breaker bar.

15. Locate puller jaws on three tabs as shown. Photo is taken on the back of the balancer.

16. Place crankshaft end protector in crankshaft, and then use the balancer puller to remove balancer.

17. When installing supplied modified balancer, be sure end of crankshaft and inner diameter of modified balancer are clean and lightly oiled.

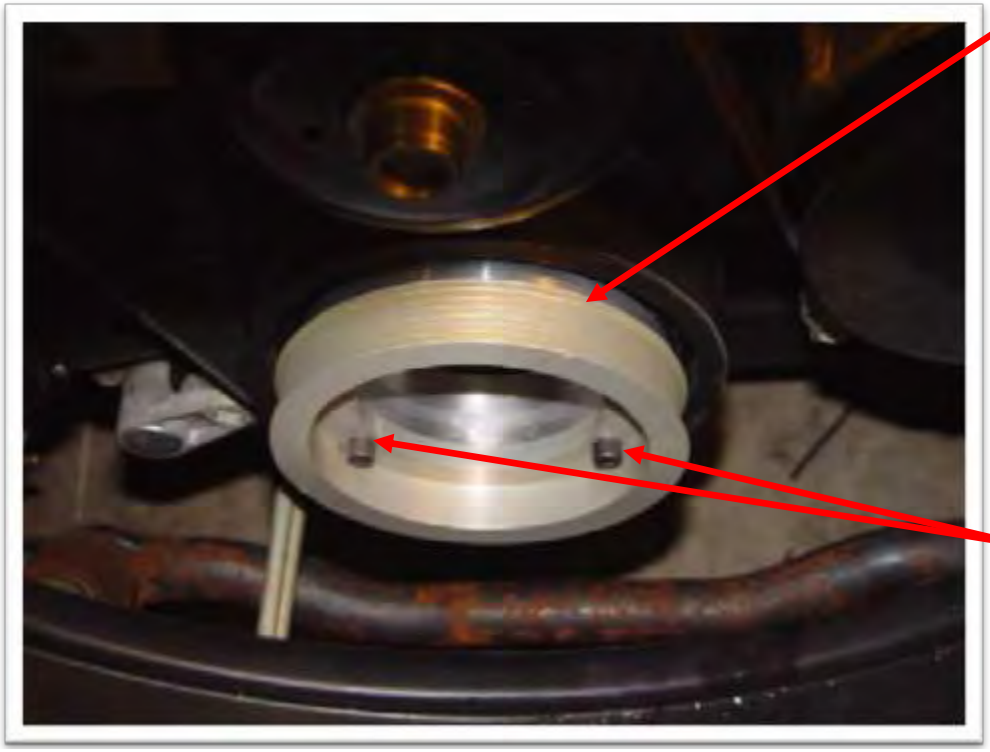
18. Slide modified balancer over shaft and thread installation rod into crankshaft at least 1”.



19. Remove the installation tool. Check that the end of the crankshaft is recessed in the balancer 0.094”-0.176”. This is important to assure balancer is properly seated.

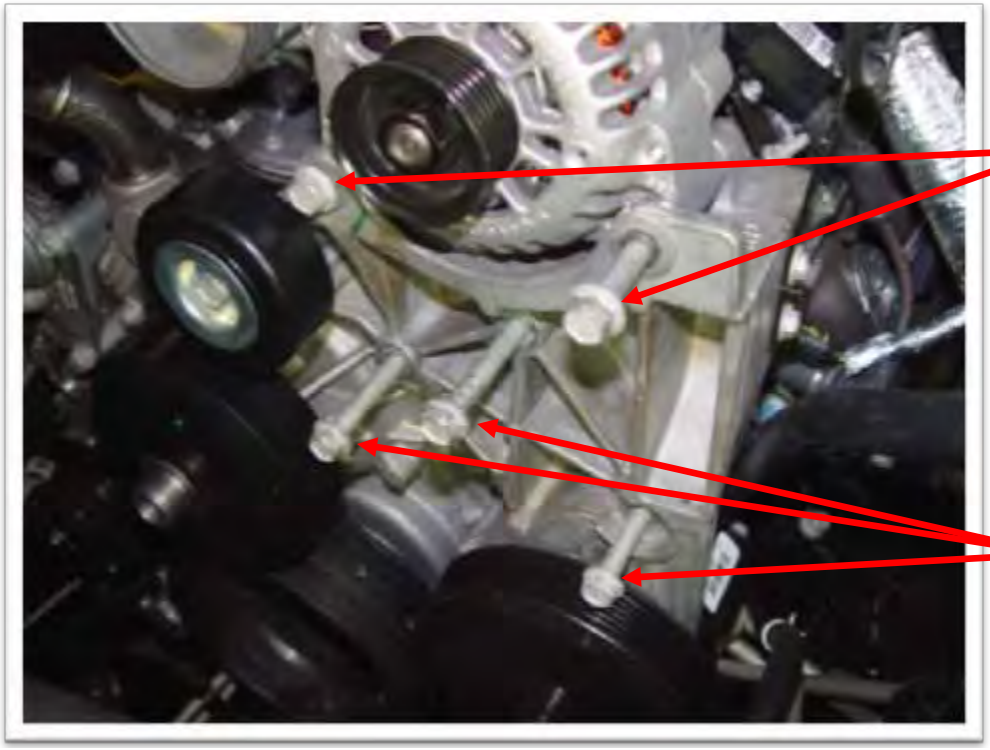
20. Use **OLD** balancer bolt and tighten to 240 ft lb torque. Remove bolt, wipe balancer clean and install new bolt. **DO NOT** use any lubricant, Loc-Tite, etc., of any kind. Tighten bolt to 37 ft lb.

21. Use torque angle meter to further tighten to new bolt another 140°. **Note that the measuring face of the meter must be secured from turning and set to zero before further tightening the bolt**



22. Bolt the aluminum pulley spacer to balancer with three 5/16-18 x 1-1/2" socket head cap screws. Use Loc-Tite removable thread locker (blue) or equivalent. Torque to 22 ft lbs.

23. Bolt the aluminum serpentine pulley to the spacer using three 5/16-18 x 7/8" socket head cap screws also using Loc-Tite. Torque to 22 ft lbs.



24. Remove these bolts and save for later.

25. Remove and discard these three bolts.

Note: This spring pin may have to be filed down to properly install front shaft.

Note that the alternator will have to be changed if van is 2005 and has the heavy duty electrical system (large body alternator).

26. Install adapter bracket using two existing alternator bolts and one M10 x 140mm supplied bolt

27. Install drive shaft coupler that is machined thinner in this area as shown.

28. Remove connector from rear of alternator

29. Install drive shaft through the tunnel next to the driver's side. Reconnect the alternator wiring connector.

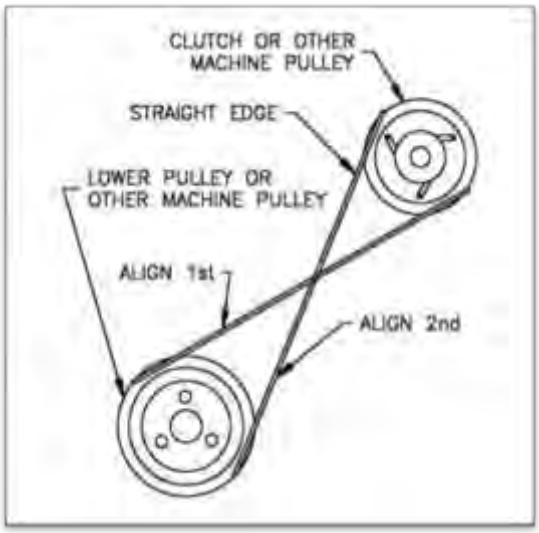
30. Install the clutch magnet with the supplied four 10mm bolts to the drive shaft face.

31. Install the clutch with the 13mm bolt.

32. Install the front tensioner mount as shown with two M10 x 140mm hex bolts and washers.

33. Install idler pulley with bushing, 5/8” spacer and 7/16-20 x 2” bolt.

34. Install 65 7/8” serpentine belt onto clutch, lower pulley, and belt tensioner



35. Align tensioner assembly pins and bolt to mount using 3/8-16 x 2 ½" bolt.

36. Replace heater hose with 5/8" hose and run under the engine and along the frame rail back to the heat exchanger. Mark both ends of the hose "hot" to ensure proper hose routing.

37. Splice the return hose from the heat exchanger into the existing vehicle heater core hose. The hose attaches to the rear of the coolant heat exchanger. For hose routing purposes, mark both ends of the hose “return”.

Follow this series of pictures for coolant hose routing under the vehicle.


Fig. 1


Fig. 2

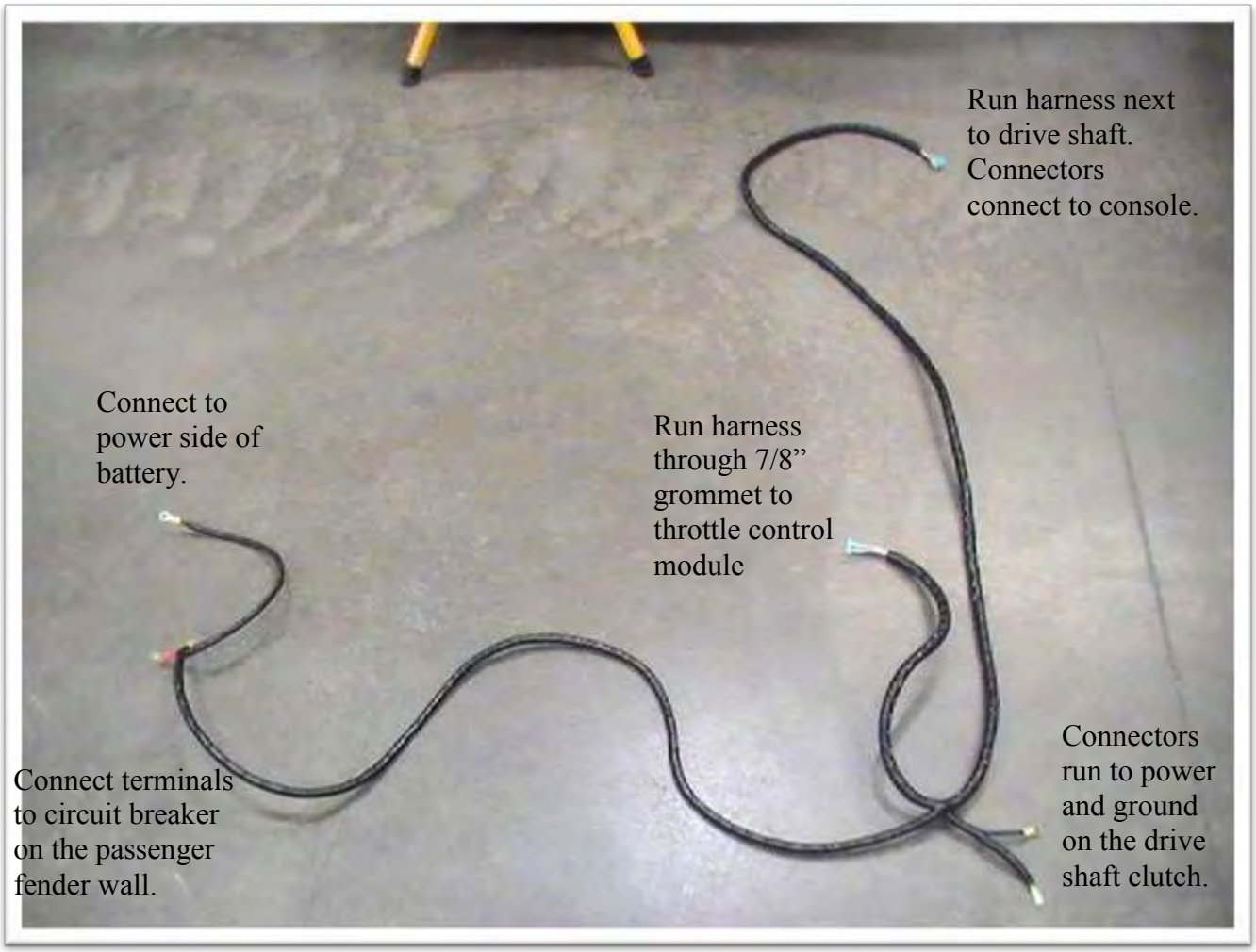

Fig. 3


Fig. 4


Fig. 5


Fig. 6

ELECTRICAL INSTALLATION



39. Install circuit breaker inside engine compartment on passenger side using two ¾" TEK screws.

40. Red jumper – Battery to circuit breaker
Black jumper – Ground

Notch rubber cable protectors for terminal ring clearance.

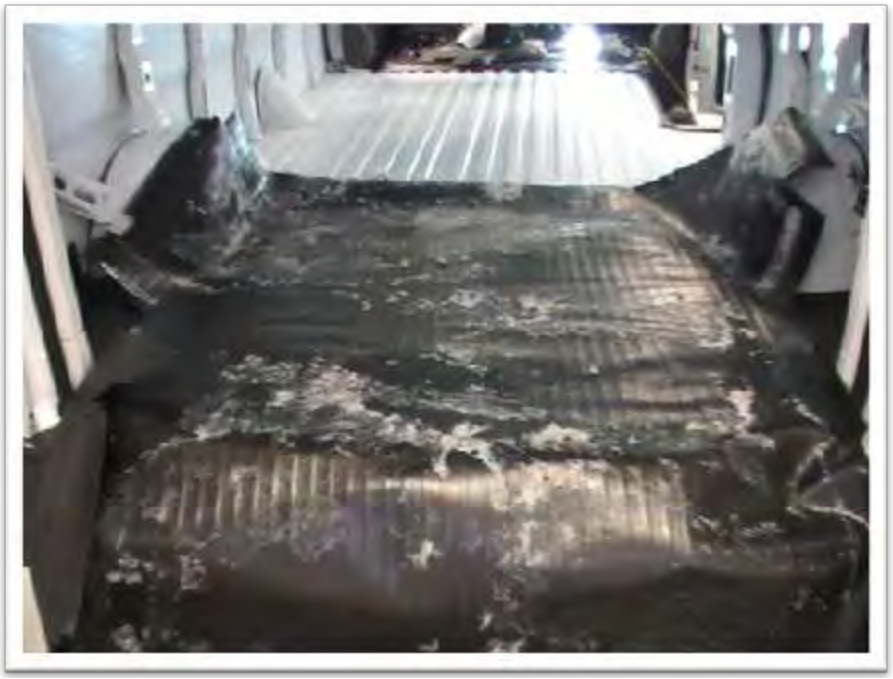
41. Install 7/8" grommet into drivers side firewall then feed wire harness through.

42. Mount the throttle control module EMT68A to the cast metal portion under the steering column with ¾" TEK screws as shown. **Note: Leave the EMT68Ahanging free until after the speed controls are set.**

43. Connect the 18 AWG wires to the EMT68A as follows: RPM3-WHT/BLK, RPM2-WHT/GR, and RPM1-WHT/RED/BLK.

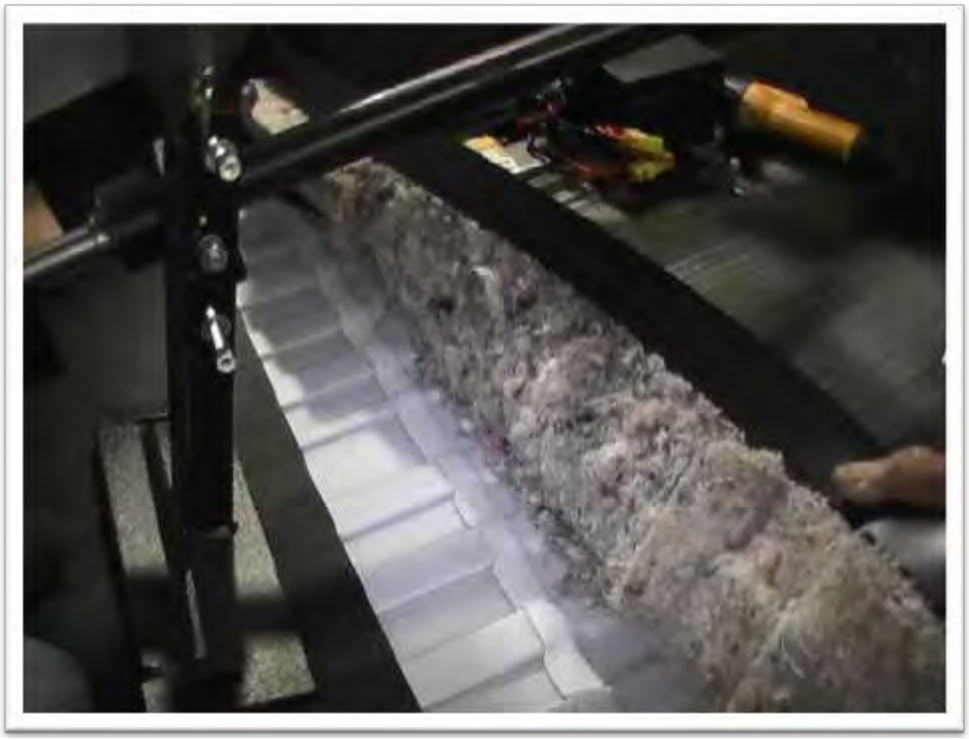
44. Connect the OBDII connector to the EMT68A as follows: GRD-BLK, +12V-BLU/RED.

45. Connect the other end of the OBD II connector to the on-board vehicle access port located above the parking brake. The connector has no retention device so it needs to be secured with a wire tie.



46. Prep the inside of the van. If the OEM rubber mat will be used, remove the fiber backing up to the rear wheel wells. A spray on liner maybe also used.

DRIVE SHAFT AND CONSOLE INSTALLATION



47. Remove the fiber backing on the front mat in the area the drive shaft bracket will sit.

48. Use rear shaft alignment tool (available PN 60-1199) when installing the rear shaft mount.

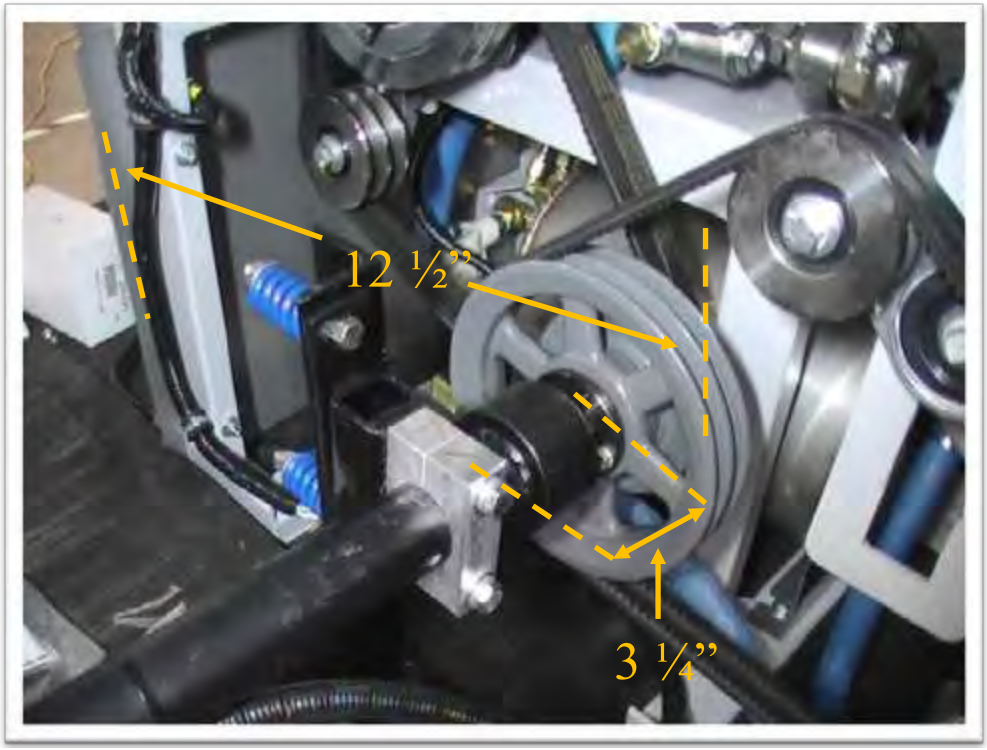
Be sure to put alignment jig against wall of van.

Alignment jig should position the drive shaft to within a 3/4" adjustment of final location.

49. Rest collar of bearing on alignment jig

Illustration of driveshaft rear isolators

50. When drive shaft, clutch, and lower pulley are aligned, drill and bolt the rear shaft mount in place with two 3/8-16 x 1 3/4:" bolts. **Before drilling through the floor of the van, check for any hazardous obstructions. Verify alignment using a straight edge. Tighten front and rear clamps and re-check alignment.



51. When placing machine into truck, align by measuring 12 1/2” from the center to the steel drive shaft to the front of the machine frame.
**Be sure to leave enough space between the shaft and the machine to slide pulleys and belts on and off.

52. Slide the 8”OD blower drive pulley all the way onto the rear drive shaft and tighten in place. Repeat the process for the 5”OD pump pulley.

53. With a straight edge, align the machine blower pulley to the large rear drive shaft pulley while holding the 12 ½” from shaft to machine front.

54. Drill four 7/16” holes through the floor in the machine mounting holes and bolt in place with 3/8-16 x 2” bolts, 3/8” lock washers and 3/8” flat washers and 3/8” nuts. **Be sure to check under the van for clearance before drilling any holes.**

55. Re-check the blower to drive shaft alignment then loosen the pump mount and align it to the small rear shaft pulley. Tighten pump tray then verify alignment.

56. Add blower belt then pump belts and set to proper tension with the tensioners.

57. Route the wire harness down the length of the drive shaft taking care that it clears all rotating equipment. Wire tie in place.

58. Drill two 1 ½" holes through the floor of the van. Place plastic grommet in each hole. **Be sure to check under the van for clearance before drilling any holes.**

59. Attach the two coolant hoses to the heat exchanger. The “HOT” in goes to the front lower hose barb. Clamp in place.

60. Drill a 2 ¾” or 3” hole through the floor through which to route the blower exhaust.

61. Drill a 1 1/2” hole in the van floor at the rear of the machine near the exhaust. Insert grommet and press the supplied length of 3/4” hose over the pop off valve then through the floor.

62. Connect the clear chemical primer hose at rear of machine to the barb on the side of the recovery tank.

63. Install the engine fan. On 2003-2006 GM use a fan spacer if needed to achieve proper clearance.

64. Re-install the upper radiator shroud and clip all removed hoses back onto the upper shroud.

65. Place the drive shaft boot as shown. Align the doghouse cutout template on the dog house and cut out as shown on the template. Place the doghouse back in the van and clamp the four latches in place.

66. Place doghouse cutout weather seal under drive shaft boot. Align this edge so it runs straight up and down. Pull tight and TEK screw in place. Bolt cup holder back on clamping the edge of the weather seal down.

67. Place the console onto the machine.

68. Connect the negative battery cable.

69. Top off radiator with coolant. Start vehicle and slowly add coolant. Bleed the machine lower heat exchanger with the petcock on top.

70. After console and driveshaft installation is complete, verify that there are no coolant leaks on the console or the engine.

71. Bleed all air from the lower coolant heat exchanger using the petcock on the top of the heat exchanger. Make sure to keep the vehicle radiator and coolant recovery bottle at the proper levels.

SPEED ADJUSTMENT

NOTE: It is best to have the speed control module NOT attached to the vehicle so that it can be held in one hand and you can easily see the speed screws to make adjustments while observing the vehicle tachometer.

1. Ensure vehicle is in park and the parking break is set.

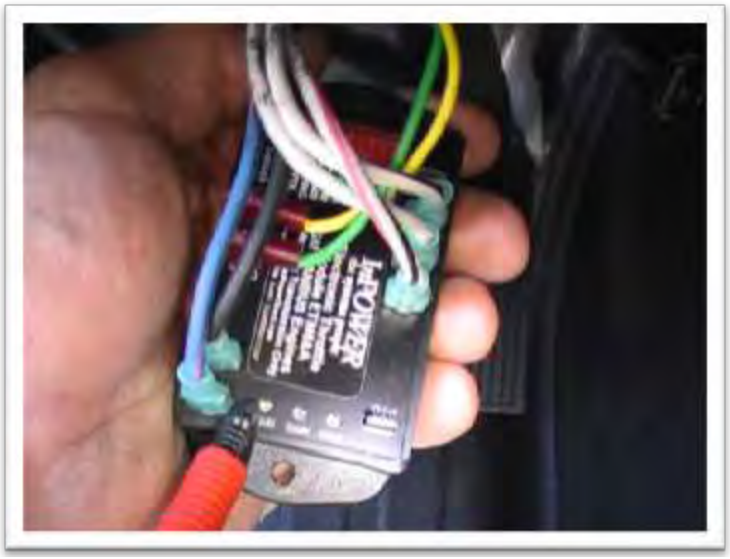
2. Start van.

3. Turn switch on the console to vacuum only.

4. Set speed switch on the console to low.

5. Press the top button to the left of the instrument cluster until the tachometer is displayed.

6. Digital tachometer displayed in lower cluster



7. Set console speed switch to low. With an eyeglass size screwdriver, very slowly rotate the RPM3 screw on the speed control clockwise and with a pause between movements until 1100 RPM is indicated on the tachometer. Speed can be reduced by turning the screw counter clockwise.

