HYDRAMASTER
Corporation
11015 47th Avenue W, Mukilteo, WA 98275

CrossFire 4.2

Machine Serial Number _____

182-023

Revised August 15, 1997

Table of Contents

CrossFire 4.2

Introduction

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Section 1-1

This manual contains installation and operation instructions as well as information required for proper maintenance, adjustment and repair of this unit. 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.

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?**!

♦ 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.

HOURS	TELEPHONE NUMBERS
Monday - Friday	(206) 775-7276 Parts
8:00 am to 5:00 pm	(206) 775-7275 Service
PACIFIC STANDARD TIME	(800) 426-4225 Parts / Service FAX

System Operation

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Section 1-3

The CrossFire 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 operator. The majority of the water flows to the by-pass valve assembly, then back through the secondary exhaust heat exchanger, and back to the mix tank. The water demanded by the operator 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

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Frame: 23"W x 59"L x 37"H

Weight: Crossfire 4.2: 750 lbs.

Cowling: Steel with baked-on Epoxy finish.

Engine: Honda V-Twin Engine GX620

Ignition: Electronic, Keystart.

Vacuum Blower: Proprietary Dual Shaft Roots
45 RAI J WhispAir™

Chemical System: Electro-mechanical, meter controlled.

Heating System: 1 Stainless steel exhaust exchanger.
2 Copper shell and tube exchangers.

Instruments:
Water Pressure gauge, liquid filled, 0-1000 PSI
Water Temperature gauge, 0-280° F
Vacuum Level gauge, 0-30" HG
Hour Meter, machine runtime
Keyed Ignition, start/stop
Chemical Flowmeter, clear acrylic, 0-10 GPH
Circuit Breakers, resettable

Recovery Tank: 70 gallon aluminum, Epoxy finish.

Cleaning Wand: Stainless steel with heat shield. Grip and replaceable

vacuum lips with stainless steel solution valve.

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
WhispAir™ Vacuum Blower
CrossFire™ Water Heating Package
Deluxe Sound Suppression Package
Vacuum Recovery Tank
Carpet Cleaning Wand
Chemical Jug
Chemical Jug Holder
Chemical Jug Fill Line
150 ft, 2" Vacuum Hose
10 ft, 1 1/2" Wand Whip-line
10 ft, 1 1/2" Recovery Drain Line
50 ft, Water Supply Line
150 ft, Super Flex Solution Line
Dual-Wand Vacuum Fittings
Dual-Wand Solution Fittings
Freeze Guard System
Battery Box with Holder
Telescoping Console Legs with Casters
Van Decal Package
Van Installation Kit
Operation Manual
HydraMaster Jacket

Spare Parts

CrossFire 4.2
Section 1-6

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 assistence is needed, contact the factory and coordinate your needs. If this becomes necessary, always indicate the method of shipment you desire, i.e. UPS, Blue Label, Air Freight, Air Express, etc.

HydraMaster Parts Dept. Phone . . . . . (206) 775-7276
HydraMaster Parts Dept. Toll Free Fax 1-800-426-4225

Parts List (078-096)

PART NO	DESCRIPTION	QTY
010-014	Belt, #9341 Pump Drive	1
010-018	Belt, BX 59-MultiCat Drive	2
018-004	Breaker, 25 amp Circuit	1
018-005	Breaker, 20 amp Circuit	1
025-011	Cable, Aqua 5' Choke	1
049-046	Filter, Oil - 20 HP Honda	1
049-007	Filter, S/S Vacuum Pump	1

PART NO	DESCRIPTION	QTY
049-015	Filter, 1/2" Replacement Y	1
049-016	Filter, 1/4" Replacement Y	1
049-023	Screen, Garden Hose	1
049-045	Filter, Air - 20 HP Honda	1
049-030	Filter Bag, 92+ Truck Mount	2
052-050	Quick Connect, 440 Male	3
052-051	Quick Connect, 440 Female	2
052-052	Quick Connect, 660 Male	1
052-053	Quick Connect, 660 Female	1
057-043	Gasket, Recovery Tank - All	1
076-005	Jet, #6 S/S - Hydra Hoe	1
074-003	Gauge, Hi PSI (0-1000)	1
074-020	Meter, Chemical Flow - CDS	1
078-018	Kit, Diaphragm 3 GPM H-M Hi PSI	1
078-015	Kit, Chem Flowmeter	1
078-019	Kit, H/M Solution Valve	1
078-101	Kit, Seal & Spring Hi PSI	1
106-017	Plug, 20 HP Honda, Spark	2
131-037	Wrap, Exhaust Insulation	1
149-011	Thermostat, Aqua 185 Deg.	1
149-013	Sensor, 245 Degree - Hot	1
157-001	Switch, Tethered Mercury	2
157-007	Switch, 12V DC Lited	1
157-008	Switch, Ignition	1
157-022	Switch, Relay - A/C, B/C, CDS	2
157-111	Switch, Chrome Momentary	1
169-022	Valve, 1 1/2" Full Port	1
169-062	Valve, 1/4 Anti-Siphon	1
169-120	Valve, Chemical System	1

Responsibilities

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The **Purchaser's** responsibilities are:

Prior to arrival of unit, install 5/8" exterior plywood flooring in the vehicle and cover it with artificial turf.

♦ CAUTION ♦

Purchase heavy duty 42 - 60 amp hour battery and have the battery 'slow' charge if new. If the battery is not fully charged, damage can occur to the engine charging regulator.

Reading of 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:

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 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 INCLUDES:

- 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 staring the unit;
- Starting the unit to check engine and see that all systems function normally;
- Checking all hoses, wands, etc. for correct operation.

TRAINING SHALL INCLUDE:

- 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.

Vehicle Prep

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Section 1-10

The preferable vehicle for a CrossFire or ProFire installation is a cargo van with a heavy-duty suspension package. The van should have 3/4 ton capacity.

TRUCK PREPARATION

The manufacturer recommends the installation of plywood flooring, covered with polypropylene 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 a metal-to-cushion mounting rather than metal-to-metal, insulation and makes an attractive van interior. The astroturf should be color keyed to the van interior.

Materials Needed:
1. 2 sheets 4x8x⅝" exterior plywood
2. 6'x12' piece of commercial astroturf
3. 16 - 1½" sheet metal screws
4. 1 quart marine adhesive (optional)

5. 1 staple hammer with ½" staples
(See illustration for correct placement of plywood flooring)

ROOF VENTS

HydraMaster strongly recommends installation of roof vents in all truckmount installations. When installing equipment with propane heaters, these must be vented through the roof of the van.

PLACEMENT OF UNIT IN VEHICLE

There are two recommended unit placements described below and illustrated in the following diagrams.

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 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 improves 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.

