

BRIDGEPOINT SYSTEMS

Incorporated

Dagger

Machine Serial Number _____

182-027

Copyright © 1998. No part of this manual may be reproduced or used in any form or by any means (i.e. graphic, electronic, photocopying or electronic retrieval systems) without express written permission. All rights reserved.

Revised October 8, 1998

Introduction

Dagger Section 1

This manual contains installation and operation instructions as well as information required for proper maintenance, adjustment and repair of this private label machine. Since the first and most important part of repair work is the correct diagnosis of the problem, component manual troubleshooting charts have been included for your convenience. The Dagger is exclusively manufactured for Bridgepoint Systems, Inc.

Unlike a garden tractor, lawn mower or cement mixer, all having one or two functions to perform, the truck-mounted carpet cleaning plant has many functions to perform simultaneously.

- ▶ The engine has to run at a consistent RPM.
- ▶ The vacuum has to pull air and dirty water back from cleaning site.
- ▶ The water pump provides stable pressure at proper water flow for cleaning.
- ▶ The chemical has to be injected into the water stream at the right concentration.
- ▶ The heating system must maintain proper heat.
- ▶ The vacuum tank must store dirty water until drained.

As you can see, it is not just a turn-key operation with one thing to worry about, **Does it start?!**

Dagger

◆ WARNING ◆

The manufacturer uses this symbol throughout the manual to warn of possible injury or death.

◆ CAUTION ◆

This symbol is used to warn of possible equipment damage.

System Operation

Dagger Section 1

The SpitFire heat exchanger system is a highly engineered cleaning plant designed by HydraMaster Corporation. The system utilizes a dynamic heating system comprised of three separate exhaust heat exchangers for capturing "free heat."

The water flow is as follows:

Water is fed into the machine under tap pressure. It flows through one pre-heater and then is automatically combined with a cleaning solution as it enters the mix tank. The solution is then picked up by the high pressure pump and pressurized to the desired level. The water then splits flow, as demanded by the technician. The majority of the water flows to the bypass valve assembly, then back through the secondary exhaust heat exchanger, and back to the mix tank. The water demanded by the technician flows from the water pump through the primary exhaust heat exchanger then out to the cleaning tool.

When the cleaning solution reaches a pre-set high temperature, it is released from the system and directed to the recovery tank. Then cool water enters the system to regulate the temperature.

As there is no guess work in the manufacture of these highly advanced cleaning plants, there must be none in preparing it to get the job done in the field. It is the purpose of this manual to help you properly understand, maintain and service your cleaning plant. Follow the directions carefully and you will be rewarded with years of profitable, trouble-free operation.

It is imperative that no section be overlooked when preparing for operation of this equipment.

Machine Specifications

Dagger
Section 1

Frame: 22"W x 29"L x 27"H
Steel with baked-on Epoxy finish

Weight: Spitfire 3.2: 350 lbs.

Engine: Vanguard 14 HP Briggs and Stratton
Pressurized oil system
Spin-on filter and oil PSI protection switch

Ignition: Electronic, keystart

Vacuum Blower: Roots 33 RA1

Chemical System: Electro-mechanical, meter controlled

Heating System: 1 Stainless steel exhaust exchanger
1 Copper shell and tube exchanger
1 Copper and aluminum block exchanger

Instruments: Water Pressure Gauge, liquid filled, 0-1000 PSI
Hour Meter, machine runtime
Keyed Ignition, start/stop
Chemical Flowmeter, clear acrylic, 0-10 GPH

Recovery Tank: 50 Gallon Aluminum, Epoxy finish

Cleaning Wand: Stainless steel with heat shield
Replaceable grip
Rebuildable solution valve

Dagger

High Pressure Hose: 1/4" High temperature lined / vinyl covered
Hose rated to 1250 PSI

Vacuum Hose: 2" reinforced, 1 1/2" reinforced.

Standard Equipment: Machine Power Console
Full Instrumentation
Roots Vacuum Blower
SpitFire™ Water Heating Package
Vacuum Recovery Tank
Carpet Cleaning Wand
Chemical Jug
100 ft, 2" Vacuum Hose
10 ft, 1 1/2" Wand Whip-line
100 ft, Super Flex Solution Line
Battery Box
Van Decal Package
Van Installation Kit
Operation Manual
HydraMaster Jacket

Spare Parts

Dagger *Section 1*

Down-time on the unit can be very expensive, because your truck-mounted unit is capable of generating several hundred dollars per day. In order to minimize such down-time, it is strongly recommended by the manufacturer that you purchase and keep in your truck the parts listed below.

Parts Orders

To expedite your parts needs, please call your sales representative. In most instances, he either stocks or has access to parts through a regional service center. If further assistance is needed, contact the factory and coordinate your needs. If this becomes necessary, always indicate the method of shipment you desire.

Parts List (078-092)

PART NO	DESCRIPTION	QTY
010-011	Belt, Gates #9335	1
049-014	Filter, Vanguard Oil	2
049-007	Filter, S/S Vacuum Pump	1
049-016	Filter, 1/4" Replacement Y	1
049-023	Screen, Garden Hose	1
049-012	Filter, Vanguard Air	1
049-030	Filter Bag, 92 + Truck Mount	2
052-050	Quick Connect, 440 Male	3
052-051	Quick Connect, 440 Female	2

Dagger

PART NO	DESCRIPTION	QTY
052-052	Quick Connect, 660 Male	1
052-053	Quick Connect, 660 Female	1
057-043	Gasket, Recovery Tank	1
074-003	Gauge, Hi PSI (0-1000)	1
074-013	Meter, Chemical Flow	1
078-015	Kit, Chem Flowmeter	1
078-101	Kit, Seal & Spring Hi PSI	1
106-016	Plug, Vanguard Spark	2
131-037	Wrap, Exhaust Insulation	1
157-001	Switch, Tethered Mercury	1
157-115	Mini-Rocker with Terminal	1
157-022	Switch, Relay	2
169-022	Valve, 1 1/2" Full Port	1
169-062	Valve, 1/4 Anti-Siphon	1
169-120	Valve, Chemical System	1
152-008	Sleeve, #6 Drive Coupler	1
078-140	Kit, Hypro Seal	1

Responsibilities

Dagger Section 1

The *Purchaser's* responsibilities, prior to arrival of unit, are:

To install 5/8" exterior plywood flooring in the vehicle and cover it with artificial turf.

◆ CAUTION ◆

In Dodge vans the fuel tanks are located directly against the floor. Caution must be used when drilling any holes through the floor. (See Product Support Bulletin 94062 at the end of this manual.)

To purchase heavy duty 42 - 60 amp hour battery and have the battery 'slow' charge if new.

◆ CAUTION ◆

If the battery is not fully charged, damage can occur to the engine charging regulator.

To read the owner's manual!! It is the purchaser's responsibility to read the unit operation manual and to familiarize himself with the information contained therein. *Special attention should be paid to all **Cautions and Warnings**.*

The *Sales Representative's* responsibilities are as follows:

ACCEPTANCE OF SHIPMENT

1. If the unit shows any outward signs of damage, do not sign the delivery receipt until you have closely inspected the unit and noted any damage on the

Dagger

delivery receipt.

2. The salesman from whom you purchased your unit is responsible for supervising the correct installation of the unit in your vehicle and thoroughly training you in its operation, maintenance and precautions.

CORRECT INSTALLATION

- ▶ Vehicle of proper load carrying capacity[▲].
- ▶ Installation of through-floor fittings for gasoline fuel lines.
- ▶ Placing the unit and recovery tank in your vehicle and securing them with bolts or tie down cleats.
- ▶ Connecting gasoline lines.
- ▶ Connecting the battery.
- ▶ Checking the pump, vacuum blower and engine oil levels prior to starting the unit.
- ▶ Starting the unit to check the engine and see that all systems function normally.
- ▶ Checking all hoses, wands, etc. for correct operation.

TRAINING

- ▶ A thorough review of the operation manual with purchaser.
- ▶ Instruction and familiarization in: how to correctly start up and shut down the unit, how to correctly clean with the unit, where and how often to check and change component oil levels, how the unit's systems work, how to troubleshoot the unit, how to do basic repairs, safety precautions and their importance, freezing damage and how to avoid it, hard water damage and how to avoid it.
- ▶ A thorough review of the unit warranty and warranty procedures.

[▲] Load Capacity Recommended: ½ ton

Vehicle Prep

Dagger *Section 1*

When selecting a truck, remember the preferable vehicle for a SpitFire installation is a cargo van with a heavy-duty suspension package and a half ton capacity. If a fresh water tank is added, a three quarter ton or larger capacity van, with a 2,400 pound payload capacity, is required.

TRUCK PREPARATION

The manufacturer recommends the installation of plywood flooring, covered with poly propylene backed astroturf (do not use rubber-backed), in the vehicle prior to installation of machine.

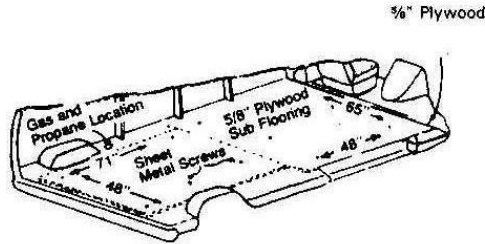
◆ CAUTION ◆

Be cautious when drilling any holes through the van floor. Many vans have critical components mounted directly below the van floor that could be damaged by a misplaced drill bit. (See Product Support Bulletins 92102, 94062 and 94063 at the end of this manual.)

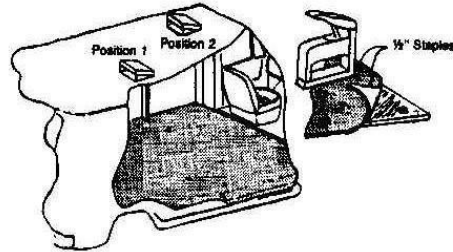
This provides 'metal to wood' mounting rather than 'metal to metal', and provides insulation and makes an attractive van interior. Astroturf should be color keyed to the van interior. See illustrations below for correct placement of plywood flooring.

Dagger

Plywood Installation



Astroturf and Roof Vent



Materials Needed:

1. 2 sheets 4x8x5/8" exterior plywood
2. 6'x12' piece of commercial astroturf
3. 16-1 1/2" sheet metal screws
4. 1 quart marine adhesive (optional)
5. 1 staple hammer with 1/2" staples

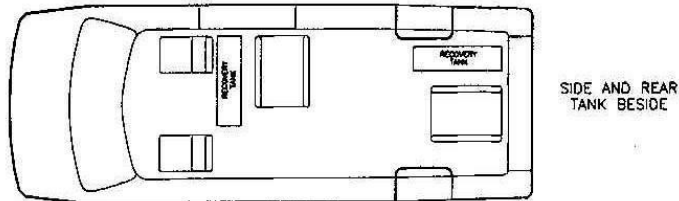
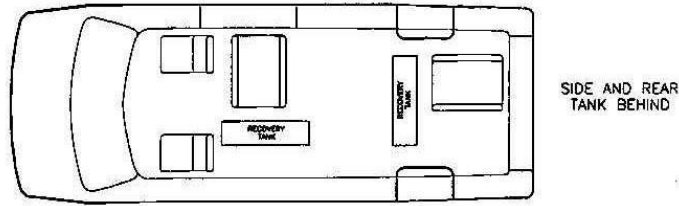
PLACEMENT OF UNIT IN VEHICLE

There are two recommended unit placements:

A. **SIDE DOOR:** Most installations are side door. This provides rear access for accessories and hoses as well as unobstructed access to the component/working side of the machine, thus making it a bit easier to perform maintenance and/or repair without removing the unit from the truck.

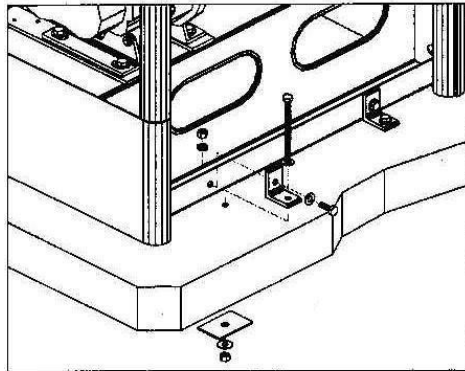
B. **REAR DOOR:** Although this location partly limits working access, it does direct the noise away from the cleaning site. Some cleaners in the colder areas prefer this location because it puts the weight mass over the rear wheels for better traction in ice and snow. Rear mounting requires the unit to be slid to the right side as far as possible. This not only provides adequate working space on the component side of the unit but also makes better weight distribution inside the van (engine and component weight line up over drive shaft). Also, it is physically easier to load the unit into the rear door due to the height of the van bed.

Dagger



Machine Tie Down Cleats

Secure the machine to the floor of the van with the four tie down cleats provided. This safety measure will ensure that the machine will not slide inside the van. See the following illustration for the correct installation.



Ensure that the machine is well secured to the floor of the van with the

Dagger

hardware supplied. A sudden or crash stop will cause the machine to rocket forward! Protect yourself and the machine. **SECURE IT!**

◆ **WARNING** ◆

It is recommended by the manufacturer that the exhaust from the front of the machine be vented down under the truck to prevent carbon monoxide from entering the job site. **Always park the truck so the exhaust is blowing away from the job site.**

The manufacturer also recommends the installation of aluminum vents in the truck roof to allow heat to escape.

◆ **WARNING** ◆

Never operate this machine with a portable gas can inside the truck. Doing so increases the risk of a fire or explosion.

Mount a fire extinguisher just inside the rear or side door for emergencies.

◆ **WARNING** ◆

Do not use a portable propane tank inside of the truck or van. It is dangerous and illegal in most states.

◆ **WARNING** ◆

Transportation in a vehicle of any vented fuel container that presently has or has ever contained a flammable liquid is strictly forbidden by HydraMaster Corporation and by federal and state regulation.

Dagger

◆ WARNING ◆

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Local Water Precautions

Dagger Section 1

The quality of water varies greatly. Many areas have an excess of minerals in the water which results in what is commonly called "hard water". These minerals tend to adhere to the insides of heater coils and other parts of the machines causing damage and a loss of cleaning effectiveness. This influences the reliability and efficiency of your equipment.

HARD WATER AREA MAP

The following map defines areas in the United States which compromise fluid related components such as hoses, fittings, heaters, pumps, valves and water cooled engines. For other countries, hard water area maps can be obtained from geological societies.

WATER SOFTENER

Cleaning efficiency and equipment life is increased, chemical use decreased, and the appearance of cleaned carpets enhanced when water softeners are incorporated in hard water areas. The manufacturer strongly urges the use of water softener units in areas exceeding 3 1/2 grains per gallon. Using a hard water area map as a reference, determine the quality of water in your area and take action immediately, if necessary.

Reports from several of our machine users commending the results of the use of water softeners in conjunction with their machines prompts us to recommend the procedure to everyone in a "hard water" area.

The relatively low cost of a water softener service is more than made up for in the increased life of machine parts and continued cleaning efficiency. The water softener will also increase the effectiveness of the cleaning chemical

Dagger

being used and, therefore, less chemical will be needed.

Contact a water softener distributor in your area for information on the rental of a simple water treatment unit to carry in your truck. Be sure to change the water softener in accordance with the capability of the softener. For example: If the softener will treat 900 gallons of water and the machine uses an average of 30 gallons per hour, for an average of 5 hours a day, this equals 150 gallons per day. In 6 days the machine would use 900 gallons of water. Therefore, the softener would need to be changed every 6 working days for maximum softening.

WASTEWATER DISPOSAL ADVISORY

There are laws in most communities prohibiting the dumping of recovered "gray" water from carpet cleaning in any place but a sanitary treatment system.

This cleaning rinse water, recovered into your unit's vacuum tank, contains materials such as detergents. These must be processed before being safe for streams, rivers and reservoirs.

IN ACCORDANCE WITH THE EPA, STATE AND LOCAL LAWS, DO NOT DISPOSE OF WASTEWATER INTO GUTTERS, STORM DRAINS, STREAMS, RESERVOIRS, ETC.

In most cases, an acceptable method of wastewater disposal is to discharge into a municipal sewage treatment system after first filtering out solid material such as carpet fiber. Access to the sanitary system can be obtained through a toilet, laundry drain, RV dump, etc. Permission should first be obtained from any concerned party or agency.

One disposal method which usually complies with the law is to accumulate the wastewater and haul it to an appropriate dump site. Another solution to the disposal problem is to equip yourself with an Automatic Pump-Out System. These systems are designed to remove wastewater from the extractor's recovery system and actively pump the water through hoses to a suitable disposal drain. Properly designed, they will continuously monitor the level of

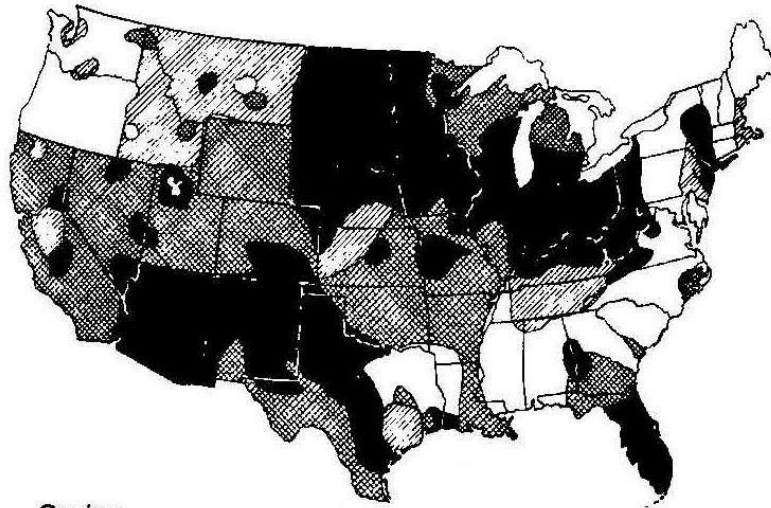
Dagger

wastewater and pump it out simultaneously to the cleaning operation. The hidden benefit of this process is that the technician does not have to stop his cleaning to empty the recovery tank. HydraMaster makes an A.P.O. System available which can be ordered with new equipment or installed later.

The penalties for non-compliance can be serious. Always check local laws and regulations to be sure you are in compliance.