8. Set console speed control switch to medium. Repeat step 7 on screw marked RPM2 and set speed to 1300 RPM.

9. Set console speed control switch to high. Repeat step 7 on screw marked RPM1 and set speed to 1500 RPM.

10. Attach speed module to van above the throttle pedal

SECTION 3: OPERATION

4. SYSTEMS

5. OPERATION

4. 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/HEATING SYSTEM

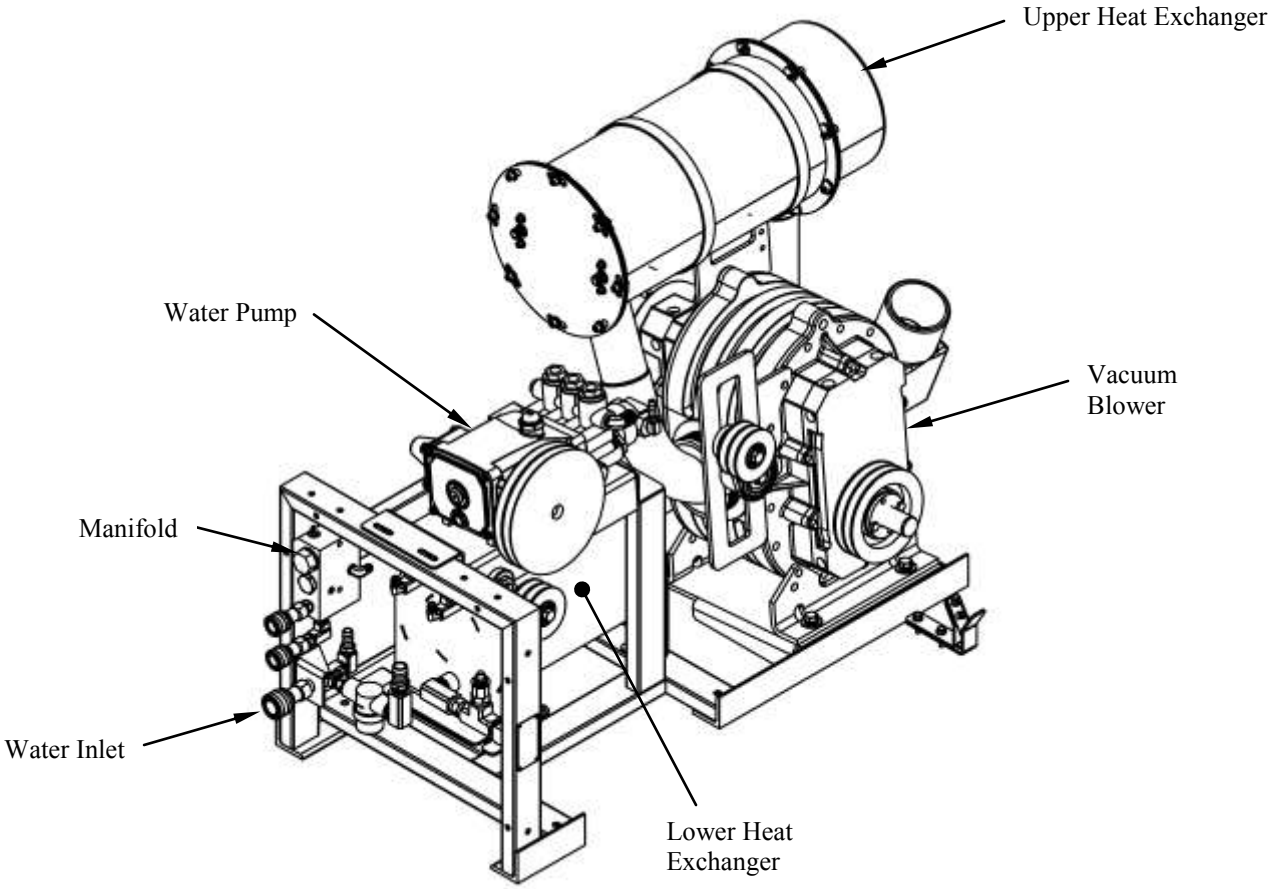
Cold water enters the console through the water inlet connection located on the lower left corner of the lower front panel.

Cold water enters the console through the water inlet connection located on the lower left corner of the lower front panel.

The water flows directly to the inlet side of the water pump where it is pressurized. From there it flows to the heat exchanger where it travels through finned tubing and is further heated by the vacuum blower and engine coolant.

The hot water then flows through the check valve manifold that contains a strainer and a check valve. At this point, the chemical injection takes place.

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



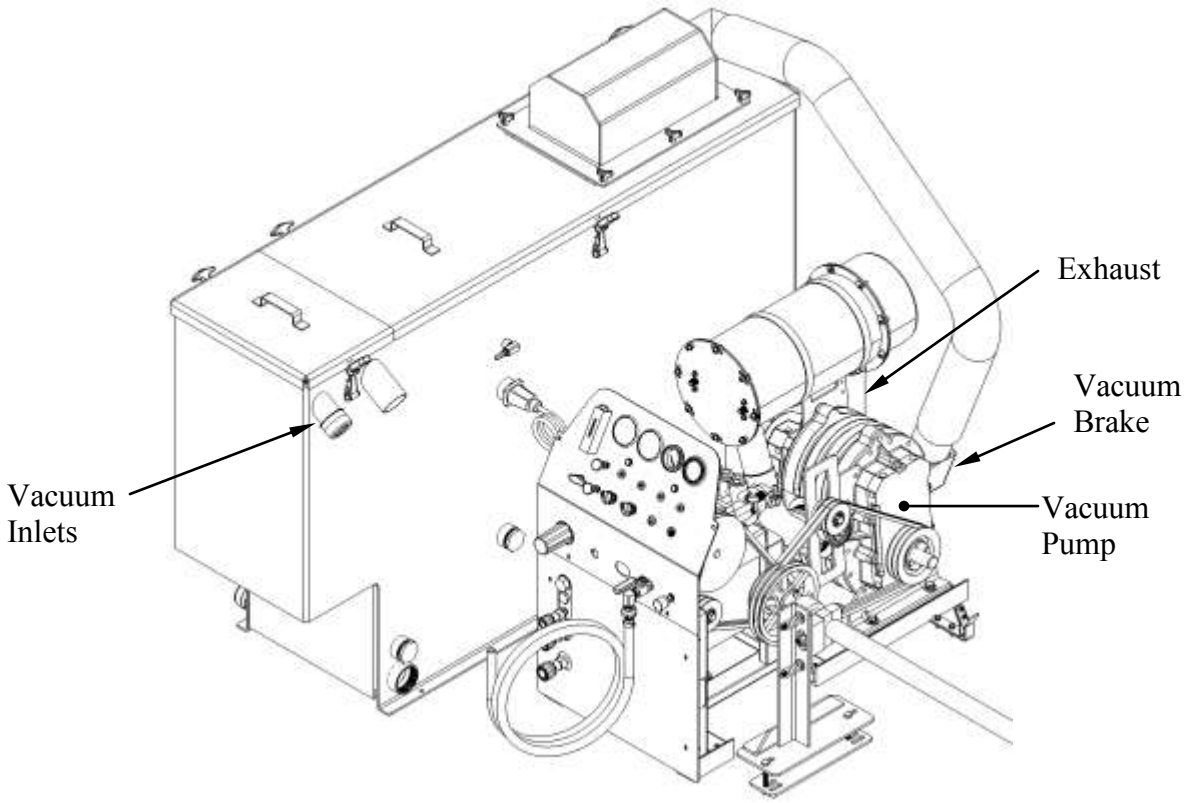
VACUUM SYSTEM

The engine turning a vacuum pump generates the vacuum. The air is channeled in one side of the vacuum pump, compressed and discharged on the opposite side, creating airflow. This airflow is used to do the work necessary for the extraction process. A vacuum nozzle applied to the carpet surface removes moisture, dirt and spent chemicals. These elements are conveyed back to a separating tank utilizing hoses and the force of air. Particles of moisture and dirt are separated in the vacuum tank using a series of changes in direction and velocity. The air is then filtered and rushes into the vacuum pump.

The vacuum pump also heats incoming air as it is compressed. The hot discharged air goes into a secondary heating element/silencer before being discharged under the van.

The vacuum pump speed is factory set to maximize vacuum pressure and provide sustained system life. Do not alter the vacuum speed outside the recommended range shown in the Technical Specifications section.

A level shut off sensor is located near the top of the waste tank and will shut down the 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. A green indicator lamp will illuminate to alert the operator when the tank is full.

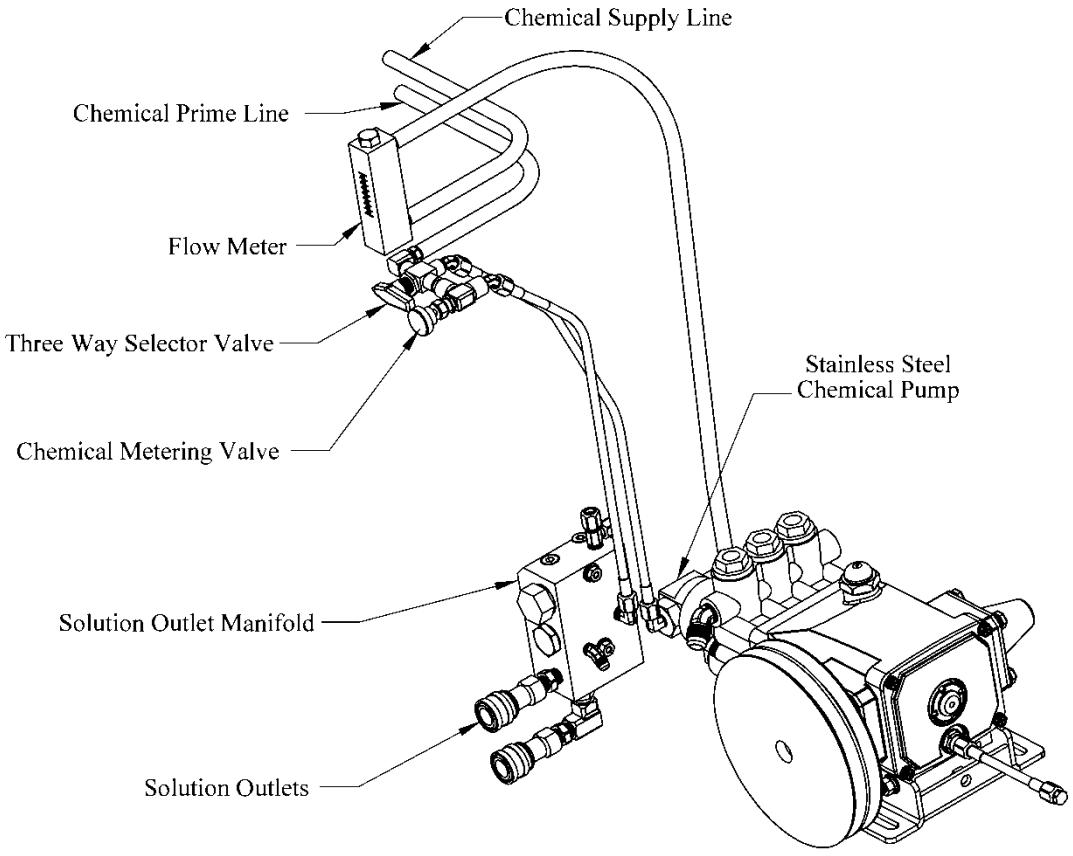


CHEMICAL PUMPING SYSTEM

The chemicals are drawn from the chemical container through a strainer into the flow meter mounted on the control panel. The flow meter indicates the rate of chemical flow.

The chemicals then flow through the stainless steel chemical pump, the chemical is then injected into a three way selector valve located on the front panel. This valve may be used to turn the chemical flow **ON**, **OFF**, or to **PRIME** the chemical pump.

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.



5. OPERATION

PREPARATION

This section of the operator's manual explains how to prepare, start, operate, shut down and maintain your **SAPPHIRE SCIENTIFIC MODEL PRO-1200®** mobile cleaning unit. The **MODEL PRO-1200®** unit is easy to operate, however only trained operators should proceed.

REMOVE TOOLS FROM THE VEHICLE

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

WATER SUPPLY CONNECTION

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.

1. Connect the water supply hose to the water inlet quick connector on the front of the unit. Connect the hose to the faucet.

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

2. Turn the water supply faucet on.

HIGH PRESSURE HOSE

Before starting the unit, connect the high pressure hose to the solution outlet connection at the front of the unit. Connect the cleaning tool to the opposite end of the pressure hose.

STARTING THE UNIT

⚠ CAUTION!

1. Put vehicle in park and set the parking brake. Start the vehicle.

2. Set throttle control to desired speed.

3. Turn clutch switch to vacuum/pressure

NOTE: If the unit does not build water pressure after 5 seconds, check for adequate water supply. See "Loss of Water Pump Pressure in the **Troubleshooting** section of this manual.

VACUUM HOSE

Connect the vacuum hose(s) to the vacuum inlet connection. Connect at the opposite end of the vacuum hose(s) the cleaning tool.

SAPPHIRE SCIENTIFIC recommends that the total floor tool size does not exceed #6. Using larger jet sizes on your **MODEL PRO-1200®** unit may reduce cleaning temperatures.

PRIMING THE CHEMICAL PUMP

NOTE: SAPPHIRE SCIENTIFIC 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.

1. Insert the chemical inlet tube into the chemical container.

NOTE: When inserting the chemical tube into the chemical container, ensure that it stays submerged, as the chemical pump will not function if air is allowed to enter the inlet line.

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 container through the chemical prime tube.

After the flow begins, turn the chemical selector valve to **OFF** position.

3. When the chemical flows with no air bubbles, priming 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.

AUTOMATIC WASTE PUMP

1. If your unit is equipped with an optional automatic waste pump, connect one end of the ⅝ in. or larger garden hose to the pump-out connection and the other end to an acceptable waste disposal.

2. Turn the pump-out switch located on the front console control panel to the **ON** position. The waste pump will now operate automatically throughout the cleaning period.

DO NOT use an outlet hose that is smaller than ⅝ in. I.D.

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

⚠ WARNING!

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 or restoration operation. Set speed to desired position for cleaning job. A float shut-off switch is located inside of the waste tank. It will automatically shut down the unit if the tank reaches its full capacity. If this occurs, empty the waste tank before continuing. When doing flood extraction, the water pump should be in the **OFF** 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. Run unit on low speed. Upholstery tools have a lower flow rate and smaller orifices. Adjust the thermostatic temperature control to the desired temperature. To maintain proper cleaning temperatures, make certain that the unit has been fully heated up prior to cleaning.

STAIR TOOL CLEANING

1. Run unit on low speed. Adjust the temperature control to the desired temperature. To maintain proper cleaning temperatures, make certain that the unit has been fully heated up prior to cleaning.

FLOOD RESTORATION/EXTRACTION

1. Set speed to high on the front control panel. Make certain that the main switch is set to **Vacuum Only**. Proceed into the extraction process.

NOTE: During flood extraction it is recommended the throttle control is set to maximum.

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 hose from the unit.

4. Adjust the speed to low position.

5. Allow the unit to run for at least **5 minutes**. This will also help to remove any excess moisture from the vacuum pump and cool the unit down.

NOTE: If shutting down for the day: Plug the vacuum inlet and set the throttle control to high. Spray WD-40 (or equivalent) into the **blower lubrication cup,** located on the right hand side of the panel for **5 seconds**. Let machine run 2 to 3 minutes to disperse lube to blower.

6. Unplug the vacuum inlet and remove load. Next, return the speed control to idle position**,** and let idle for 2 to 5 minutes.

7. Ensure all switches are in the **OFF** position. This will prevent a drain on the vehicle battery.

8. Turn the water supply faucet off. Loosen the water supply hose at the water supply to bleed off any pressure. Unhook the water supply hose and return it to the vehicle.

9. 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.

10. 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.

11. Remove the strainer basket from the waste tank. Clean out any debris and re-install. Microban QGC cleaner is the best product for cleaning and sanitizing the waste tanks as well as other parts of the system

NOTE: Damage may occur to the vacuum pump. Replacement and maintenance of the filter will prevent rust and corrosion from entering the vacuum pump.

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

NOTE: To remove the vacuum inlet filter, grip the plastic hexagon section of the filter. Gripping the filter by the screen will collapse or destroy the filter. After cleaning, grease the threads on the filter and replace the filter. Tighten the filter until hand tight and then loosen ¼ turn. This will make the filter easier to remove when cleaning or replacement is required.

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

13. At the end of the work day, rinse out the waste tank with fresh water. Microban QGC cleaner as the best product for cleaning and sanitizing the waste tanks as well as other parts of the system

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

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. The following is recommended to prevent this from occurring during the cold weather season:

1. Always park the unit in a heated building when not in use.

2. While out 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.

3. If a heated building is not available, winterize the unit with anti-freeze.

It is not possible to winterize units that have auxiliary water tanks. If the unit has an auxiliary water tank(s), it must be stored in a heated building.

WINTERIZING YOUR UNIT WITH ANTI-FREEZE:

1. Shut off the water supply to the unit and disconnect the water inlet hose from the console.

2. Connect all solution hoses and a tool to the console.

3. Start the unit with the water pump in the **ON** position. Open a valve on the tool.

4. Attach hose to water inlet and into antifreeze source

5. Start the unit and set the speed control to the low position. Insure the water pump is on. Open a tool valve until anti-freeze comes out of the tool. Repeat this procedure with **ALL** remaining tools and hoses.

6. After the tools and solution hoses have been filled with anti-freeze, disconnect and store them.

Recover all anti-freeze that comes out of the tools and hoses and store in an approved container. **ALWAYS** re-use or re-cycle anti-freeze.

7. Prime the chemical injection system with a 100% glycol based antifreeze. Insert the chemical inlet and prime tube into the anti-freeze container. Turn the chemical valve to **PRIME** until anti-freeze comes out of the prime hose. Turn the chemical valve to the **ON** (chemical) position. Ensure that the flow meter indicates flow while the attached tools solution valves are opened. Ensure that all anti-freeze that comes out of the chemical hose goes into an approved container.

After **25 seconds**, turn the chemical valve to the **OFF** position.

REMOVING ANTI-FREEZE FROM THE UNIT:

1. Attach water supply hose and turn on water.

2. Connect the solution hoses to the unit, with a tool attached to the opposite end. Start the unit. Turn the water pump on. Open the tool valve and ensure that the anti-freeze goes into an approved container. Allow the anti-freeze to flow into the container until all anti-freeze has been drained.

Open all tool valves and drain the anti-freeze into an approved container until the water runs clear and all of the anti-freeze is purged from the hoses and tools.

3. Submerge the chemical hose into fresh water. Turn the chemical valve to the **PRIME** position until the water runs clear through the sight glass.

4. Turn the chemical valve to the **ON** (chemical) position and open attached tools solution valves. This will allow water to flow to the other side of the system.

After all of the anti-freeze has been removed, the unit is ready to operate.

The anti-freeze in your approved storage container will eventually become diluted with water. When the anti-freeze level drops below 70% of the total mixture, properly dispose of it and start over with fresh 100% anti-freeze.

⚠ WARNING!

DO NOT drain used anti-freeze on the ground or into storm drains.
Dispose of anti-freeze only in an approved location. Observe Local, State and Federal laws when disposing of anti-freeze.

OPERATING PROCEDURE

To Start:

1. Vehicle must be in park
2. Parking brake must be deployed
3. Accelerator pedal cannot be engaged
4. Service brake pedal cannot be engaged
5. Engine must be running and idling below 900RPM
6. Vehicle cannot sense forward motion
7. AC and/or heat must be turned off

To Shut Down:

Note: When you turn your machine off the electronic throttle control does not immediately turn off. It will continue to slowly idle the engine down to the standard idle. Once the vehicle engine has reached the target idle speed
the throttle control module will hand back engine speed control to the vehicle computer.
Interrupting this change over by not obeying the following will generally cause a check engine light.

1. Switch to vacuum only
2. Remove vacuum load
3. Switch speed switch to low and allow idle to drop (about 1 minute)
4. Turn machine off

Wait 2 minutes before doing any of the following:

Shifting vehicle out of park
Turning vehicle engine off
Pressing accelerator pedal

VEHICLE PREPERATION

1. Park vehicle, place automatic transmission in Park and set emergency brake.

2. The vehicle engine must remain running. Therefore, if the vehicle is to be unattended, the doors should be locked and the hoses run through the security access door.

CAUTION:
A. Do not park vehicle on a lawn or close to shrubs, as heat from exhaust or water overflow may cause damage.

B. Do not allow vacuum or solution hoses to rest against vehicle exhaust pipe, or damage will result.

C. Do not operate machine with covers or guards removed.

MACHINE SET-UP FOR CARPET CLEANING OPERATION

1. Assure that chemical jug has adequate chemical supply.
2. Connect an incoming water source to the machine. Assure the inline water supply valve is open.

3. Assure that the waste tank drain valve is closed.

4. Connect the vacuum and solution hoses to the machine. Connect the cleaning tool to the other end of the hoses and open the solution line valve.

5. Select the desired machine operating speed.

6. With the vehicle engine running, rotate the main power switch to the **PRESSURE** & **VACUUM** position.

7. Set speed control to match tool/job.

8. Depress the cleaning tool trigger and observe the water pressure gauge reading. Set pressure to 500 PSI or as needed for the job being performed. To adjust, turn the unloader handle clockwise to increase pressure and counterclockwise to decrease pressure.

9. Depress the cleaning tool trigger and read the face panel temperature gauge. Set the output water temperature by adjusting the temperature mixing valve which is located on the pump system plumbing between the heat exchanger input and output hoses inside the console. When the valve knob is closed, the temperature will be at maximum.

10. Depress the cleaning tool trigger and monitor the face panel chemical flow meter reading. Adjust as desired by rotating chemical adjust valve counter-clockwise to increase flow and clockwise to decrease flow. If air is in flow meter or lines, pulse pump may need to be primed. (Refer to pulse pump priming)

11. Proceed to your cleaning task by starting to clean at the point furthest away from the vehicle and working back toward it.

12. To disconnect a tool from the solution line, turn the solution valve to the perpendicular OFF position, depress the cleaning tool trigger, and disconnect tool.

13. When cleaning is complete, rotate the main power switch to the **Vacuum Only** position. Allow unit to run for five minutes. Spray WD40 or equivalent into lube cup for 5 seconds. Disconnect set-up and proceed to an approved waste dump area if necessary. Close drain valve before starting the next cleaning job.

CAUTION:

A.) Protect equipment from freezing.

B.) If recovery tank becomes full, it will automatically shut the machine off. Rotate the main power switch to OFF and empty the recovery tank.

C.) The overflow / vent hose for the fresh water tank requires a 3" - 4" slit in the hose near the floor of the van. This is a safety feature to ensure that pressure cannot build up due to ice forming at the end of the hose.

GAUGE READINGS AND SETTINGS

VACUUM GAUGE

The vacuum gauge should read near **zero** with vacuum hose disconnected from the recovery tank. If gauge shows a reading, check filter inside the vacuum tank. With vacuum port sealed, vacuum gauge should read 13 to 14 inches of mercury. This is preset by the factory for the maximum safe flow. Do not exceed this level, as damage to the blower will result.

TEMPERATURE GAUGE

This gauge reads the water temperature at the outlet of the machine. The output temperature is adjustable by controlling the temperature control valve located on the front panel and by speed settings.

TEMPERATURE CONTROL

The low speed setting is for upholstery and delicate cleaning. Set the machine to medium speed for single wand operation. The high speed setting is for dual wand operation. If a lower temperature is desired, open the temperature control valve on the control panel. The highest temperatures are achieved with the valve closed.

FLOW METER

The flow meter reads the flow rate from the chemical jug while the chemical is being drawn. The chemical adjustment should normally be set at 1 or 2 GPH for a normal job and at 2 or 3 for an extremely dirty job. NOTE: This setting depends upon the type of chemicals used and their concentrations. Always use the lowest flow rate that properly cleans the affected areas, whereas excessive chemical may cause damage to the item being cleaned.