Figure 1-1: **Plywood Installation**

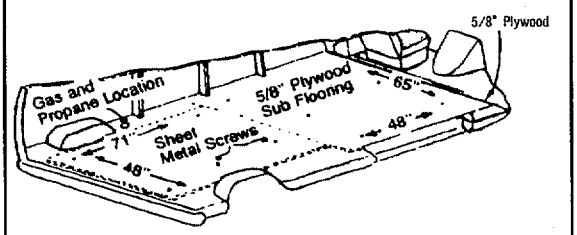


Figure 1-2: **Astroturf and Roof Vent**

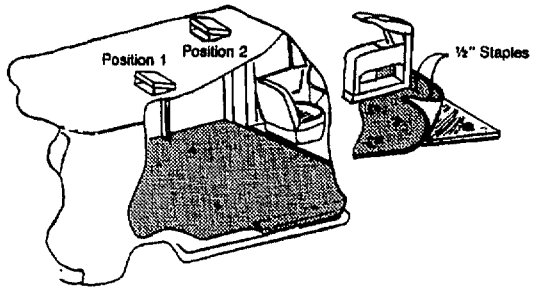
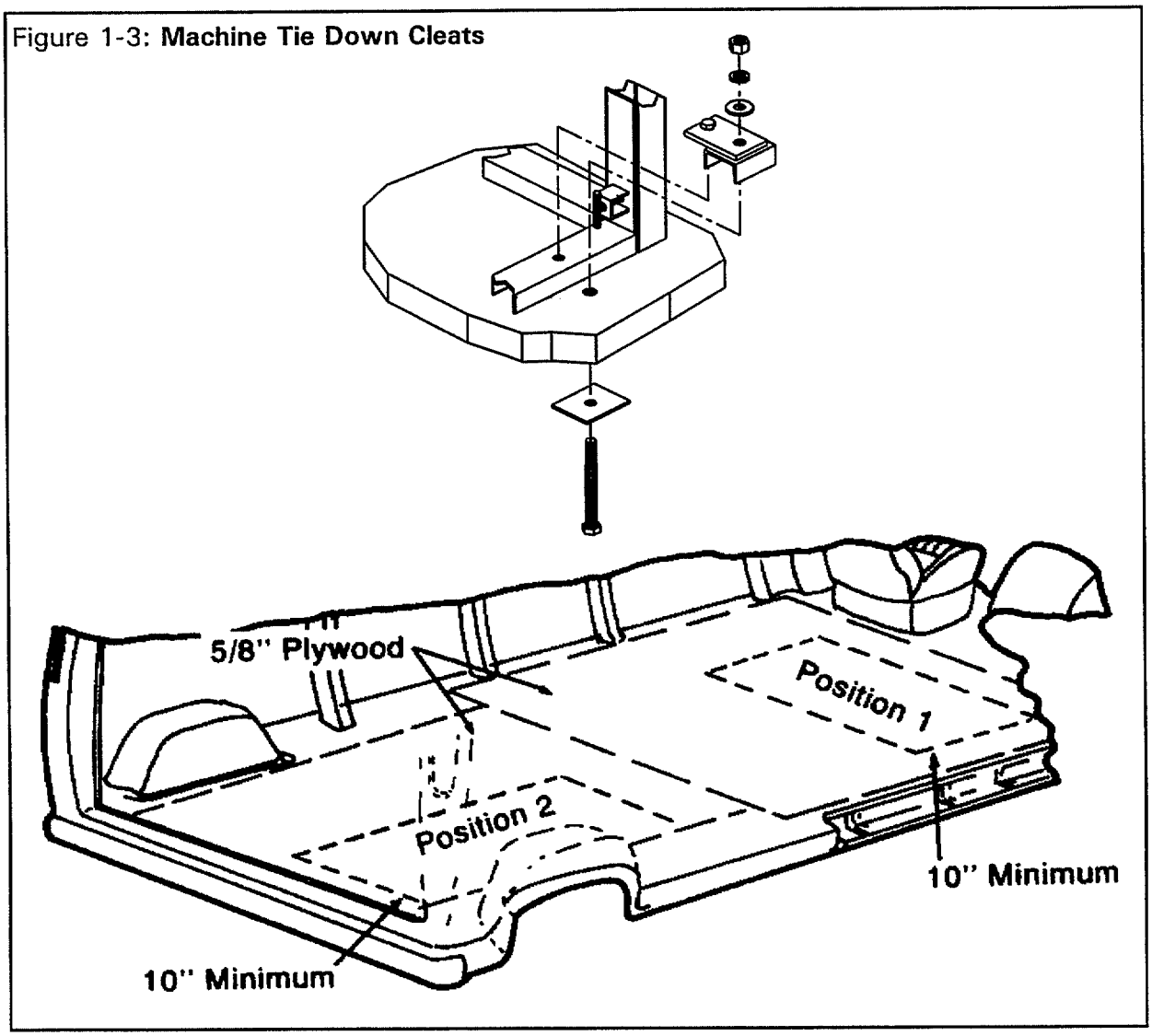


Figure 1-3: **Machine Tie Down Cleats**



♦ WARNING ♦

Ensure that the machine is well secured to the floor of the van with the hardware supplied. A sudden or crash stop will cause the machine to rocket forward, all 750 lbs. worth! 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.

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

♦ WARNING ♦

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

♦ WARNING ♦

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

♦ WARNING ♦

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

Local Water Precautions

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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 equipment in direct proportion to the level of hardness.

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 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.

WASTE WATER 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.

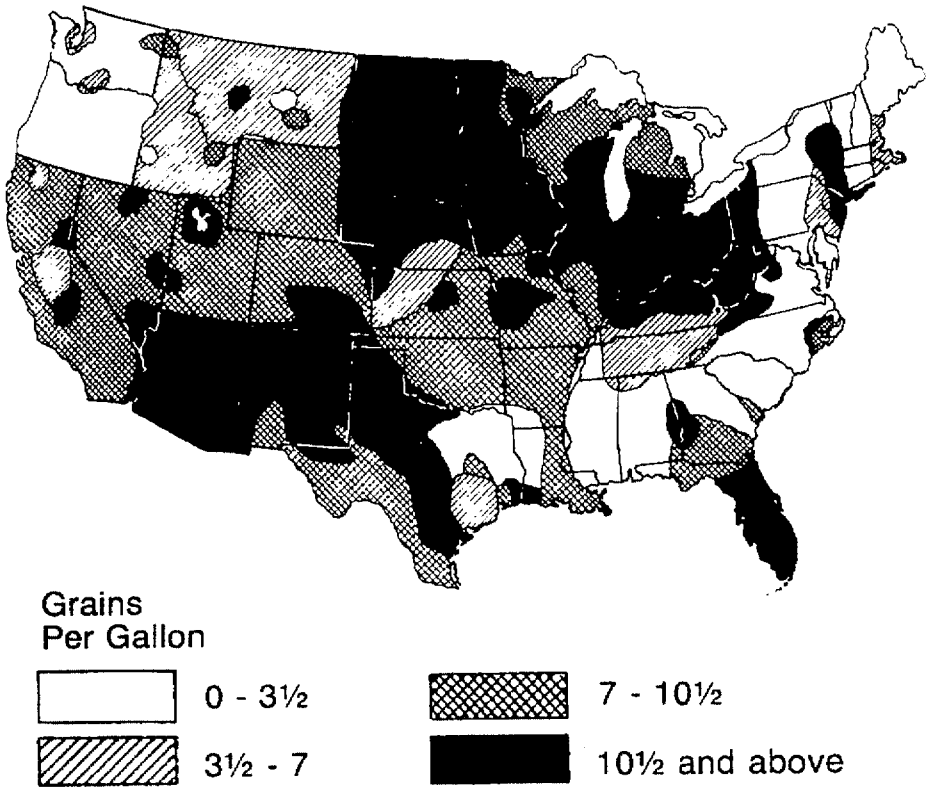
IN ACCORDANCE WITH THE EPA, STATE AND LOCAL LAWS, DO NOT DISPOSE OF WASTE WATER INTO GUTTERS, STORM DRAINS, STREAMS, RESERVOIRS, ETC.