Dagger

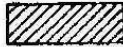
Hard Water Map



Grains
Per Gallon



0 - 3½



3½ - 7

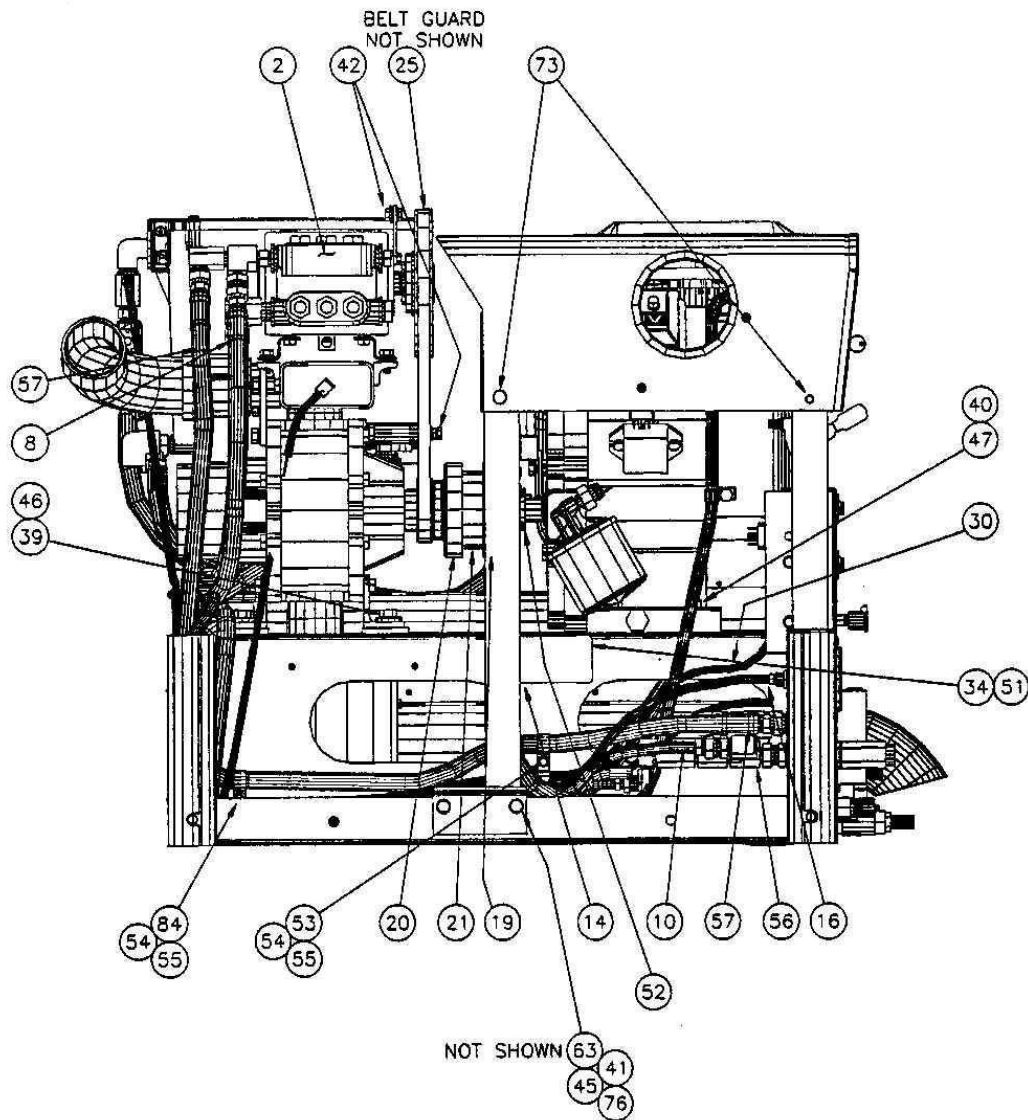


7 - 10½

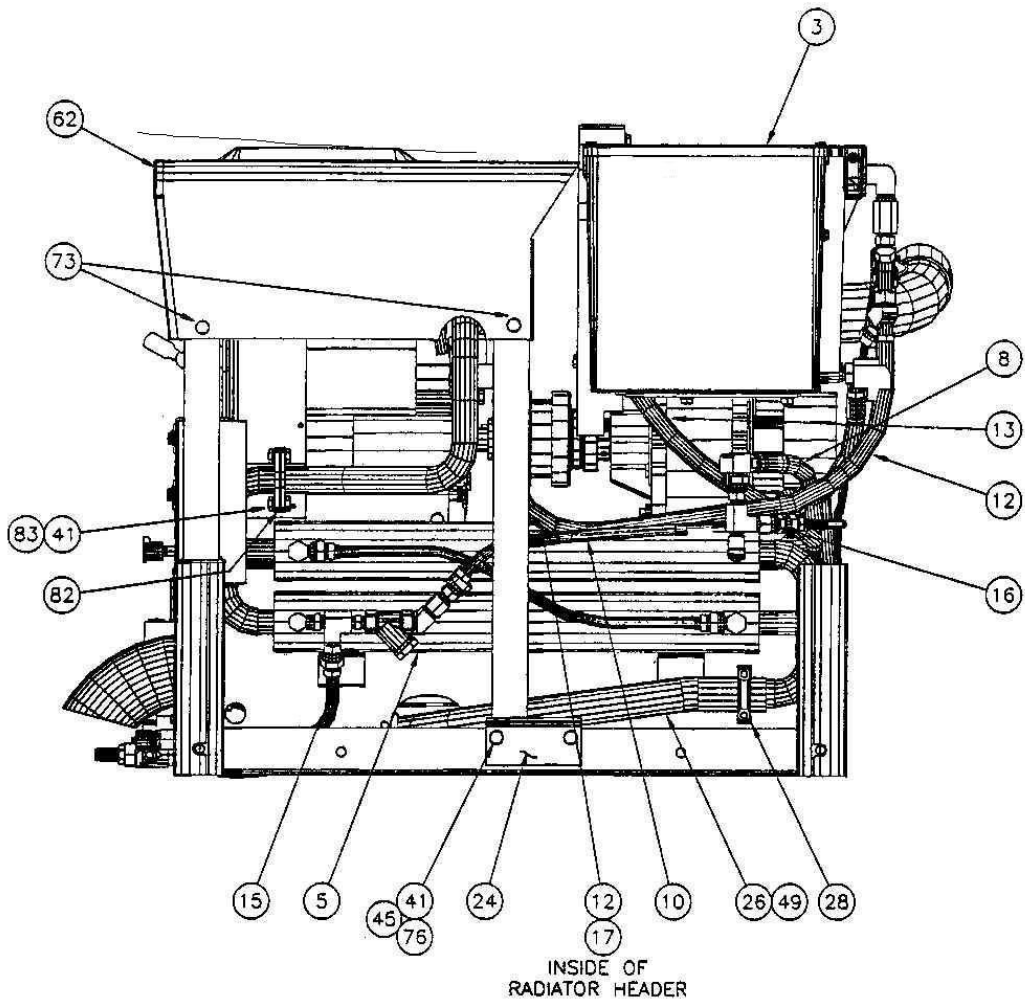


10½ and above

Dagger

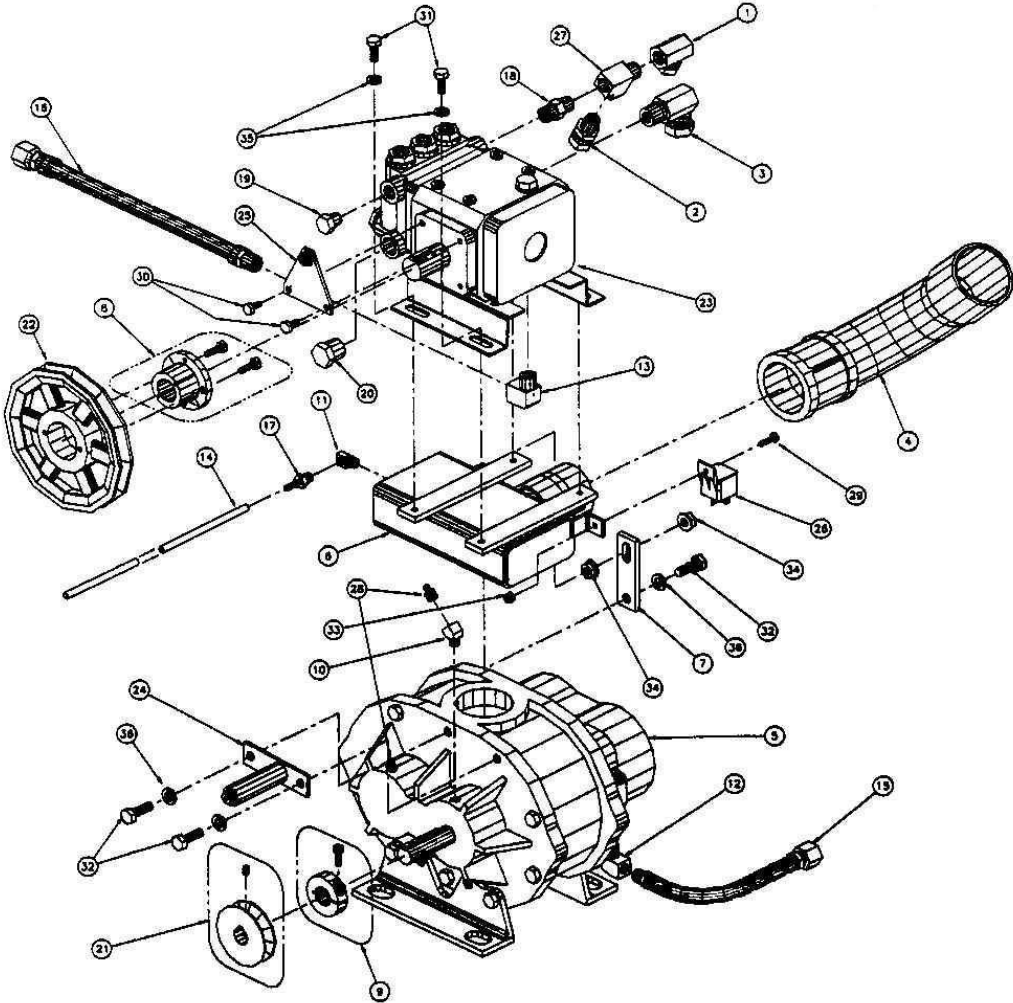


Dagger



Dagger

Blower and Pump Assembly

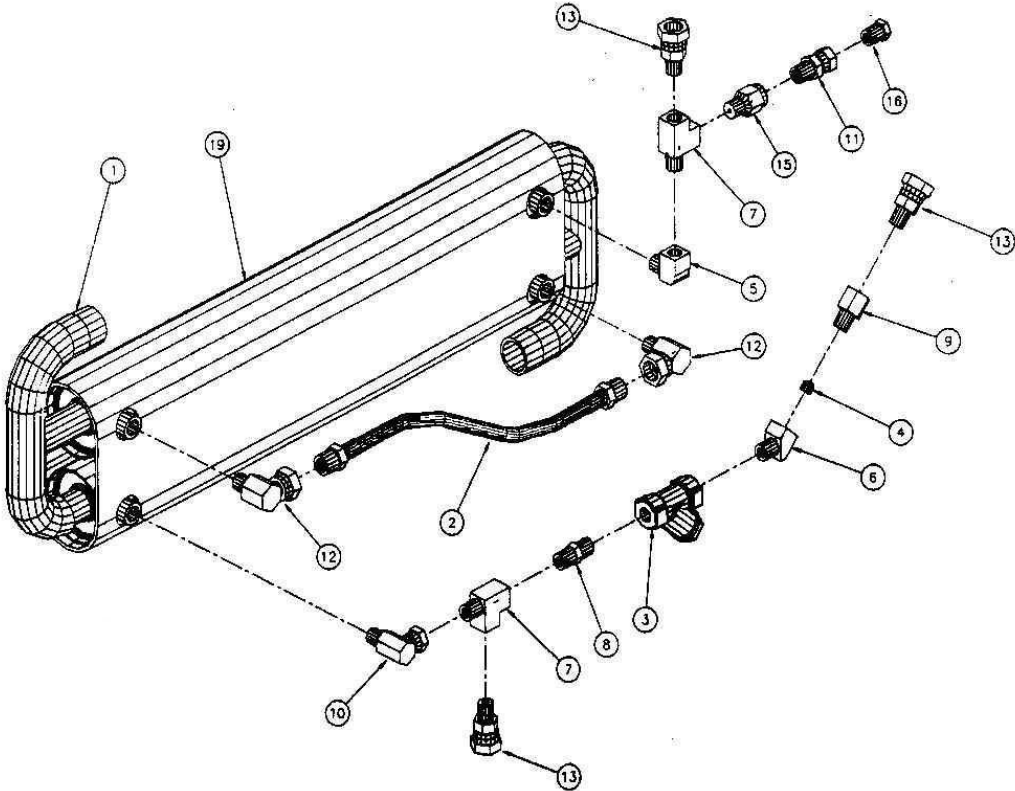


Dagger

Blower and Pump Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	052-026	6FA-6UFS	1
2	052-019	6M-6UFS	1
3	052-036	8MA-8UFS	1
4	001-027	Adapter, Blower Collector Box	1
5	111-020	Blower, 3.2 Roots	1
6	015-347	Bracket, Comet Pump - Collector Box	1
7	015-267	Bracket, Mount Straps	1
8	020-013	Bushing, #H x 24mm	1
9	020-011	Collar, Blower Shaft - Single Screw Type	1
10	052-078	Elbow, 1/8" Brass 45 Street	1
11	052-084	Elbow, 1/8" Brass Street	1
12	052-085	Elbow, 1/4" Brass Street	1
13	052-086	Elbow, 3/8" Brass Street	1
14	068-030	Hose, 5/32" Rubber - Vacuum	4 Ft
15	068-221	Hose, 3/8" x 24" Pump Drain	1
16	068-219	Hose, Pump Drain	1
17	052-293	Insert, #23	1
18	052-074	Nipple, 3/8 Brass Hex	1
19	106-003	Plug, 3/8" Brass	1
20	106-004	Plug, 1/2" Brass	1
21	109-004	Pulley, 2 3/4" x 3/4" Pump Drive	1
22	109-017	Pulley, Pump Upper	1
23	111-042	Pump, High Pressure	1
24	154-052	Spacer, Lower Belt Guard	1
25	154-057	Spacer, Upper Belt Guard	1
26	157-022	Switch, Relay	1
27	052-023	Tee, 3/8" Male Street - Brass	1
28	052-505	Zerk Fitting, 1/8" MPT Grease Fitting - Straight	2
29	143-062	Screw, 10-24 x 3/4" s/s PanHd MS Phillips	1
30	143-221	Screw, 6M-1 x 14mm HHCS	2
31	143-012	Screw, 5/16-18 x 3/4" HHC s/s	4
32	143-019	Screw, 3/8-16 x 1 1/4" HHC Grade 5 Zinc	3
33	094-034	Nut, 10-24 s/s Nylock	1
34	094-016	Nut, 3/8 - 16 Whiz	2
35	174-018	Washer, 5/16" s/s Lock	4
36	174-021	Washer, 3/8" Lock	3

Heat Exchanger Assembly



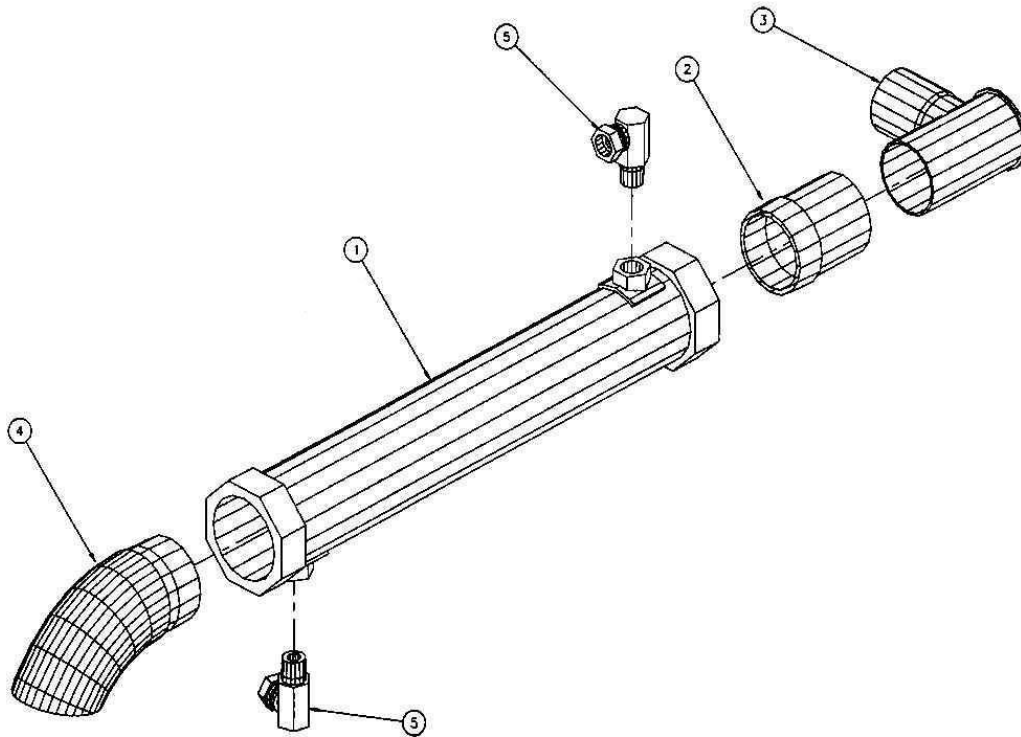
Dagger

Heat Exchanger Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	038-022	Heat Exchanger	1
2	068-078	Hose, 3/8" x 18" Teflon	1
3	049-033	Filter, 1/4" Inline	1
4	180-002	Orifice, Set Screw .039"	1
5	052-085	Elbow, 1/4" Brass Street	1
6	052-082	Elbow, 1/4" Brass 45 Street	1
7	052-090	Tee, 1/4" Male Branch M-F-F	2
8	052-071	Nipple, 1/4" Brass Hex	1
9	052-423	Bushing, Mod. Set Screw Orifice Housing	1
10	052-006	4 MA - 4 UFS	1
11	052-005	4 M - 4 UFS	1
12	052-014	4 MA - 6 UFS	2
13	052-013	4 M - 6 UFS	2
15	135-052	Regulator, High PSI Snubber	1
16	052-059	Bushing, 1/4M x 1/8F Brass	1
17	131-009	Insulation, 1' x 1/2" x 15' OUCT	.5
18	131-046	Ins. Sleeving, .054 x 1 1/2" Exhaust Tube Wrap	4 Ft
19	108-023	Protective Insulation Blanket	1

Dagger

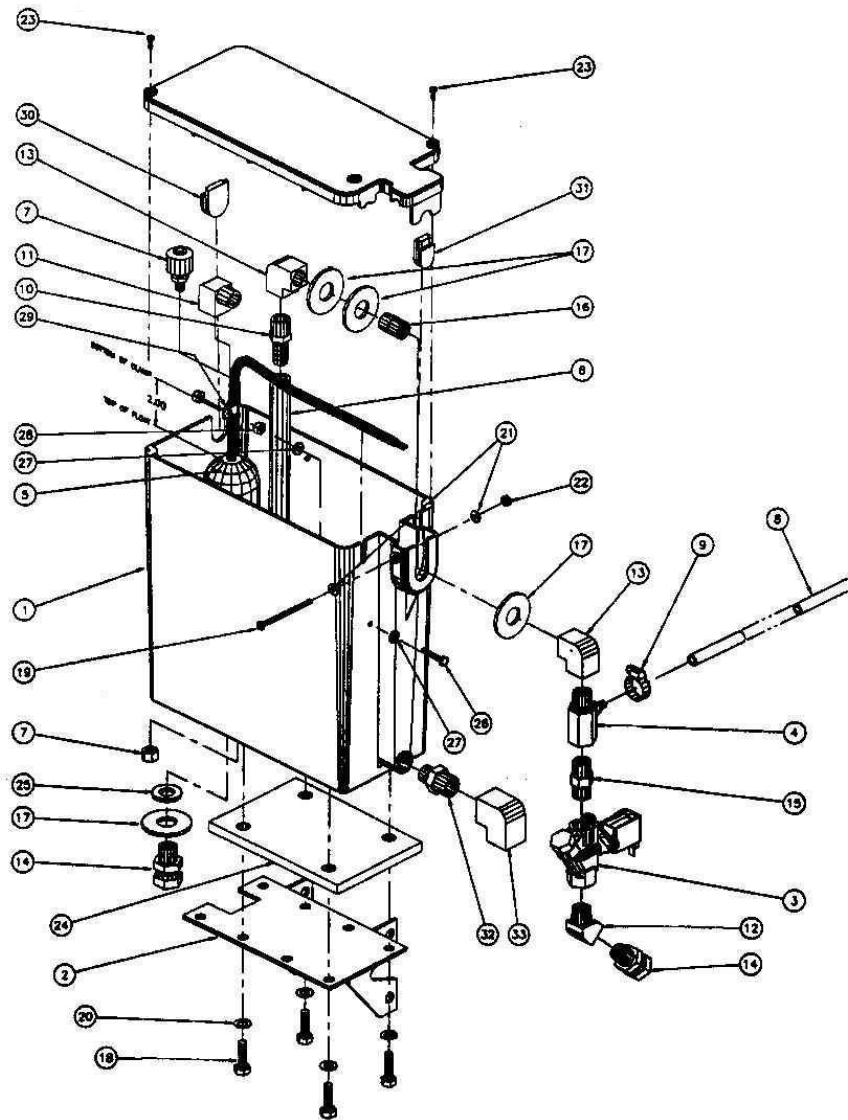
Lower Heat Exchanger Assembly



ITEM	PART NO	DESCRIPTION	QTY
1	038-018	Core, 3" Copper CrossFire Heat Exchanger	1
2	052-343	Adapter, Heat Exchanger Inlet	1
3	001-017	Adapter, Silencer Outlet	1
4	052-321	Exhaust Turn Down Fitting	1
5	052-036	8 MA - 8 UFS	2
Not Shown:			
	131-009	Insulation, 1 x 1/8" x 15' Duct	.5