HOUR METER

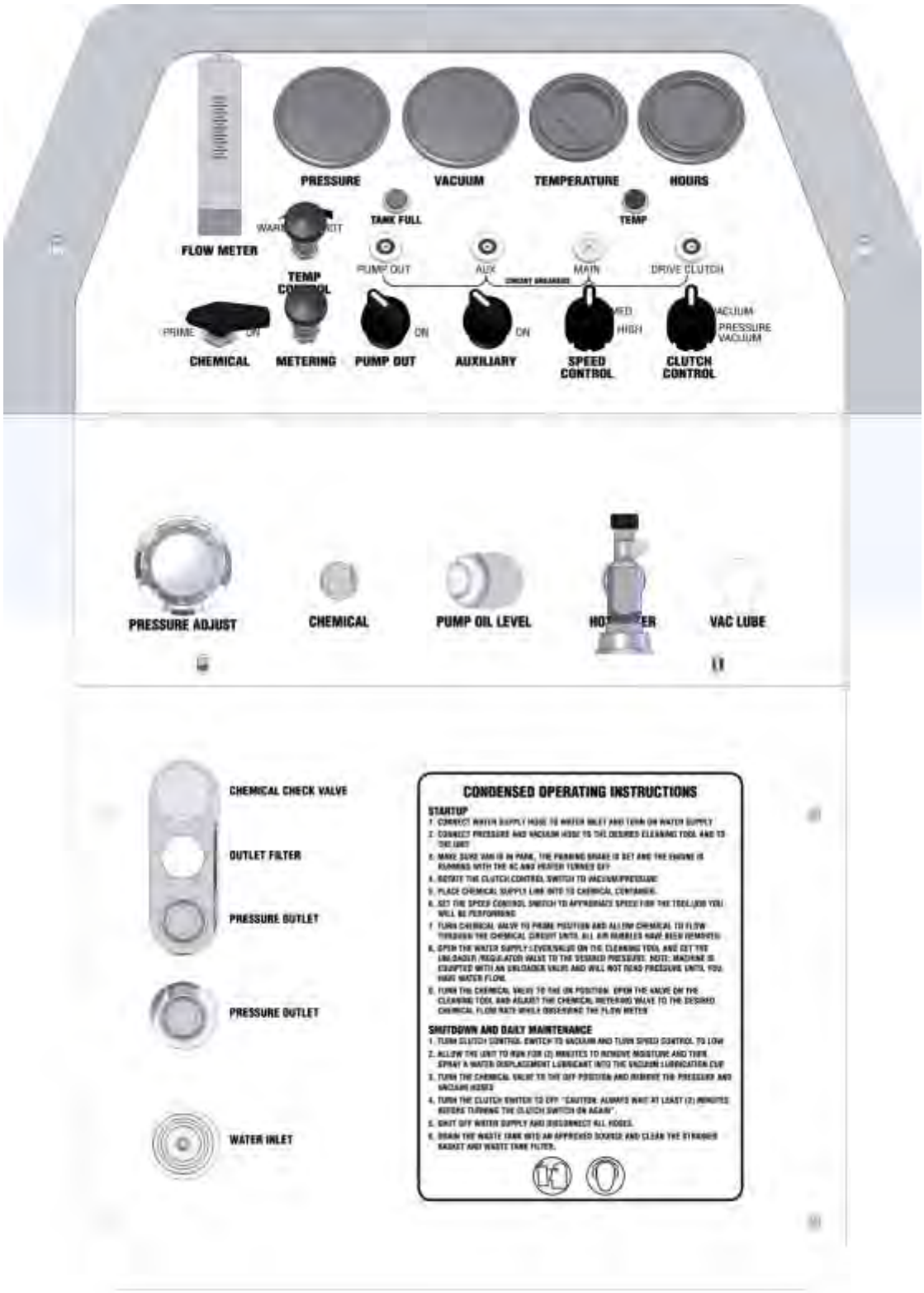
The hour meter records the operating time of the machine. This information is needed to calculate water pump and blower oil change intervals as well as additional machine maintenance times.

WATER PRESSURE GAUGE

Water pressure is set by adjusting the unloader valve for the desired water pressure. Prior to increasing pressure, conform to all precautions noted in the pressure washing section. Normal setting is 200 PSI for upholstery cleaning, 500 PSI for carpets and 1200 PSI maximum for pressure washing. If upholstery tool designed for truck mount operation is used, the pressure for upholstery cleaning can be set at the same level as for carpet cleaning.

CONSOLE CONTROL SWITCHES

MAIN POWER switch operates recovery blower and the pressure pump. Separate switches are provided for auxiliary pump out and demand pump if equipped.


PRESSURE
VACUUM
TEMPERATURE
HOURS
FLOW METER
TANK FULL
TEMP
TEMP CONTROL
PUMP OUT
AUX
MAIN
DRIVE CLUTCH
PRIME
ON
CHEMICAL
METERING
PUMP OUT
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HIGH
SPEED CONTROL
VACUUM
PRESSURE
VACUUM
CLUTCH CONTROL
PRESSURE ADJUST
CHEMICAL
PUMP OIL LEVEL
VAC LUBE
CHEMICAL CHECK VALVE
OUTLET FILTER
PRESSURE OUTLET
PRESSURE OUTLET
WATER INLET
CONDENSED OPERATING INSTRUCTIONS
STARTUP
SHUTDOWN AND DAILY MAINTENANCE

CHEMICAL PUMP PRIMING

1. Assure chemical jug is adequately filled.
2. Set the CHEMICAL switch to prime.
3. Rotate the MAIN POWER switch to the PRESSURE & VACUUM position.
4. Allow chemical to flow until all the air is removed and steady flow is observed in flow meter.
5. Rotate the CHEMICAL switch to the on position; Chemical adjustment can now be made as desired for the cleaning tool to used.

AUTOMATIC SHUT DOWN

1. When the waste tank is full, the machine will shut down and a green waste tank full light will illuminate. Turn clutch switch off and empty waste tank to resume operation.
2. A red high temperature light will illuminate along with machine shut down if the engine coolant temperature reaches 250 degrees.

CHEMICALS

CARPET CLEANING

Always use a good quality emulsifier which is recommended for use in truck-mounted equipment. Mix emulsifier thoroughly in accordance with manufacturers recommendations. Note that combining two or more chemicals, inadequately
dissolving of powders, or using inferior quality materials may cause sedimentation and will clog the machine. Serious damage will result from using improper chemicals or mixtures.

UPHOLSTERY CLEANING

Use only chemicals recommended for wet cleaning of upholstery fabrics. Consult factory for specific instructions.

PRESSURE WASHING

Use #1 or #2 pressure washing solvents only. **DO NOT USE** the highly aggressive #3 alkaline degreaser. Flush chemical system and pumping system with clean water after job is complete.

UPHOLSTERY CLEANING OPERATION

Cleaning can be performed with either a single or a dual wand hookup at pressure up to 400 PSI. When cleaning upholstery, change to a chemical recommended for wet cleaning and take all necessary precautions to ensure satisfactory results.

PRESSURE WASHING OPERATION

CAUTION: ***Use extreme caution not to come in contact with the spray or personal injury could result.***

Disconnect the vacuum hose from the input to the recovery tank or remove cover from the filter box assembly, which will reduce the vacuum load on the system. Adjust the machine high pressure output as desired up to a maximum of 1200 PSI. With the pressure washing tool valve open, adjust chemical draw reading on flow meter as desired. When pressure washing is completed, readjust pump pressure and reconnect the vacuum hose to the system.

WATER EXTRACTION OPERATION

1. Start machine by rotating the MAIN POWER switch to the VACUUM ONLY position. This disengages the pump clutch to prevent pump damage.

2. Connect the vacuum hose directly to the optional filter box assembly or directly to the recovery tank. Do not use the active hose reel or excessive vacuum loss will occur.

3. Drain recovery tank as necessary. Return machine to normal settings when complete

DUAL WAND OPERATION

PRO-1200

The direct drive systems have sufficient capacity for dual wand operation with minimal pressure loss at each wand. The pump pressure and temperature can remain at the same levels as for single wand operation. The chemical flow rate may be set slightly higher than for single wand operation. To set up for dual wand operation, remove the plug on the optional filter box assembly or on the dual wand adapter elbow. For proper operation, each vacuum hose line should be the same length.

WINTER OPERATION

Extreme care must be taken to assure that the machine and its associated tools are protected from freeze damage. Freeze damage may be extremely expensive to repair and is not covered under the warranty. If below freezing temperatures are experienced, the van must either be garaged in a heated area or the equipment must be winterized.

WINTERIZING

NOTE: Undiluted windshield washing antifreeze is sufficient for temperatures down to -10°F. For protection at lower temperatures, permanent engine antifreeze. Before cleaning operations, the antifreeze must be flushed from the system.

1. Drain recovery tank and close drain valve.

2. Rotate the MAIN POWER switch to PRESSURE & VACUUM and start machine; open blower lubrication valve located on face panel; and allow blower to draw in a small amount of WD40 or equivalent oil into the blower. This will prevent rust from developing in the blower if the machine is left idle.

3. Remove chemical draw line from chemical jug and place it into a container of antifreeze. Fully open the CHEMICAL ADJUST valve (turn counter-clockwise). Switch chemical valve to “PRIME”.

4. Open the PRESSURE PUMP output valve and observe that the antifreeze is drawn through the chemical line, flow meter, and chemical pump. Allow machine to continue to run another five to ten seconds. Switch valve to “OPEN” and run another ten seconds.

5. When the chemical feed portion of the machine is winterized, close PRESSURE PUMP OUTPUT valve, rotate the MAIN POWER switch to the OFF position; fully close the CHEMICAL ADJUST valve (turn clockwise), switch chemical valve to “OFF”.

6. Remove chemical feed line from antifreeze container.

7. Place inlet hose into the container of antifreeze. It will require approximately one gallon of antifreeze to protect machine and approximately two gallons of antifreeze if hoses and tools are to be winterized.

8. Rotate the MAIN POWER switch to the PRESSURE & VACUUM position and restart the machine.

9. Open the PRESSURE PUMP output valve and operate until a steady flow of antifreeze is observed flowing from the PRESSURE PUMP output hose. Open the temp. control valve for 2-5 seconds. **Use Caution**, the antifreeze jug will empty quickly and cause the pump to run dry.

10. If the hoses and tools are to be winterized, add more antifreeze if necessary, close PRESSURE PUMP output valve, and run antifreeze through solution lines and the tools to be winterized. Allow the flow of antifreeze to almost stop before turning off the machine.

11) The system is now winterized.

WINTERIZING AN AUTOMATIC PUMPOUT SYSTEM

1. Prior to machine winterization, empty the recovery tank by using the automatic pump out or by turning the system off and opening the drain valve.

2. With the machine off and the drain valve open, allow the recovery tank to completely drain. When empty, close valve.

3. With the cap removed from the end of the pump out, turn the PUMPOUT SWITCH to manual position to start pump.
4. Allow pump to run until water stops flowing from pump out drain hose.

5. Return AUTOMATIC PUMPOUT switch to the middle position.

6. Elevate the PUMPOUT drain hose and pour approximately 16 oz. of antifreeze into it. The antifreeze will run into the pump and protect it from freezing.

7. Re-attach cap to end of pump-out hose and proceed to machine winterization.

SECTION 4:
SERVICE and MAINTENANCE

6. MAINTENANCE CHART

7. MAINTENANCE

8. GENERAL SERVICE ADJUSTMENTS

9. TROUBLESHOOTING

6. MAINTENANCE CHART

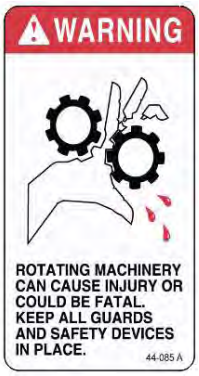
Vacuum Pump	Daily	Spray WD-40 (or Equivalent) into the lubrication cup for 5 seconds.
Water Pump	Daily	Check water pump oil level. (3) Fill to proper level.
Vacuum Inlet Filter	Daily	Inspect filter, clean and or replace if required. (1)
Waste Tank Strainer Basket	Daily	Empty and clean stainless steel basket.
Vacuum Hoses	Daily	Rinse with fresh water.
Waste Pump-Out (Optional)	Daily	Inspect and remove any debris or sediment. (1)
Vacuum Pump	Daily	Check vacuum pump oil level. Fill to proper level. Do not overfill. (1)
Check Valve Strainer	Monthly	Clean and remove any debris. (1,3)
Check Valve	Yearly	Check Teflon seat for abnormal wear or debris. Replace as needed.
Belts	25 Hours	Re-tension all belts. (6)
High Pressure Solution Hoses	25 Hours	Inspect for wear, damage, or impending rupture. Replace if damaged.
High Pressure Solution Hoses	50 Hours	Inspect for wear, damage, or impending rupture. Replace if damaged.
Belts	100 Hours	Re-tension all belts. (6)
Vacuum Break	100 Hours	Check and adjust vacuum relief valve to 14” Hg if needed.
Pressure Un-loader	100 Hours	Lubricate o-rings. Use only o-ring lubricant part # 13-003.
Chemical Metering System	200 Hours	Inspect packing nut on selector and metering valve. Adjust as needed.
Water Pump	500 Hours	Change crankcase oil. (2)
Pulleys and Hubs	500 Hours	Check pulley and hub set screws for proper torque. (4)
Chemical Pump	500 Hours	Change diaphragm and check valves. Inspect disk.
Belts	1000 Hours	Replace all belts.
Vacuum Pump	1000 Hours	Drain, flush, and replace oil. (5)

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

(1) Or as often as required.
(2) Change water pump crankcase oil after **first 50 hours** of operation
(3) Inspect after **first week** of operation, and remove any debris present. Inspect again after **2 to 4 weeks**.
(4) Check pulley and hub set screws after **first 50 hours** of operation, and again at **100 hours** of operation.
(5) Every **1000 hours** or **yearly**, whichever comes first.
(6) After first **25 hours** and then at every **100 hours** of operation.

7. MAINTENANCE

This section of the operator's manual contains the service and maintenance information for the **MODEL PRO-1200®** unit. A planned preventative maintenance program will ensure that your **SAPPHIRE SCIENTIFIC MODEL PRO-1200®** has optimum performance, long operating life, and a minimum amount of down time.



WARNING!

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: Refer to the hour meter as a guide for coordinating a maintenance schedule.

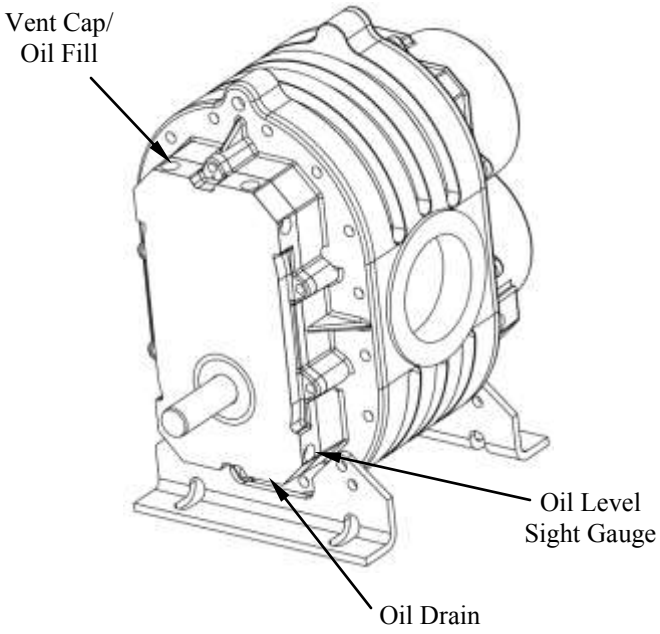
VACUUM PUMP

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

Lubrication: SAPPHIRE SCIENTIFIC *requires* that you use only AEON PD-XD Synthetic Blower Lubricant in both sides of the vacuum pump for all operating temperatures. AEON PD-XD is formulated specifically for positive displacement blower service to provide maximum blower protection at any temperature.

NOTE: Adding petroleum oil to synthetic oil is **NOT** recommended.

1. Check the oil level **daily** on both sides to ensure they are at the proper level. Too little oil will damage and ruin the bearings and gears. Too much oil will result in overheating.



2. A lubrication cup has been provided at 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 moisture from the vacuum pump. Then, spray WD-40 (or Equivalent) into the lubrication cup for **5 seconds** while the unit is running and the vacuum inlet port is sealed. This procedure should be done at the end of **every working day**.

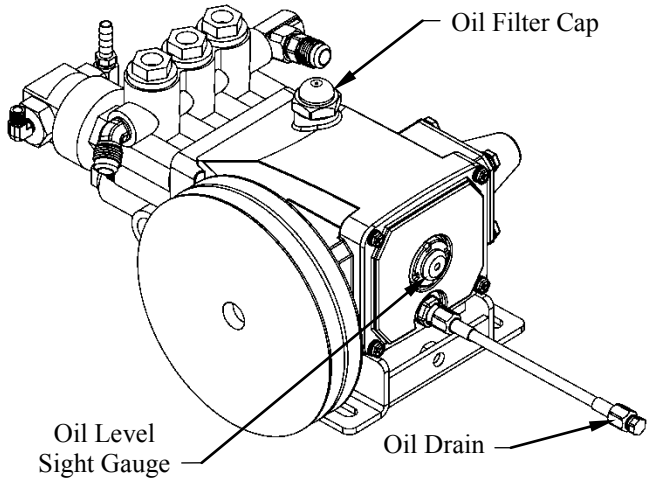
3. Drain, flush and replace the oil every 500 **hours or yearly, whichever comes first.**

NOTE: Two drains are on your vacuum pump. Ensure that both sides of the vacuum pump are filled to their proper level when servicing.

WATER PUMP

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

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

VACUUM PUMP

Belt Replacement Procedures for Model PRO-1200:

Only use Gates EPDM belts:

1. Remove hood
2. Relax tensioner and remove bolts
3. Reverse procedure to install
4. Check pulleys for alignment using a straight edge (example: ½" key stock). Make sure pulley flange touches on 2 places on each pulley (4 total places)
5. Estimated time, 10 minutes

VACUUM INLET FILTER

1. The vacuum inlet filter in the waste tank should be inspected and cleaned **daily.**

CAUTION!

When removing the vacuum inlet filter, grip the plastic hexagon section of the filter. Grasping filter by the screen will damage or destroy the filter. Applying grease to the threads will allow easier removal of filter when cleaning or replacement is required.

DRIVE BELTS, PULLEYS and HUBS

Check pulley set screws and hub screws after the first **25 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.

Insure belts are properly tensioned after checking the torque values. Use Gates EPDM belts.

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**
Water Pump Hub	180	15
Vacuum Pump Hub	180	15

WASTE TANK STRAINER BASKET

The strainer basket located in the waste tank should be emptied and cleaned on a **daily** basis. Microban QGC cleaner is the recommended product for cleaning and sanitizing the waste tanks as well as other parts of the system.

CHECK VALVE STRAINER (OUTLET)

Unscrew the screen and inspect the strainer after the first **week** of operation. Remove any debris present. Inspect again after **2** and **4 weeks.** Thereafter, inspect the strainer and screen at least **monthly**. If a frequent build-up of debris is noticed, inspect and clean more frequently.

CHEMICAL PUMP

The chemical pump should be rebuilt every **500 hours.** This involves changing the diaphragm, check valves, and inspecting the disk. **DO NOT** attempt to reuse o-rings after the check valves have been removed. Replace all o-rings when servicing check valves.

CHEMICAL METERING SYSTEM

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

PRESSURE UNLOADER

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, **SAPPHIRE SCIENTIFIC** recommends that you wash out the hoses with fresh water **daily.** Microban QGC cleaner as the best product for cleaning and sanitizing the wands and hoses as well as other parts of the system

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.

WARNING!

NEVER attempt to repair high-pressure solution hoses. Repairing high-pressure solution hoses may result in severe burns and serious injury.

All high-pressure solution hoses must be rated for 3000 PSI at 250 deg. F. Thermoplastic hoses do not meet this requirement and should not be used. Severe burns and injury may result if the hoses do not meet these requirements.

8. GENERAL SERVICE ADJUSTMENTS

⚠WARNING!

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 port and read the vacuum gauge. If adjustment is required, shut the unit down and adjust the locking nut tension on the vacuum relief valve. Re-start the unit and read the vacuum gauge. Repeat this process until the vacuum relief valve opens at 14" Hg.
Always ensure the lock nut is retightened.

WATER PUMP DRIVE BELT

To tighten the water pump belt:

1. Loosen the bolt on the back of the tension arm under pump.

2. Rotate arm to tension belt. While holding arm, tighten bolt.

3. Check alignment pump to drive pulleys.

⚠CAUTION

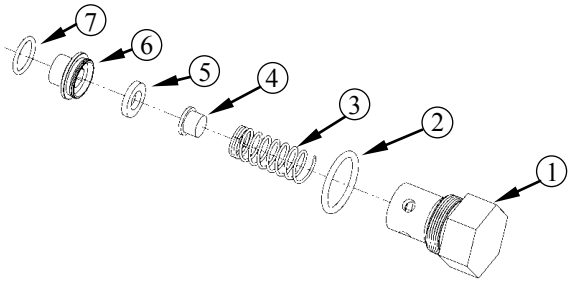
Over tightening of belts may cause damage to pump casing, causing it to fail.

DO NOT over tighten damage to pump may occur.

SOLUTION OUTLET CHECK VALVE

Inspect the check valve whenever performing service on the chemical pump or if flow problems are occurring in the chemical system.

1. Shut down Unit.
2. Remove the check valve, ensuring that the small o-ring on the seat comes out with it
3. Next, remove the seat using a 5/16 in. Allen wrench
4. Check the Teflon seat for wear or debris. Clean and replace the seat if necessary.
5. Inspect the poppet and the spring for wear or damage. Clean and replace as necessary.
6. Re-assemble the check valve. Thread the seat by hand until snug. Then tighten with a 5/16 in Allen wrench. **DO NOT** over-tighten.



23-063 VLV, CHECK, CHECK VLV MANIFOLD

Item #	Part Number	Qty.	Description
1	27-009	1	CAP, CHECK VALVE ASSY. SS
2	41-007	1	ORING, 7/8 ID X 1-1/16 OD
3	15-007	1	SPRING, CHECK VALVE ASSY.
4	27-010	1	POPPET, CHECK VALVE ASSY
5	27-004	1	INSERT, SEAT-CHK VLV ASSY TM
6	27-011	1	SEAT, CHECK VALVE ASSY.
7	41-008	1	ORING, ½ ID 5/8 OD

Note: Improper seating of the check valve seat, poppet, damaged spring or o-rings will result in poor performance of the chemical system.

7. Lubricate the new o-rings with o-ring lubricant. (Part # 13-003) and re-install.

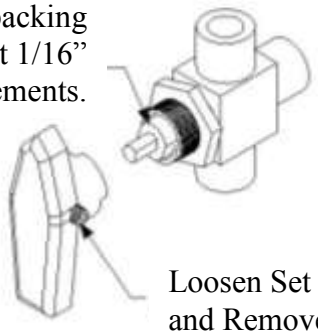
CHEMICAL PUMP

The **MODEL PRO-1200**® 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.

Chemical Prime Valve

Adjust the packing nut by turning the packing bolt clockwise at 1/16" increments.

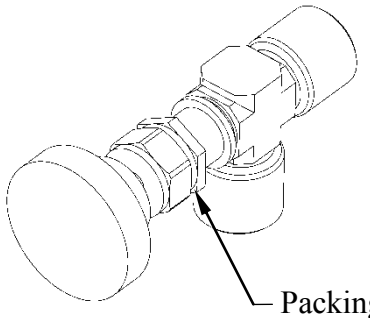


Loosen Set Screw and Remove Knob

PACKING NUT ADJUSTMENT CHEMICAL METERING/SELECTOR VALVES

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 Metering Valve



Packing Nut

PRESSURE UNLOADER

The pressure unloader controls water pressure at a preset point and bypasses the excess water back to the water pump.

To adjust:

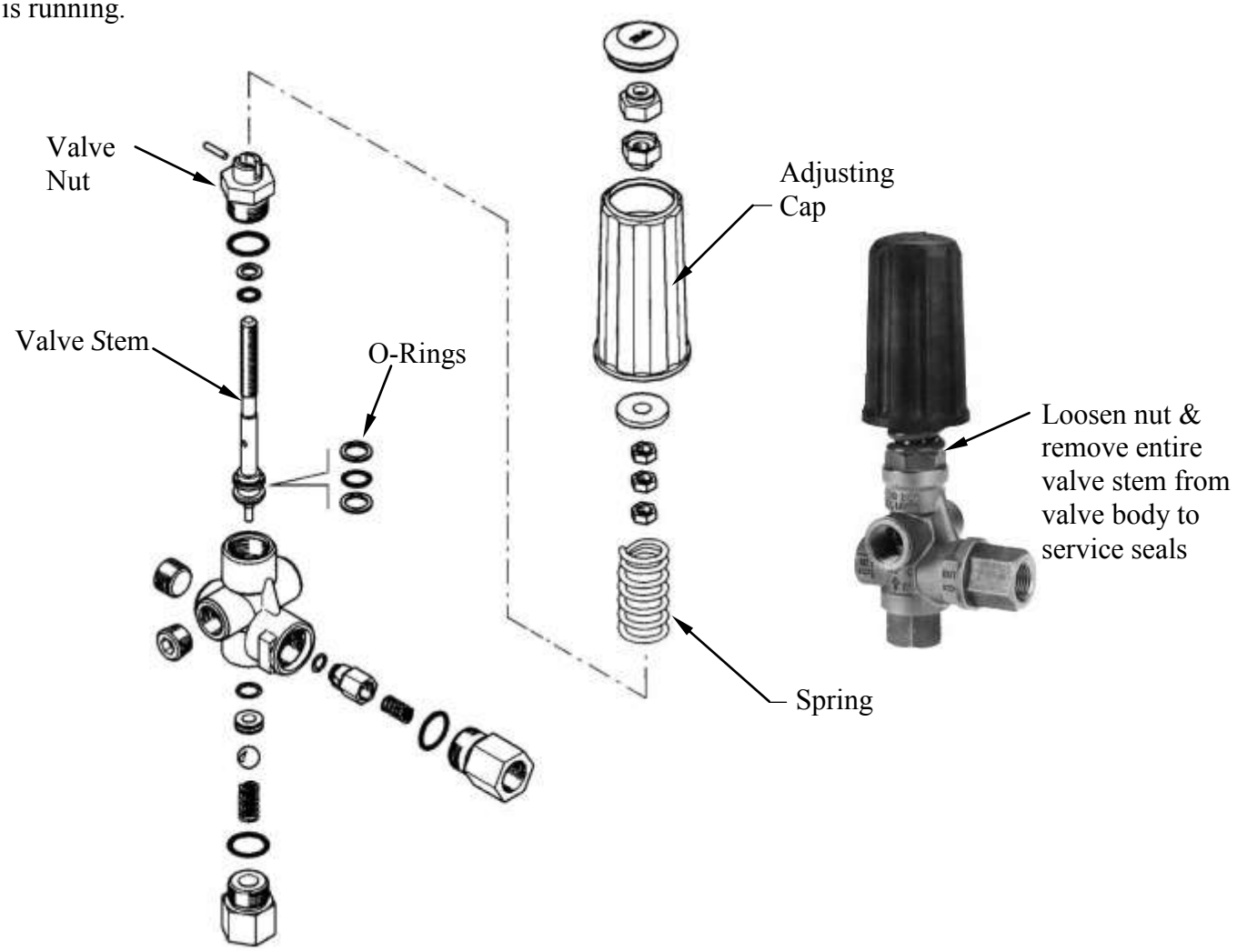
1. To adjust the pressure unloader, turn the adjusting knob (while observing the pressure gauge on the control panel) until you reach the desired pressure with the valve on cleaning tool open.