In most cases, an acceptable method of waste water 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 waste water 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 waste water 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 waste water and pump it out simultaneously to the cleaning operation. The hidden benefit of this process is that the operator 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.

Figure 1-4: **Hard Water Map**



Machine Assembly Parts

CrossFire 4.2
Section 1-19

Figure 1-5: **Machine Assemblies**

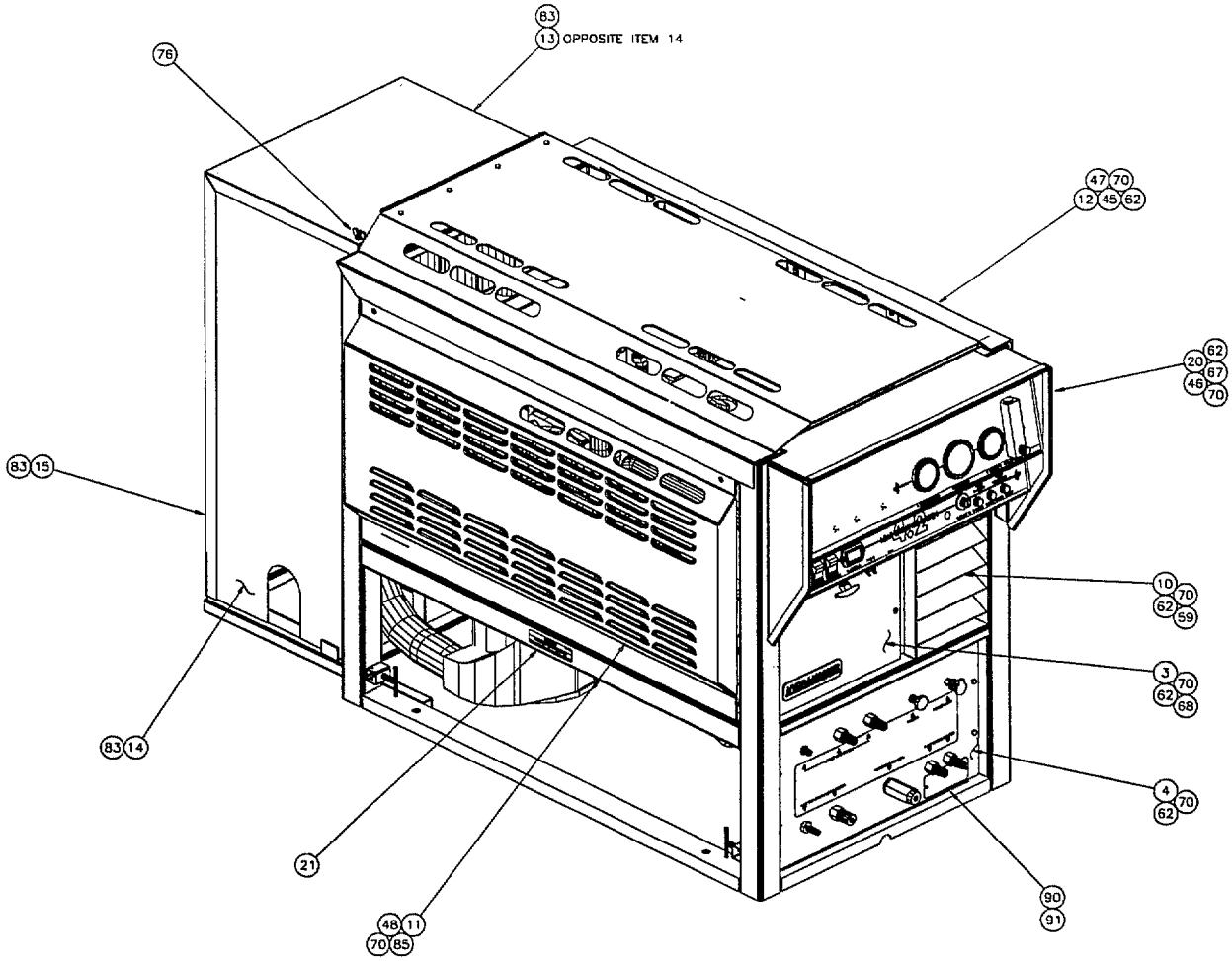


Figure 1-6
D2950, Rev B

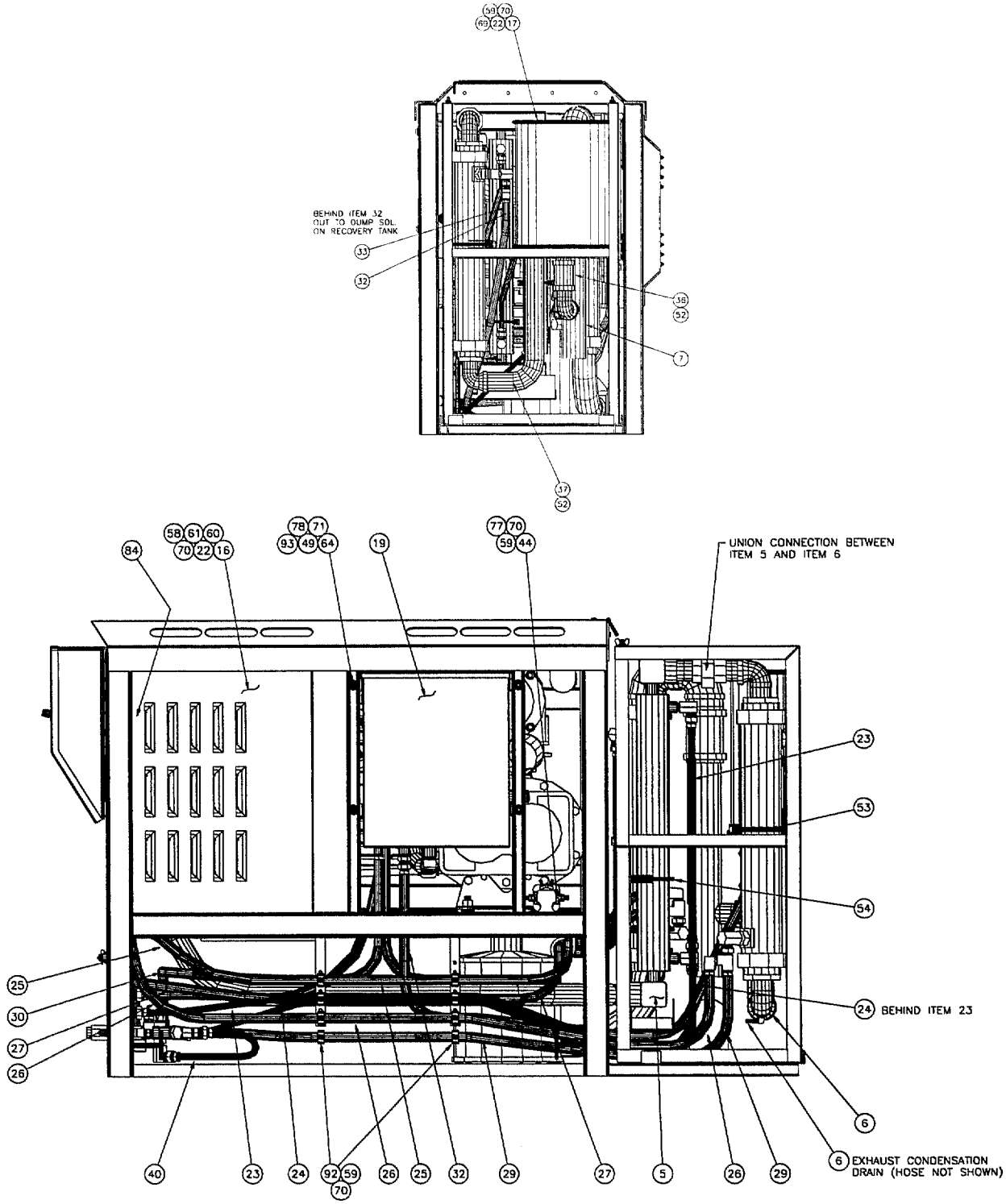
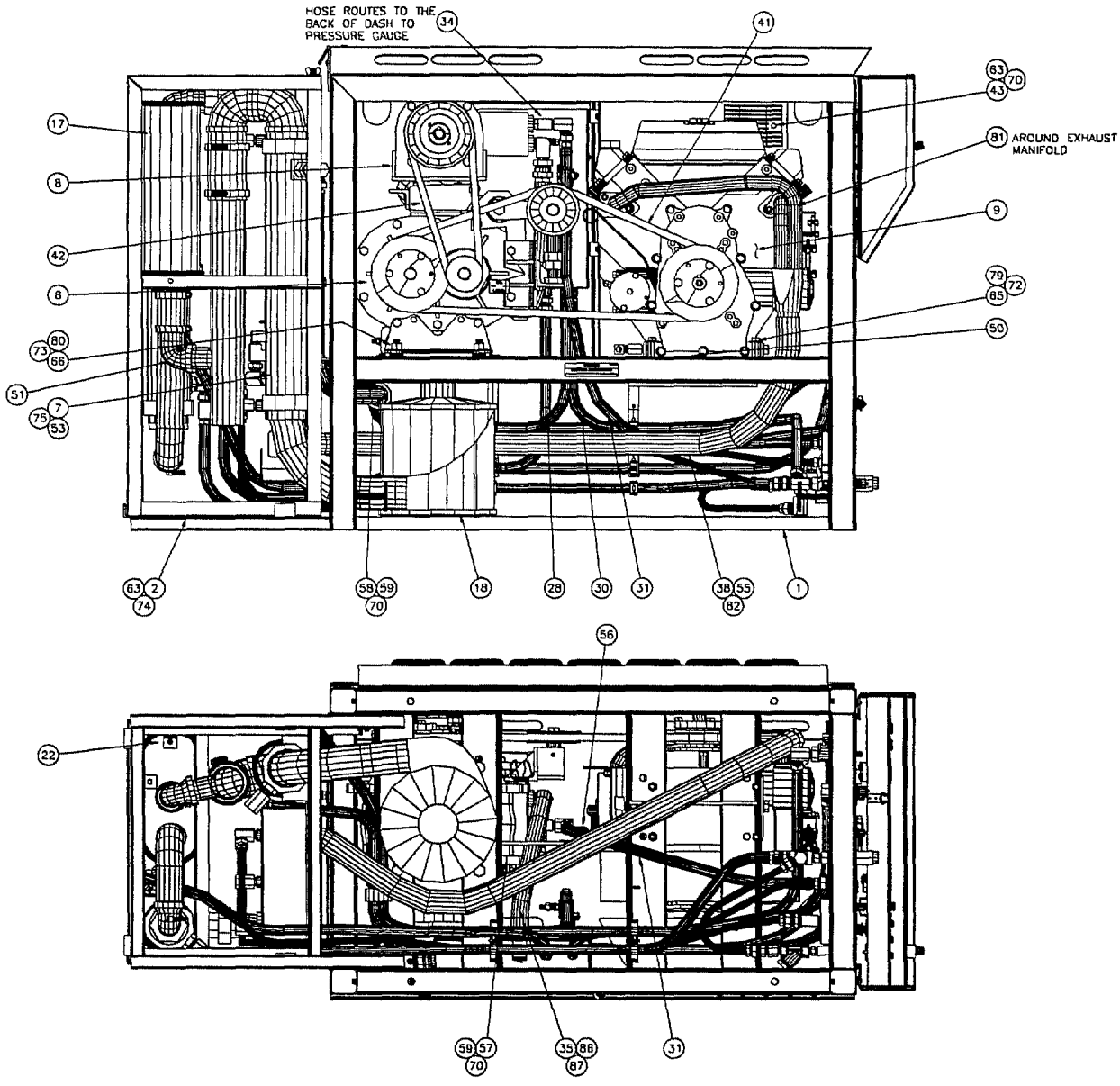


Figure 1-7


HOSE ROUTES TO THE BACK OF DASH TO PRESSURE GAUGE
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AROUND EXHAUST MANIFOLD
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35
86
87
31