Dagger

Mix Tank Assembly



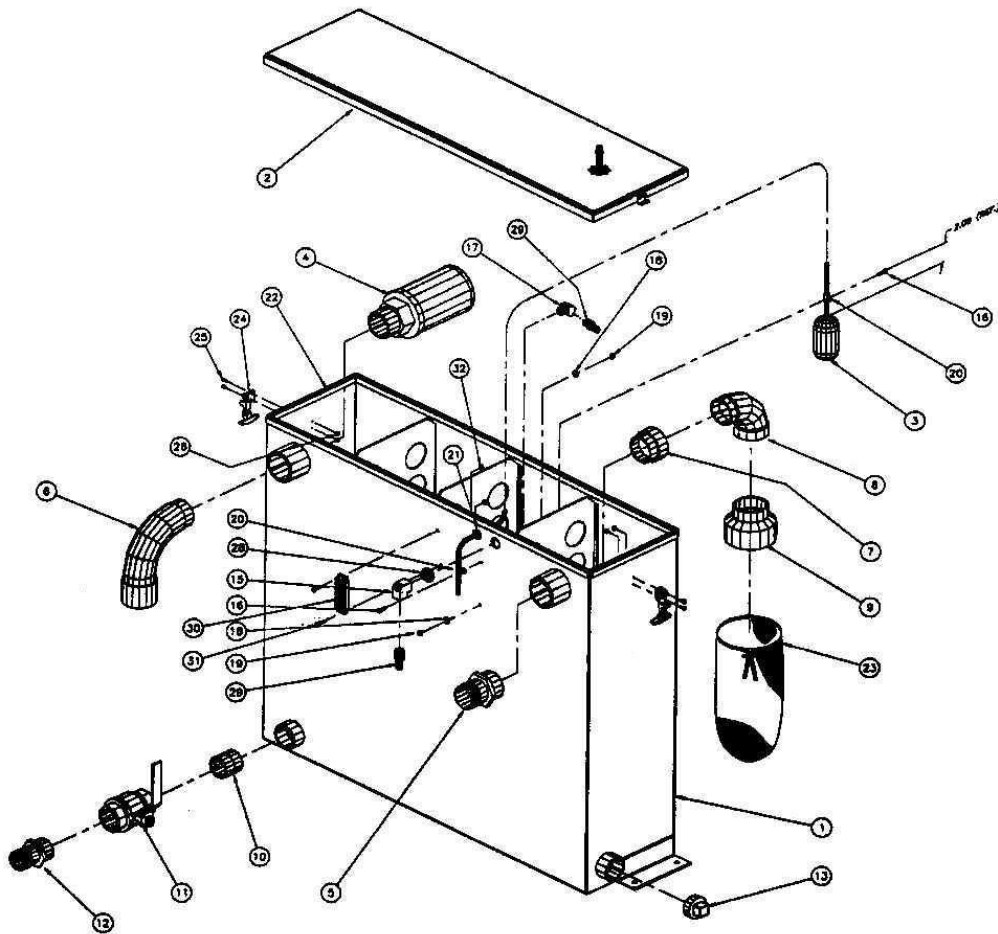
Dagger

Mix Tank Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	159-042	Tank, SF Mix	1
2	015-299	Bracket, Mix Tank Mount	1
3	169-120	Valve, Chemical System Solenoid - 12 v	1
4	181-008	Venturi, Low PSI Injector	1
5	157-0012	Switch, Tetherd Float Heavy-Duty Liquid Level	1
6	068-327	Hose, ½" Clear Braid	1
7	157-004	Switch, Mini Liquid Level Reed Kill	1
8	068-015	Hose, ¼" Rubber	1
9	033-004	Clamp, Size 6 Mini Hose	1
10	052-105	Insert, #68	1
11	052-086	Elbow, ⅜" Brass Street	1
12	052-083	Elbow, ⅜" Brass 45 Street	1
13	052-142	Elbow, ⅜" F x F Brass	2
14	052-019	6 M - 6 UFS	2
15	052-074	Nipple, ⅜" Brass Hex	1
16	052-077	Nipple, ⅜" Brass Close	1
17	174-034	Washer, 0.688 ID x 1.5 OD x 0.078 Thk s/s	4
18	143-143	Screw, ⅝" - 18 x 1" HHC s/s	4
19	143-311	Screw, #8 - 32 x 2½" PANHMS	1
20	174-059	Washer, ⅝" s/s External Star	4
21	174-047	Washer, #8 Flat	2
22	094-059	Nut, #8 - 32 Nylock	1
23	143-314	Screw, #8 x ½" PNHD	2
24	057-028	Gasket, Mix Tank to Bracket Vibration Dmp.	1
25	057-055	Gasket, Garden Hose	1
26	143-134	Screw, 10-24 x 1" HHCS s/s	1
27	174-036	Washer, #10 s/s Flat - Rubber Back	2
28	094-034	Nut, 10-24 s/s Nylock	2
29	033-021	Clamp, ¼ Nylon Hose	1
30	106-039	Plug, Mix Tank 0.75"	1
31	106-038	Plug, Mix Tank 0.41"	1
32	052-075	Nipple, ⅜" x ⅝" Brass Hex	1
33	052-143	Elbow, ½" F x F Brass	1

Dagger

Recovery Tank Assembly

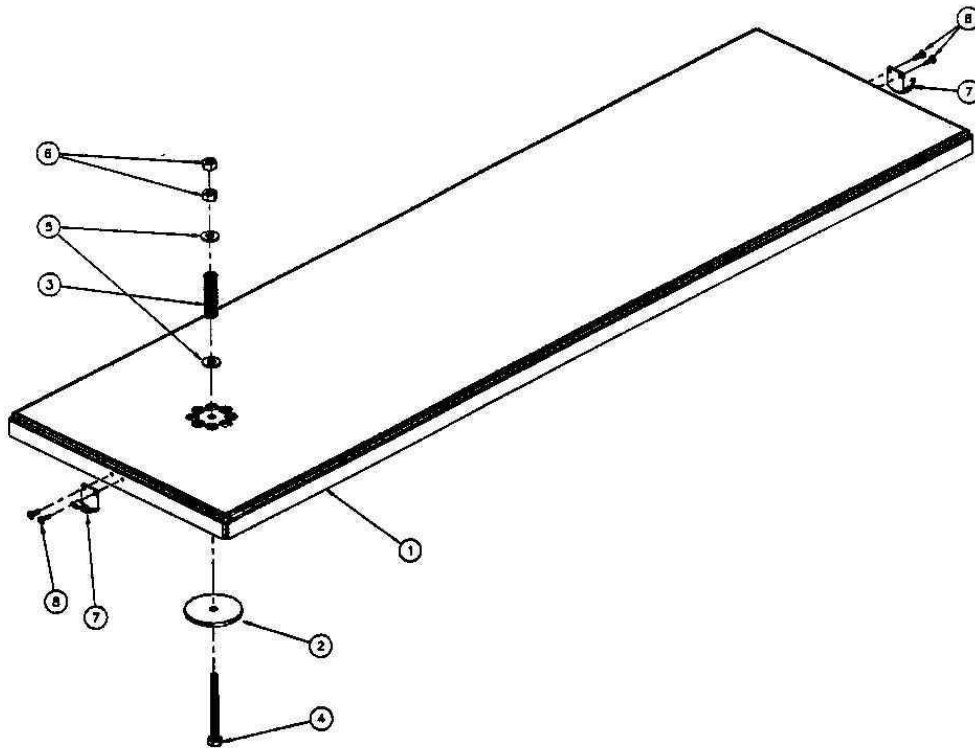


Dagger

Recovery Tank Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	159-041	Recovery Tank	1
2	Page 33	Recovery Tank Lid Assembly	1
3	157-0012	Switch, Tethrd Float Heavy-Duty Liquid Level	1
4	049-007	Filter, s/s Vacuum Pump and Blower	1
5	052-221	Insert, 2" NPT x 2" Plastic Barb	1
6	001-036	Adapter, 2.75 x 2" NPT Vac Tank Inlet Elbow	1
7	052-219	Adapter 2" NPT x 2" F Slip	1
8	052-223	Elbow, 2" M Slip x 2" F Slip	1
9	052-404	Adapter, 3" F Slip x 2" F Slip	1
10	052-182	Nipple, 1 1/2" x Close - Black Steel	1
11	169-022	Valve, 1 1/2" Full Port Brass Dump	1
12	052-226	Insert, 1 1/2" NPT x 1 1/2" Barb	1
13	106-019	Plug, 1 1/2" Plastic	1
15	052-142	Elbow, 3/8" F x F Brass	1
16	143-062	Screw, #10 - 24 x 3/4" PANHDMS	2
17	052-083	Elbow, 3/8" Brass 45 Street	1
18	174-001	Washer, #10 Flat	2
19	094-027	Nut, #10 - 24 Hex	2
20	033-021	Clamp, 1/4 Nylon Hose	2
21	060-008	Grommet, 5/16" ID Rubber	1
22	131-027	Trim Lock, CrossFire Brow	4 Ft
23	049-030	Filter Bag, 92+ Truckmount	1
24	086-001	Latch, Cowling Hood	2
25	143-046	Screw, 6-32 x 1/2" Round Head Mach	4
26	094-063	Nut, 6-32 Nylock s/s	4
28	060-002	Grommet, Large Wiring	1
29	052-105	Insert, #68	2
30	012-002	Block, 6 Post Terminal	1
31	143-051	Screw, 8-32 x 3/4" s/s Phil Binder Head	2
32	094-059	Nut, 8-32 s/s Nylock	2

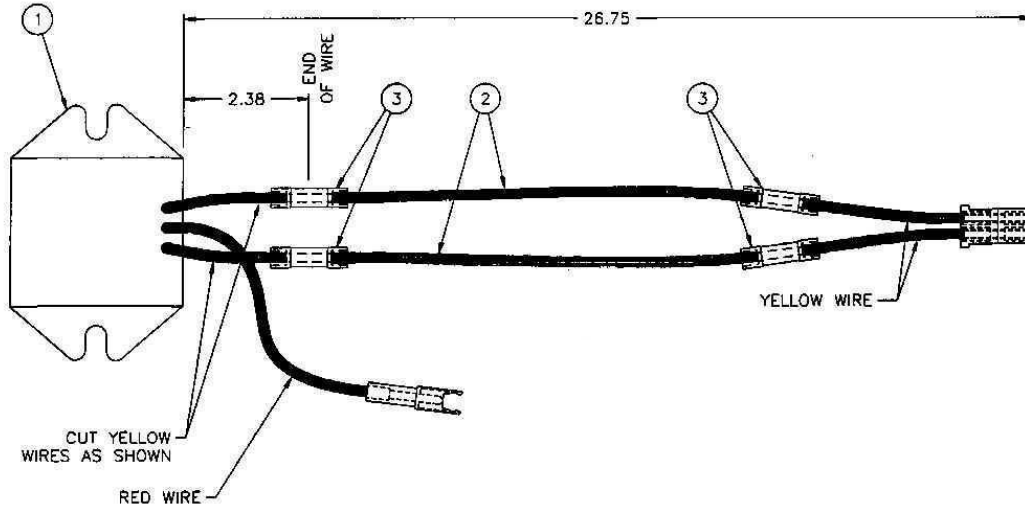
Recovery Tank Lid Assembly



ITEM	PART NO	DESCRIPTION	QTY
1	041-170	Lid, Recovery Tank	1
2	105-005	Plate, Vacuum Relief	1
3	155-002	Spring, s/s Vacuum Relief Valve	1
4	143-009	Screw, 1/4" - 20 x 2 1/2" HHC	1
5	174-003	Washer, 1/4" Flat	2
6	094-010	Nut, 1/4" - 20 Hex	2
7	086-006	Latch, Hydra Heater Draw	2
8	140-017	Rivet, 1/8" x 3/8" Closed End - Pop s/s	4

Dagger

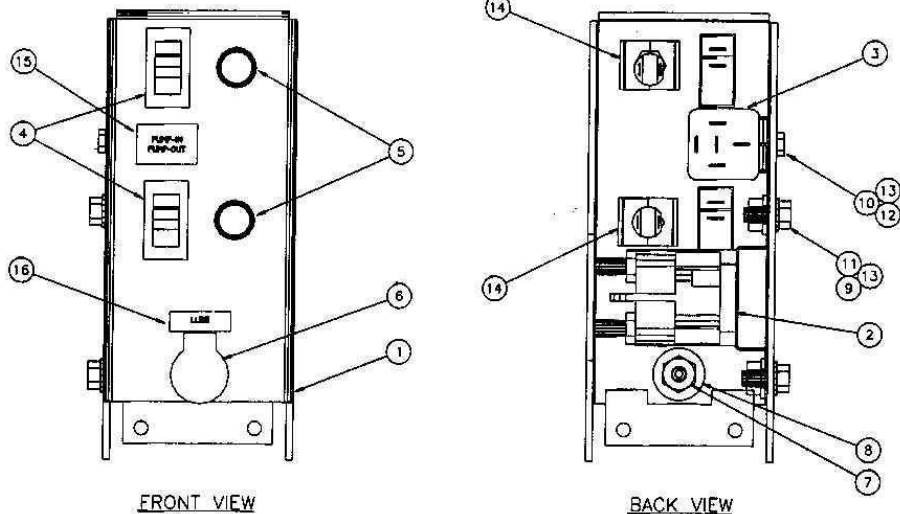
B & S Voltage Regulator Modification



ITEM	PART NO	DESCRIPTION	QTY
1	PFR394890	Briggs & Stratton Voltage Regulator (Incl. with engine, part nos. 047-007 or 011)	1
2	178-026	Wire, 16 AWG Yellow	2
3	037-033	Connector, #22 Pink Butt	4

Dagger

Starter Solenoid Cover Assembly



ITEM	PART NO	DESCRIPTION	QTY
1	041-177	Cover, Starter Solenoid	1
2	PFR691656	Briggs & Stratton Starter Solenoid	1
3	157-022	Switch, Relay	1
4	157-115	Switch, 16 amp Mini Rocker with Terminal	2
5	084-006	Lamp, Red Pilot - Round	2
6	052-272	Cup, Gravity Feed Oil Blower Lubrication Port	1
7	052-096	Insert, #F23	1
8	174-005	Washer, 3/8 Flat	1
9	143-074	Screw, 1/4 - 20 x 1/2" HXWSHD Self Tapping	2
10	143-126	Screw, 10 - 24 x 1/2" s/s HHC	1
11	174-017	Washer, 1/4" Lock	2
12	174-014	Washer, #10 s/s Lock	1
13	094-008	Nut, 1/4 - 20 Hex	2
14	033-049	Clamp, Indicator Light	2
15	081-071	Label Set (Pump-In/Out)	1
16	081-071	Label Set (Lube)	1

Operating Instructions

Dagger Section 2

START UP

1. Perform daily and periodic maintenance as specified in this Owner's Manual.
2. Connect all required hoses.
3. Connect the cleaning tool to the length of hose required to perform the cleaning.
4. **CAUTION:** Mix tank must be full prior to ignition.
5. Place the throttle in the 'Slow' position. This is approximately 1800 rpm.
6. Start engine (choke as required).
NOTE: If the engine will not start depress the oil pressure by-pass switch and hold until the engine begins running.

Allow the engine to run for 3 to 5 minutes. Then increase the engine rpm to 'Fast' for normal carpet cleaning. This is approximately 3200 rpm.

7. Spray the wand to void all air from the system. When the mix tank begins a fill cycle, the chemical flowmeter may be adjusted to your desired setting. Set your cleaning pressure at 300 PSI.
NOTE: A chemical flowmeter set at 5 GPH is a 1 to 30 mix ratio and 10 GPH is a 1 to 15 ratio. When the flowmeter is set at 10 GPH, you will be using what most chemical manufacturers recommend at 5 GPH.
8. Run the machine for several minutes under load (8 to 10" HG) until your desired temperature is achieved.
9. Commence cleaning operation.

Dagger

SHUT DOWN

1. Remove the vacuum hose.
2. Flush clear water through the chemical system for 10 seconds. Vinegar should be rinsed through the system weekly. Turn off chemical flowmeter.
NOTE: De-scaler should be rinsed through the entire system monthly.
3. Turn on the cleaning tool to flush the chemical from unit the hoses and cleaning tool.
4. At this time, the blower should be lubricated with an oil based lubricant.
NOTE: If freeze guarding is necessary, perform the freeze guard procedure at this time.
5. Throttle the machine down.
6. Turn the machine off.
7. Drain the vacuum tank. The vacuum filter should be cleaned prior to mobilization of the van.

FLOOD DAMAGE WORK

◆ CAUTION ◆

Caution must be exercised to prevent overheating during long periods of vacuum work such as water damage. Water must be supplied to the machine during extended vacuum work.

Precautions

Dagger Section 2

Although this unit has been factory adjusted, it may require additional adjustments to achieve optimum performance, i.e. altitude may require carb adjustment and ambient temperatures may require heat control adjustment. When required, consult an authorized representative.

◆ CAUTION ◆

THROUGH-FLOOR DRILLING: Be cautious when drilling holes through the van floor. Many vans have critical components mounted directly below the van floor that could be damaged by a misplaced drill bit. (See Product Support Bulletins 92102, 94062 and 94063 at the end of the manual.)

◆ CAUTION ◆

ENGINE COOLING: Units employing air cooled engines must not be enclosed within a van with doors and windows closed. Excessive temperatures within the engine will result in premature engine failure and a compromise of applicable warranty.

◆ CAUTION ◆

LEVEL OPERATION: During operation, van or trailer must be parked on level ground not to exceed + or - 10 degrees. Failure to insure proper leveling may prevent proper internal lubrication of engine, vacuum and/or high pressure components.