⚠ WARNING

DO NOT loosen the adjusting body (cap) all the way (counterclockwise) or remove it while the unit is running.

We recommend that you lubricate the pressure regulator o-ring every **50 hours** or whenever We recommend that you lubricate the pressure unloader o-ring every **50 hours** or whenever required. If you do not, the stem may become seized due to inadequate lubrication. If this occurs:

a) Shutdown the unit.
b) Relieve all pressure from the water system.
c) Remove the cap from the pressure regulator and remove the stem with long nose pliers.
d) Clean and lubricate stem.
e) Reassemble pressure regulator



9. TROUBLESHOOTING

WARNING!

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.**

TROUBLESHOOTING: HEAT ISSUES/MISC

PROBLEM	CAUSE	SOLUTION
Excessive Heating	Not enough water flow.	Check jet size of tool.
	Flow restriction caused by hard water scaling	Descale unit, repair or replace damaged plumbing components as necessary. Install water softner
Heat Exchanger Leaks	Engine/Vacuum exhaust heat exchanger is damaged from frozen water.	Inspect heat exchanger for leaks. Visually inspect for damage. Pressure check after removing from the unit. (Maximum test pressure 1200 PSI)
Loss of temperature. The heat output of the unit is LESS than normal	No vacuum hose connected	Connect vacuum hose to vacuum inlet
	Engine RPM is low.	Reset engine RPM
	Defective temperature gauge	Test gauge and sensor. Replace failed component
Automatic waste pump is malfunctioning or not operating normally.	Defective waste pump float switch	Replace float switch
	Broken diaphragm(s)	Replace diaphragm(s)
	Pump-out circuit breaker on control panel has tripped.	After inspecting waste pump to determine the cause of the tripped breaker, press the reset button
	Check valve dirty or damaged	Clean or replace if necessary

TROUBLESHOOTING: BLOWER / VACUUM PUMP

PROBLEM	CAUSE	SOLUTION
Loss of vacuum. While cleaning, the vacuum is not up to specification. Engine RPM is normal.	Vacuum gauge is giving an improper reading.	Examine the tubing between the vacuum relief valve and the vacuum gauge and remove any blockage.
	Vacuum hose(s) is damaged, causing a suction leak.	Inspect hose(s), repair or replace.
	Waste tank gaskets not sealing properly, not positioned properly	Inspect the gasket. Repair seal or replace Re-position lid(s).
	Plugged vacuum hose or vacuum plumbing between vacuum inlet and strainer basket.	Unplug vacuum hose or inlet plumbing.
	Waste tank filter or strainer basket is plugged.	Clean or replace filter. Clean strainer basket.
	Loose vacuum pump drive belts.	Tighten the drive belts
	Waste tank drain valve is damaged or left open, causing a vacuum leak.	Drain the waste tank. Close drain valve, if open. Remove the dump valve and, after inspecting, replace the defective components.
	Vacuum relief valve requires adjustment or has a vacuum leak due to damaged diaphragm.	Re-adjust the vacuum relief valve. If the vacuum does not increase, remove and inspect the relief valve diaphragm. If damaged, replace
	Vacuum exhaust heat exchanger plugged.	Remove and clean.
	Vacuum pump is worn out.	Replace the vacuum pump.
Excessive Vacuum	Improper throttle adjustment.	Adjust throttle to set desired vacuum pressure.
	Vacuum relief valve requires adjustment.	Readjust the vacuum relief valve.

TROUBLESHOOTING: WATER PUMP

PROBLEM	CAUSE	SOLUTION
Loss of solution pump pressure. With the cleaning tool open, the solution pressure gauge reads below the normal operating pressure.	Water supply is turned off	Turn the water supply on or up. Check for kinks in the water supply hose.
	Solution pump inlet supply line is plugged or drawing air.	Examine the water inlet filter inside the water box. Remove accumulated debris and replace if required. Check for suction leaks and loose clamps or fittings. Tighten any loose fittings or clamps. Replace any ruptured hose(s).

TROUBLESHOOTING: WATER PUMP

PROBLEM	CAUSE	SOLUTION
Loss of solution pump pressure. With the cleaning tool open, the solution pressure gauge reads below the normal operating pressure.	Improper engine speed	Using a tachometer, check the engine speed. High throttle engine speed is 1500 RPM.
	Pressure unloader o-rings are dry.	Lubricate o-rings, using o-ring lubricant
	Pressure unloader has worn o-rings	Check o-rings. If necessary, replace.
	Pressure unloader is dirty, stuck open, or improperly adjusted.	Clean or repair regulator. Adjust to working pressure. Lubricate o-rings, using o-ring lubricant
	Low pump volume. (Measure the amount of water being returned to the water box from the pressure regulator. It should fill a gallon container about every 17.6 seconds).	Examine the check valves, plunger cups, and cylinder head on the water pump. Repair, whenever required (refer to the water pump service manual).
	Defective water pressure gauge.	Replace gauge
	Orifice (spray nozzle) in the cleaning tool is worn, defective, or wrong size.	Replace Nozzle or change nozzle size.
	Debris clogging water lines or water inlet disconnect.	Clean or replace as needed.
	Belts loose or broken	Re-tension or replace as needed.
	Loss of pump prime	Manually prime water pump.
	Temperature Balance Orifice missing	Replace Orifice
Loss of solution volume at cleaning tool orifice. Solution pressure gauge reads normal.	Plugged orifice and/or screen in the cleaning tool.	Unplug or replace orifice and/or screen
	Internal block between the pressure regulator manifold and the outlet manifold, or the solution screen is clogged	Inspect all lines, remove accumulated debris which is blocking proper flow. Replace any defective hoses. Remove, inspect, and clean the solution screen. De-scale unit and install a water softener, if necessary.
	Outlet check valve is plugged	Examine the check valve, remove any debris
	Defective quick-connect on one or more of the high pressure hoses.	Replace defective quick-connects(s) on high pressure hoses(s).
	Cleaning tool valve is malfunctioning.	Repair or replace valve.
	Hose inner lining is constricted.	Remove restriction or replace hose.
	Air leak in chemical supply line, priming valve or metering valve.	Check for air leaks. Replace faulty parts.

TROUBLESHOOTING: CHEMICAL SYSTEM

PROBLEM	CAUSE	SOLUTION
Chemical flow meter indicates flow with the tool valve closed	External leak in chemical piping	Tighten fittings. Re-apply thread sealant where required. If any fittings are damaged, replace.
	Outlet check valve is full of debris or damaged, not allowing it to close properly	Close the chemical valve on the instrument panel. If the flow meter does not indicate flow, remove debris or replace check valve, if necessary.
Chemical flow meter indicates flow with the tool valve closed	Chemical pump diaphragm is ruptured	Close the chemical valve on the instrument panel. If the flow meter still indicates flow, replace the chemical pump diaphragm.
	Internal leak in chemical valve causing continual flow through prime tube returning to container.	Tighten valve packing nut (see "General Service Adjustments" section in this manual). Replace valve, if necessary.
Solution pump does not engage	Solution pump circuit breaker has been tripped	Check the solution pump circuit breaker on the control panel. Press the circuit breaker reset button.
	Defective electrical connection in the console wiring or defective switch.	Examine switch, electrical connections, and wiring. Repair any defective connections. If there is power going to the switch but not going out, replace the defective switch.
	Solution pump has not been activated	Turn solution pump switch to on.
	Defective solution pump clutch. NOTE: The clutch may be manually engaged by inserting two ¼-20 x ½ bolts. Line up the holes on the clutch and insert the bolts. To disengage the pump, remove the bolts.	If there is power in the switch, but not power at the clutch, replace the defective wire. If there is power at the clutch, replace the defective switch.
	Loose or broken solution pump belts.	Tighten or replace belts.
Loss of chemical. With the cleaning tool valve open, no chemical	Chemical pump is improperly primed.	Refer to chemical pump priming instructions.
	The strainer at the inlet end of the chemical inlet line is clogged	Unclog the strainer. If damaged, replace.
	Suction leak in the inlet line leading into the chemical pump.	Inspect inlet lines and flow meter for air leaks or damage and replace, if required.
	Chemical pump check valve(s) is clogged	Remove any debris from the chemical check valve(s). Replace chemical check valve(s) or seals, if necessary.
	Chemical prime/on-off valve or chemical metering valve is defective.	Replace valve(s).

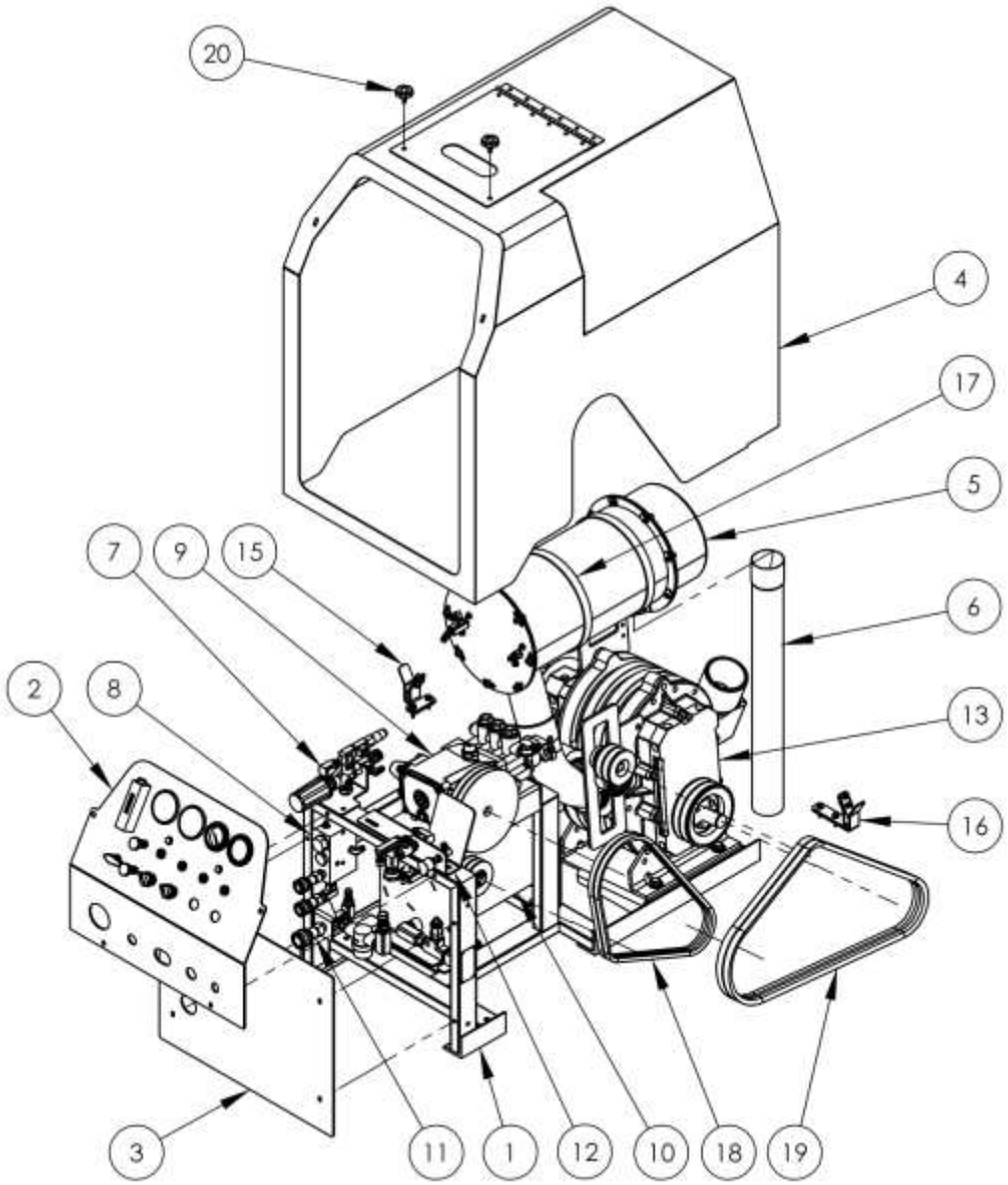
TROUBLESHOOTING: CHEMICAL SYSTEM

PROBLEM	CAUSE	SOLUTION
Loss of chemical. With the cleaning tool valve open, no chemical	Chemical pump diaphragm is ruptured.	Disassemble the chemical pump and replace the damaged diaphragm.
	Defective cylinder in the water pump.	Measure the pump volume. If the pump volume is less than normal, refer to “Loss of Pump Volume” in the Troubleshooting section in this manual.

SECTION 5:
PARTS and ACCESSORIES

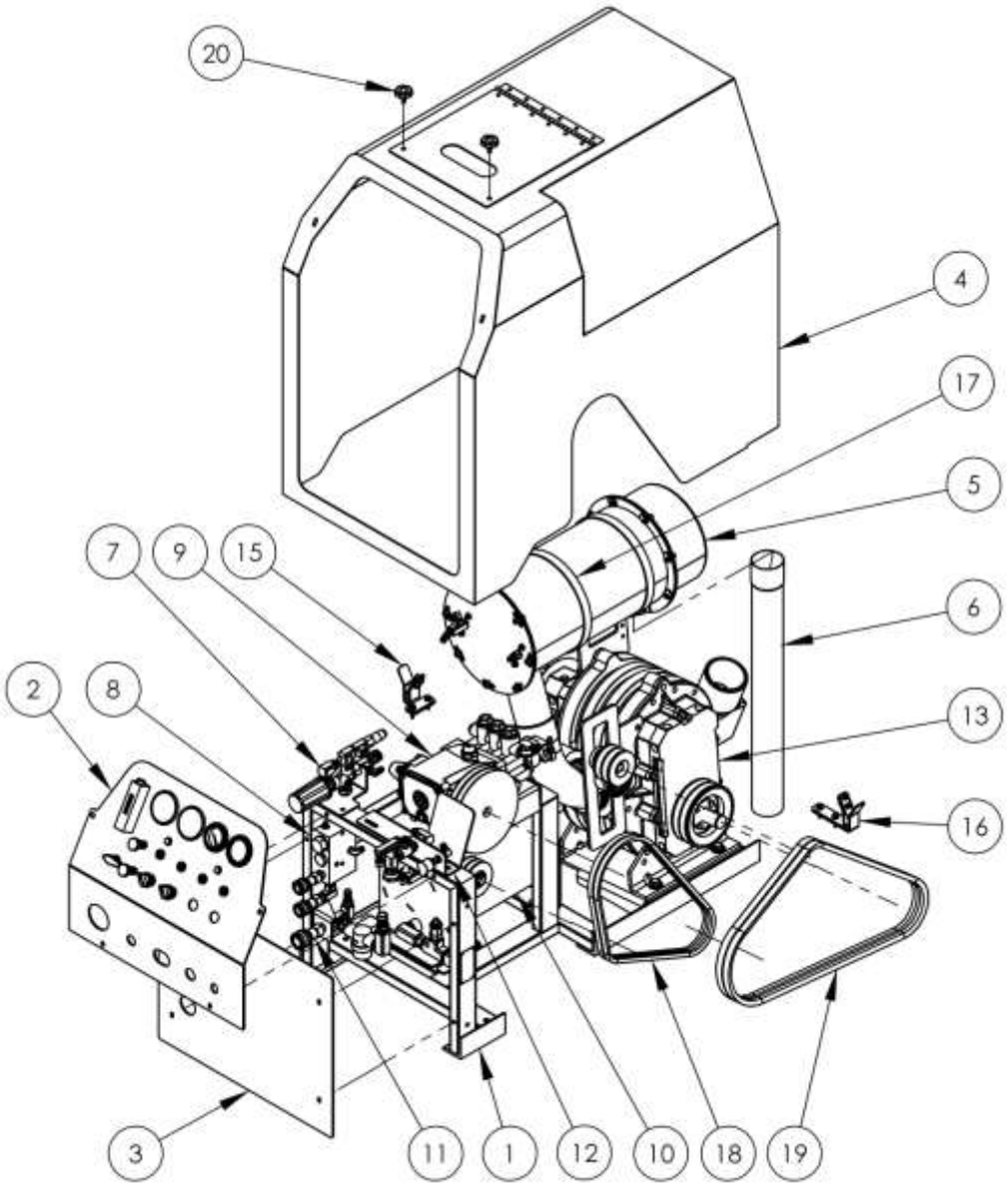
10. ILLUSTRATED PARTS LISTINGS

11. ACCESSORIES



70-1200, CONSOLE PRO-1200

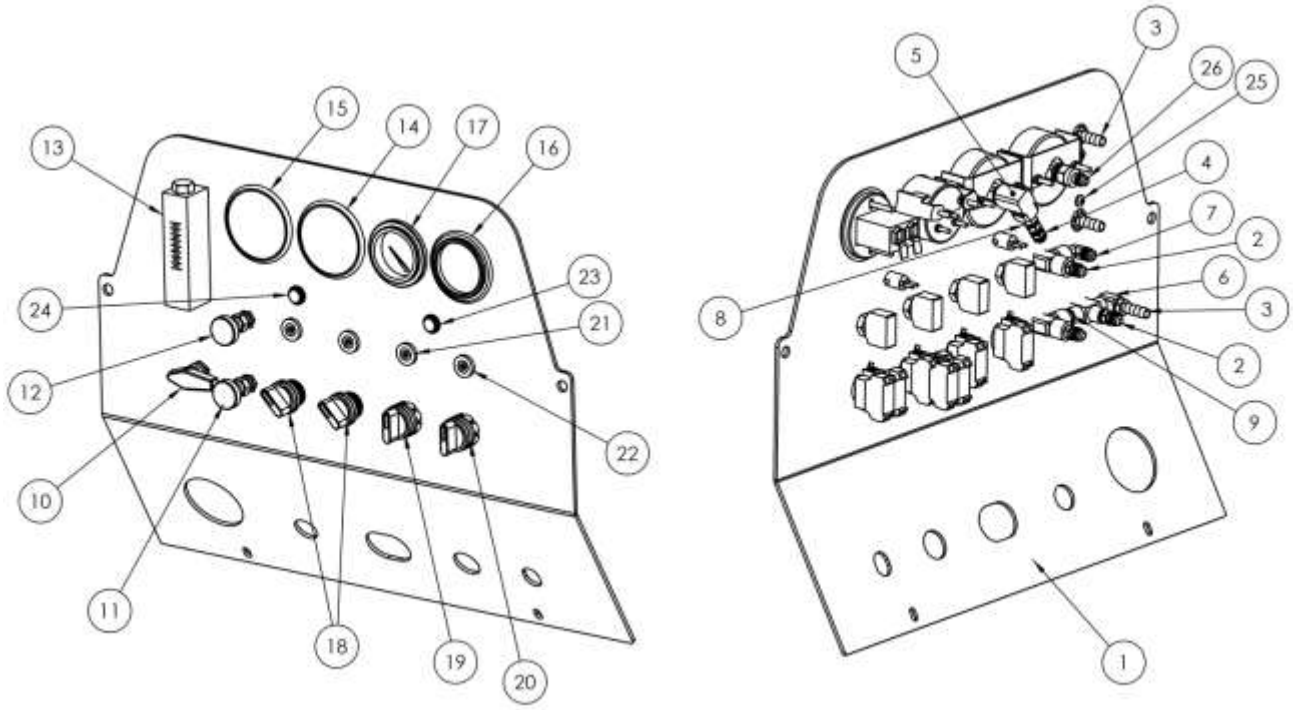
Item No.	Part Number	Qty	Description
1	61-718	1	WELDMENT, PRO-1200 FRAME
2	69-348	1	ASSY, CONTROL PANEL
3	66-326	1	PANEL, LOWER FORNT
4	69-381	1	ASSY, CONSOLE COVER
5	69-330	1	ASSY, VULCAN HEAT EXCHANGER
6	63-165	1	TUBE, EXHAUST OUTLET
7	69-341	1	ASSY, REG BRKT PRO-1200
8	69-352	1	ASSEMBLY, MANIFOLD BLOCK
9	69-350	1	ASSY, WATER PUMP 5CP2120
10	69-349	1	ASSY, LOWER HEAT EXCHANGER
11	69-353	1	ASSY, QD BRACKET



70-1200, CONSOLE PRO-1200…Continued

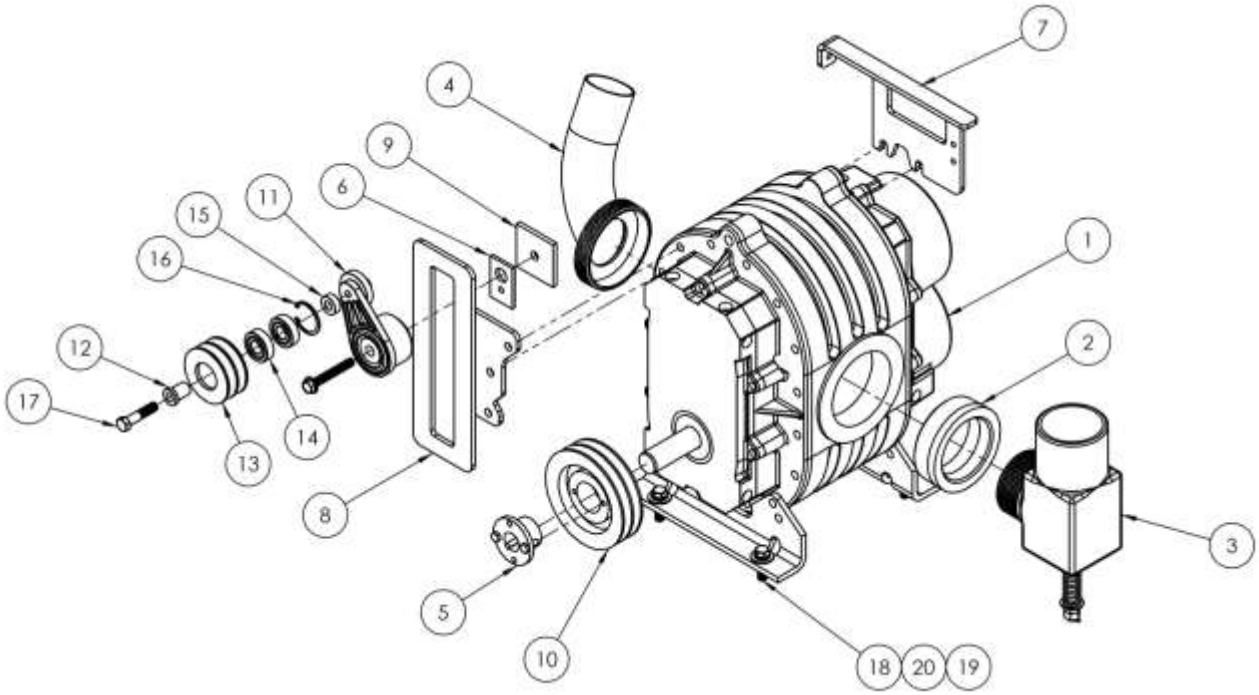
Item No.	Part Number	Qty	Description
12	69-354	1	ASSY, OIL CUP & WATER OUTLET
13	69-358	1	ASSY, VAC BLOWER PRO-1200
14	44-120	1	PLATE, SERIAL PRO-1200
15	68-163	1	ASSY, CASE STOP LH
16	68-164	1	ASSY, CASE STOP RH
17	60-1251	2	FORMING, VULCAN HEATER CLAMP
18	37-077	2	BELT, 42" TOP COG V AX40 GATES
19	37-083	2	BELT, BX50 GATES COG V
20	11-007	2	NUT, THUMB 1/4-20 FLWR.HD KNOB

Note: Earlier units may be outfitted with AX50 belts for item #19. Use p/n 37-078 if applicable.