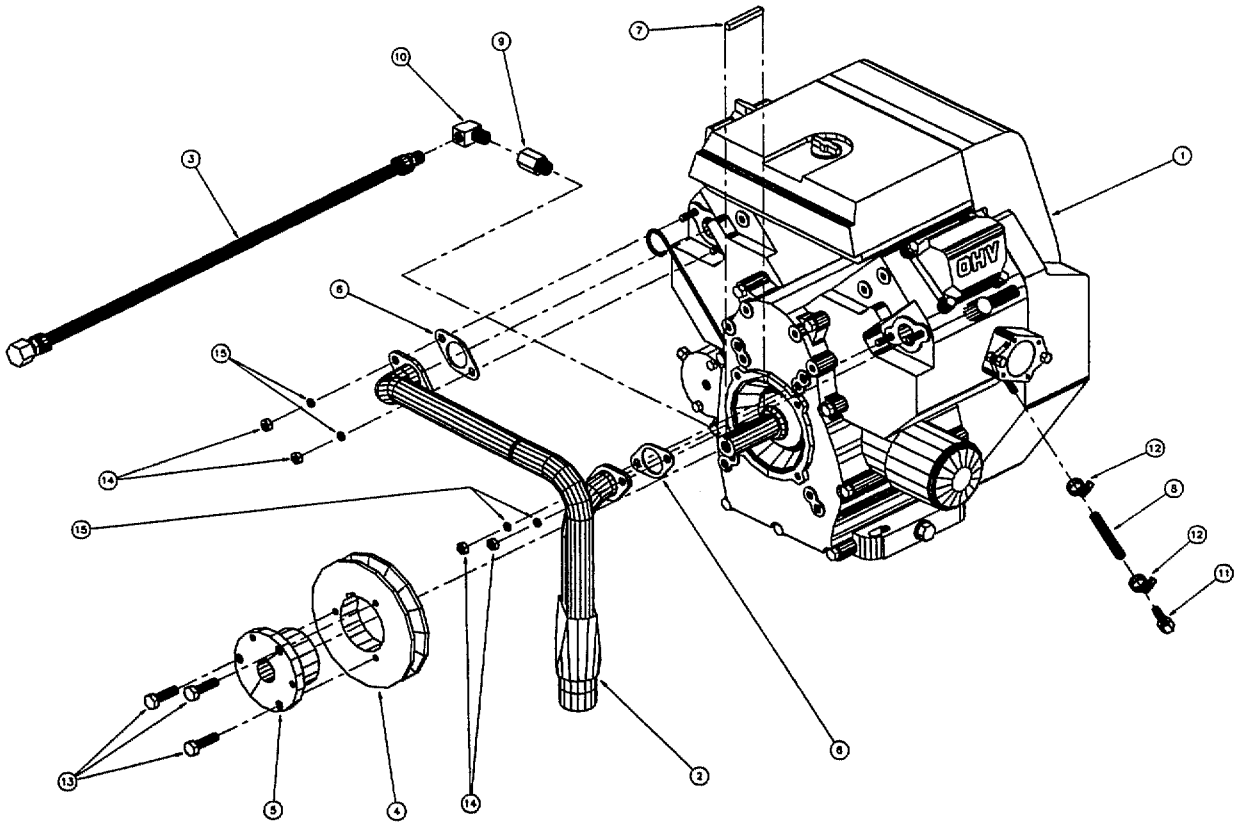
Machine Assembly

ITEM	PART NO	DESCRIPTION	QTY
1	055-015	Frame, Multi Fire	1
2	055-030	Frame, HX Heat Exchanger Mount	1
3	Figure 1-16	Mid Panel Assembly	1
4	Figure 1-17	Lower Panel Assembly	1
5	Figure 1-19	Triple HX Assembly	1
6	Figure 1-21	By-Pass HX Assembly	1
7	Figure 1-20	Preheater HX Assembly	1
8	Figure 1-9	Pump and Blower Assembly	1
9	Figure 1-8	Engine Assembly, Honda V-Twin 20 HP	1
10	100-037	Louver	1
11	041-162	Cover, Deflector - Side	1
12	041-160	Cover, Top	1
13	041-040	Cover, Heat Exchanger Side - Right	1
14	041-041	Cover, Heat Exchanger Side - Left	1
15	041-032	Cover, Upper Heat Exchanger	1
16	042-013	Housing, Air Duct	1
17	093-029	Muffler	1
18	093-017	Silencer, 2½" Whisper	1
19	Figure 1-12	Mix Tank Assembly	1
20	Figure 1-15	Dash Assembly	1
21	081-032	Label, "Caution - Hot Surface..."	1
22	015-236	Bracket, Air Duct Mount	2
23	068-083	Hose, ⅜" x 70" Teflon	1
24	068-114	Hose, ⅜" x 50" Teflon	1
25	068-222	Hose, ½" x 62" Rubber with ⅜" Ends - Yellow	1
26	068-223	Hose, ½" x 58" Rubber with ⅜" Ends - Yellow	1
27	068-224	Hose, ½" x 67" Rubber with ⅜" Ends - Blue	1
28	068-225	Hose, ½" x 44" Rubber with ⅜" Ends - Blue	1
29	068-227	Hose, ½" x 51" Rubber with ⅜" Ends - Red	1
30	068-228	Hose, ½" x 36" Rubber with ⅜" Ends - Yellow	1
31	068-237	Hose, ⅜" x 40" Throb	1
32	068-233	Hose, ½" x 55" Rubber with ⅜" Ends - Red	1
33	068-234	Hose, ⅜" x 82" Rubber with ⅜" and ¼" Ends	1
34	068-235	Hose, 3/16" x 59" Teflon	1
35	068-170	Hose, ¾" x 18" Steam without Ends	1

ITEM	PART NO	DESCRIPTION	QTY
36	068-144	Hose, 1⅝" x 3" Red Stripe - Glass Pack	1
37	068-275	Hose, 1⅝" x 17" Red Stripe Exhaust	1
38	068-231	Hose, 1⅝" x 50" s/s Exhaust	1
40	068-071	Hose, ⅜" x 12" Teflon	1
41	010-050	Belt, 5VX-610 Single	1
42	010-014	Belt, Pump Drive	1
43	135-035	Regulator, Honda Voltage	1
44	157-016	Switch, Starter Solenoid	1
45	067-013	Hinge, Top Cover	1
46	067-015	Hinge, Dash	1
47	108-024	Protector, Grommet Bumper	2
48	089-003	Magnet, Arm	2
49	060-008	Grommet, 5/16" ID Rubber - Mix Tank	8
50	060-007	Grommet, ⅜" Rubber	2
51	052-209	Street Elbow, 1¼" IPS MXF, Galv., 150 lb.	1
52	033-007	Clamp, #28 s/s Hose	2
53	033-055	Clamp, 3½" Muffler	2
54	033-058	Clamp, 2½" Muffler	3
55	033-028	Clamp, Muffler 1⅝"	2
56	033-038	Clamp, Hose Hanger	1
57	033-040	Clamp, ¾" Spring-Rake and Accessory	1
58	033-057	Clamp, 1" Cushion Loop	4
59	143-132	Screw, 10-24 x ¾" HHC s/s	2
60	143-112	Screw, 10-24 x ⅜" HHCS	4
61	143-133	Screw, 10-24 x 1½" HHC s/s	2
62	143-126	Screw, 10-24 x ½" s/s HHC	19
63	143-115	Screw, ¼-20 x ¾" HHCS s/s	4
64	143-004	Screw, ¼-20 x 1½" HHC s/s	4
65	143-093	Screw, ⅜-16 x 2" HHC	4
66	143-039	Screw, ½-13 x 1½" HHC Grade 5, Zinc Plated	4
67	143-060	Screw, 10-24 x ⅜" Flat Hd Machine	3
68	143-063	Screw, 10-24 x ¾" Flat Phillips Hd s/s	2
69	143-119	Screw, #8 x ¾" HXWSHD SM	2
70	094-034	Nut, 10-24 s/s Nylock	31
71	094-009	Nut, ¼-20 s/s Nylock	4