Dagger

◆ WARNING ◆

MOVING PARTS: Never touch any part of the machine that is in motion. Severe bodily injury may result.

◆ CAUTION ◆

ACID RINSE AGENTS: The increased demand for "clear water" rinsing results in the need for special care when using these acid based chemicals in your equipment. The negative side of these products is the corrosive effects the acid can have on metals, including swivels, pumps, heat exchangers, etc.

HydraMaster's *ClearWater Rinse* has been formulated to protect vital components. HydraMaster will not warranty parts that have been damaged from using acid products that have obviously caused failures.

◆ CAUTION ◆

FREEZE PROTECTION: Mother nature gives little warning as to her cold spells. Therefore, not protecting this equipment from freezing will result in costly down-time. Placing an electric heater in the truck or parking the truck indoors will help to insure against freezing, but should not be the primary method of freeze protection.

◆ CAUTION ◆

EXHAUST SYSTEM: Do not allow flammable material (i.e. oil, fuel, plastic or wood products) to come in contact with the exhaust system.

◆ WARNING ◆

HOT SURFACES: During the operation of this equipment, many surfaces on the

Dagger

machine will become very hot. When near the van for any reason, care must be taken not to touch any hot surface, such as the heating system, engine, exhaust, etc.

◆ WARNING ◆

HEARING PROTECTION: The Occupational Safety and Health Administration (OSHA) recommends the use of hearing protection when a technician is exposed to an *average* of 85 decibels (this is an average of exposure over an 8 hour period). This equipment can produce 85 decibels to a distance of 10 feet. Please check with your local state agencies to see if OSHA standards apply to your application.

◆ WARNING ◆

NO SMOKING: It is unsafe to smoke in or around the vehicle.

◆ WARNING ◆

CARBON MONOXIDE: This unit generates toxic fumes. Position the vehicle so that the fumes will be directed *away* from the job site. **Do not park** where exhaust fumes can enter a building through open doors, windows, air conditioning units or kitchen fans.

◆ WARNING ◆

TOXIC FUMES: Do not occupy the vehicle when the cleaning equipment is operating. Toxic fumes may accumulate inside a stationary vehicle.

◆ WARNING ◆

ENGINE EXHAUST: The engine exhaust from this product contains chemicals

Dagger

know to the State of California to cause cancer, birth defects or other reproductive harm.

◆ WARNING ◆

PORTABLE GAS CAN: Never operate this machine with a portable gas can inside the truck. Doing so increases the risk of a fire or explosion.

◆ WARNING ◆

PORTABLE PROPANE TANK: Do not use a portable propane tank inside of the truck or van. It is dangerous and illegal in most states.

◆ WARNING ◆

TRANSPORTATION OF FUEL CONTAINERS: Transportation in a vehicle of any vented fuel container that presently has or has ever contained a flammable liquid is strictly forbidden by HydraMaster Corporation and by federal and state regulation.

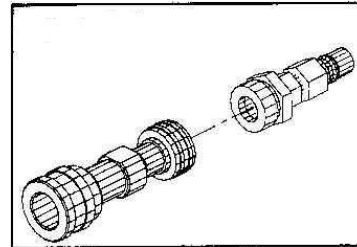
Freeze Guard

Dagger Section 3

1. Start the machine.
2. Spray all of the water out of the system until the engine stops.
3. Add a half gallon of 50/50 antifreeze and water mix to the chemical mix tank and draw the antifreeze into the flow meter.

When using the recirculation kit (part no. 078-058), fill a third of the mix tank with a 50/50 antifreeze mix. Verify that the upper float is not lying horizontal, but floats below.

Attach the recirculation fitting provided in the kit to the garden hose quick connect (see illustration to right) and this combination to the front of the machine.



Attach one section of female/female solution hose to the outgoing solution fitting on the front of the machine and the other end to the garden hose and recirculation fitting combination that is attached to the front of the machine (or as many sections as you want, if you wish to freeze guard your hoses).

4. Start the machine. Allow it to run for 2 to 3 minutes.

With the recirculation kit, skip ahead to step 6.

5. Remove the quick connect fitting from the end of the garden hose. Attach the garden hose quick connect to the machine. Using a vacuum hose attached to the recovery tank, vacuum the water out of the garden hose quick connect.

Dagger

6. Spray the antifreeze and water mix out of the machine and into a container to reclaim the solution. Run the machine until it stops.

NOTE 1: The reclaimed antifreeze solution may be used 3 times before being discarded.

NOTE 2: *To freeze guard hoses and wand,* perform the above step with all the hoses and wand attached.

The machine is now freeze guarded. Remember to flush antifreeze from the system prior to carpet cleaning.

Recovering antifreeze for re-use:

Before cleaning with the machine again, flush the remaining antifreeze solution from the system into a sealable container so that it may be used again. To do this spray water through the hoses and wand until all signs of antifreeze are gone.

◆ CAUTION ◆

One manufacturer of antifreeze cautions: "WHEN DISPOSING OF USED ANTIFREEZE COOLANT: Follow local laws and regulations. If required, dispose at facilities licensed to accept household hazardous waste. If permitted, dispose in sanitary sewer systems. Do not discard into storm sewers, septic systems, or onto the ground."

◆ WARNING ◆

This warning appears on the label of one brand of antifreeze: "HARMFUL OR FATAL IF SWALLOWED. Do not drink antifreeze coolant or solution. If swallowed, induce vomiting immediately. Call a physician. Contains Ethylene Glycol which caused birth defects in animal studies. Do not store in open or unlabeled containers.

KEEP OUT OF REACH OF CHILDREN AND ANIMALS."

Water and Chemical System

Dagger Section 4

This electro-mechanical system has been designed to be simple and trouble free.

WATER/CHEMICAL FLOW OPERATION

Incoming water flows first through the Solenoid Control Valve and the low pressure Chemical injector which are both mounted on the exterior of the mix tank. As the water passes through the Chemical injector, it is automatically proportioned with a predetermined quantity of detergent. The Mix Tank is equipped with a Water Level Float that responds to the level in the tank and will maintain the proper volume of solution to be reserved for the water pump.

The desired chemical injection ratio may be obtained by an adjustment of the Chemical Flowmeter during the fill cycle of the mix tank. Water must be flowing into the mix tank in order to adjust the chemical mix. The chemical will flow from the Chemical Jug to the Chemical Flowmeter, then to the Chemical injector where it is proportioned into the Mix Tank at the desired chemical setting.

NOTE: With this unique chemical system, the chemical flow is proportioned only during the filling cycles of the Mix Tank, not during the direct spraying of the wand. Therefore, it is possible that as your wand is spraying, you may have no chemical flow. Also, the converse is true in that you may not be spraying your wand, but if the mix tank is in a filling cycle, your Chemical Flowmeter may be active at the desired flow rate.

The chemical proportioning system will mix chemical with water at a 1 to 30 ratio when the Flowmeter is set at 5 GPH, or a 1 to 15 ratio when the

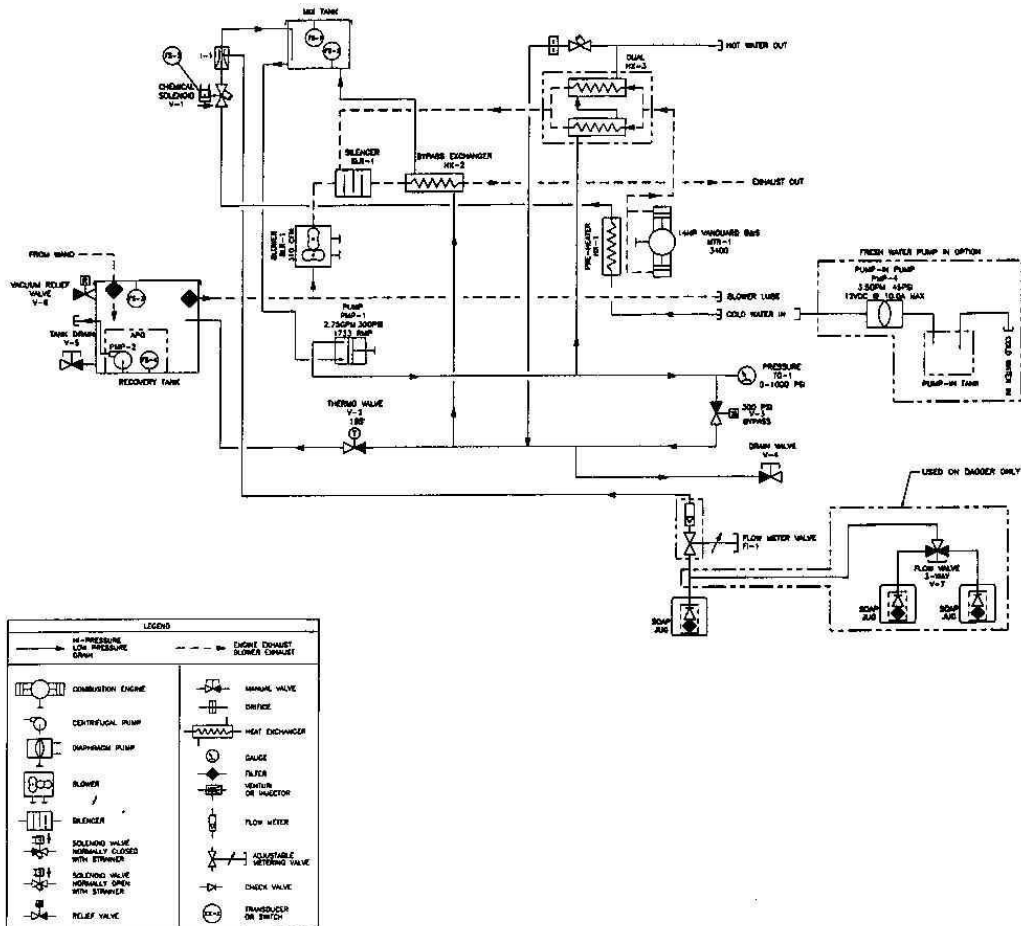
Dagger

Flowmeter is set at 10 GPH.

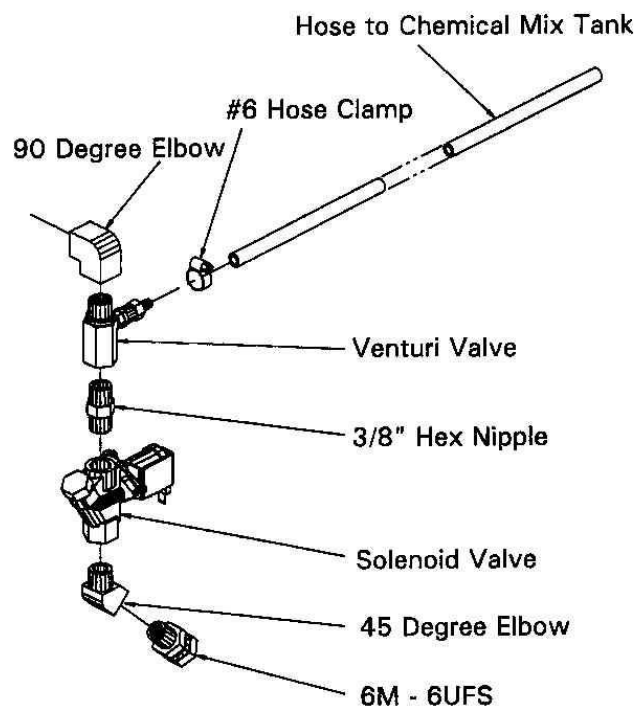
CHEMICAL SYSTEM MAINTENANCE

The chemical lines may need to be flushed with vinegar periodically to prevent abnormal chemical build-up. This flushing may be done by removing the clear plastic hose from the Chemical Jug and inserting it into a one quart container of vinegar. This should be done with the Chemical Flowmeter setting 10 GPH. Simply spray water from the wand until the quart of vinegar is exhausted. Then repeat the process with one quart of clear water to void all lines of vinegar.

Water Flow Diagram

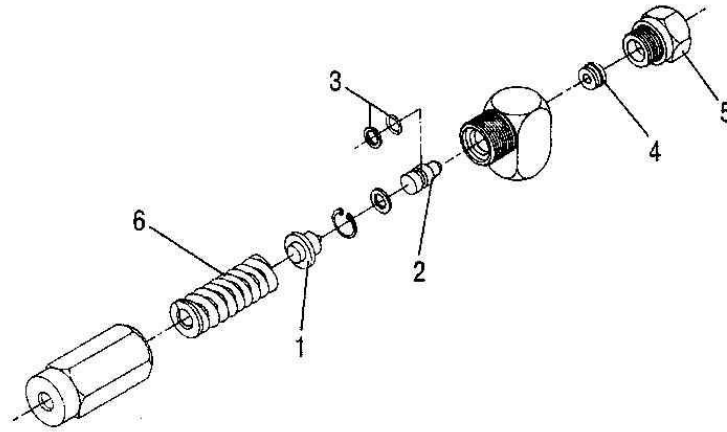


Proportioner Diagram



Dagger

By-Pass Valve Assembly



169-101 Valve, By-Pass Truckmount

ITEM	PART NO	DESCRIPTION	QTY
1	105-101	Thrust Plate, By-pass Valve	1
2	105-102	Piston Plate, By-pass Valve	1
3	097-028	Seal Set for By-pass Valve	1
4	148-004	Seat and O-Ring, By-pass Valve	1
5	097-005	O-Ring, By-pass Valve Fitting	1
6	155-019	Spring, High PSI By-pass	1
Not Shown:			
	078-102	Kit, By-pass Repair (Complete, Incl. 078-101)	1
	078-101	Kit, Seal and Spring High PSI By-pass (Includes Items 3 and 6)	1

Chemical Tank Troubleshooting

Dagger
Section 5

SpitFire Water System

No	Problem / Possible Cause	Solution
1	There is a loss of water pressure.	
1.1	The <i>mix tank water supply hose</i> is missing. This will cause aeration and turbulence in the tank.	Look inside the mix tank and determine if a water inlet hose is present. If the hose is missing, order a new hose from your HydraMaster distributor and install it.
1.2	Foreign material is blocking the outlet hole for the pump in the bottom of the <i>mix tank</i> .	Inspect the outlet hole leading to the pump in the bottom of the mix tank. Remove any foreign material blocking the hole.
1.3	Foreign material is blocking the <i>water supply hose</i> leading to the pump from the mix tank.	Remove the water supply hose between the mix tank and the pump. Sight through the hose. Remove any foreign material from the hose. Reattach the hose.
1.4	The <i>water supply hose</i> from the mix tank to the pump is kinked or blocked.	Remove the hose and clean it. If it is kinked, order a replacement hose from your HydraMaster distributor.

Dagger

No	Problem / Possible Cause	Solution
1.5	The end of the <i>mix tank water supply hose</i> is pointed directly at the pump inlet hole in the bottom of the mix tank.	Inspect the mix tank and determine the orientation of the water hose. If it is pointing directly at the pump inlet hole in the bottom of the tank, reposition the hose to point towards the opposite side of the tank from the inlet.
1.6	The <i>mix tank supply hose</i> is blocking the outlet hole leading to the pump in the bottom of the mix tank.	The water inlet hose may have to be shortened or lengthened to avoid blocking the outlet hole.
1.7	There is an air leak in the <i>water supply hose</i> from the mix tank to the pump.	Inspect the supply hose for worn or damaged areas. Also check for loose fittings. Replace the hose or fittings if necessary.
1.8	The <i>water supply hose</i> from the mix tank to the pump collapses when the machine is running hot.	Allow the machine to reach full water operating temperature (approximately 10 minutes). Inspect the water supply hose between the mix tank and the pump. If the hose appears to be collapsing, remove the hose and order a replacement hose from your HydraMaster distributor. Reinstall the new hose.
1.9	There is foreign material in the inlet or outlet valves of the <i>pump</i> .	Inspect the valves and remove any foreign material.
1.10	The controlled <i>orifice</i> is loose and water is flowing around it.	Clean the orifice and tighten the fittings around it. This may require adding an "O" ring around the jet. Also, check the fitting for wear. If there is excessive wear, replace the fitting with part #052-025.

No	Problem / Possible Cause	Solution
1.11	The <i>by-pass valve</i> is malfunctioning.	Remove the plunger and lube the "O" rings. Clean the walls of the by-pass valve with a bristle brush and de-scaler. NOTE: Use a water resistant high temperature lube.
1.12	The <i>glide seals and valves</i> in the pump are defective. NOTE: Do not operate the engine at low RPMs for long periods of time because damage may occur to the pump.	Repair the pump as necessary.

Dagger

No	Problem / Possible Cause	Solution
2	The water temperature is too low.	
2.1	The <i>thermo valve</i> is stuck open and water is flowing continually past the valve.	This is a non-serviceable valve. Replace it.
2.2	The <i>orifice</i> (spray nozzle) in the cleaning tool is worn, defective, or the wrong size.	Replace or change the orifice size. The SpitFire uses a 11004 T-jet.
2.3	The incoming <i>water supply</i> is extremely cold.	Keep the incoming water supply hoses away from ice and snow during winter months.
2.4	There is an <i>exhaust</i> leak.	Inspect the exhaust system for leaks. Tighten any loose clamps. Weld or replace any broken parts.
2.5	There is excessive <i>pressure</i> .	Adjust the pressure regulator for less pressure.
2.6	There is <i>exhaust wrap</i> missing.	Replace any missing wrap.
2.7	The <i>engine</i> speed is low.	Reset the engine speed. Refer to the Engine Operation and Maintenance manual.
2.8	A <i>heat exchanger</i> is scaled.	De-scale the heat exchanger or remove it and take it to a radiator shop to be boiled out.
2.9	A <i>heat exchanger</i> is carbon-coated.	<p>a. For a stainless steel heat exchanger, clean it with oven cleaner or have it acid-dipped, "hot tanked".</p> <p>b. For a copper tube heat exchanger, carefully unplug the tubes by poking a small rod through them. Then take the heat exchanger to a radiator shop to be boiled out.</p>

Dagger

No	Problem / Possible Cause	Solution
2.10	The <i>preheater</i> mounted behind the motor is scaled.	Remove the preheater. At a radiator shop, give it a hot tank treatment.

Dagger

No	Problem / Possible Cause	Solution
3	The water temperature is excessive.	
3.1	The <i>filter</i> in front of the controlled orifice is clogged.	Inspect the filter. Clean it if necessary.
3.2	The controlled <i>orifice</i> is clogged.	Inspect the controlled orifice. Clean it if necessary.
3.3	The <i>thermo valve</i> is not opening and no water is flowing through the valve.	This is a non-serviceable valve. Replace it.
3.4	The <i>engine</i> speed is too low or too high.	Reset the engine speed. Refer to the Engine Operation and Maintenance manual.

Dagger

No	Problem / Possible Cause	Solution
4	There is pressure on the gauge, but no water coming out of the wand.	
4.1	The <i>wand jet</i> is plugged.	Inspect and clean the jet.
4.2	The <i>quick connect</i> on one or more of the high pressure hoses is defective.	Remove and clean or replace the defective quick connect(s).
4.3	The <i>cleaning tool</i> has a clogged valve.	Remove the valve stem. Clean the valve. Replace the "O" rings and stem if they are bad.
4.4	The high pressure <i>quick connect</i> on the front of the machine is clogged.	Remove and clean or replace the quick connect.
4.5	The inner lining on a <i>hose</i> is constricted.	Remove the restriction or replace the hose.