69-348, ASSY, CONTROL PANEL

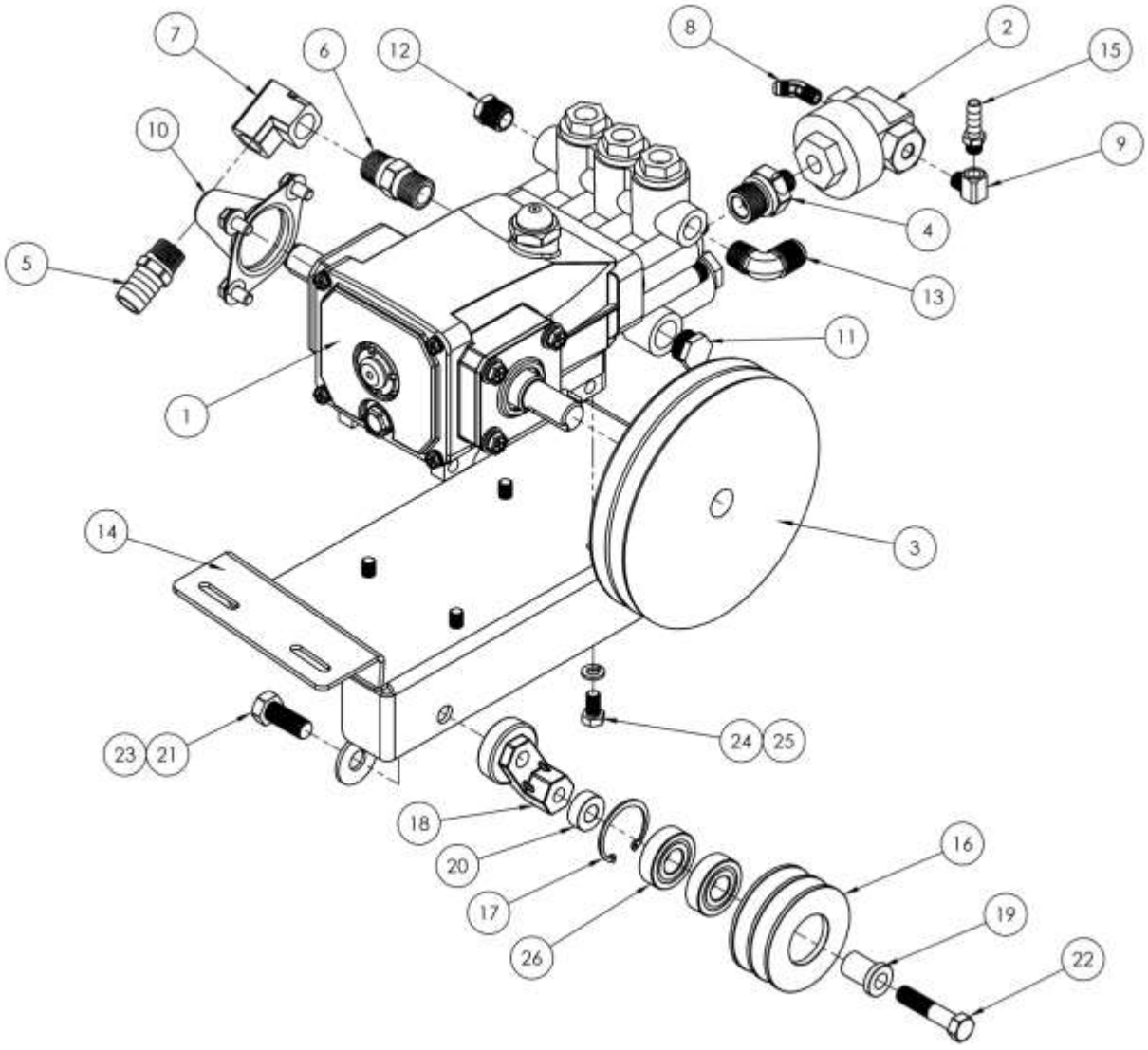
Item No.	Part Number	Qty	Description
1	66-325	1	PANEL, UPPER FRONT
2	21-001	3	CONN, 1/8 P X 1/4 T BR
3	21-007	3	FTTG, BRB 1/8 P X 5/16 H BR
4	21-028	1	CONN, 1/8 P X 1/4 POLY
5	21-037	1	FITTING, ELBOW, .25 IN NPT, BRASS
6	21-038	1	ELL, STREET 1/8 IN BRASS
7	21-054	1	ELL, 1-8P X 1-4 T BRASS
8	21-076	1	BUSHING, 1/4 NPT X 1/8 FNPT BRASS
9	21-042	1	NIP, CLOSE, 1-8 IN. BRASS
10	23-003	1	VLV, 3-WAY BALL 1/8FP BR
11	23-015	1	VLV, MET 1-8FP (CHEM) RT ANG
12	23-029	1	VLV, MET 1/8 FP RT ANG WHITEY
13	26-003	1	FLOWMETER, 1/8 FP
14	26-004	1	GAUGE, VAC 30IN HG DUALSCALE
15	26-005	1	GAUGE, WATER PRESSURE 1500 PSI DUAL
16	26-033	1	HOURMETER, HOBBS CHROME BEZEL
17	26-034	1	GAUGE, WTR TEMP CHROME 320 DEG.
18	29-016	2	SWITCH, ROTARY NON-ILLUMINATED
19	29-024	1	SWITCH, THROTTLE CONTROL 3 POS
20	29-057	1	SWITCH, CLUTCH CONTROL 3 POS
21	30-007	1	BREAKER, 30 AMP
22	30-008	3	BREAKER, 20 AMP
23	30-073	1	LIGHT, IND LAMP 12V RED
24	30-074	1	LIGHT, IND LAMP 12V GREEN
25	10-150	2	SCREW - 10-32 X .500 PHP ZP
26	21-004	1	CONN, 1/4 NPT X 1/4 T BRASS



69-358, ASSY, VAC BLOWER PRO-1200

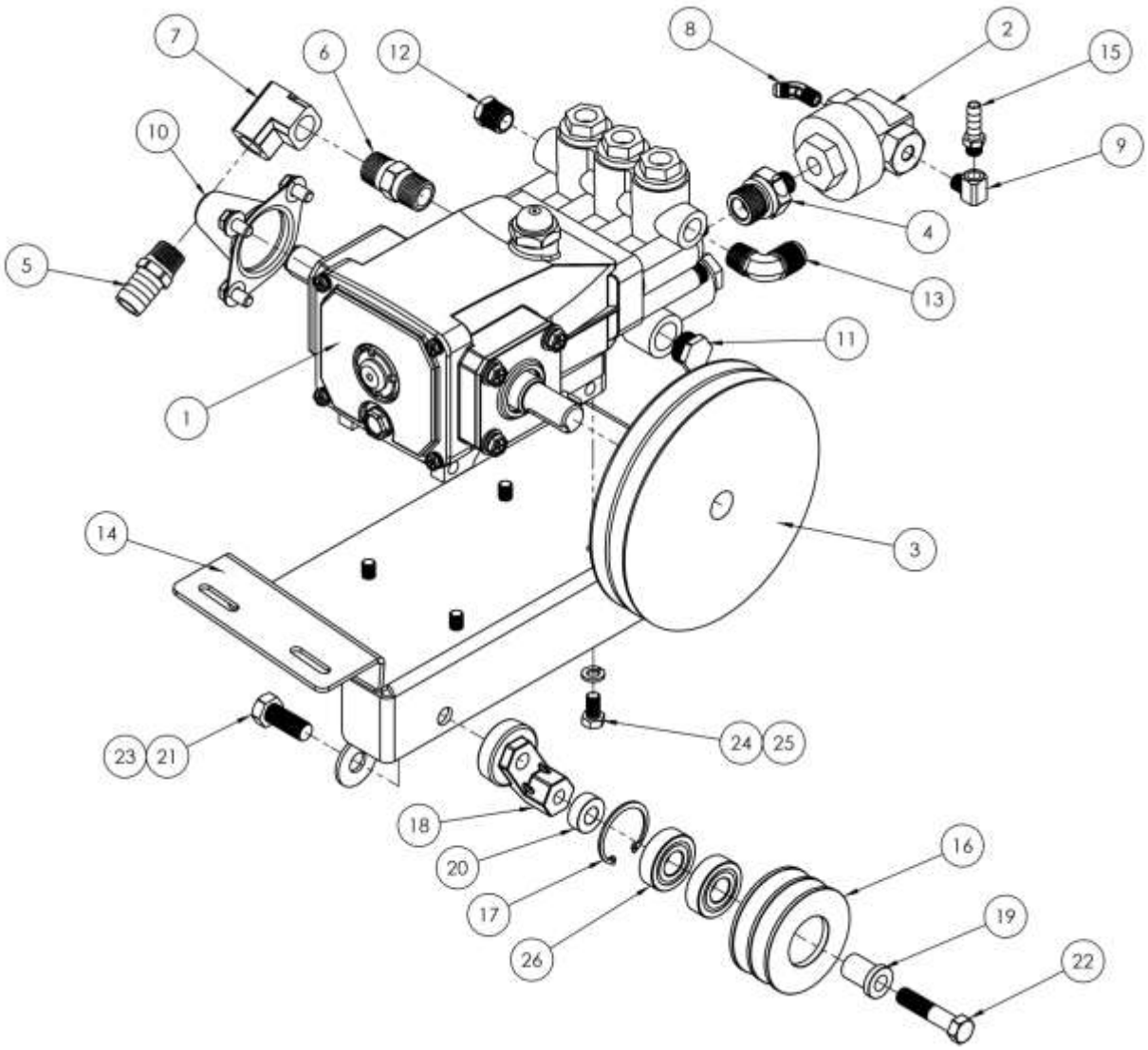
Item No.	Part Number	Qty	Description
1	46-066	1	VACUUM PUMP, TUTHILL 5006
2	66-249	1	ADAPTER, 4 IN NPT TO 3 IN NPT
3	69-360	1	ASSEMBLY, VACUUM BRAKE
4	61-725	1	WELDMENT, BLOWER OUTLET
5	38-052	1	BUSHING, BROWNING H X 1.125
6	60-1195	1	PLATE, TENSIONER ADJ
7	61-709	1	WELDMENT, VULCAN SUPPORT
8	61-729	1	WELDMENT, BELT TENSIONER
9	61-732	1	WELDMENT, TENSIONER ADJ
10	38-096	1	PULLEY, COUPLER IDLER 5.0 PD
11	66-346	1	TENSIONER, MACHINED
12	39-054	1	BEARING, 7-16 DOUBLE BUSHING
13	66-356	1	PULLEY, DOUBLE IDLER 3.0
14	39-048	2	BEARING, IDLER PULLEY
15	38-088	1	SPACER, IDLER PULLEY
16	15-039	1	SNAP RING, 1-9/16 INTERNAL
17	10-206	1	SCREW, MACH .43-20 X 2 HXHD
18	10-039	4	SCREW, MACH 7/16-14 X 1-1/2 HXHD
19	12-020	4	LKWSR, 7/16 ZINC
20	12-021	4	WASHER, FLAT 7/16 ZINC

Note: Earlier units may be outfitted with pulleys for “A” belts. If this applies, substitute item “13” with p/n 38-074.



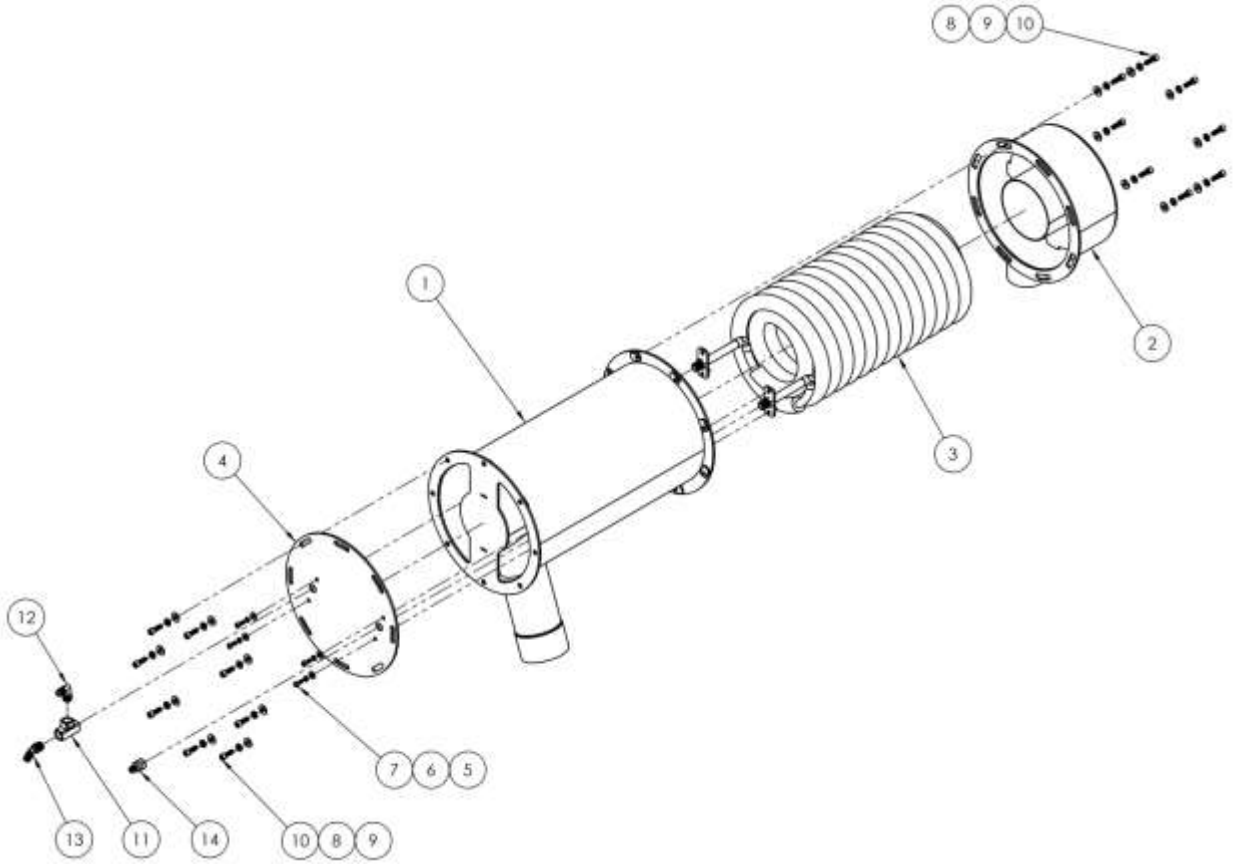
69-350, ASSY, WATER PUMP 5CP2120

Item No.	Part Number	Qty	Description
1	46-067	1	PUMP, WATER, CATP 5CP2120W
2	46-056	1	PUMP, CHEMICAL, MFG BY GENERAL PUMP
3	35-005	1	CLUTCH, ELECT CAT 5CP 2 GROOVE
4	66-002	1	ADAPTOR CHEMICAL PUMP SS
5	21-032	1	FTTG, BRB 1/2 P X 3/4 H BRASS.SLDPRT
6	21-047	1	NIP, 1/2 IN HEX BRASS
7	21-127	1	ELL, 1/2 NPT BRASS
8	21-055	1	ELL, 1-8 P X 1/4 T 45 DEG BRASS
9	21-038	1	ELL, STREET 1/8 IN BRASS
10	36-153	1	COVER, SHAFT PROTECTOR
11	21-065	1	PLUG, 1/2 NPT SOLID BRASS HEXHD
12	21-361	1	PLUG, .375 NPT X HEX HEAD BRASS
13	21-061	1	ELL, 3/8 P X 1/2 T BRASS
14	60-1159	1	FORMING, WATER PUMP MNT
15	21-007	1	FTTG, BRB 1/8 P X 5/16 H BR
16	38-074	1	PULLEY, DOUBLE IDLER



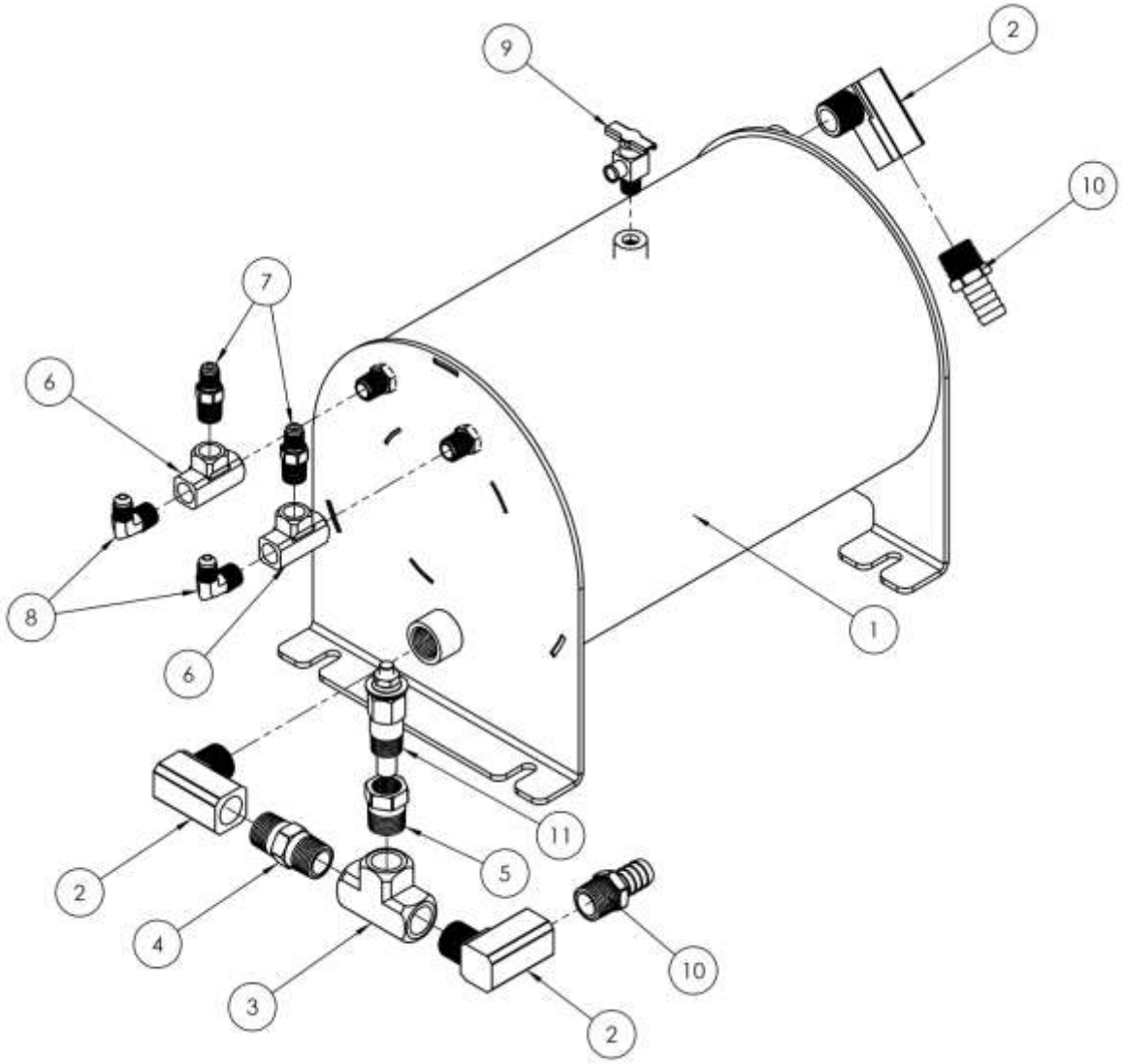
69-350, ASSY, WATER PUMP 5CP2120 …. Continued

Item No.	Part Number	Qty	Description
17	15-039	1	SNAP RING, 1-9/16 INTERNAL
18	39-056	1	IDLER ARM, 1.5 ECCENTRIC
19	39-054	1	BEARING, 7-16 DOUBLE BUSHING
20	38-088	1	SPACER, IDLER PULLEY
21	10-205	1	SCREW, MACH .5-20 X 1.25 HXHD
22	10-206	1	SCREW, MACH .43-20 X 2 HXHD
23	12-018	1	WASHER, FLAT 1/2 USS
24	10-008	4	SCREW, MACH 8MM-16 X 1.25MM
25	12-016	4	LKWSR, 5/16 ZINC
26	39-048	2	BEARING, IDLER PULLEY



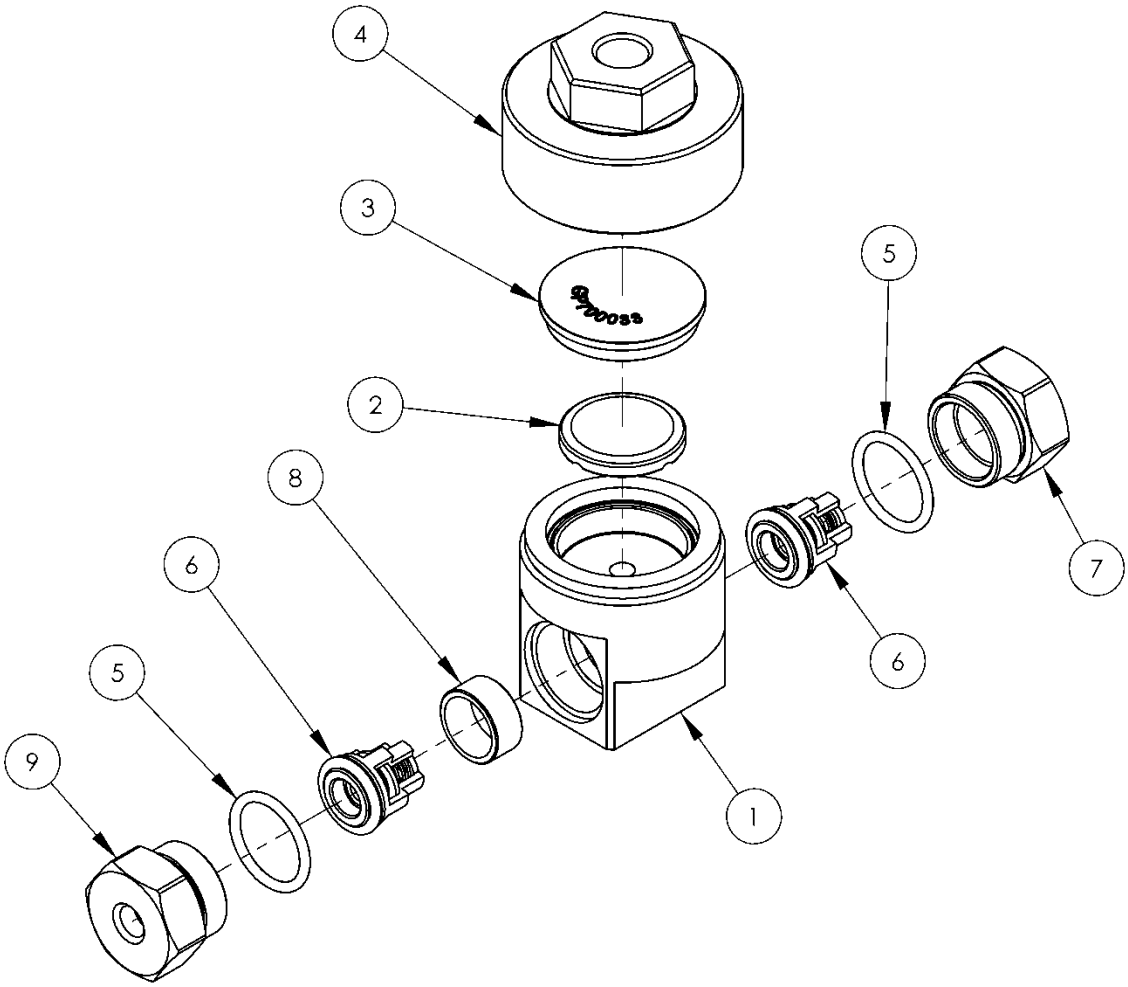
69-330, ASSY, VULCAN HEAT EXCHANGER

Item No.	Part Number	Qty	Description
1	61-720	1	WELDMENT, HEAT EXCHANGER BODY
2	61-721	1	WELDMENT, HE COMPRESSION CAP
3	61-722	1	WELDMENT, HEAT EXCHANGER COIL
4	58-506	1	PLT, HEAT EXCHANGER FRONT CAP
5	12-028	4	WASHER, FLAT #10 SS
6	12-050	4	LKWSR, #10 SPLIT ZINC
7	10-202	4	SCREW, MACH 10-24 X 1/2 SHCS ZP
8	12-002	16	WASHER, FLAT 1/4 SS ANC
9	12-003	16	LKWSR, 1/4 IN SS
10	10-021	16	SCREW, MACH 1-4-20 X 3-4 SOCHD SS
11	21-122	1	FITTING, TEE, .25 IN NPT, BRASS
12	21-064	1	ELL, 1/4 P X 1/4 T BRASS
13	21-051	1	ELL, 1/4P X 1/4T 45 DEG BRASS
14	21-004	1	CONN, 1/4 NPT X 1/4 T BRASS



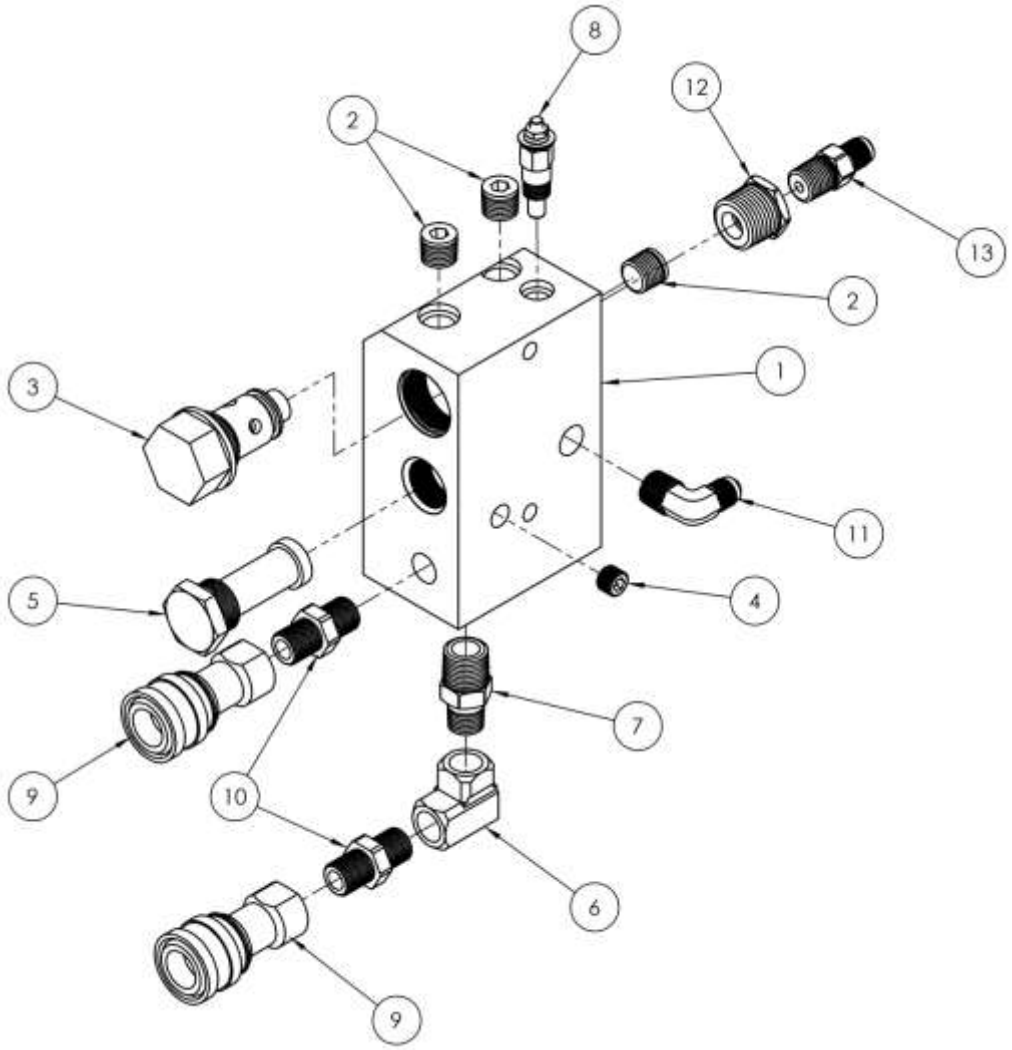
69-349, ASSY, LOWER HEAT EXCHANGER

Item No.	Part Number	Qty	Description
1	61-730	1	WELDMENT, LWR HEAT EXCHANGER
2	21-034	3	ELL, STREET 1-2 NPT BRASS
3	21-110	1	TEE, 1/2 NPT BRASS
4	21-047	1	NIP, 1/2 IN HEX BRASS
5	21-371	1	BUSHING, 1/2 NPT X 3/8 NPT HEX BRASS
6	21-122	2	FITTING, TEE, .25 IN NPT, BRASS
7	21-050	2	CONN, 1/4 NTP X -04 JIC BRASS
8	21-064	2	ELL, 1/4 P X 1/4 T BRASS
9	23-008	1	COCK, DRN 1/4P X 1/4H ELL BRASS
10	21-109	2	FTTG, 1/2 NPT X 5/8 BARB BRASS
11	34-035	1	SWITCH, TEMP STANDARD 250 TS-81