ITEM	PART NO	DESCRIPTION	QTY
72	094-015	Nut, ⅜-16 Two-Way Lock, Zinc Plated Steel	4
73	094-037	Nut, ½-13 Two-Way Lock, Zinc Plated Steel	4
74	094-007	Nut, ¼-20 Whiz	2
75	094-016	Nut, ⅜-16 Whiz	2
76	094-039	Nut, ¼ s/s Wing	2
77	174-001	Washer, #10 s/s Flat	2
78	174-003	Washer, ¼" s/s Flat	4
79	174-005	Washer, ⅜ Flat	4
80	174-007	Washer, ½ Flat	4
81	131-009	Insulation, 1' x ⅛" x 15' Duct	1
82	131-037	Wrap, Exhaust Insulation - 2" x 50'	1
83	131-003	Gasket, Trim	1 Ft
84	131-027	Trimlok, CF Brow Trim	56"
85	143-168	Screw, 10-24 x ¾" BTN HD s/s	2
86	052-358	Insert, #1212 Brass	1
87	052-129	Insert, #812	1
88	177-004	Wheel, 3" TR MNT Caster w/ Sq. Tube	4
89	600-001-001	Leg, Silver	4
90	105-012	Plate, Machine Serial ID	1
91	140-015	Rivet, ⅛" x ¼" Aluminum Pop	2
92	033-025	Clamp, 1" Tie Wrap Harness Mounting	13
93	154-002	Spacer, Mix Tank Mounting	4

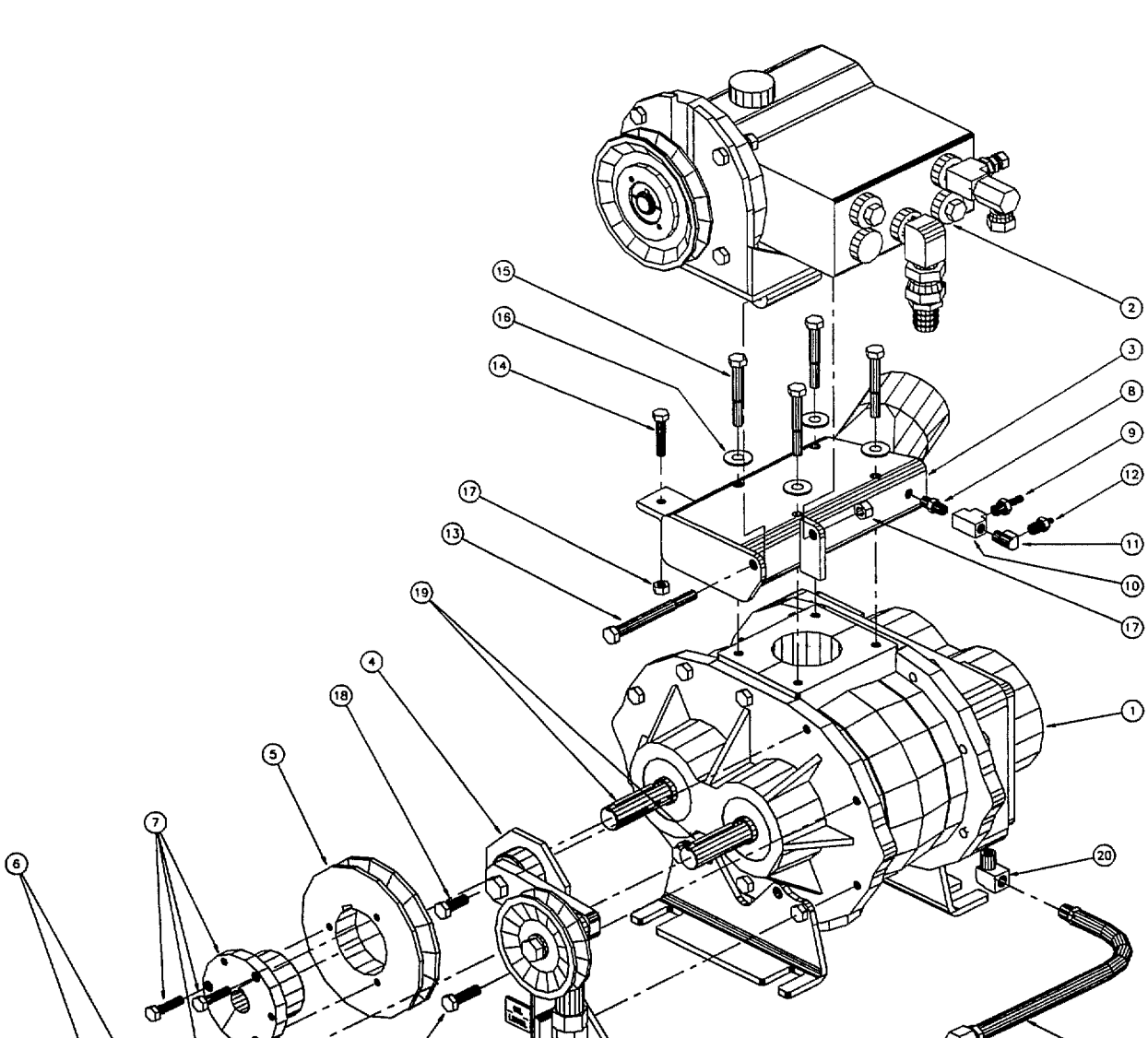
Figure 1-8: **Honda Engine Assembly**



Honda Engine Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	047-001	Engine, 20 HP Honda V-Twin	1
2	090-002	Manifold, 20 HP Honda s/s Exhaust	1
3	068-221	Hose, ⅜" x 24" Pump Drain	1
4	109-026	Pulley, 1B 5V54 - Single Belt	1
5	020-016	Bushing, #B x 1" Hub Engine	1
6	057-016	Gasket, P220 Exhaust Manifold	2
7	077-006	Key, Briggs 16 HP Engine	1
8	068-026	Hose, ¼" Rubber Fuel Line Per Foot	3"
9	052-063	Bushing, 14 MM x ¼" NPT Eng. Oil Drain Adp.	1
10	052-085	Elbow, ¼" Brass Street	1
11	052-109	Insert, #24	1
12	033-031	Clamp, Size #4 Hose	2
13	143-158	Screw, 5/16" - 18 x 1¼" HHC s/s	3
14	094-043	Nut, 8 MM Hex	4
15	174-019	Washer, ¼ s/s Lock	4