Dagger

No	Problem / Possible Cause	Solution
5	The water in the mix tank will not keep up with the wand.	
5.1	There is dirt in the <i>solenoid valve</i> along side of the mix tank.	Take the valve apart and clean it.
5.2	The <i>upper float</i> is bad.	Remove the wire on terminal 87a on the chemical relay. With a volt-OHM meter check for voltage between the end of the wire you removed and a ground. There should be no voltage reading on the meter with the float in the down position. Replace the float if necessary.
5.3	The <i>mix tank relay</i> is bad.	With the upper float in the mix tank in the up position, there should be no voltage reading on terminal 87a on the chemical relay. With the float in the down position, there should be +12 volts on terminal 87a. Replace the relay if it is defective.
5.4	The <i>water supply</i> is improperly adjusted.	The water supply should be two (2) gallons per minute or more.
5.5	The <i>water inlet supply hose filter</i> is clogged or the hose is kinked.	Remove the obstructions.
5.6	There is a problem with the <i>pump-in pump</i> .	Check the amount of water the pump-in pump is supplying. It should supply a minimum of 2 GPM if you use one wand or one RX20.

Dagger

No	Problem / Possible Cause	Solution
6	There is water coming out of the exhaust.	
6.1	There are small amounts of water usually seen at start up.	This is <i>normal!</i> There is no solution! The water is condensation.
6.2	One of the <i>heat exchangers</i> is damaged from frozen water.	Determine which heat exchanger is bad. Replace it if it is necessary.
6.3	The <i>recovery tank</i> is full.	Empty the tank.
6.4	There is excessive foam in the recovery tank.	Apply a powdered or liquid defoamer to counter act this reaction to the excessive chemical in the carpet.

Dagger

No	Problem / Possible Cause	Solution
7	The mix tank overflows.	
7.1	The <i>upper float in the mix tank</i> is malfunctioning.	Remove the wire on terminal 87a on the chemical relay. With a volt-OHM meter check for voltage between the end of the wire you removed and a ground. There should be no voltage reading on the meter with the float in the down position. Replace the float if necessary.
7.2	There is dirt in the <i>solenoid valve</i> next to the mix tank.	Remove one of the wires from the solenoid valve and turn the key on. If the water continues to flow, then take the solenoid apart and remove the foreign matter. Replace the solenoid valve if necessary.
7.3	The <i>chemical relay</i> is bad.	With the upper float in the mix tank in the up position, there should be no voltage reading on terminal 87a on the chemical relay. With the float in the down position, there should be + 12 volts on terminal 87a. Replace the relay if it is defective.

Dagger

Chemical System

No	Problem / Possible Cause	Solution
1	There is a loss of, or erratic, chemical flow.	
1.1	The anti-siphon <i>foot valve</i> is clogged or missing causing the solution to reverse from the mix tank to the chemical jug.	Inspect the anti-siphon screen and remove any debris. Rinse it out in warm water or a vinegar solution.
1.2	The <i>flowmeter</i> is cracked allowing air intake which causes a loss of chemical suction.	Check for hairline cracks in the flowmeter. Fittings in the back of the meter can be tightened too much causing a crack. Freezing can also cause cracks. Replace the flowmeter if necessary.
1.3	There <i>water pressure</i> to the machine is too low causing a loss of chemical suction. The volume of water entering the mix tank is not be enough to siphon the chemical.	Unscrew the spring from the foot valve if you are in a low water pressure area. After removing the spring, the chemical hose must sit vertically in the jug enabling the ball in the foot valve to seat by gravity. (This is only a temporary fix.) Also check the incoming garden hose filter.
1.4	The <i>chemical feed hose</i> is cracked or split causing a loss of chemical suction.	If given the opportunity, the chemical venturi will suck air rather than water. Check for air leaks in the upper and lower hoses. Replace any defective hoses.
1.5	The <i>proportioning venturi</i> is closed causing a loss of chemical suction.	Remove the venturi and soak it in warm water or a vinegar solution. Adjust the side port for proper suction.

Dagger

No	Problem / Possible Cause	Solution
1.6	The <i>mix tank supply hose</i> is internally collapsed causing reduced flow of inlet water or reversed flow of solution from mix tank to chemical jug.	Replace the hose.

Pump Maintenance

Dagger
Section 6

DAILY

Check the oil level and the condition of the oil. The oil level should be up to the center of the sight glass on the back of the pump.

Use a 30 weight, non-detergent oil.

◆ CAUTION ◆

If the oil becomes discolored and contaminated, one of the oil seals may be damaged. Refer to the Service Section.

Do not operate the pump if the crankcase has been contaminated with water.

◆ CAUTION ◆

Do not leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as it is discovered and replace it with clean oil.

PERIODICALLY

Change the oil after the first 100 hours of operation, and every 400 operating hours thereafter. When changing, remove the drain plug on the oil drain center located on the frame so all oil and accumulated sediment will drain out.

Dagger

◆ CAUTION ◆

Do not turn the drive shaft while the oil reservoir is empty.

◆ CAUTION ◆

Protect the pump from freezing.

Service

Dagger Section 6

The next few pages explain how to disassemble and inspect all easily-serviceable parts of the pump.

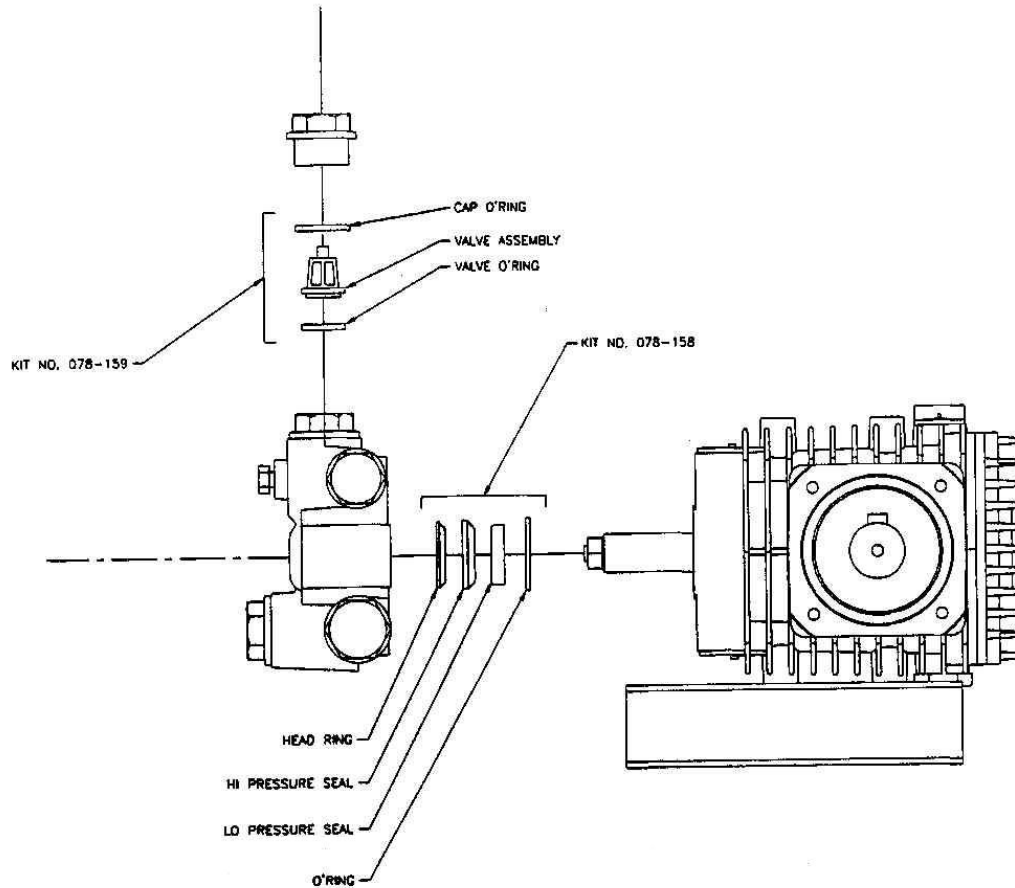
◆ CAUTION ◆

Do not disassemble the hydraulic end unless you are a skilled mechanic. For assistance, contact the distributor in your area.

1. Servicing the Valves

- A. Remove the hex valve plugs (top—discharge, bottom—inlet).
- B. Unthread the valve plug and examine the o-ring under the plug for cuts or distortion. Replace it if it is worn. Lubricate new o-rings before installing.
- C. Grasp the valve retainer by the tab at the top with needle-nose pliers, then remove the o-ring at the bottom of the valve chamber.
- D. Inspect all valve parts for pitting, gouges, or wear. If wear is excessive, replace valve assembly.
- E. Reinstall valve assemblies:
 1. Using a clean towel, clean the valve chamber.
 2. Install the o-ring into the high pressure manifold.
 3. Install the valve assemblies into the high pressure manifold (the metal side of the valve faces the manifold).
 4. Replace the o-ring on the hex valve plug.
 5. Torque the plug to 30 foot pounds.

Dagger



2. Removing the High Pressure Manifold

- A. Using an M6 allen wrench, remove all eight of the socket head bolts.
- B. Rotate the crankshaft by hand to start separation of the manifold head from the crankcase.
- C. Insert two flat-head screwdrivers on opposite sides to further separate the manifold from the crankcase.

◆ CAUTION ◆

To avoid damage to either plunger or seal, keep the manifold properly aligned with the ceramic plungers when removing it.

- D. Remove the seal retainer from the manifold and inspect for wear.
 - E. Examine the ceramic plunger for cracks or scoring (refer to *Servicing the Plungers* for replacement).
3. Servicing the Low Pressure Seals and High Pressure Seals (See Figure 6-1)
- A. Remove the low pressure seal from the seal retainer using a 90 degree pick tool.
 - B. Remove the high pressure seal from the manifold.
 - C. Inspect the low pressure seal and high pressure seal for wear and replace if necessary.
 - D. Reinstall the low pressure seal:
 - 1. Install the low pressure seal into the seal retainers with the garter spring down.
 - E. Reinstall the high pressure seal:
 - 1. Lubricate the seal chamber in the manifold.
 - 2. Carefully square the high pressure seal into position by hand with the grooved side down (metal back facing out).
 - 3. Examine the seal retainer's o-ring and replace if worn. Lubricate the new o-ring before installing.
 - 4. Next, press the seal retainers into the manifold until completely seated.
4. Servicing the Plungers
- A. Using a hex tool, loosen the plunger retainer about three to four turns. Push the plunger back to separate it from the retainer and finish unthreading the plunger retainer by hand.
 - B. Unthread the plunger retainer with sealing washer.

- C. Remove the ceramic plunger, keyhole washer and barrier slinger from the plunger rod.
 - D. Reinstall the ceramic plungers:
 - 1. Examine the sealing washer on the plunger retainer and replace it if it is cut or worn. Lubricate the new sealing washer for ease of installation and to avoid damage.
 - 2. Apply Loctite 242™ to the threads of the plunger retainer and press it into the ceramic plunger. Thread hand tight, then torque the bolt to 4.4 foot pounds.
 - 3. Install the seal retainer with holes to the top and bottom, and forward.
5. Reinstall High Pressure Manifold
- A. Slip the seal retainer over the ceramic plungers with the holes to the top and bottom and forward.
 - B. Turn the shaft by hand to line up the plungers so that the end plungers are parallel.
 - C. Lightly lubricate the plungers and carefully slide the manifold head onto the plungers while supporting it from the underside to avoid damaging the plungers.
 - D. Reinstall the socket head bolts and torque to 4.4 foot pounds.
6. Servicing the Crankcase
- A. While manifold, plungers, and seal retainers are removed, examine the crankcase seals for wear.
 - B. Rotate the crankshaft oil seal externally for drying, cracking or leaking.
 - C. Consult your distributor if crankcase servicing is necessary.

Dagger

Water Pulsations

- Foreign object lodged in pump valve.
- Air in suction line.
- Valve spring broken.
- Cavitation.
- Aeration or turbulence in supply tank.
- Stuck inlet or discharge valve.

Valve Wear

- Normal wear.

Loss of Oil

- External seepage.
- Frozen pump.
- Worn crankshaft seal.
- Oil drain piping or fill cap loose.

Premature Failure of Valves or Seals

- Excessive cavitation.
- Foreign object in the pump.
- Pump running too fast.
- Valve or seal material incompatible with fluid being pumped.
- Excessive inlet pressure.
- Scored plungers.
- Running pump dry for excessive periods of time.
- Excessive temperatures of fluid being pumped.

Installation, Operation, Repair and Parts Manual

9/94

Description

Hypro's triplex plunger pumps are designed for high pressure washing applications in industrial cleaning areas.

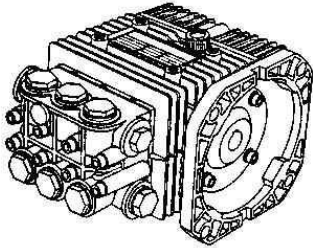
These pumps are constructed of anodized aluminum die cast bodies with a choice of aluminum or brass heads. Internal components are made of corrosion resistant stainless steel valves and ceramic plungers. All pumps come standard with large oil bath crankcases.

Hypro's triplex plunger pumps feature 1/2" NPT female inlet ports and 3/8" NPT female outlet ports. A combination unloader with chemical injector can be added to the 2250 Series pumps that include a garden hose adapter and filter.

The pumps are electric motor and gas engine driven. Each model of pump is designed and developed to work at the performance indicated on the pump's nameplate. The flows depend on:

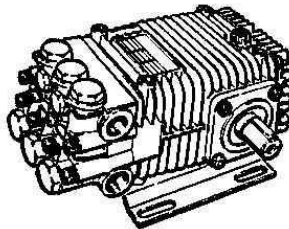
- 1) the diameter of the plungers,
- 2) the stroke of the plungers,
- 3) the number of plungers,
- 4) the number of revolutions per minute (rpm).

The pressure generated by the pump depends upon the nozzle used. **The pressure and rpm must remain within the maximum values indicated.**



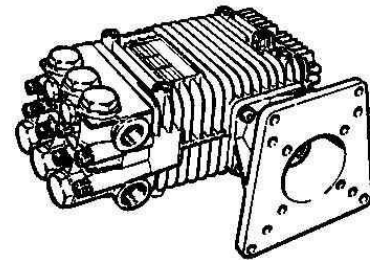
2250 "Kwik-Mount" Series
Triplex Plunger Pump

Max. Flow Rate: 2.1 to 3 gpm
Max. Pressure: 1000 to 2000 psi
RPM: 1750, 3400 and 3450 rpm
Shaft: 5/8" Dia. (Hollow)
 3/4" Dia. (Hollow)



2333B thru 2337B
Powerline Series
Triplex Plunger Pump

Max. Flow Rate: 3.5 to 4.5 gpm
Max. Pressure: 2200 to 3000 psi
RPM: 1750 rpm
Shaft: 24 mm Solid Shaft and Base



2362B-C thru 2363B-CU
"Kwik-Mount" Series
Triplex Plunger Pump

Max. Flow Rate: 4 gpm
Max. Pressure: 3000 psi
RPM: 3400 rpm
Shaft: 1" Dia. (Hollow)

For mounting dimensions, request Hypro's individual spec sheets for each pump.

Read Before Installing the Pump



Safety Information

1. Use a pressure relief device on the discharge side of the pump to prevent damage from pressure build-up when the pump discharge is blocked or otherwise closed and the power source is still running. For trigger gun operation, or where discharge is frequently shut off, pressure unloader valves are recommended.
2. **Warning: Do Not Pump Flammable or Explosive Fluids Such as Gasoline, Fuel Oil, Kerosene, Etc. Do Not Use in Explosive Atmospheres. The Pump Should be Used Only with Liquids that have a Viscosity Very Close to Water and are Compatible with the Pump Component Materials. Failure to Follow this Warning Can Result in Personal Injury and/or Property Damage and Will Void the Product Warranty.**
3. Do not run the pump faster than maximum recommended rpm.
4. Do not pump at pressures higher than the maximum recommended pressure.
5. Maximum liquid temperature is 160° F. For better packing and valve life when water temperatures are above 110° F, a pressure feed system of 40 to 60 psi should be incorporated.
6. Make certain that the power source conforms to the requirements of your equipment.
7. Provide adequate protection in guarding around the moving parts such as the shaft and pulleys.
8. Disconnect power before servicing.
9. Release all pressure within the system before servicing any component.
10. Drain all liquids from the system before servicing any component.
11. Secure the discharge lines before starting the pump. An unsecured line may whip, causing personal injury and/or property damage.
12. Check hose for weak or worn condition before each use. Make certain that all connections are tight and secure.
13. Periodically inspect the pump and the system components. Perform routine maintenance as required (see Maintenance section).

WARNING: Risk of Electric Shock!

To reduce the risk of electric shock, electric motor must be adequately grounded to a grounded metal raceway system, or by using a separate grounding wire connected to bare metal on the motor frame, or to the grounding screw located inside motor terminal box, or by other suitable means. Refer to the most recent National Electric Code (NEC) Article 250 (Grounding) for additional information. **All Wiring Should be Performed by a Qualified Electrician.**

WARNING: Do Not Handle a Pump or Pump Motor With Wet Hands or When Standing on a Wet or Damp Surface, or in Water.

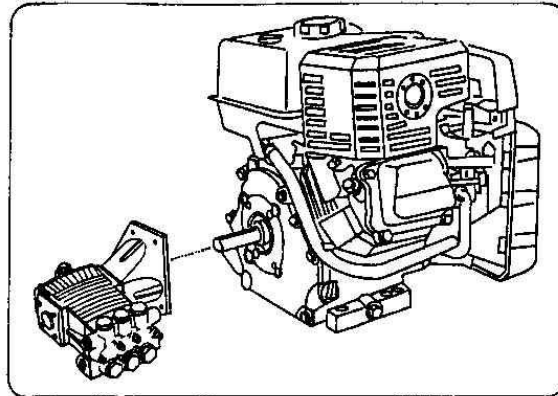
14. Do not operate a gasoline engine in an enclosed area. Be sure the area is well ventilated.

WARNING: Gasoline is a Highly Combustible Fuel. The Improper Use, Handling, or Storage of Gasoline Can be Dangerous. Never Touch or Fill a Hot Engine.

15. Use only pipe, hose and fittings rated for the maximum psi rating of the pump and/or unloader or relief valve, whichever has the highest psi rating. If a trigger type gun is used, an unloader valve is recommended.
16. Do not use these pumps for pumping water or other liquids for human or animal consumption.

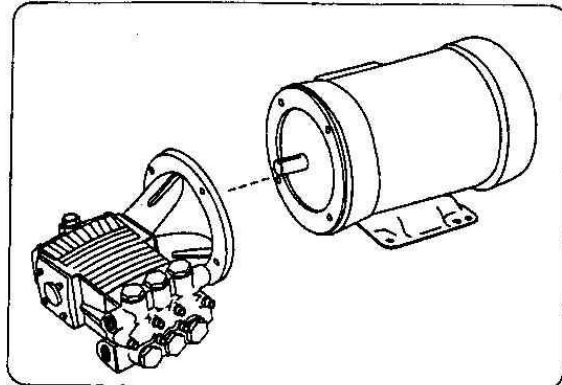
Direct Drive - Gas Engine Installation

1. Insert the key into the motor shaft keyway. Apply Never-Seize to the shaft and key. Insert the set screw into shaft, but do not tighten.
NOTE: Some models do not require set screws.
2. Slide the pump onto the motor shaft, making sure the pump's key slot is aligned with the key on the engine shaft. **DO NOT FORCE**, preventing binding.
3. Make sure the mounting pads on the engine face are in contact with the pump housing.
4. Insert the four proper-size bolts into the pump flange and tighten securely unto the engine mounting face. **Do not over tighten** to avoid stripping the threaded mounting holes located in the engine mounting face. A mild thread locker such as No. 242 Loctite or equivalent is recommended for mounting bolts.
5. For Models 2362B-C and 2363B-C, tighten the set screw onto the key in the shaft.