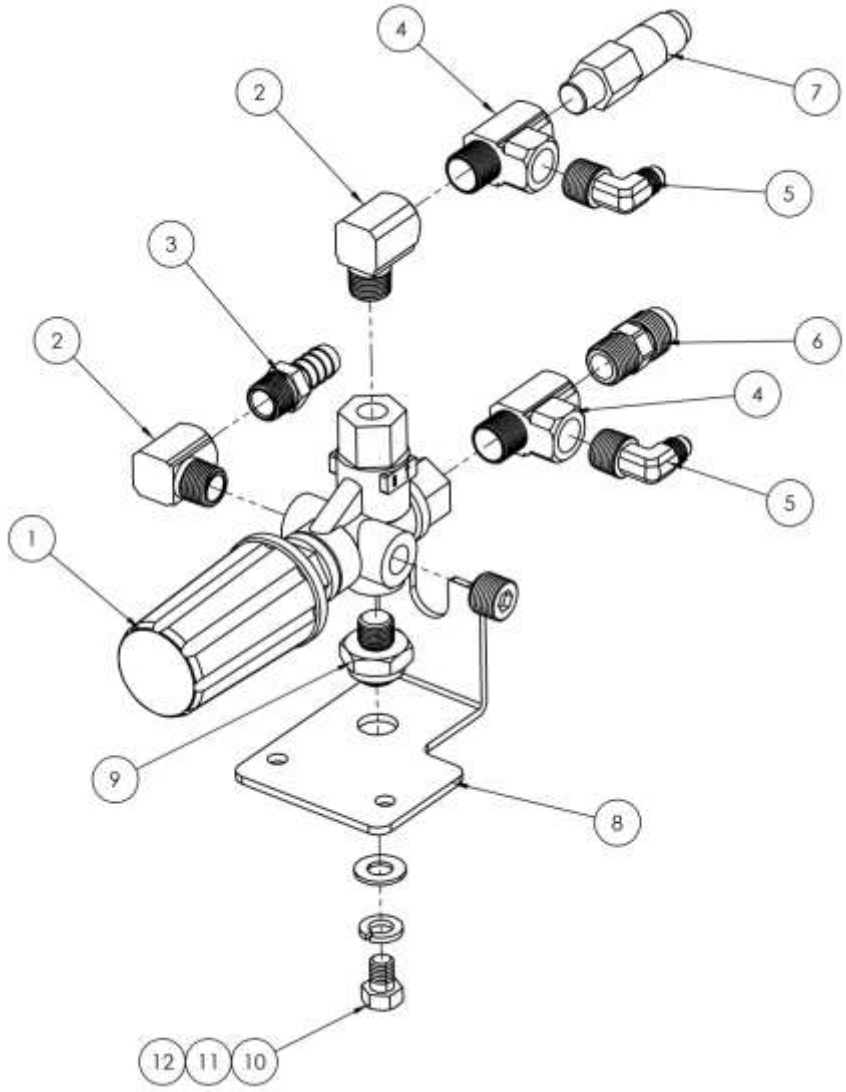
46-056 PUMP, CHEMICAL, GENERAL PUMP

Item No.	Part Number	Qty	Description
1	36-350	1	BODY, PULSE PUMP, GP PULSE PUMP
2	36-351	1	PLASTIC DISC, GP PULSE PUMP
3	36-352	1	RUBBER DIAPHRAGM, GP PULSE PUMP
4	36-353	1	TOP COVER INLET, GP PULSE PUMP
5	36-354	2	O-RING, 70 DURO, GP PULSE PUMP
6	36-355	2	VALVE CAP 303SST, GP PULSE PUMP
7	36-356	1	ASSY, VALVE KIT, GP CHEMICAL PULSE PUMP
8	36-357	1	SPACER RING, 303 SST, GP PULSE PUMP
9	36-358	1	VALVE CAP, 303 SST, GP PULSE PUMPMP 520196



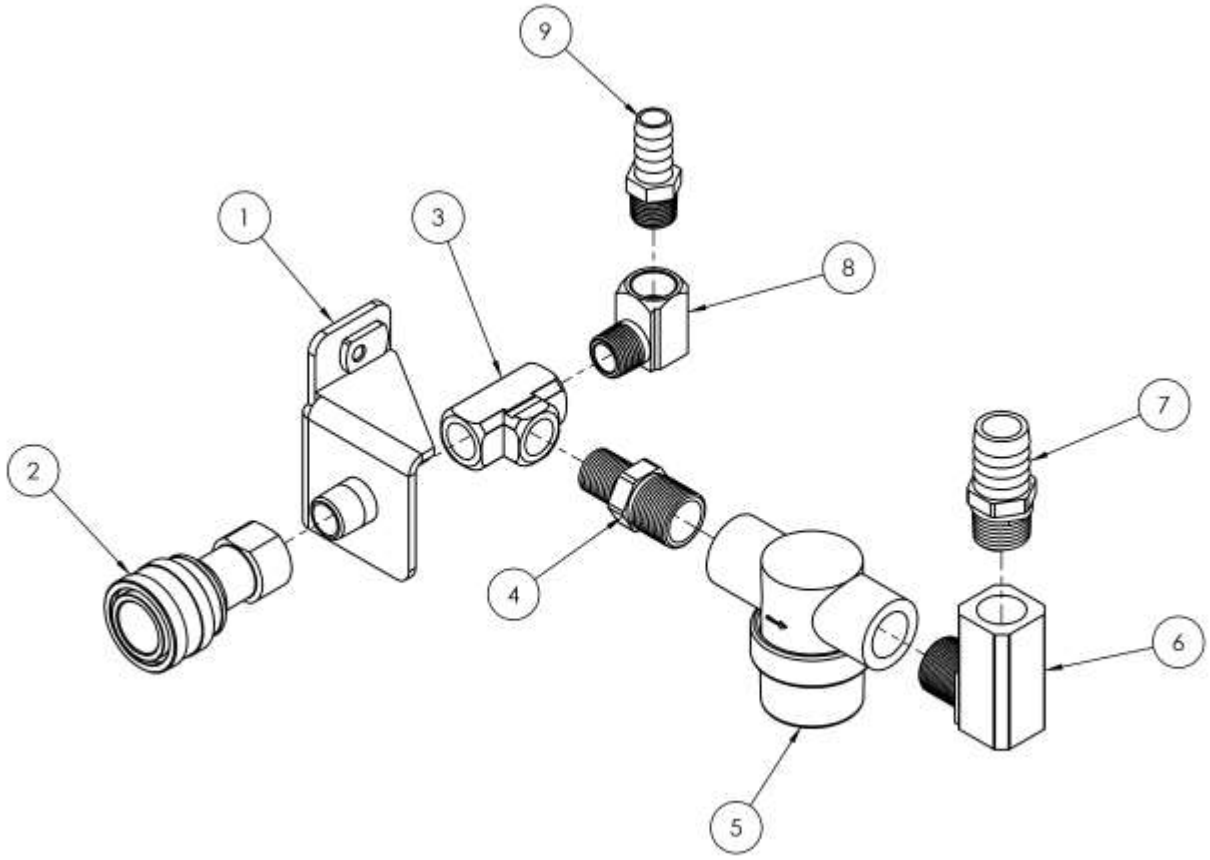
69-352, ASSEMBLY, MANIFOLD BLOCK

Item No.	Part Number	Qty	Description
1	66-205	1	MANIFOLD BLOCK
2	21-264	3	PLUG, 1-4 NPT BRASS
3	23-063	1	CHECK VALVE MANIFOLD
4	21-029	1	PLUG, 1/8 NPT SOCKET HD BRASS
5	20-018	1	SCREEN, CHECK VALVE MANIFOLD
6	21-037	1	FITTING, ELBOW, .25 IN NPT, BRASS
7	21-052	1	NIP, 3/8 X 1/4 HEX BRASS
8	34-000	1	SENSER, TEMP, 140-320 DEGREE
9	25-001	2	QUICK DISCONNECT, .25 NPT, SOCKET, HANSEN SERIES B2-HK
10	21-026	2	NIPPLE, 1/4 NPT NPT HEX BRASS
11	21-064	1	ELL, 1/4 P X 1/4 T BRASS
12	21-233	1	BUSHING, 1/2 NPT X 1/4 FNPT
13	21-050	1	CONN, 1/4 NTP X -04 JIC BRASS



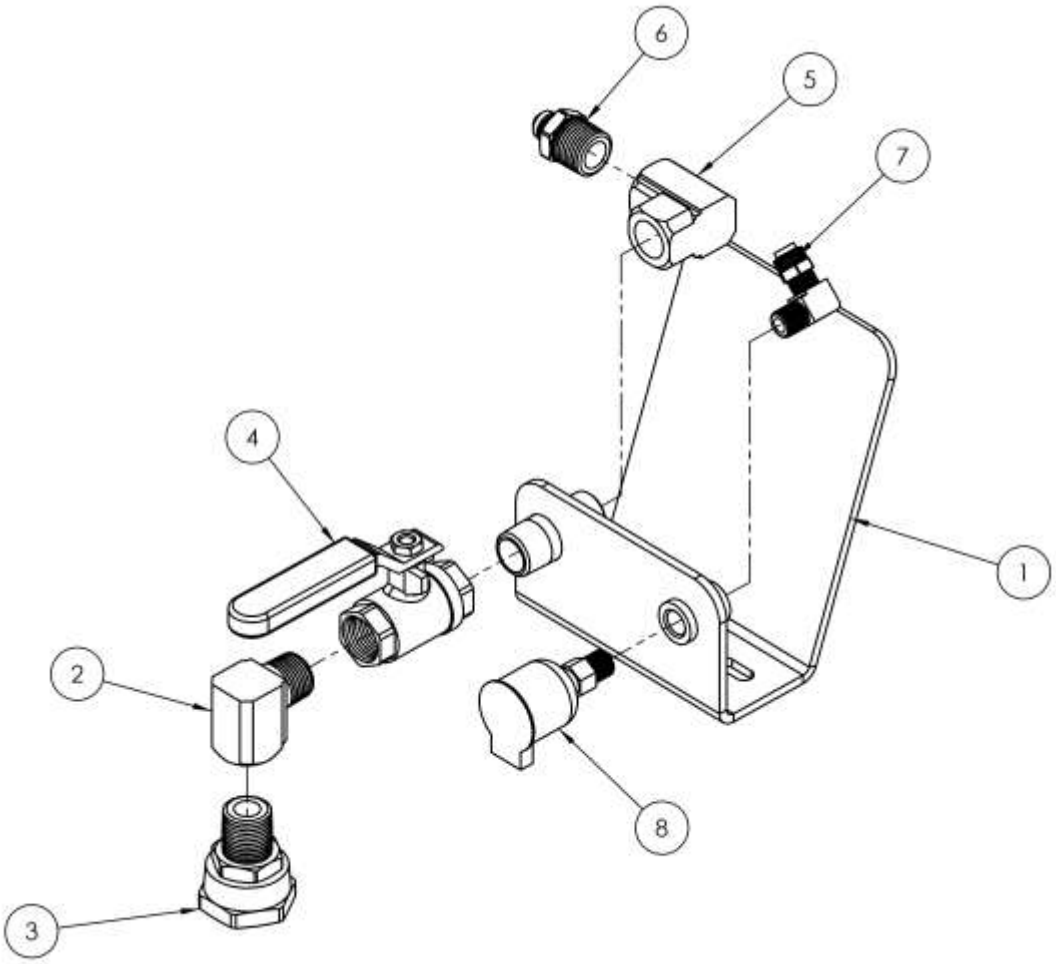
69-341, ASSY, REG BRKT PRO-1200

Item No.	Part Number	Qty	Description
1	23-079	1	UNLOADER, CAT #7670
2	21-040	2	FITTING, STR ELL, .375 IN NPT, BRASS
3	21-014	1	FTTG, BRB .375 X .50H BR
4	21-062	2	TEE, 3/8 FNPT X NPT X FNPT BRASS
5	21-063	2	ELL, 3/8 P X 1/4 T BRASS
6	21-057	1	CONN, 3/8 NPT X 1/2 JIC BRASS
7	23-077	1	VALVE, POP-OFF 3/8 NPT
8	60-1154	1	FORMING, REG MNT BRKT
9	66-340	1	FITTING, 3/8 NPT M X 3/8-16 F STANDOFF
10	10-157	1	SCREW, MACH 3/8-16 X 1/2 HH ZP
11	12-014	1	LKWSR, 3/8 ZINC
12	12-013	1	WASHER, FLAT 3/8 SAE



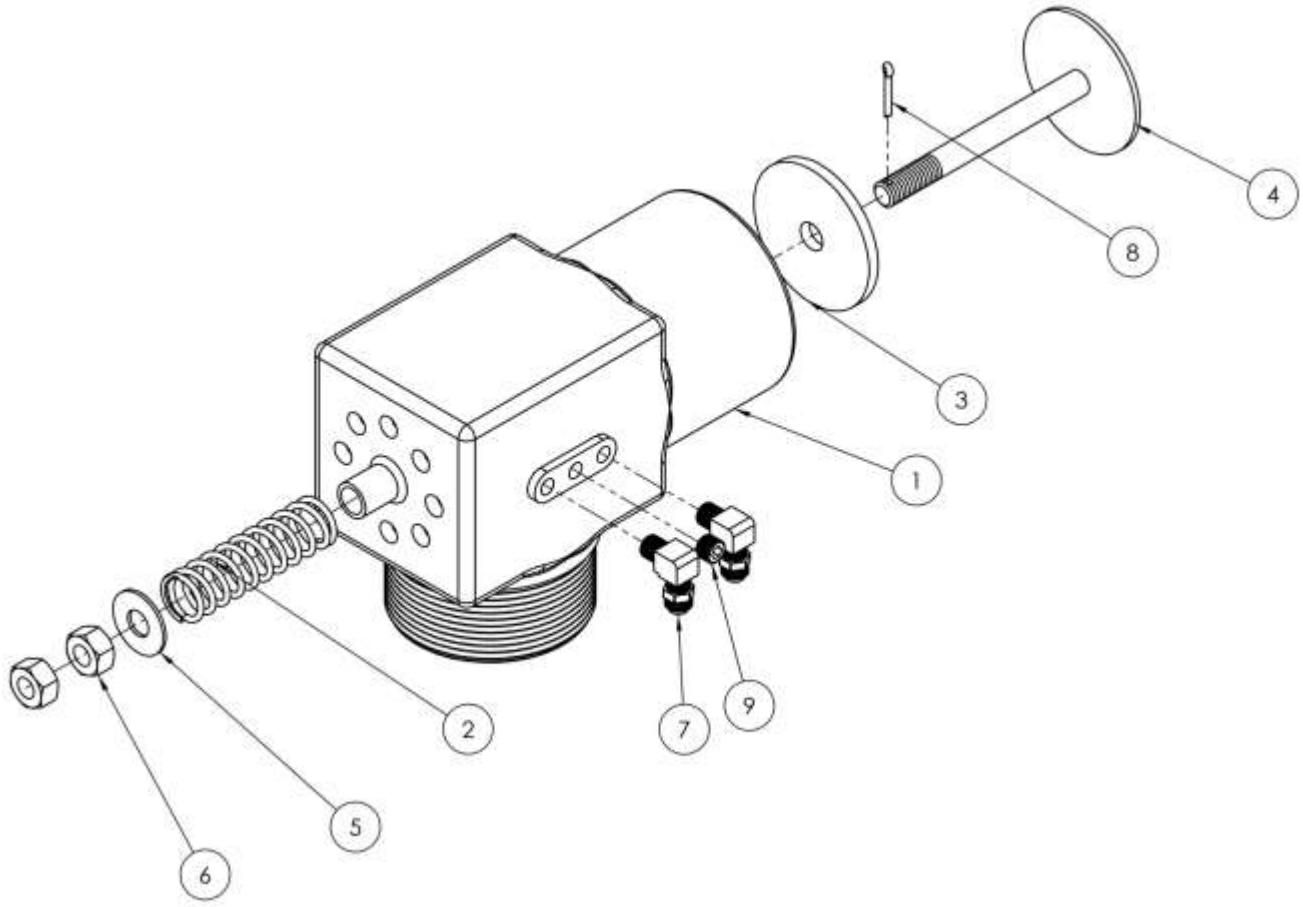
69-353, ASSY, QD BRACKET

Item No.	Part Number	Qty	Description
1	61-507	1	WELDMENT, BRACKET QD MOUNTING
2	25-005	1	QUICK COUPLING, 3/8 F X 3/8 FNPT BRASS
3	21-041	1	TEE, 3/8 NPT BRASS
4	21-030	1	NIPPLE, HEX 1-2 NPT X 3-8 NPT BRASS
5	20-033	1	FILTER, MICRO INLINE CAT 1/2 FNPT X 1/2 FNPT
6	21-034	1	ELL, STREET 1-2 NPT BRASS
7	21-032	1	FTTG, BRB 1/2 P X 3/4 H BRASS.SLDPRT
8	21-040	1	FITTING, STR ELL, .375 IN NPT, BRASS
9	21-014	1	FTTG, BRB .375 X .50H BR



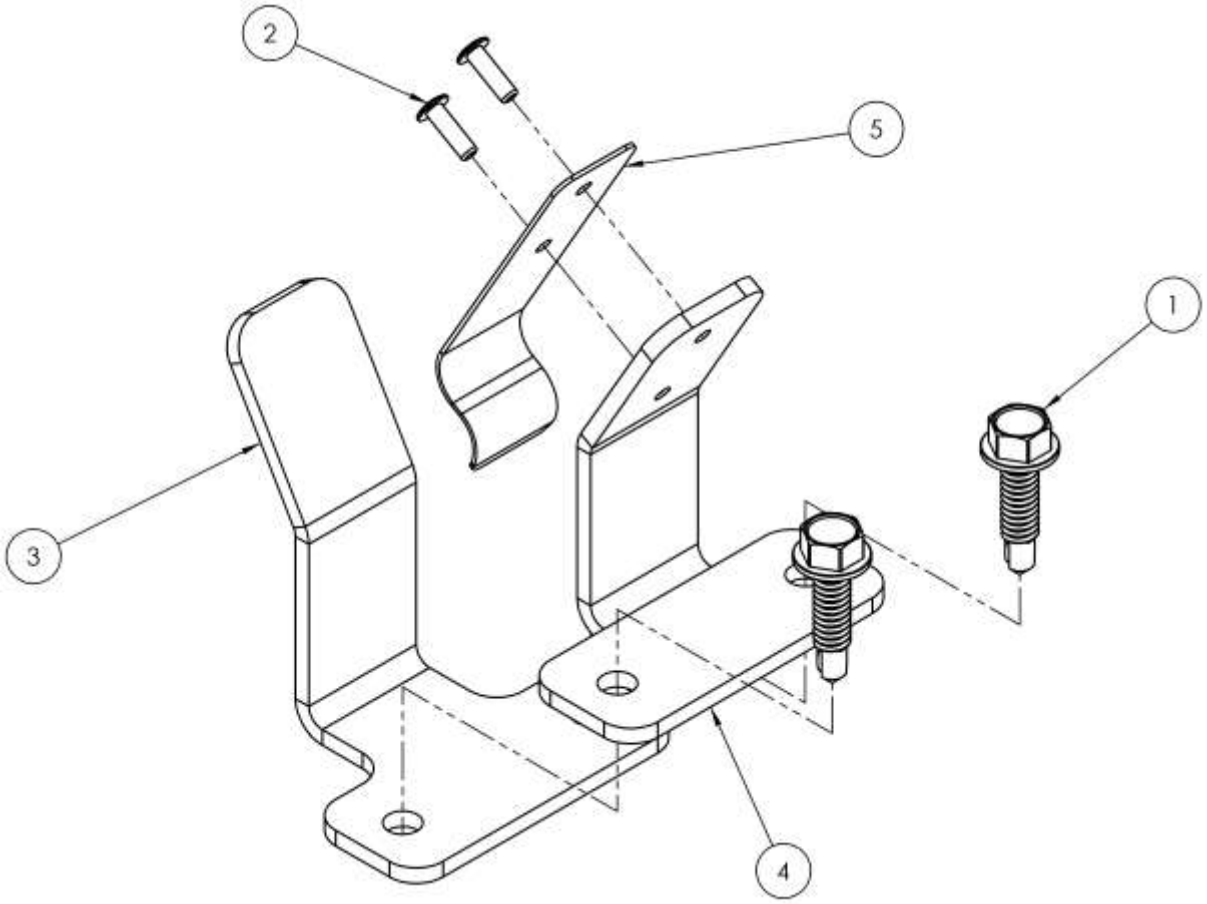
69-354, ASSY, OIL CUP & WATER OUTLET

Item No.	Part Number	Qty	Description
1	61-724	1	WELDMENT, OIL CUP & HOT WTR VLV
2	21-040	1	FITTING, STR ELL, .375 IN NPT, BRASS
3	21-421	1	FTTH, GRDN HOSE 3/8 P X 3/4 H
4	23-078	1	VALVE, BALL 3/8 FNPT X FNPT
5	21-152	1	ELL, 3/8 FNPT X 3/8 FNPT BRASS
6	21-017	1	CONN, 3-8 P X 1/4 T
7	21-011	1	ELL, 1/8 NPT X 1/4 POLY BRASS
8	28-000	1	CUP, OILFILL, 1/8 NPT



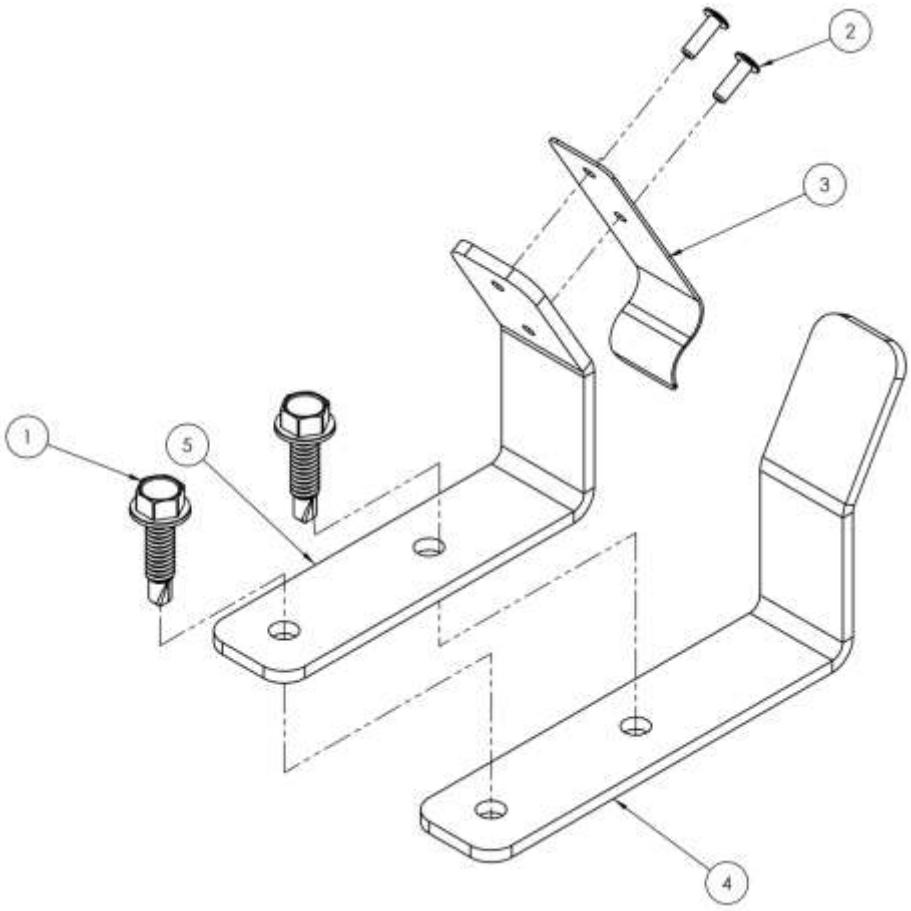
69-360, ASSY, VACUUM BRAKE

Item No.	Part Number	Qty	Description
1	66-001	1	VACUUM BRAKE, MACHINED 4L
2	15-002	1	SPRING, VAC RELIEF VALVE
3	41-009	1	DIAPHRAGM, VAC RELIEF VLV 4L, 5M
4	61-035	1	STEM, VACUUM RELIEF VLV 4L 5M
5	12-021	1	WASHER, FLAT 7/16 ZINC
6	11-012	2	NUT, 7/16-14 ZP
7	21-011	2	ELL, 1/8 NPT X 1/4 POLY BRASS
8	14-032	1	PIN, COTTER 7/64 X 3/4 SS
9	21-029	1	PLUG, 1/8 NPT SOCKET HD BRASS