Figure 1-9: **Pump and Blower Assembly**

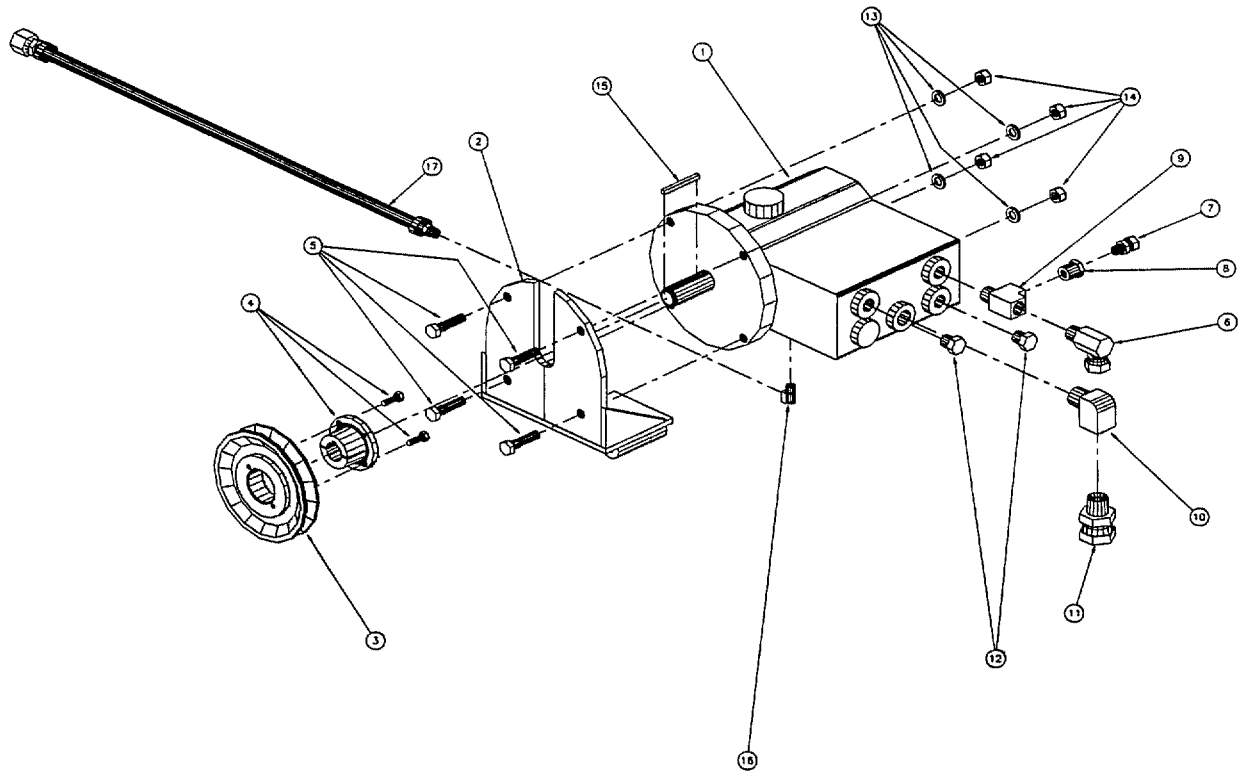


Pump and Blower Assembly

ITEM	PART NO	DESCRIPTION	QTY
1	111-022	Blower, 4.2 Hydra Whisper	1
2	Figure 1-10	Pump Assembly	1
3	015-250	Bracket, 4.2 Blower Collector Box	1
4	Figure 1-11	Pulley Idler Assembly	1
5	109-026	Pulley, 1B 5V54 - Single Belt	1
6	109-006	Pulley, 2¾" x ⅞" Pump	1
7	020-017	Bushing, #B x ⅞" Hub Blower	1
8	052-069	Nipple, ⅛" Brass Hex	1
9	052-293	Insert, #23	1
10	052-092	Tee, ⅛" Brass	1
11	052-084	Elbow, ⅛" Brass Street	1
12	----------	Fitting, Vacuum Gauge*	1
13	143-139	Screw, ⅜" - 16 x 4" HHCS Grade 8	1
14	143-020	Screw, ⅜" - 16 x 1½" HHC Grade 5 Zinc	1
15	143-097	Screw, ⅜" - 16 x 2½" Grade 5 HHCS	4
16	174-029	Washer, ⅜" SS Rubber Back	4
17	094-015	Nut, ⅜ - 16 2-Way Lock Nut, Zinc Plated Steel	2
18	143-019	Screw, ⅜ - 16 x 1¼" HHC Grade 5 Zinc	3
19	077-001	Key, #3 and #4 Vacuum Pump Drive	2
20	052-085	Elbow, ¼" Brass Street	1
21	068-221	Hose, ⅜" x 24" Pump Drain	1

* Note: This fitting comes with part no. 074-006 and is not available seperately.