Direct Drive - Integral C-Flange Installation

1. Position and mount motor onto base.
2. For hollow shaft models install rubber grommets into the pump base, and install pump base onto pump securing with two 5/16" x 1/2" bolts.
3. Insert key into motor shaft keyway. Apply Never-Seize to shaft and key.
4. Slide pump onto motor shaft. **DO NOT FORCE**, this prevents binding.
5. For integral C-flange models line-up holes in flange with holes in motor face and secure with four 3/8" x 7/8" hex head bolts.
6. Install setscrews into pump shaft and tighten securely.



Belt/Pulley Drive Installation

Belt and pulley drive systems are typically used to reduce pump speed. Pumps may be rotated in either direction allowing either CW or CCW operation of the motor or engine.

For determining proper pulley sizes, use the formula below as a guideline and use "A" or "B" section belts.

$$\frac{\text{Motor rpm}}{\text{Pump rpm}} = \frac{\text{Flow (@ Rated Speed)}}{\text{Flow (Desired)}} = \frac{\text{Pump Pulley Dia.}}{\text{Motor Pulley Dia.}}$$

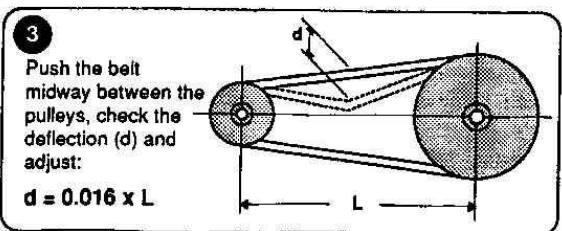
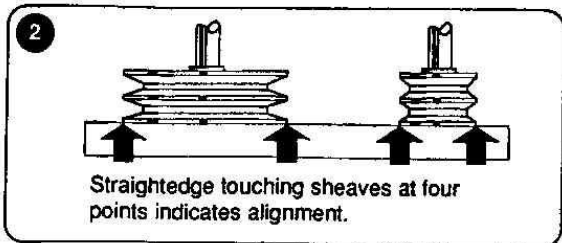
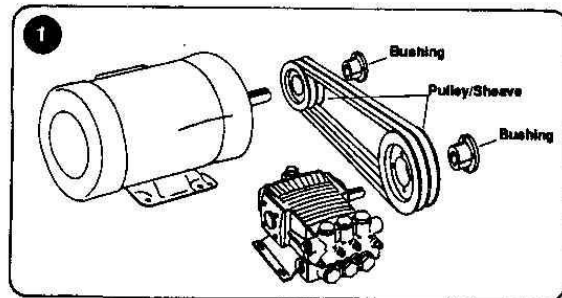
EXAMPLE: Use a 1725 rpm electric motor to drive a pump at 950 rpm.

Typically, a pulley diameter on the motor is 3.4 inches. The pump pulley diameter can be determined from the formula above:

$$\frac{1725}{950} = \frac{\text{Pump Pulley Diameter}}{3.4 \text{ Inches}}$$

$$\frac{1725 \times 3.4 \text{ Inches}}{950} = 6.2 \text{ Inches}$$

1. Install pulley or bushing/sheave combination (See Fig. 1) onto pump and motor shaft. Mount pump next to the motor making sure pulleys are lined up properly. Use a straightedge as shown in Figure 2. Rotate to check for run-out and bent shafts.
2. Install belt(s) and use slots in pump mounting rails to tighten belts. Make sure belts have proper tension—belts too tight will cause bearing wear and belts too loose will cause slipping. See Figure 3.

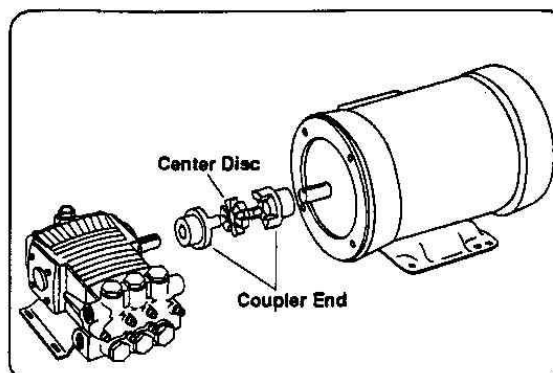


Direct Drive - Flexible Coupling Installation

To order correct shaft couplers, refer to Hypro Accessory Price List 1.

1. Insert keys onto shafts and slide coupler ends on to the pump and motor shafts flush with the shaft end.
2. Mount motor and pump onto bases — shim pump or motor so that shafts are aligned. Also make sure shafts are aligned parallel. Leave enough space between the ends of the shaft to allow coupler center disk to be inserted with some clearance.
3. When alignment is made slide coupler ends together over the coupler center disc.
4. Tighten set screws in both coupler ends securely.

CAUTION: For safety, install a shield over rotating shafts and couplers.



System Installation

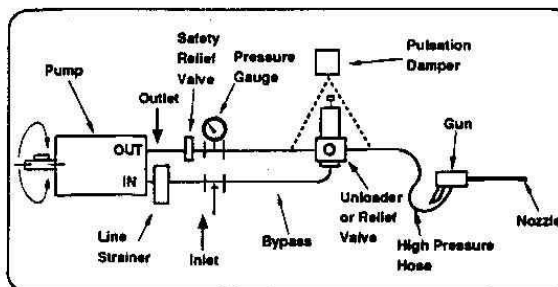
1. In general, select adequate size drive unit to avoid overloading. Avoid unnecessary restrictions in the line such as elbows, check valves, and all extraneous curves and bends.
2. Avoid using looped section which might permit air to become trapped.
3. Use pipe joint sealant on pipe threads to assure airtight connections.
4. Selection of the right type and size of hose is vital to good performance. Be sure to hook up the lines to the proper ports on the pump.
5. Always use genuine suction hose of at least the same diameter as the inlet port of the pump. If the suction (inlet) hose is more than four feet long, then use the next larger size.
6. A strainer should be installed in the suction line (80 to 100 mesh is recommended). Clean the strainer as soon as it becomes clogged.
7. Use one or two braid reinforced hose to prevent collapse of suction line.
8. Use only approved high pressure hose on the discharge side and make sure all connections are tight.

NOTE: Use only pipe, fittings, accessories, hose, etc. rated for the maximum pressure rating of the pump.

Pump

1. Before installing the pump, clean all fittings and hoses.
2. Rotate pump by hand to make sure it turns freely.
3. Make sure that all hose connections are tight and proper size fittings are used that are capable of safe operation.

IMPORTANT: Before Operating, Fill Crankcase with Oil to Level Indicated on the Dipstick. SAE 30W Detergent Oil is Recommended.



Discharge Side Installation

From pump to discharge hose the following accessories are recommended: a dampened pressure gauge with a face pressure double the maximum operating pressure, an unloader valve, a pulsation damper, an optional pressure gauge to monitor unloader and discharge hose.

Accessories such as unloader valve, pressure gauge, pulsation damper — should be installed as close to the pump as possible. Hose must be used right after the accessories. If solid piping is used, a two to four foot section of hose must be installed between the accessories and the piping.

Recommended Installation for the Pulsation Damper

For the proper operation of many unloader valves, the pulsation damper may have to be installed downstream side of the unloader valve. However, for maximum system protection, the pulsation damper should be installed upstream from the unloader valve, provided the unloader will function properly.

Inlet Side Installation

From source of liquid to pump the following components are recommended: a shut off valve, a bypass return tee from the unloader, a line strainer, and a compound pressure gauge.

Operation

WARNING: Aluminum and bronze are the materials available for pump heads. Aluminum is recommended for solutions with a pH range of 5.5 - 8. Bronze is best for concentrated soap solutions. **DO NOT** pump flammable or explosive liquids such as gasoline, kerosene, etc. **DO NOT** pump corrosive or abrasive liquids as these will cause rapid wear or deterioration of plungers, valves and seals in the pump. The pump should be used only with liquids compatible with pump component materials. Do not exceed maximum specified rpm and pressure. Observe the lubrication instructions. Failure to follow this warning will void the product warranty.

Input Water Supply

Utilize liquids free from impurities (such as sand or other solid particles that will affect the efficiency of the valves, the plunger and the packings). Use a strainer such as Hypro's poly or nylon bowl-type strainers with a large filtering surface and low suction loss. Replace or clean the strainer as soon as it becomes clogged to avoid noisy operation and pulsations that can damage the mechanical parts of the pump. If the pump draws from a tank, place the filter at the entrance of the pump.

Maximum temperature of pumped liquid is 160° F (60° C), maximum forced suction (measured at the pump) is 60 psi (10 BAR).

Before Starting Up

1. Check that oil is at the correct level at the oil level window, topping up, if necessary, using SAE 30W detergent oil.
2. Make sure the inlet water flow is sufficient (ideally twice the volume the pump requires.)
3. Prime the pump with the outlet completely open.

Priming the Pump

To prime pump, uncouple the discharge hose and gun or adjust the unloader valve to its lowest pressure setting. After starting the pump, open and close the gun to aid priming and to clear the valves of air. If the pump does not prime within a few seconds, stop the motor and inspect the installation for suction line leaks and obstructions. In general, keep suction lift to a minimum and avoid unnecessary bends in the suction line. The unloader valve must be readjusted after the prime has been obtained.

During Running

Check the efficiency of the hydraulic circuit while the pump is running; drips or signs of wear on the hoses can cause injuries as well as reduce the life and performance of the machine. If the circuit recycles thru a by-pass, avoid running the pump for longer than five minutes without pulling the trigger, since this heats the liquid and could damage the seals.

Care of the Pump

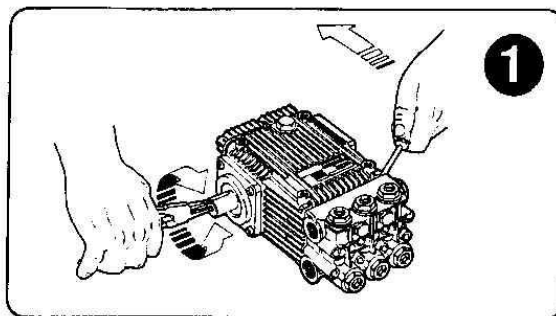
Generally, after each use, flush pump with a neutralizing solution for the liquid pumped. Follow with a clear water rinse. For storage under freezing conditions, flush pump with a 50% mixture of automotive anti-freeze and water.

Change oil after the first 50 hours of operation and every 500 hours thereafter.

Repair Instructions

Packing Replacement

1. Water leakage between the head and crankcase indicates the plunger packings should be replaced.
2. Use an allen wrench to remove the head bolts. Remove the head from the crankcase in the following manner:
 - a. Turn the crankshaft and at the same time,
 - b. Use a screwdriver to carefully pry between the head and the crankcase. See Figure 1.
3. After removing the head, remove the plunger seal retainers and packings using an extractor pliers. (Part Number 3010-0245.) See Figure 2.
4. Using a small-blade screwdriver, remove the low pressure packing from the retainer.



Repair Instructions

Packing Replacement (Continued)

5. Install the new parts as follows (see parts lists for proper packing kits):
 - a. Insert a low pressure packing into the retainer by forming the seal into a kidney or oval shape. Work the seal into place in the retainer.
 - b. Replace the retainer o-ring.
 - c. Place the high pressure packing and cup spreader into the head bore.
 - d. Place the brass packing retainer into the head and push the retainer in until the retainer o-ring is sealed in the head.
 - e. Repeat this procedure for the other cylinders.
6. Lightly oil the plungers and install the head onto the plungers. Push the head against the crankcase. Secure the head to the crankcase with the head bolts torqued in sequence. See Figure 3.

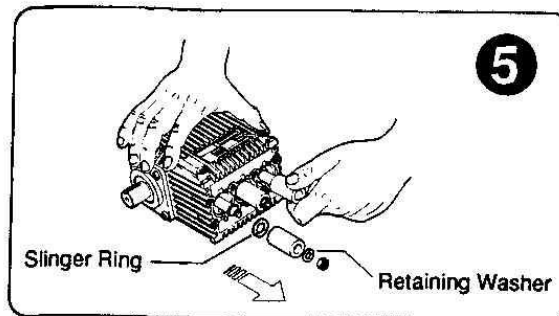
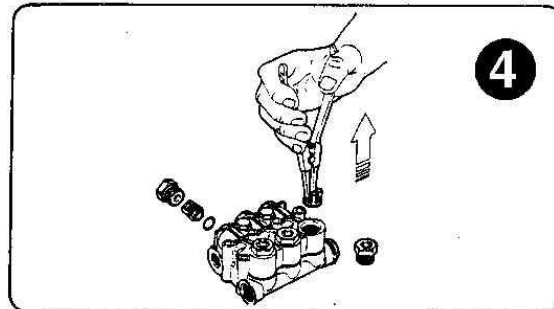
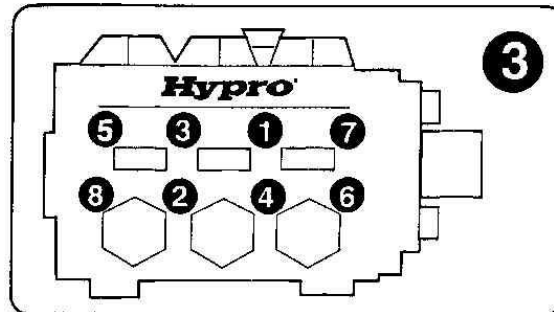
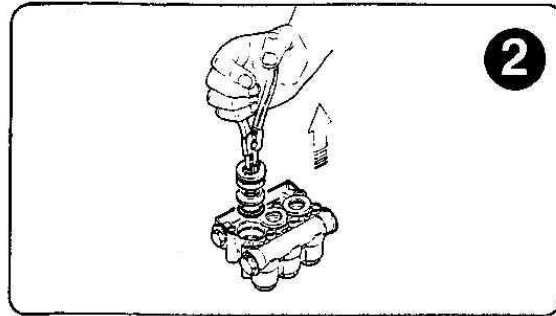
Torque to 88 in. lbs. on Model 2250 pumps; 217 in. lbs. on the 2333B thru 2337B series and 2362B-C thru 2363B-CU series.

Valve replacement

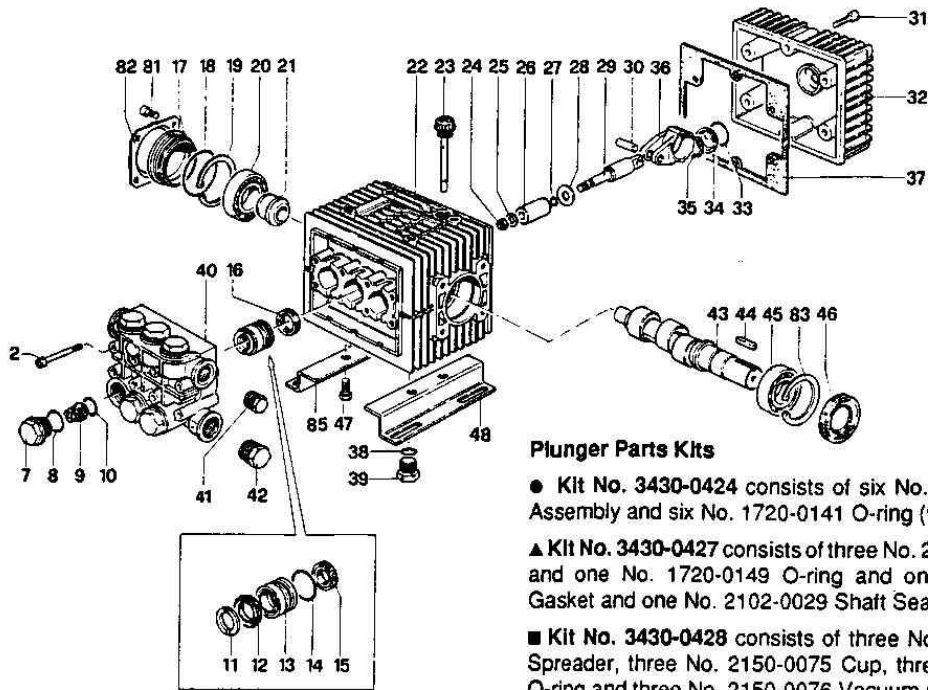
1. Erratic or low pressure operation may be caused by debris in the valves or worn poppets and/or seats.
2. Remove the valve caps and pull out the valve assembly using a needle-nose pliers. See Figure 4.
3. Inspect the valves for debris and wear. If worn or damaged, replace the valves and valve o-rings.
4. Install the valve caps and torque to 25 ft. lbs. on the 2250 series; 40 ft. lbs. on the 2333B thru 2337B series and 2362B-C thru 2363B-CU series.

Plunger Replacement

1. Remove the pump head from the crankcase as described above in the **Packing Replacement** section.
2. Remove the plunger retaining nut and carefully slide the plunger off of the lower plunger. Remove the o-ring from the lower plunger. Remove the plunger retaining nut washer and slinger ring. See Figure 5.
3. Inspect the plungers for cracking or damage and replace if damaged. Always replace the slinger ring and retaining washer when a ceramic plunger is removed to avoid fracturing the plunger when torquing the plunger retaining nut. See the parts list for proper plunger kits.
4. Install new parts as follows:
 - a. Install the slinger ring onto lower plunger.
 - b. Lightly oil the lower plunger rod and install the o-ring into place.
 - c. Slide the plunger onto the lower plunger.
 - d. Install the plunger retaining nut washer and retaining nut onto the lower plunger. Torque the plunger nut with Loctite 271 to 88 in. lbs. for all models.
5. Install the new plunger packings as described in the **Packing Replacement** section.



2258B and 2259B Plunger Pump Parts List



Plunger Parts Kits

● Kit No. 3430-0424 consists of six No. 3400-0133 Valve Assembly and six No. 1720-0141 O-ring (valve assembly).

▲ Kit No. 3430-0427 consists of three No. 2102-0031 Oil Seal and one No. 1720-0149 O-ring and one No. 1700-0108 Gasket and one No. 2102-0029 Shaft Seal.

■ Kit No. 3430-0428 consists of three No. 1830-0138 Cup Spreader, three No. 2150-0075 Cup, three No. 1720-0142 O-ring and three No. 2150-0076 Vacuum Cup.