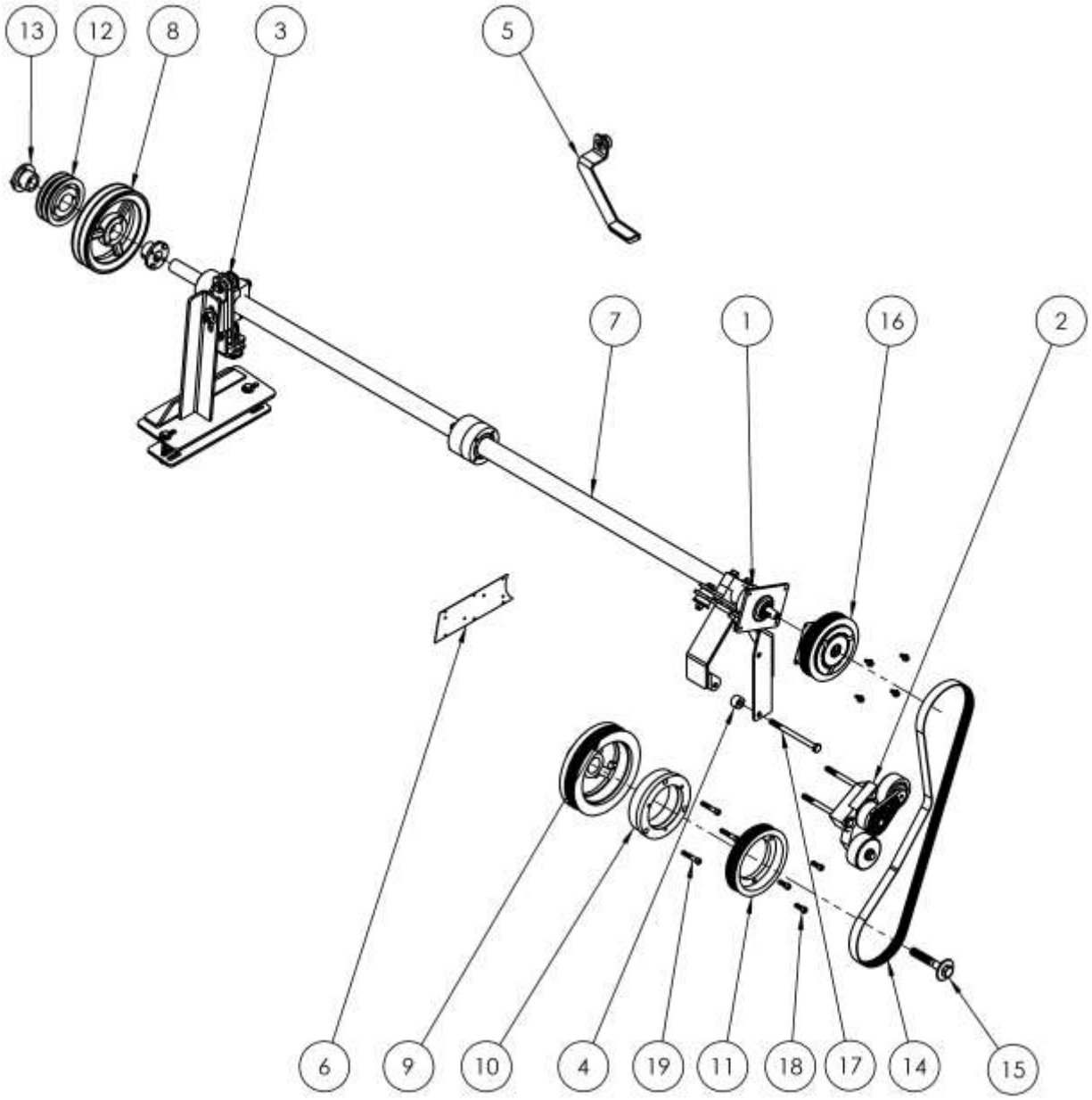
69-163, ASSY, CASE STOP LH

Item No.	Part Number	Qty	Description
1	10-209	2	SCREW, SELF DRILL-TAP #14 HXHD
2	14-019	2	RIVET, ALUM NAMEPLATE
3	60-1226	1	FORMING, CASE STOP LWR
4	60-1227	1	FORMING, CASE STOP UPPER
5	60-1228	1	FORMING, CASE STOP SPRING



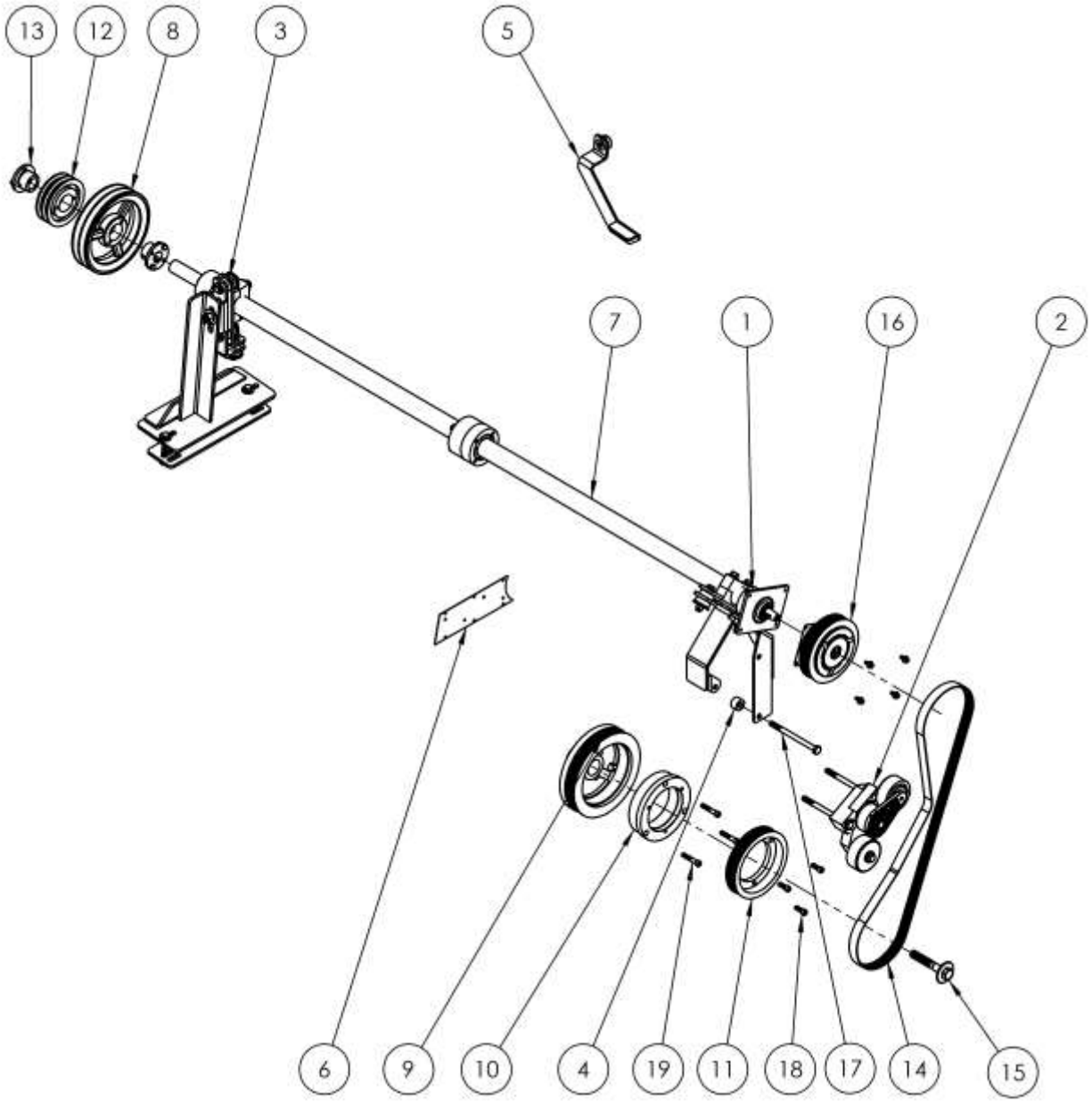
69-164, ASSY, CASE STOP RH

Item No.	Part Number	Qty	Description
1	10-209	2	SCREW, SELF DRILL-TAP #14 HXHD
2	14-019	2	RIVET, ALUM NAMEPLATE
3	60-1228	1	FORMING, CASE STOP SPRING
4	60-1264	1	FORMING, CASE STOP LWR RH
5	60-1265	1	FORMING, CASE STOP UPPER RH



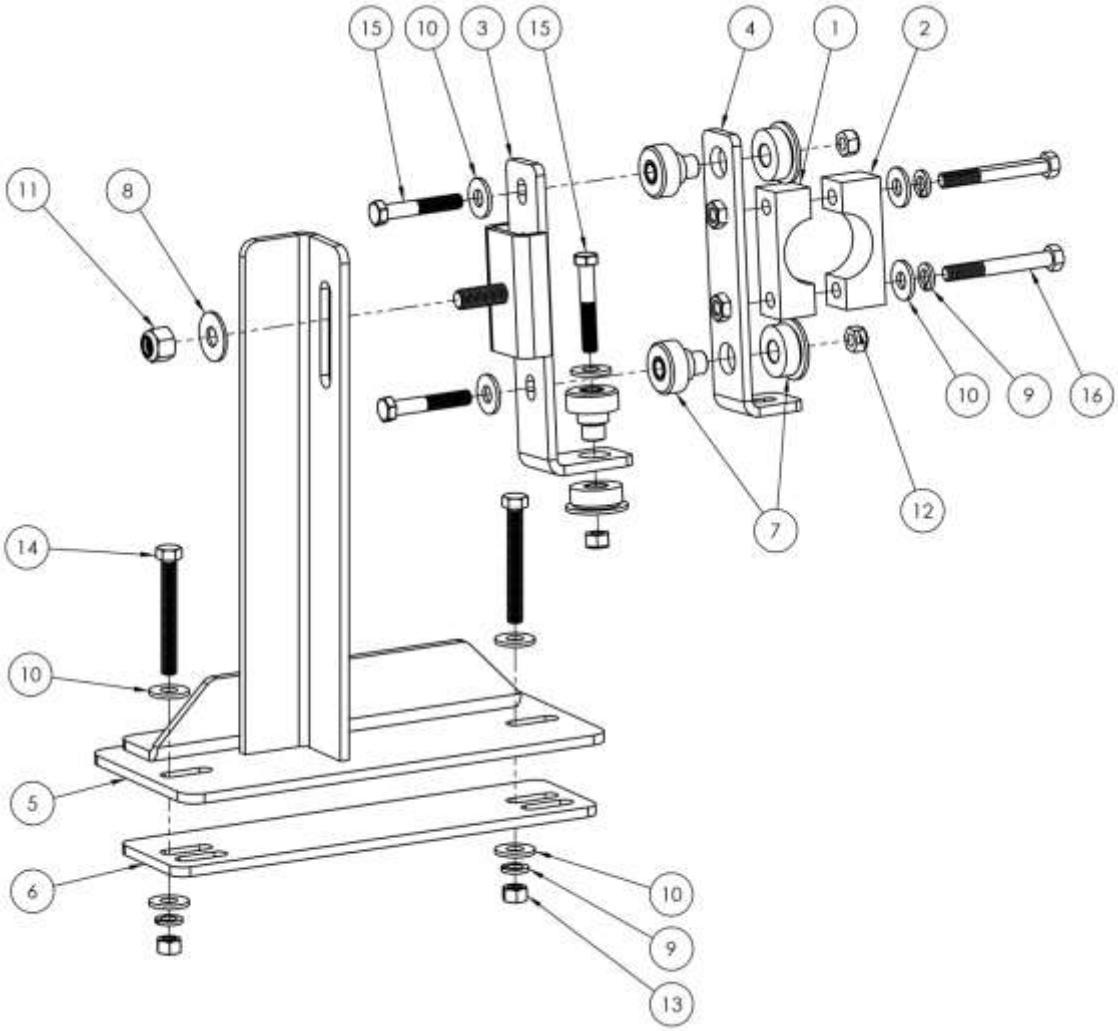
68-162, ASSY, FRONT END KIT, CHEVY

Item No.	Part Number	Qty	Description
1	69-382	1	ASSY, FRONT DRIVE SHAFT MOUNT
2	69-364	1	ASSY, FRONT END IDLER
3	69-363	1	ASSY, REAR DRIVE SHAFT MOUNT
4	66-336	1	SPACER, SHAFT MOUNT
5	61-726	1	WELDMENT, SEAT LEVER
6	68-175	1	KIT, CUTOUT COVER
7	39-055	1	DRIVE SHAFT ASSY
8	38-097	1	PULLEY, 7.00 PD B DBL GRV
9	38-090	1	BALANCER, MACHINED 2003 + GM
10	38-089	1	SPACER, ENGINE PULLEY



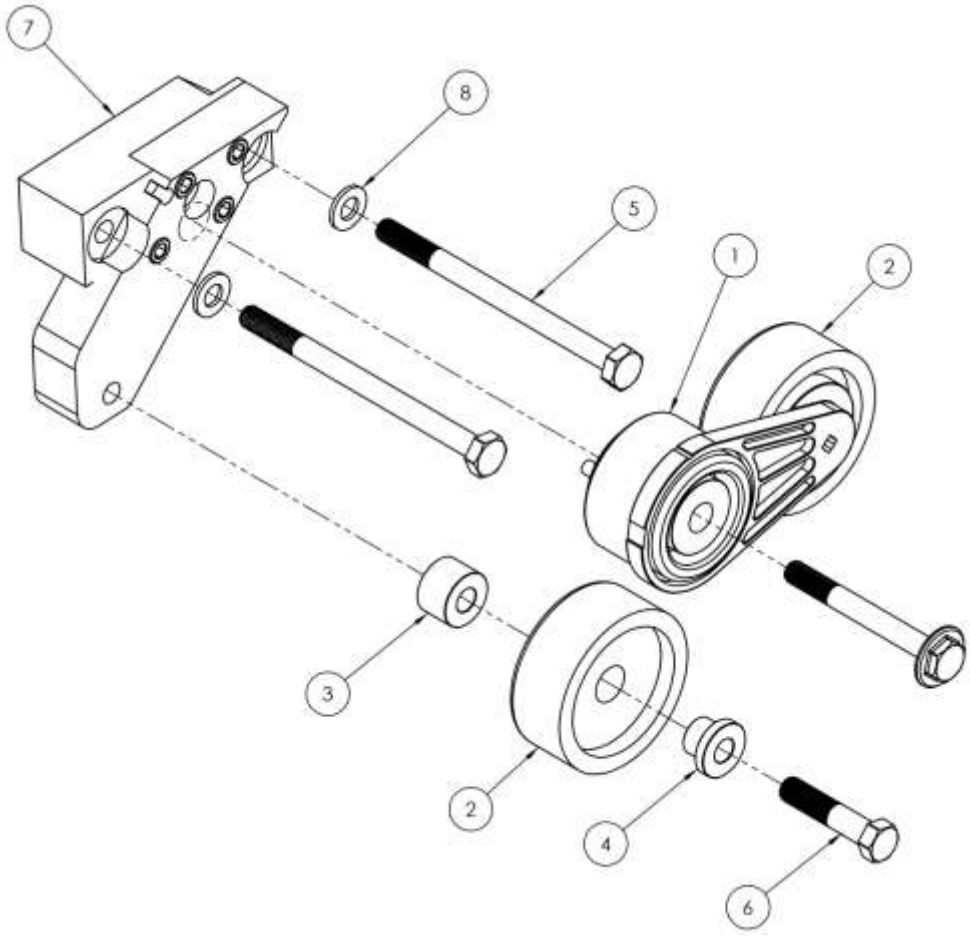
68-162, ASSY, FRONT END KIT, CHEVY…Continued

Item No.	Part Number	Qty	Description
11	38-087	1	PULLEY, ENGINE DRIVE
12	38-076	1	PULLEY, 4.2 PD DOUBLE GROOVE
13	38-052	2	BUSHING, BROWNING H X 1.125
14	37-085	1	BELT, SERPENTINE 65 .5 GATES
15	36-425	1	BOLT, BALANCER GM 2003 6.0L
16	35-022	1	CLUTCH, SERP 6IN - 6 GROOVE, TAPERED BORE
17	10-217	1	SCREW, MACH M10 X 1.5 X 140 HXHD
18	10-216	3	SCREW, MACH 5/16-18 X .875 SOCHD
19	10-213	3	SCREW, MACH 5/16-18 X 1.75 SOCHD



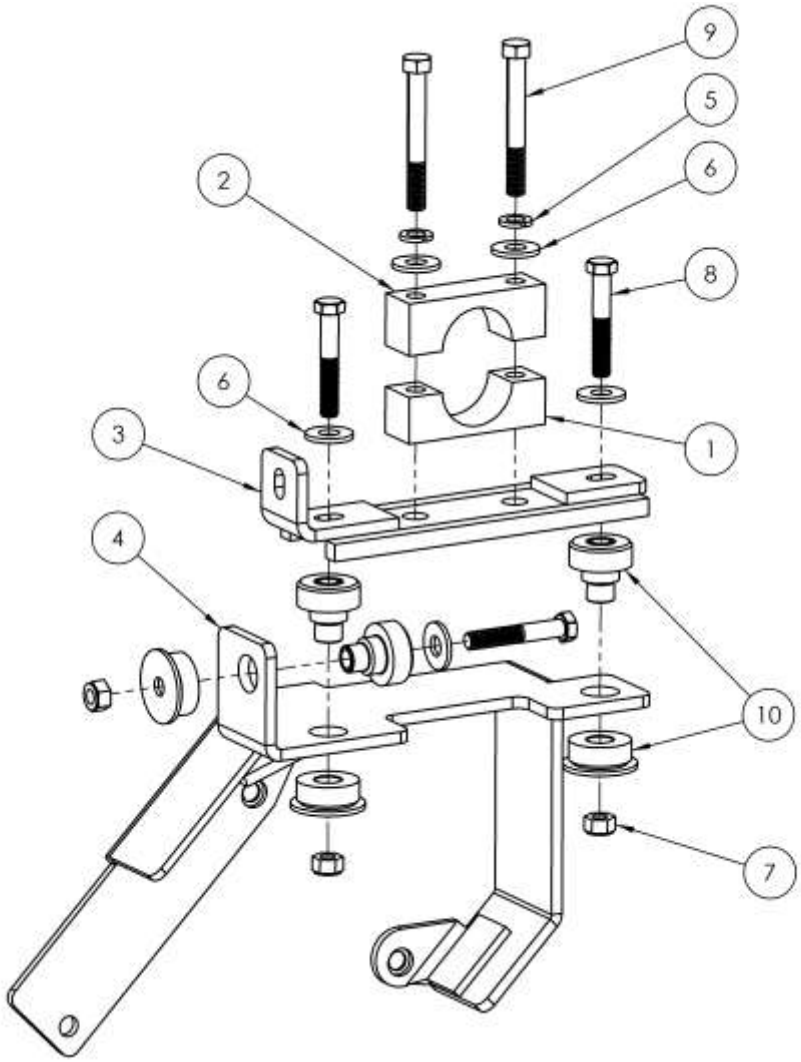
69-363, ASSY, REAR DRIVE SHAFT MOUNT

Item No.	Part Number	Qty	Description
1	66-332	1	CLAMP, BOTTOM REAR SHAFT
2	66-331	1	CLAMP, TOP REAR SHAFT
3	61-770	1	WELDMENT, REAR ISOLATOR MOUNT
4	61-769	1	WELDMENT, REAR CLAMP MOUNT
5	61-728	1	WELDMENT, DRIVE SHAFT MNT
6	60-1191	1	PLATE, SHAFT REINFORCMENT
7	41-117	3	ISOLATOR, 250/50 (65A)
8	12-021	1	WASHER, FLAT, 7/16 ZINC
9	12-014	4	LKWSR, 3/8 ZINC
10	12-013	9	WASHER, FLAT 3/8 SAE
11	11-044	1	NUT, 1/2-13 NYLOCK
12	11-019	3	NUT,3/8-16 NYLOK
13	11-006	2	NUT, 3/8-16 ZINC
14	10-067	2	BOLT,TAP 3/8-16 X 4
15	10-055	3	SCREW, MACH 3/8-16 X 2-1/4 ZINC HXHD
16	10-030	2	SCREW, MACH 3/8-16 X 3 HXHD



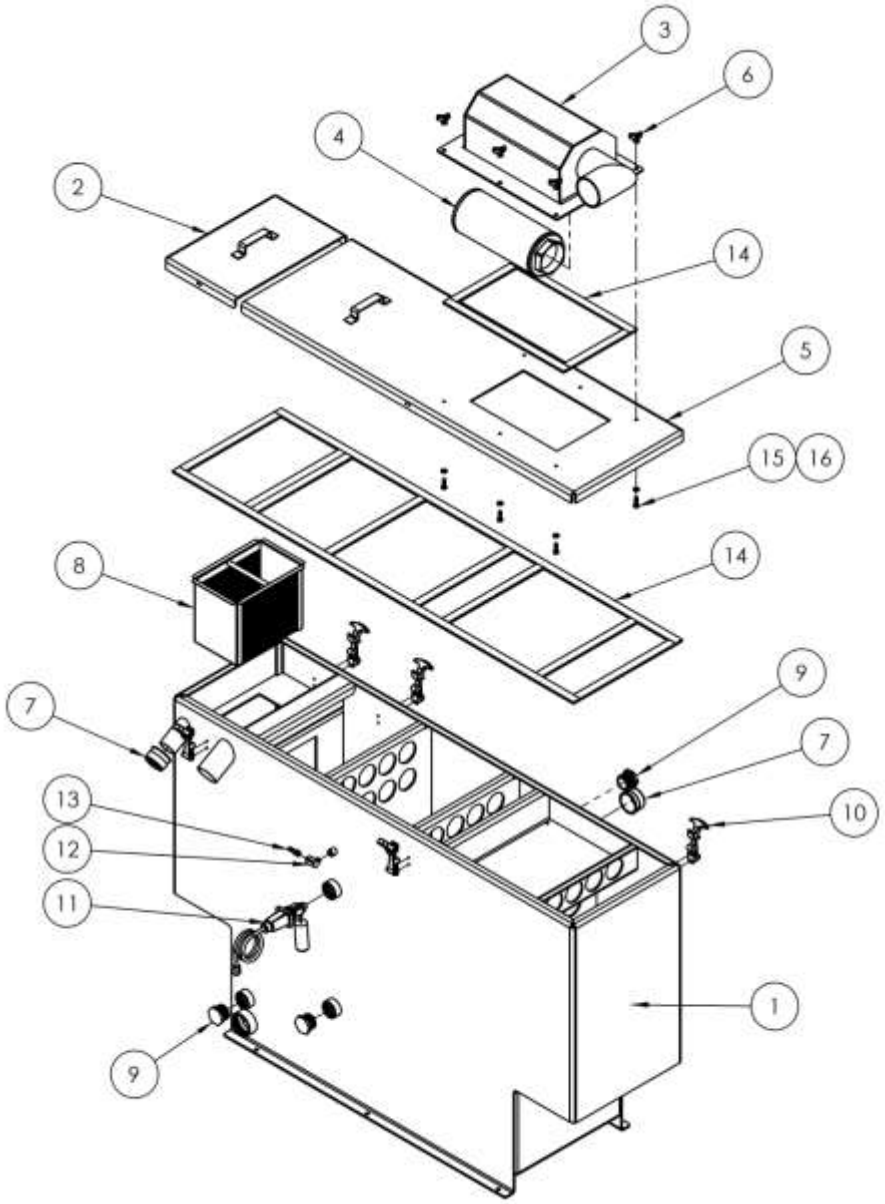
69-364, ASSY, FRONT END IDLER

Item No.	Part Number	Qty	Description
1	66-355	1	TENSIONER, FRONT END MACHINED
2	38-078	2	PULLEY, 76MM FLAT
3	66-336	1	SPACER, SHAFT MOUNT
4	66-337	1	BUSHING, SINGLE IDLER
5	10-217	2	SCREW, MACH M10 X 1.5 X 140 HXHD
6	10-214	1	SCREW, MACH 7/16-20 X 2.00 HXHD
7	69-367	1	ASSY, TENSIONER MOUNT
8	12-025	2	WASHER, FLAT M10