Ref. No.	Qnty. Rqr'd.	Part Number	Description
2	8	2220-0074	Bolt (M6 x 60)
7	6	2404-0208	Valve Cap
8	6	1720-0140	O-ring (valve cap)
● 9	6	3400-0133	Valve Assembly
● 10	6	1720-0141	O-ring (valve assembly)
■ 11	3	1830-0138	Cup Spreader
■ 12	3	2150-0075	Cup
13	3	1830-0139	Cup Retainer
■ 14	3	1720-0142	O-ring
■ 15	3	2150-0076	Vacuum Cup
▲ 16	3	2102-0031	Seal, Oil
17	1	0701-2250A	Bearing Cover
▲ 18	1	1720-0149	O-ring
19	1	1820-0033	Retaining Ring
20	1	2002-0007	Bearing-Ball
21	1	2404-0209	Retainer, Shaft
22	1	0100-2250A	Crankcase
23	1	2630-0014	Dipstick
24	3	2250-0062	Nut, Plunger
25	3	2270-0063	Plunger Seal Washer
26	3	3500-0061	Plunger 18 mm
27	3	1720-0150	O-ring
28	3	2270-0064	Slinger
29	3	3500-0054	Guide Plunger
30	3	2404-0210	Wrist Pin

Ref. No.	Qnty. Rqr'd.	Part Number	Description
31	6	2220-0075	Bolt (M5 x 20)
32	1	0702-2250A	Cover, Crankcase
33	1	1720-0146	O-ring (sight glass)
34	1	2630-0015	Sight Glass
35	1	1800-0016	Retainer, Sight Glass
36	3	0500-2250B	Connecting Rod
▲ 37	1	1700-0108	Gasket
38	1	1720-0147	O-ring
39	1	2406-0023	Drain Plug
40	1	0200-2250B	Head (Bronze)
41	1	2406-0012	Port Plug
42	1	2406-0021	Port Plug
43	1	0500-2258	Crankshaft, 24 mm (2258B)
43	1	0500-2259	Crankshaft, 3/4" Dia. (2259B)
44	1	1610-0047	Key, 8 mm (2258B)
44	1	1610-0007	Key, 3/16" (2259B)
45	2	2002-0007	Bearing
▲ 46	1	2102-0029	Seal, Shaft
47	4	2210-0096	Bolt
48	1	1510-0080	Base (Right)
81	4	2220-0069	Bolt
82	1	2404-0228	Bearing Retainer
83	1	1820-0033	Retaining Ring
85	1	1510-0081	Base (Left)

Troubleshooting

Symptom	Probable Cause(s)	Corrective Action
Pumps runs but produces no flow	Pump is not primed	Flood suction then restart pump.
Pump fails to prime	Air is trapped inside pump.	Disconnect discharge hose from pump. Flood suction hose, restart pump, and run pump until all air has been evacuated.
Pump loses prime. Chattering noise, pressure fluctuates.	Air leak in suction hose or inlet fittings.	Remove suction hose and test for leaks by pressurizing hose with water. Make sure thread sealant has been used on all fittings.
	Suction line is blocked, collapsed or too small.	Remove suction line and inspect it for a loose liner or debris lodged in hose. Avoid all unnecessary bends. Do not kink hose.
	Clogged suction strainer	Clean strainer.
Low pressure at nozzle.	Unloader valve is bypassing.	Make sure unloader is adjusted properly and bypass seat is not leaking.
	Incorrect or worn nozzle.	Make sure nozzle is matched to the flow and pressure of the pump. If the nozzle is worn replace.
	Restricted intake.	Refer to above priming information.
Rapid cyclic operation when gun is off.	Foreign matter prevents unloader valve from seating.	Check for leaks downstream of the unloader valve. If no leaks, remove and clean the check valve of the unloader.

Oil Chart and Torque Ratings

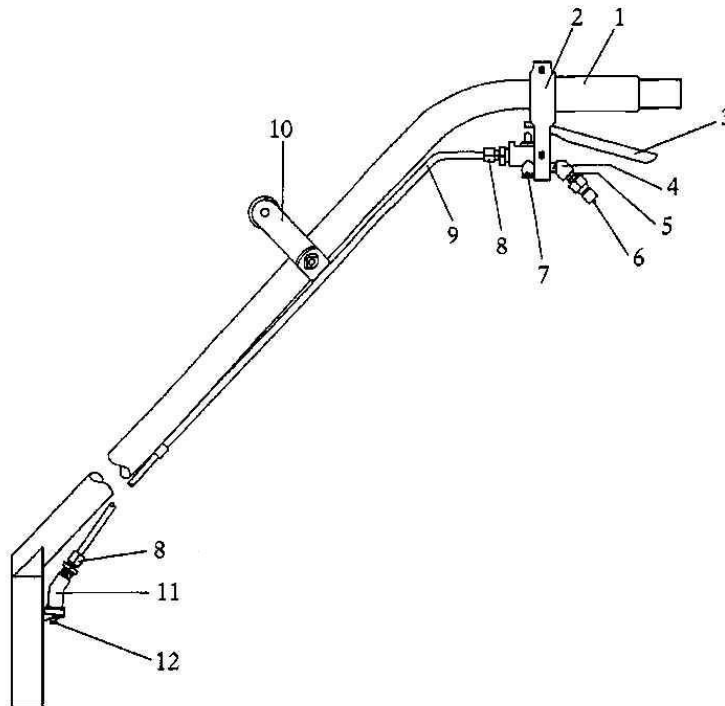
Use SAE 30W Oil NON-DETERGENT Oil Change First change: 50 hours Then every: 500 hours	2250 "Kwik-Mount" Series	2333B thru 2337B Powerline Series	2362B-C thru 2363B-CU "Kwik-Mount" Series
	Crankcase Capacity		
	18 oz.	15 oz.	15 oz.

Torque Rating Inch Pounds (ft. lbs.)

	2250 "Kwik-Mount" Series	2333B thru 2337B Powerline Series	2362B-C thru 2363B-CU "Kwik-Mount" Series
Head	88 (7.5)	217 (18)	217 (18)
Piston	88 (7.5)	88 (7.5)	88 (7.5)
Rear Cover	80 (6.6)	48 (4)	48 (4)
Side Cover	N/A	217 (18)	217 (18)
Valve Caps	300 (25)	478 (40)	478 (40)
Connecting Rods	N/A	80 (7.5)	80 (7.5)

Cleaning Wand Parts

Dagger
Section 7



Dagger

Wand Parts List

ITEM	PART NO.	DESCRIPTION	QTY
1	061-007	Handle Grip	1
2	015-203	Bracket, Low Pressure Wand Valve Holder	1
3	167-018	Trigger, Wand Low PSI	1
4	052-082	Elbow, 1/4" Brass 45 Street	1
5	052-072	Nipple, 1/4 Brass Close	1
6	052-050	Quick Connect, 440 Male with Viton	1
7	169-074	Valve, High PSI Brass	1
8	052-152	Compression, 1/4" Male HydraHoe Fitting	2
9	168-001	Tube, HydraHoe Solution 1/4" OD s/s	1
10	061-024	Handle Kit, Wand - Pressure Guide (see below)	1
11	052-450	Elbow, For Jet Assembly Wands	1
12	076-004	Jet, #11004 1/4" VV s/s	1
Handle Assembly (Item #10):			
	094-035	Nut, 5/16-18 s/s Nylock Half	2
	143-012	Bolt, 5/16-18 x 3/4" HHC s/s	2
	061-006	Handle, Pressure Guide	1

Vacuum System

Dagger Section 8

The vacuum blower in this machine is a positive displacement lobe type. The performance and life of this unit is greatly dependent on the care and proper maintenance it receives.

Because of the close tolerances between the lobes and housing of the vacuum blower, solid objects entering the inlet will damage the internal lobes, gears, bearings or drive system.

To prevent this, a stainless steel filter screen has been placed at the vacuum inlet inside the vacuum recovery tank. This stainless steel screen is finger tight and should be removed for cleaning weekly.

◆ CAUTION ◆

When the machine is being run for test purposes and the vacuum inlet on top of the machine is open, caution should be used.

To protect the vacuum blower from overloading and damaging itself, there is a vacuum relief system installed on the vacuum tank. When the vacuum tank inlet is completely sealed off, a maximum of 12 HG will be attained. At the end of each day, an oil based lubricant should be sprayed into the blower lubrication port before shutting down the machine. If you fail to lubricate the vacuum blower daily, rust deposits and moisture will decrease the life of the vacuum blower.

◆ CAUTION ◆

Foam passing through the blower could lead to serious problems. Therefore, it is important to keep the vacuum tank foam free.

Read the vacuum blower manual carefully for proper oil change and grease application. The maintenance log may differ slightly from the manual, but the truckmounted carpet cleaning machine application is very demanding of the vacuum blower and therefore it should be maintained more regularly.

◆ CAUTION ◆

The vacuum tank is protected from overflowing by a vacuum tank float kill switch. The switch is not activated by foam, only by liquid.

VACUUM TANK FILTER BAGS

HydraMaster filter bags are designed to trap lint, sand and dirt that would normally collect at the bottom of your vacuum tank. The use of these bags, if emptied at the end of each job, will eliminate the build-up of much of the debris in the tank. The drawstring top of these bags is designed to be slipped around the incoming dirty water inlet in the vacuum tank.

UNCONTESTED WARRANTY

The Roots Division of Dresser Industries, Inc. states in their February 1993 Roots Blower specification sheet, "Roots is the leader in blower warranties - the first to introduce an uncontested warranty that guarantees repair or replacement of any Universal RAI-J™ that malfunctions for any reason. We'll protect you or your customer for a full 18 months from date of original start-up or 24 months from date of shipment, whichever occurs first."

Blower Troubleshooting

Dagger
Section 8

No	Problem / Possible Cause	Solution
1	There is no vacuum or a loss of vacuum.	
1.1	The <i>stainless steel filter</i> is clogged.	Clean or replace the filter.
1.2	The <i>filter bag</i> is clogged.	Clean or replace the filter bag.
1.3	The <i>vacuum tank dump valve</i> is "open" or defective.	If water drips from the valve when the machine is not running, the valve will cause a vacuum loss when the machine is running. Replace it if it is defective.
1.4	The <i>hose</i> on the live hose reels is collecting water.	Unroll the entire length of the hose each time you use it.
1.5	The <i>vacuum hose</i> is plugged.	Remove the obstruction by reversing the vacuum hose.
1.6	There is a restriction in the <i>cleaning tool</i> .	Remove the obstruction.
1.7	The <i>vacuum tank seal</i> is defective.	Replace the seal.
1.8	The <i>hose</i> from the blower to the recovery tank is kinked or has collapsed inside.	Replace or reshape the hose. NOTE: A special reinforced hose is required for replacement.
1.9	There is a hole in the <i>recovery tank</i> .	Inspect the tank for leaks using smoke and weld the tank if it is required.
1.10	There is a hole in the <i>vacuum hose</i> .	Repair or replace the hose.
1.11	The <i>vacuum release</i> is loose.	Readjust the vacuum release.
1.12	The <i>engine speed</i> is too low.	Adjust the speed.

Dagger

No	Problem / Possible Cause	Solution
1.13	The <i>vacuum blower's</i> end plates or lobes are worn.	Replace the worn components. NOTE: This must be accomplished by a qualified technician.
1.14	There are <i>vacuum leaks</i> around the top collector box.	A vacuum leak can usually be detected by spraying a mist of WD40 or blowing smoke towards the leak. The mist or smoke will be sucked into the leak. When you see the leak, repair it.

Dagger

No	Problem / Possible Cause	Solution
2	The blower is noisy.	
2.1	There is an <i>exhaust</i> leak between the blower and the silencer.	Inspect the fittings to determine where the air leak is. Repair as necessary.
2.2	The <i>blower</i> is out of oil or the gears may be bad. NOTE: Permanent damage may result from a lack of lubrication.	Add oil. If the noise continues, replace the gears or blower. NOTE: Replacement of the gears must be accomplished by a qualified technician.
2.3	The <i>silencer</i> is bad.	Inspect it for an external hole. Repair or replace the silencer.
2.4	The <i>lobes</i> are hitting.	Replace the blower.
2.5	The <i>engine</i> is running at the wrong speed. This is noticeable because the blower noise increases with speed.	Adjust the engine to run at the proper speed.
2.6	The <i>bearings</i> are worn.	Remove and replace the bearings as required. NOTE: This process must be accomplished by a qualified technician.

Dagger

No	Problem / Possible Cause	Solution
3	The blower will not turn.	
3.1	The <i>lobes</i> are locked up because of rust, burnt chemical foam, or a sugar-like substance has been vacuumed up from the carpet.	<p>a. Most <i>burnt foam</i> and <i>rust</i> can be removed by soaking the lobes with liquid wrench. After soaking the lobes, with the machine running, pour a half gallon of hot water into the top of the blower. Then spray WD40 or Pennz Lube into the top of the blower to displace the water.</p> <p>b. Any <i>sugar-like substances</i> can be removed by soaking the lobes with hot water.</p>
3.2	There is debris in the <i>blower</i> .	Remove the debris. A stainless steel filter is provided at the vacuum inlet in the vacuum tank to prevent this problem.
3.3	The blower has broken <i>gears</i> or shattered <i>lobes</i> .	Rebuild or replace the blower. NOTE: Rebuilding the blower must be accomplished by a qualified technician.

Dagger

No	Problem / Possible Cause	Solution
4	The shaft turns, but the lobes do not.	
4.1	The <i>shaft</i> is broken inside the blower.	Replace the blower.

Engine Troubleshooting

Dagger
Section 9

No	Problem / Possible Cause	Solution
1	The engine will not turn over.	
1.1	There is a loose <i>battery cable</i> or corroded <i>battery terminals</i> .	Clean and tighten the battery terminal connections.
1.2	The <i>battery</i> is dead.	Recharge or replace the battery.
1.3	There is a problem with the <i>fuse link</i> .	Check the link. If it is defective, replace it.
1.4	There is a problem with the <i>starter solenoid</i> .	With the ignition switch in the "Start" position, check the following on the solenoid. Check for +12 volts on: a. the small terminal with the yellow wire from the ignition switch, b. the large terminal with the cable from the battery, and c. the large terminal with the cable going to the starter. If the voltage is present on the first two checkpoints, but not on the large terminal going to the starter, replace the solenoid.
1.5	The <i>ignition switch</i> is defective.	Test the switch for entering voltage. If there is voltage entering but no voltage exiting at the yellow wire when the switch is fully engaged, then replace the switch.
1.6	The <i>vacuum blower</i> has seized.	Refer to The Blower, Chapter 10.

Dagger

No	Problem / Possible Cause	Solution
1.7	The <i>starter motor</i> is defective.	Check to see if the engine will turn over manually. Check that the engine is grounded to the minus side of the battery. With the ignition key in the start position, check the starter motor for +12 volts. If all of the above conditions are met and the starter will not turn, replace it.
1.8	There is an <i>engine</i> problem.	Refer to the engine operation and maintenance manual in your owner's manual or see the local Briggs & Stratton engine repair facility.
1.9	The <i>ground cable</i> underneath the motor has fallen or broken off.	Reattach the cable.

Dagger

No	Problem / Possible Cause	Solution
2	The starter turns the engine over, however the engine will not start. (There is no spark[†].)	[†] Check for spark at the spark plugs. If there is no spark, examine the troubleshooting guide above. However, if there is no gas, see troubleshooting problem number 3 on the following page for possible fuel problems.
2.1	The <i>recovery tank</i> is full.	Empty the tank.
2.2	The <i>recovery tank float</i> is causing the engine to shut down.	Disconnect the float. If the unit starts, replace the defective float.
2.3	The <i>engine</i> is malfunctioning.	Refer to the Briggs & Stratton Engine Maintenance manual included in your owner's manual.
2.4	The <i>magnetron</i> is malfunctioning.	Check the magnetron. If it is adjusted properly, all the wires tight, and none of the wires are grounding out, then remove all the wires from the engine kill lug. If there is still no spark, replace it.
2.5	A <i>spark plug</i> is faulty.	Check for worn, fouled or improperly gapped spark plugs. Replace if necessary. CAUTION: Allow the engine to cool completely before attempting to remove the plugs.
2.6	The <i>engine kill relay</i> is malfunctioning.	Remove either end of the wire that runs from the relay to the engine kill lug. If the engine starts, replace the relay.
2.7	The <i>oil pressure switch</i> is causing the engine to shut down.	Check the engine oil level. If it is at the proper level, then disconnect the oil pressure switch. If the unit starts, then replace the switch.
2.8	The <i>lower float in the chemical mix tank</i> is defective.	Unplug the wire from terminal 86 on the kill relay. If there is water in the mix tank and the engine starts, replace the switch.

Dagger

No	Problem / Possible Cause	Solution
3	The starter turns the engine over, however the engine will not start. (There is no gas[♦].)	[♦] Check for spark at the spark plugs. If there is no spark, see troubleshooting problem number 2 on the previous page. However if there is a spark, examine the above troubleshooting guide for possible fuel problems.
3.1	The <i>fuel pump</i> is defective.	Remove the fuel line from the engine and place it in a container to see if the fuel is being pumped when the ignition is on. Replace the fuel pump if it is defective.
3.2	There is a poor <i>battery ground</i> to the fuel pump.	Repair the loose ground connection.
3.3	The <i>fuel pump</i> is sucking air between the gas tank and the inlet side of the fuel pump.	Examine the gas inlet side of the fuel pump. Tighten any loose fittings or clamps. Replace any ruptured hose.
3.4	The <i>fuel filter</i> is clogged.	Inspect the filter and replace if necessary.
3.5	The <i>quick connect</i> in the fuel line is clogged.	Clean or replace the quick connect.

Dagger

No	Problem / Possible Cause	Solution
4	The engine runs poorly or dies after running for awhile.	
4.1	The <i>air or gas filter</i> is clogged.	Inspect both filters and replace the clogged one.
4.2	There is a poor <i>battery ground</i> to the fuel pump.	Inspect the electrical grounds and repair any loose ground connections.
4.3	The <i>fuel pump</i> is sucking air between the gas tank and the fuel pump.	Inspect for air leaks between the fuel pump and the gas tank. Repair or replace any leaking components.
4.4	The <i>fuel pump</i> is defective.	Remove the fuel line from the engine and place it in a container to see if the fuel is being pumped when the ignition is turned on. Replace the fuel pump if it is defective.
4.5	There is excessive <i>engine load</i> .	Clean and adjust the recovery tank relief valve. Adjust for 12 inches of lift under a full load.
4.6	The engine overheats from poor <i>ventilation</i> .	Remove any air restriction from around the engine. Add a roof vent or external fan, if necessary.
4.7	The engine overheats from carbon build up in the <i>combustion chamber</i> .	Refer to a local Briggs & Stratton dealer.
4.8	The engine overheats from too much oil in the <i>crankcase</i> .	Check the oil level and correct if necessary.
4.9	The <i>engine</i> is malfunctioning.	Refer to the Engine Operation and Maintenance manual, or see local Briggs & Stratton dealer.

Dagger

No	Problem / Possible Cause	Solution
4.10	A clogged <i>heat exchanger</i> is causing back pressure.	This will cause the engine to run slow and spit gas from the carburetor. Remove the stainless steel hose from the end of the stainless steel heat exchanger. If the engine runs good without the hose, then remove the copper heat exchanger under the machine and clean the debris.
4.11	In dual tank Fords, the engine is pulling through the ' <i>Tank Switching Valve</i> '.	Do not try to pull gas from both tanks.
4.12	The <i>PCV valve</i> is defective.	Remove and check the air cleaner for oil saturation. If it is saturated, replace the PCV valve and air filter.

Electrical System

Dagger Section 10

The Dagger electrical system, in keeping with the entire machine concept, has been kept to a minimum so as to keep any necessary troubleshooting as easy as possible.

The entire electrical system operates on 12 volts DC which is provided by a battery. Battery levels are sustained by a 16 amp alternator inside the engine. **NOTE:** When a new battery is installed, check that it is properly charged before installation or damage to the charging regulator may occur.

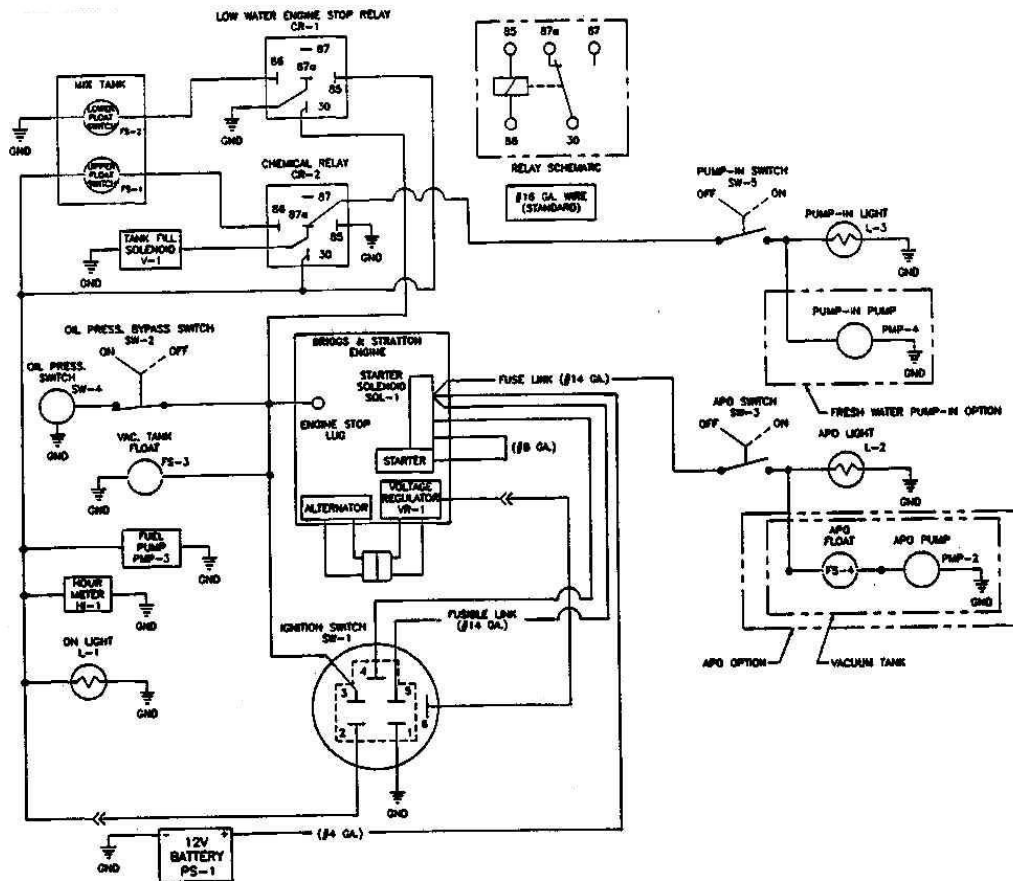
The orange wire going from the engine starter solenoid to terminal #5 on the ignition switch is a fusible link and provides protection to the electrical system in case of failure.

Ignition Switch:

Terminal No.	Wire Color	Function
1	Not Used	
2	White	To Carburetor Solenoid (when used)
3	Black	To Stop Switch Terminal on Engine
4	Yellow	To Solenoid (tab terminal)
5	Orange	To Battery (battery terminal on solenoid)
6	Red	To Regulator / Rectifier

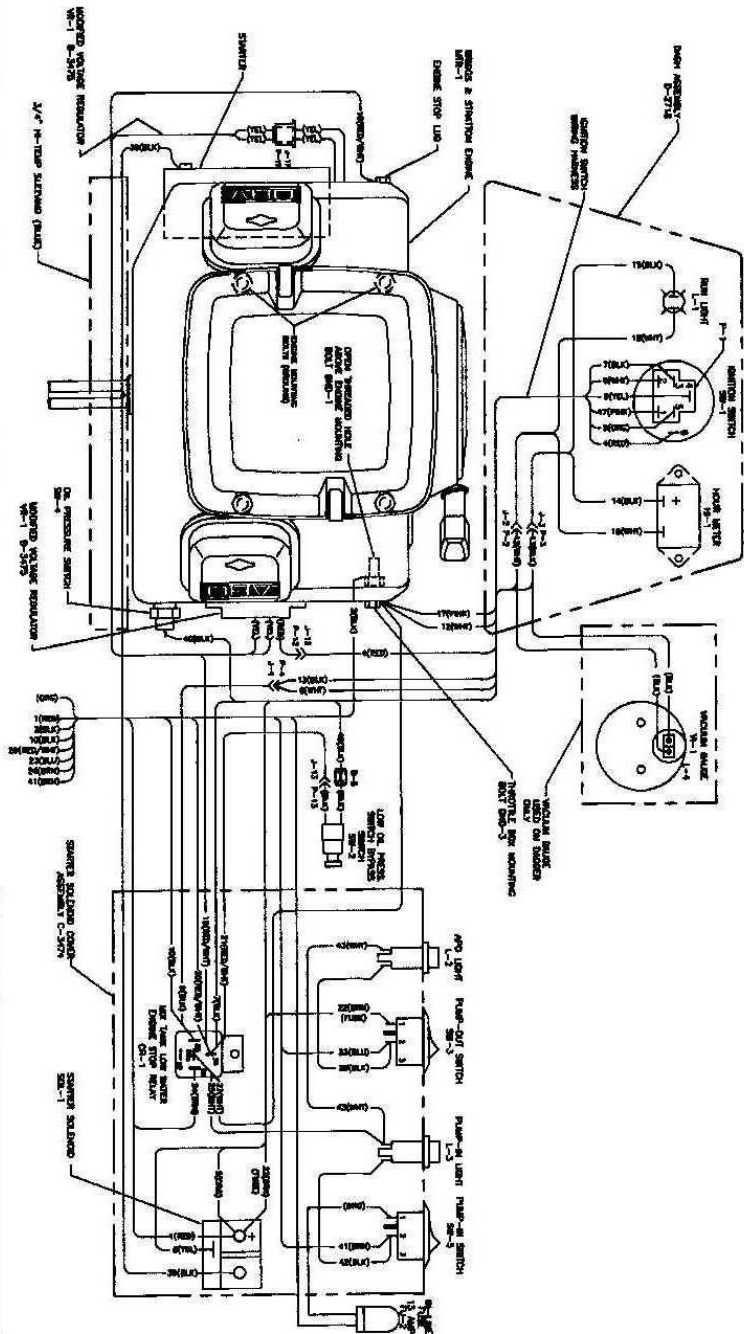
Switch Position	Continuity
1. Off	1 + 3 + 6
2. Run	2 + 5 + 6
3. Start	2 + 4 + 5

Wiring Schematic



Dagger

Wiring Diagram Part 1

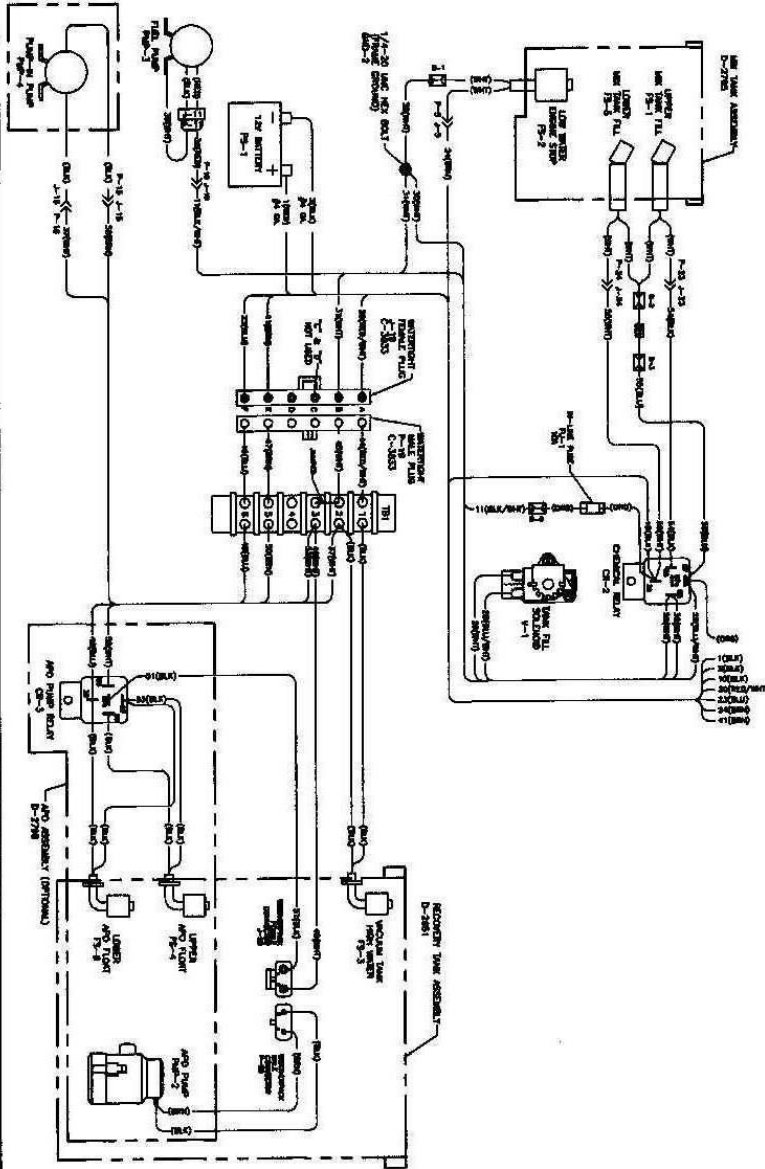


Bridgepoint Systems, Inc.

03/01/2005

Dagger

Wiring Diagram Part 2



Bridgepoint Systems, Inc.

03/01/2005

Electrical Troubleshooting

Dagger
Section 10

No	Problem / Possible Cause	Solution
1	The engine is not charging the battery.	
1.1	The <i>regulator/rectifier</i> is bad.	Check the B+ voltage from the regulator/rectifier to ground. With the engine running at normal RPM, the voltage should be 12.5 to 14.5 DC volts. If necessary, replace the regulator/rectifier.
1.2	The <i>stator</i> winding is bad.	Check for AC voltage at the regulator/rectifier. The stator should be producing an AC voltage of around 25 to 40 volts. (Check your owner's manual for the exact voltage.) If necessary, replace the stator winding.

Dagger

No	Problem / Possible Cause	Solution
2	The fusible link is blown.	
2.1	The <i>fusible link</i> is weak or there is an <i>electrical short</i> in the system.	Replace the weak link. Check the unprotected wires for a short-circuit. Check under the dash panel for a loose wire or a wire that has rubbed its insulation off and is shorting-out to ground. Unscrew each individual wire, except the white wires, one at a time until the breaker does not trip. Then trace that circuit.

Machine Maintenance

Dagger Section 11

To avoid costly repairs and down-time, it is imperative to develop and practice good maintenance procedures from the beginning. These procedures fall into daily, weekly, monthly and quarterly increments, and are outlined below. All recommended maintenance must be performed by competent service personnel.

Important: Record date and machine hours in maintenance log.

We have provided a maintenance log for your convenience at the end of this section. *Records of maintenance must be kept and copies may be required to be furnished to HydraMaster before the warranty is honored.* It is recommended that you affix a copy of the log on the vehicle door near your unit for convenience and to serve as a maintenance reminder.

OPERATIONAL MAINTENANCE

DAILY

Check engine oil level.

Check high pressure pump oil. Add as necessary.

Inspect garden hose screen. Clean as needed.

Visually inspect machine for loose wires, oil leaks, water leaks, etc.

Inspect vacuum tank s/s filter and filter bag for tears, holes, etc.

Clean, repair or replace as needed.

Lubricate blower with an oil based lubricant through blower inlet.

WEEKLY

One time change of oil and oil filter *after first 20 hours* of use.

Dagger

Check oil level in blower.
Check drive system screws. Tighten as needed.
Check pump drive belt for wear.
Check pump pulleys.
Check high pressure water lines for wear or chafing.
Check all nuts and bolts. Tighten as needed.
Check "Y" filter. Clean as necessary.
Inspect orifice.
Inspect vacuum relief valve. Clean and lubricate as necessary.
Clean vacuum tank thoroughly with high pressure washer.
Check wiring for chafing.
Flush water and chemical system with 50/50 white vinegar solution.
Change engine oil.

MONTHLY

Change oil filter.
Check engine air cleaner filter. Clean as necessary.
Remove pressure By-pass Valve piston plate. Grease plate. Reinstall.
Check water level in battery. Clean connections as needed.

QUARTERLY

Check fuel lines.
Clean and gap spark plugs.
Check drive coupler for cracks or wear. Replace as necessary.
Change oil in blower.
Change pump oil.
Grease blower bearing fittings.

AS REQUIRED: DE-SCALING

Scale deposits on the interior of the heating system can cause a noticeable loss in heating performance. Deposits of this kind result from hard water deposits,

Dagger

Check oil level in blower.
Check drive system screws. Tighten as needed.
Check pump drive belt for wear.
Check pump pulleys.
Check high pressure water lines for wear or chafing.
Check all nuts and bolts. Tighten as needed.
Check "Y" filter. Clean as necessary.
Inspect orifice.
Inspect vacuum relief valve. Clean and lubricate as necessary.
Clean vacuum tank thoroughly with high pressure washer.
Check wiring for chafing.
Flush water and chemical system with 50/50 white vinegar solution.
Change engine oil.

MONTHLY

Change oil filter.
Check engine air cleaner filter. Clean as necessary.
Remove pressure By-pass Valve piston plate. Grease plate. Reinstall.
Check water level in battery. Clean connections as needed.

QUARTERLY

Check fuel lines.
Clean and gap spark plugs.
Check drive coupler for cracks or wear. Replace as necessary.
Change oil in blower.
Change pump oil.
Grease blower bearing fittings.

AS REQUIRED: DE-SCALING

Scale deposits on the interior of the heating system can cause a noticeable loss in heating performance. Deposits of this kind result from hard water deposits,

Dagger

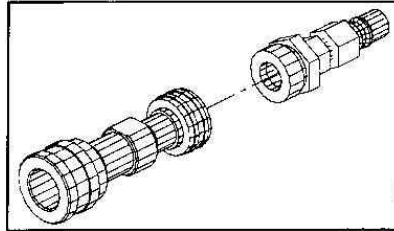
excessive chemical use, improper chemicals, etc. The frequency with which de-scaling procedures are required will vary. If your area has particularly hard water or you see evidence of deposits in the water system, you may have to de-scale monthly.

To de-scale your system, add an appropriate de-scaler chemical to your mix tank. Circulate it through the heating system. Let it stand. Flush and repeat as necessary. Clean all screens and strainers, and check them frequently following de-scaling.

NOTE: If you are using T.M. DeScaler through the flow meter, make sure to run clean water through the flow meter after this procedure.

To de-scale using the recirculation kit, start with an empty mix tank. Fill a third of the mix tank with T.M. DeScaler. Follow the recommendations on the T.M. DeScaler label for proportions. Verify that the upper float is not lying horizontal, but floats below.

Attach the recirculation fitting provided in the kit to the garden hose quick connect (see illustration to right) and this combination to the front of the machine.



Attach one section of female/female solution hose to the outgoing solution fitting on the front of the machine and the other end to the garden hose and recirculation fitting combination that is attached to the front of the machine (or as many sections as you want, if you wish to de-scale your hoses),

Start the machine and allow it to run for three to five minutes. Do not leave the T.M. DeScaler solution in the system. Flush the system with clean water and turn the machine OFF.

OVERALL MACHINE MAINTENANCE

Maintaining the original appearance of your unit is important for two reasons:

1. It represents a big dollar investment for your cleaning business and its appearance should reflect that fact. A dirty machine is not professional.
2. Maintenance, troubleshooting, and repair is much easier to accomplish on a clean, well maintained unit. Regular cleaning of the machine offers you an opportunity to visually inspect all facets of the machine and spot potential problems before they occur.

The following maintenance is recommended by the manufacturer at the frequency indicated.

AFTER EACH JOB

Check recovery tank, s/s filter and filter bag as required.

DAILY

Wipe machine down thoroughly with a damp cloth.

Flush recovery tank out thoroughly.

Empty filter bag and inspect for rips, tears, etc. Replace as needed.

Remove, thoroughly clean and reinstall stainless steel filter screen in recovery tank.

Inspect and clean vacuum slot on cleaning wand.

Check wand head for sharp edges that could tear carpet. File down as needed.

Clean wand to maintain original appearance.

Wipe down vacuum and high pressure hoses as needed.

Visually inspect hoses for cuts, etc.

Dagger

WEEKLY

Wipe down entire unit as needed.

Apply good coat of auto wax to all painted surfaces inside and out, and to control panel.

Thoroughly clean recovery tank using high pressure hot water (unit with optional high pressure cleaning gun may be used for this).

Remove stainless steel filter in recovery tank and thoroughly clean, removing all lint build-up. Inspect for damage and reinstall.

Remove filter bag. Thoroughly clean and reinstall. If torn, replace.

Empty chemical from chemical container. Wash out thoroughly to remove any chemical build-up.

Inspect chemical feed line strainer and use 50% white vinegar/water solution to remove any chemical build-up.

Thoroughly clean wand and inspect for clogged jet, debris in vacuum slot and leaking fittings at valve.

Apply light coat of auto wax to wand.

Thoroughly clean vacuum and high pressure hoses including hose cuffs.

Inspect for wear or damage to hoses and quick connect fittings.

Inspect garden hose connect/adaptor screen for debris. Remove and clean thoroughly.

Inspect all lines for wear or abrasions that may cause possible leaks.

MAINTENANCE LOG

MAX HRS	DAILY SERVICE	OIL RECOMMENDATIONS						
8	ENGINE OIL check	BLOWER	40 weight non-detergent					
8	PUMP OIL check	PUMP	5 - 30 weight synthetic motor oil					
8	GARDEN HOSE SCREEN clean	ENGINE	30 weight motor oil					
8	MACHINE general inspection		NOTE: Overhead valve engines can use multi-viscosity oil, but will experience increased oil consumption.					
8	VAC TANK FILTER BAG clean							
8	BLOWER INLET spray with lubricant							
	WEEKLY SERVICE	DATE & HOURS						
20	OIL change with filter		Break-in. One time only.					
25	BLOWER check oil level							
25	DRIVE SYSTEM tighten screws							
25	BELTS & PULLEYS check for wear							
25	HIGH PRESSURE LINES check for chafing							
25	NUTS & BOLTS check tightness							
25	"Y" FILTER check and clean							
25	ORIFICE inspect							
25	VACUUM RELIEF VALVE inspect, clean, lube							
25	VACUUM TANK clean							
25	WIRING check for chafing							
25	CHEMICAL SYSTEM flush with vinegar							
50	ENGINE OIL change							
	MONTHLY SERVICE							
100	OIL FILTER change							
100	ENGINE AIR CLEANER clean							
100	BY-PASS VALVE grease piston and o-rings							
100	BATTERY WATER LEVELS check							
	QUARTERLY SERVICE (3 MONTHS)							
300	FUEL LINES check							
300	SPARK PLUGS clean and gap							
300	DRIVE COUPLER check for wear							
400	BLOWER OIL change							
400	PUMP OIL change							
400	BLOWER grease bearing							

Dagger (2/21/97)