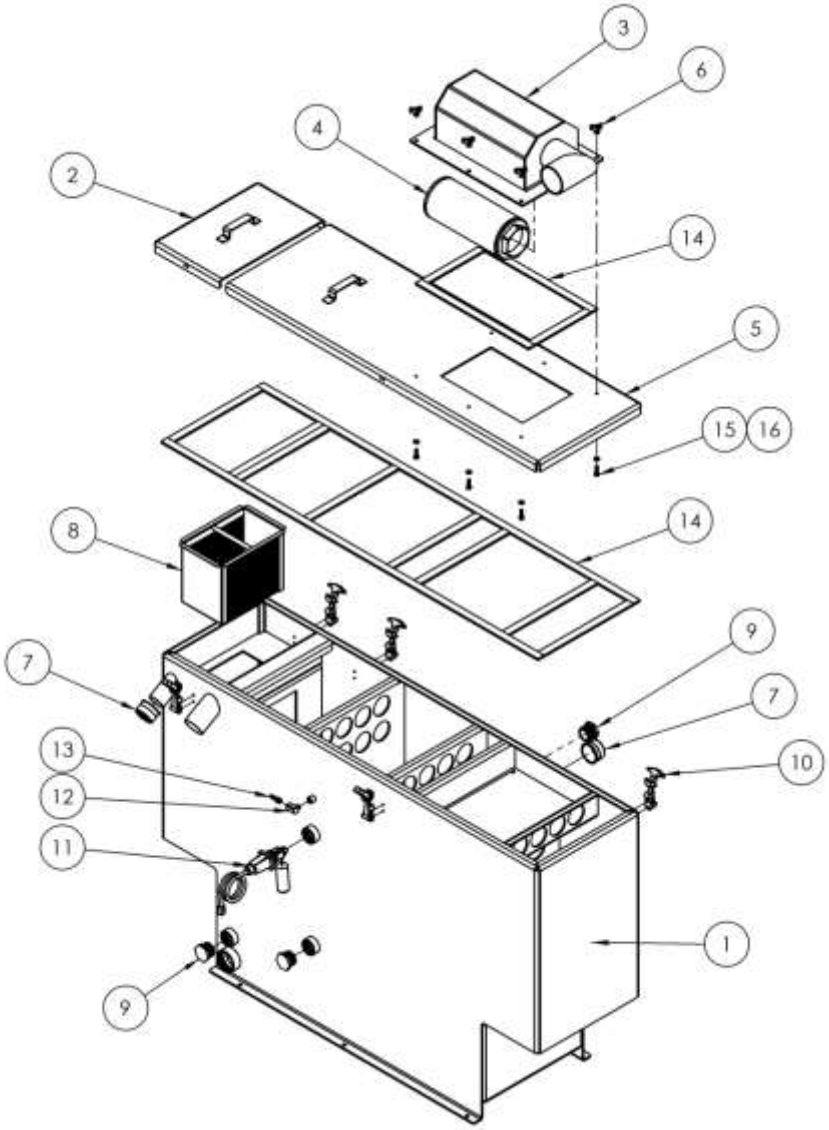
69-382, ASSY, FRONT DRIVE SHAFT MOUNT

Item No.	Part Number	Qty	Description
1	66-332	1	CLAMP, BOTTOM REAR SHAFT
2	66-331	1	CLAMP, TOP REAR SHAFT
3	61-773	1	WELDMENT, FRONT CLAMP MOUNT
4	61-727	1	WELDMENT, FRONT SHAFT MNT
5	12-014	2	LKWSR, 3/8 ZINC
6	12-013	5	WASHER, FLAT 3/8 SAE
7	11-019	3	NUT,3/8-16 NYLOK
8	10-055	3	SCREW, MACH 3/8-16 X 2-1/4 ZINC HXHD
9	10-030	2	SCREW, MACH 3/8-16 X 3 HXHD
10	41-117	3	ISOLATOR, 250/50 (65A)



69-359, ASSY, WASTE TANK

Item No.	Part Number	Qty	Description
1	61-698	1	WELDMENT, WASTE TANK
2	61-743	1	WELDMENT, SMALL TANK LID
3	61-700	1	WELDMENT, FILTER HOUSING
4	20-021	1	STRAINER, FILTER 3" 100 MESH
5	61-699	1	WELDMENT, TANK LID
6	10-031	6	SCREW, THUMB 5/16-18 X 3/4
7	19-009	2	CAP, PLUG 2IN RUBBER
8	61-002	1	WELDMENT, STRAINER BASKET
9	21-097	3	PLUG, 1-1/4 IN PVC
10	40-003	5	LATCH, PRE-FILTER BOX

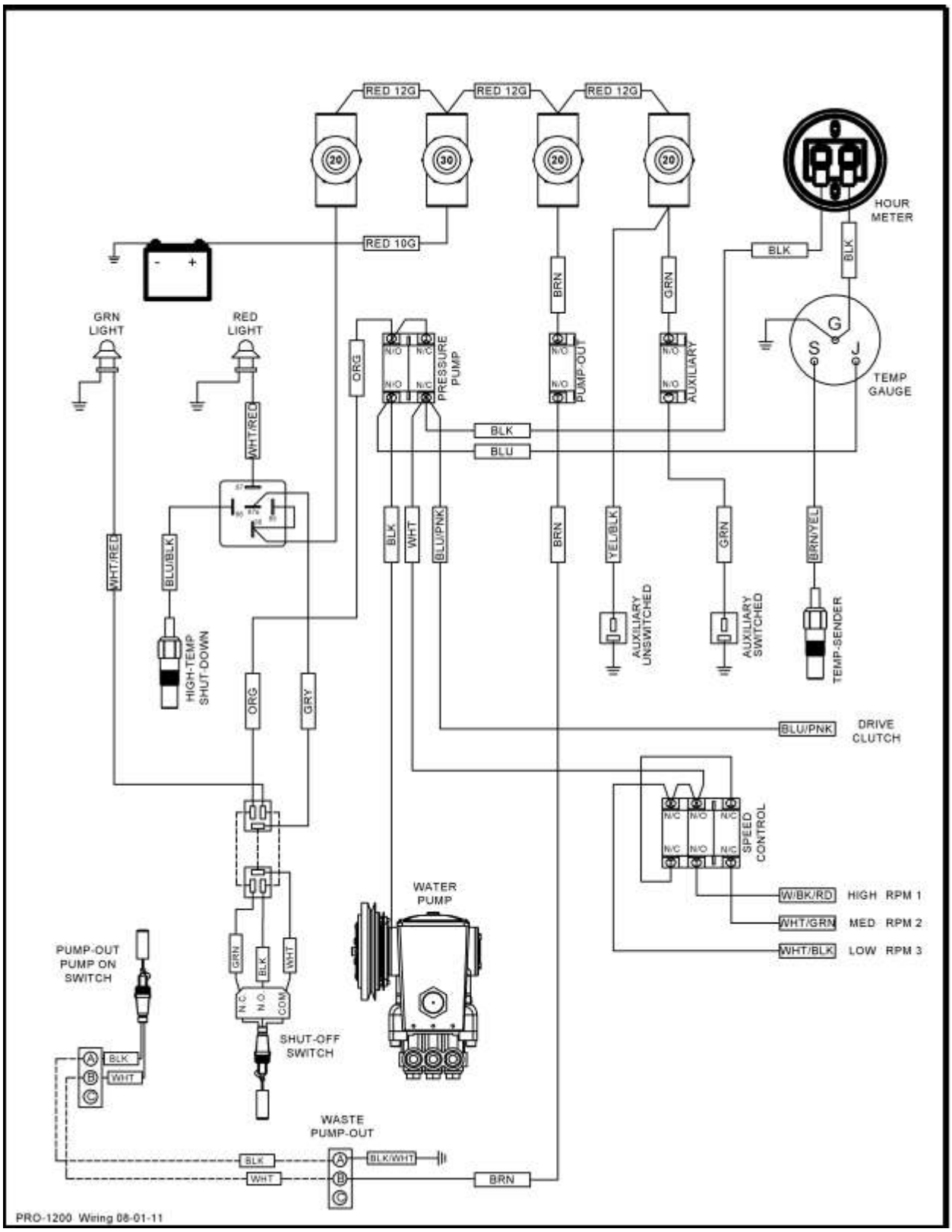


69-359, ASSY, WASTE TANK … Continued

Item No.	Part Number	Qty	Description
11	69-000	1	FLOAT SWITCH
12	21-039	1	ELL, 1/4 IN STREET BRASS
13	21-006	1	FTTG, BRB 1/4PX5/16H BR
14	41-018	288IN	GASKET, SPONGE 1 IN X 45 FT
15	10-061	6	SCREW,MACH 5/16-18 X 1 S/S HCS
16	12-002	6	WASHER, FLAT 1/4 SS ANC

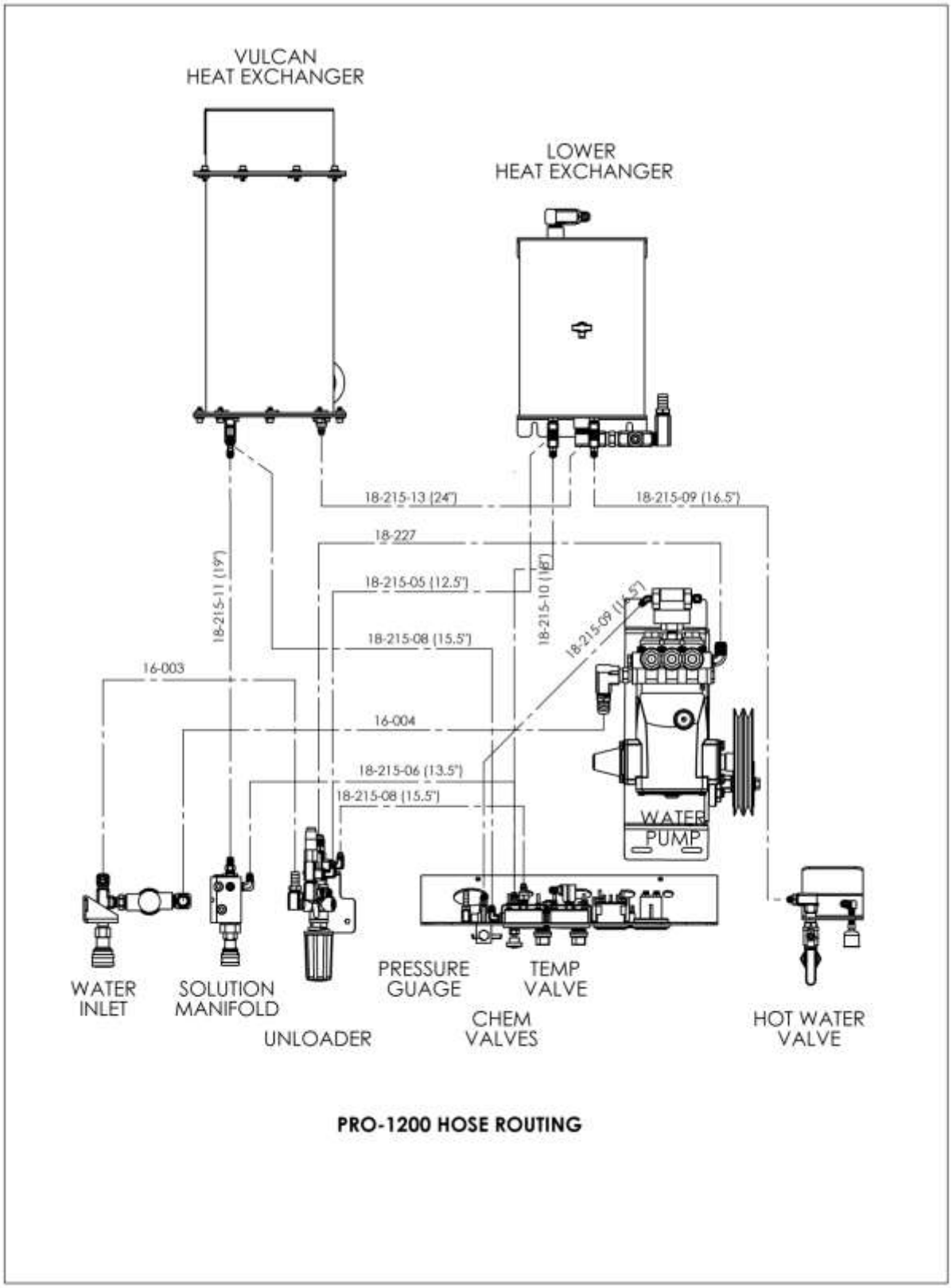
SECTION 5

ELECTRICAL DIAGRAM



SECTION 5

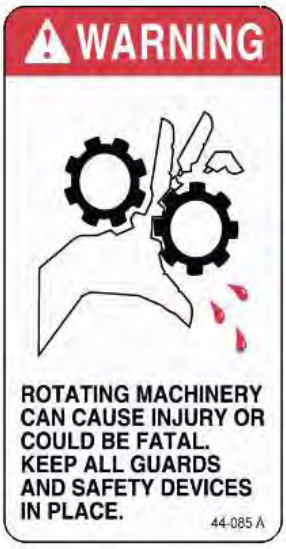
HOSE DIAGRAM



PRO-1200 HOSE ROUTING

44-084 DECAL, CAUTION HOT SURFACE

44-120 DECAL, SERIAL



44-085 DECAL,
WARNING ROTATING
MACHINERY

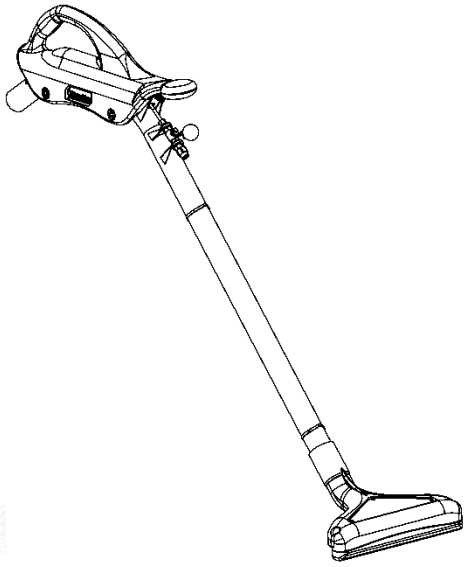
44-082 DECAL,
DANGER ROTATING
MACHINERY

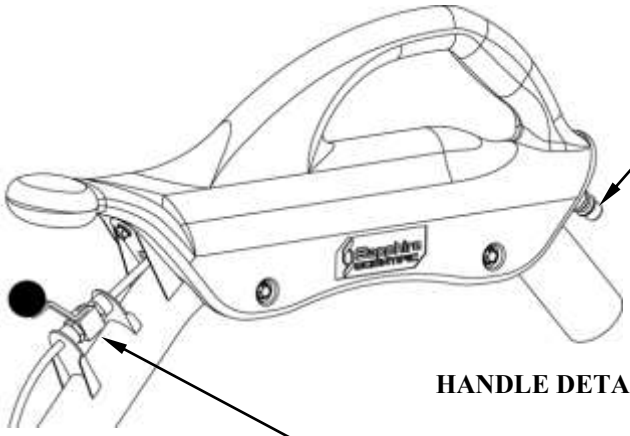
44-083 DECAL,
DANGER HIGH PRESSURE

44-119 DECAL, PRODUCT PRO-1200

11. ACCESSORIES

67-014 STRYKER WAND

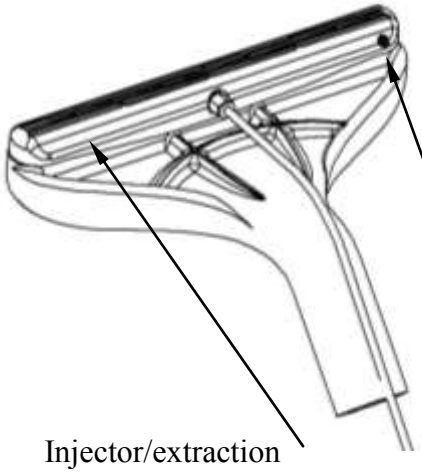




Solution line coupling.

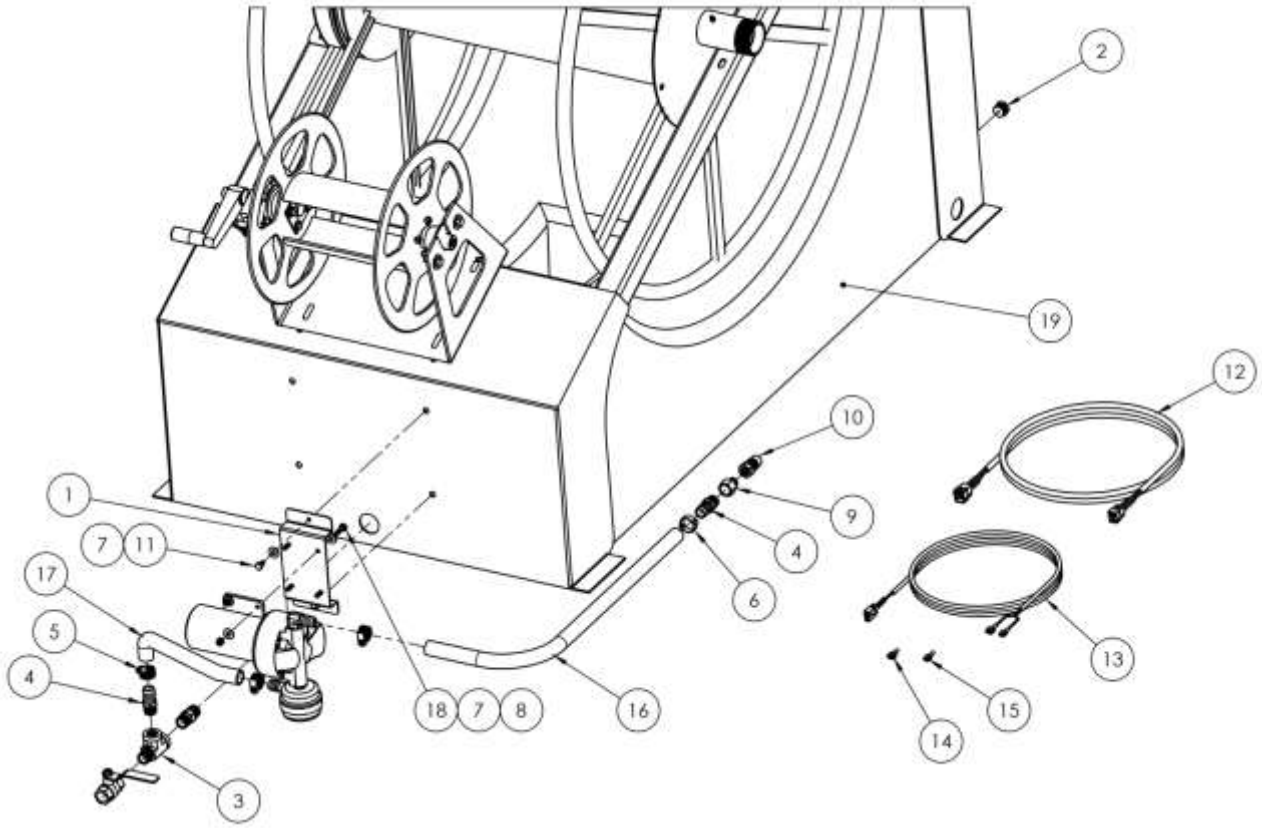
HANDLE DETAIL

Solution control valve. Turn 45° counter-clockwise to open fully.



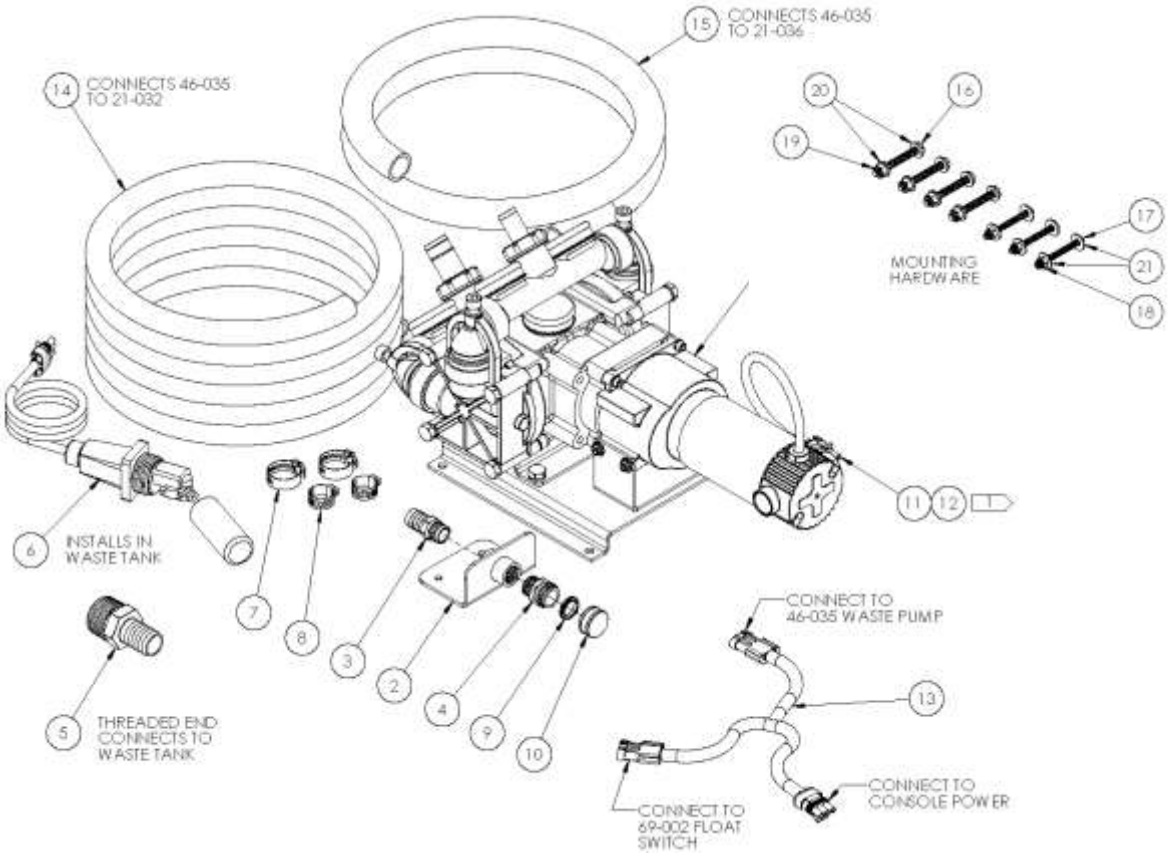
Purge valve. To flush out or debris from injector, loosen purge valve and allow solution to flow at full force.

Injector/extraction manifold



68-166, ASSY, SIDE MNT WATER POND

Item No.	Part Number	Qty	Description
1	60-1275	1	FORMING, PUMP MOUNT
2	21-065	1	PLUG, 1/2 NPT SOLID BRASS HEXHD
3	21-111	1	TEE, STREET 1/2M X 1/2F X1/2F
4	21-032	2	FTTG, BRB 1/2 P X 3/4 H BRASS.SLDPRT
5	14-000	3	CLAMP, HOSE, #12 X .50 SS
6	19-029	1	CLAMP, PINCH 1.00 HOSE DIA
7	12-012	10	WASHER, FLAT 1/4 USS
8	11-013	4	LKNUT, 1/4-20 NYLOK
9	21-035	1	CONN, 3/8 NPT X 1/2 FNPT
10	25-006	1	DSC, 3/8MX 3/8FP BR
11	10-006	2	SCREW, MACH 1/4-20 X 1/2 HEXHD
12	47-106	1	HARNESS, FLOAT SWITCH JUMPER
13	47-107	1	HARNESS, DEMAND PUMP JUMPER
14	31-041	1	TERM, INS PSH ON 16016 GA. BLUE MALE
15	31-042	1	TERM, INS PSH ON 14-16 GA. BLUE FEMALE
16	16-004	28 IN	HOSE, WTR 3/4 IN HZN 500 FT BULK
17	16-004	9 IN	HOSE, WTR 3/4 IN HZN 500 FT BULK
18	10-026	4	SCREW, MACH 1/4-20 X 1 HXHD
19	68-032	1	ASSY, H REEL MOTOR W-120



68-158, ASSY, WASTE PUMP OUT

Item No.	Part Number	Qty	Description
1	46-035	1	PUMP, WASTE
2	61-656	1	WELDMENT, HOSE BRACKET
3	21-032	1	FTTG, BRB ½ P X ¾ H BRASS
4	21-398	1	FTTG, GRDN HOSE ½ P X ¾ H
5	21-036	1	FTTG, BARB 1-1/4 P X 1 IN BARB
6	69-002	1	ASSY, LVL SENSOR SHTOFF WASTE PUMP
7	14-006	2	CLAMP, HOSE #20 SS
8	14-000	2	CLAMP, HOSE #12 X .5 SS
9	41-038	1	WASHER, GARDEN HOSE CAP
10	21-071	1	CAP, GARDEN HOSE ¾ BRASS
11	31-016	1	CONN, 3 PRG ½ TWR #38045 WAYTEK
12	31-019	3	PIN, FEMALE #31035 WAYTEK
13	47-031	1	HARNESS, WASTE PUMP OUT
14	16-004	6 FT	HOSE, WTR ¾ IN HRZ 500 FT BULK
15	16-018	2 FT	HOSE, WTR 1 IN HRZ 100 FT BULK
16	10-178	4	BOLT, TAP 5/16-18 X 2-1/2 HXHD Z
17	10-068	3	BOLT, TAP ¼-20 X 2-1/2
18	11-013	3	LKNUT, ¼-20 NYLOK
19	11-029	4	NUT, 5/16-18 NYLOK
20	12-017	8	WASHER, FLAT 5/16 SAE ZINC