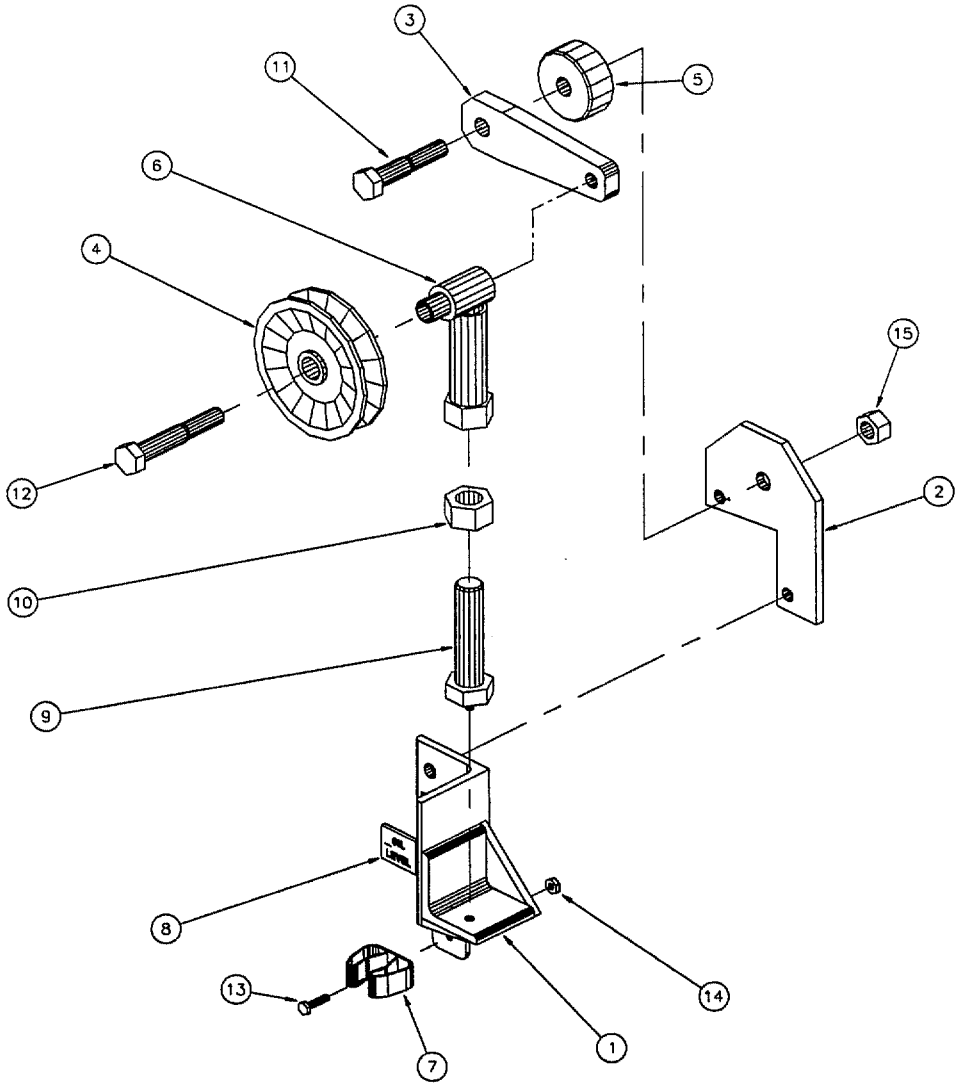
Figure 1-10: **Pump Assembly**



Pump Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	111-050	Pump, 3 GPM High PSI - Hydra	1
2	015-232	Bracket, Pump Mount	1
3	109-022	Pulley, #AK 54 H Pump	1
4	020-019	Bushing, #H x 7/8"	1
5	143-022	Screw, 3/8" - 16 x 1 3/4" HHC Grade 8	4
6	052-020	6MA-6UFS	1
7	052-001	2M-2UFS	1
8	052-060	Bushing, 3/8 M x 1/8 F Brass	1
9	052-023	6MT-6F-6F Brass	1
10	052-087	Elbow, 1/2" Brass Street	1
11	052-038	8M-12UFS	1
12	106-003	Plug, 3/8" Brass	1
13	174-005	Washer, 3/8" Flat	4
14	094-014	Nut, 3/8 - 16 Hex	4
15	077-001	Key, #3 and #4 Vacuum Pump Drive	1
16	052-084	Elbow, 1/8" Brass Street	1
17	068-256	Hose, 3/8" x 24" Pump Drain	1

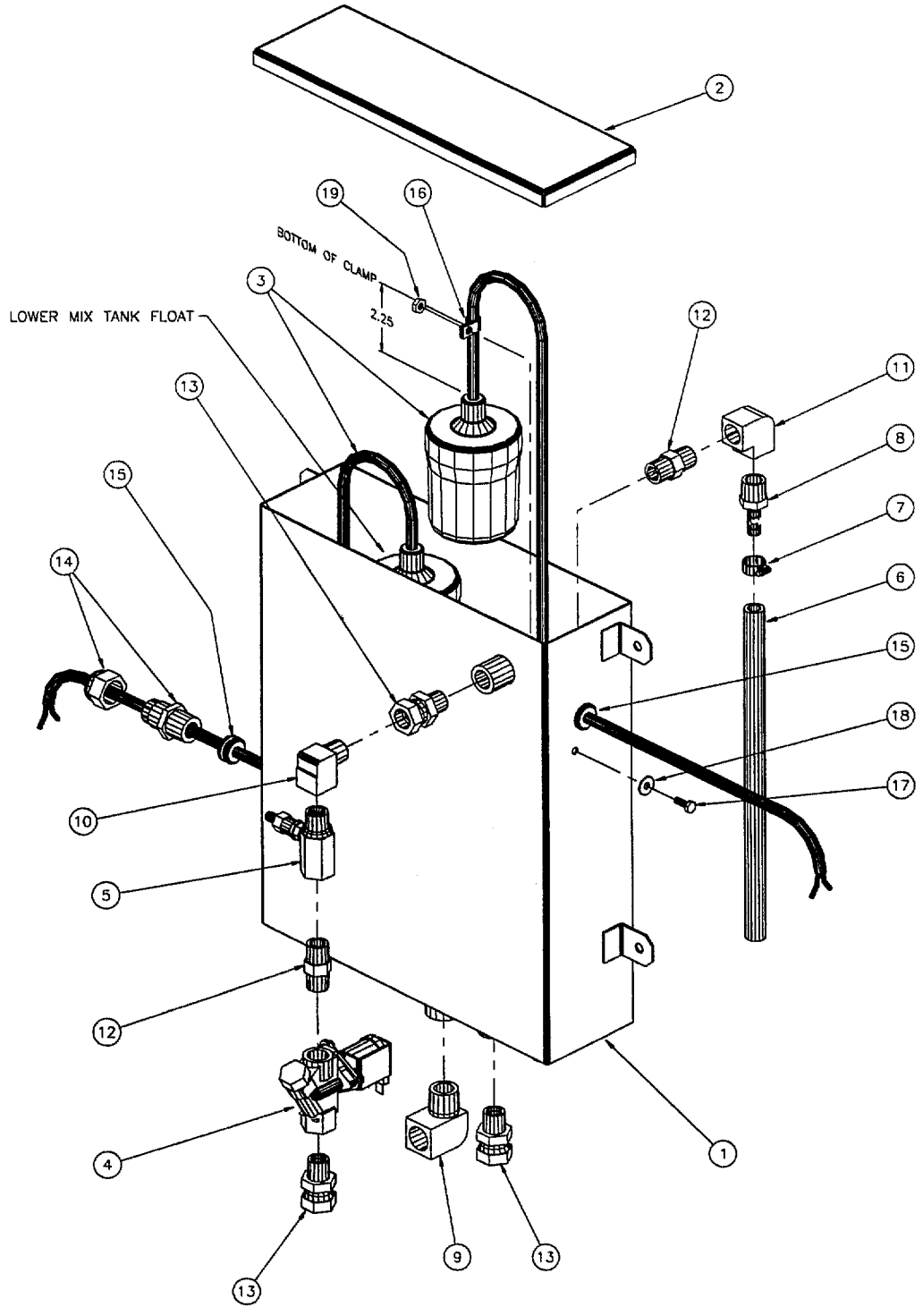
Figure 1-11: **Pulley Idler Assembly**



Pulley Idler Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	015-261	Bracket, Fixed Idler Support - For 2 Groove Sys.	1
2	015-251	Bracket, Idler Mount	1
3	015-262	Bracket, Single Belt Idler Pivot Arm w/o Pulley	1
4	109-027	Pulley, 15V4B Single Belt Idler	1
5	154-054	Spacer, Fixed Idler Support Arm - 2 Belt Sys.	1
6	154-056	Spacer, 4.2 Single Belt with Jacknut Fixed Idler	1
7	033-040	Clamp, ¾" Spring - Rake and Accessories	1
8	081-066	Label, "Oil Level"	1
9	143-202	Screw, ¾" x 3" Jack Screw Mod. for Idler Adj.	1
10	094-080	Nut, ¾" Hex	1
11	143-042	Screw, ½" - 13 x 2½" HHC Grade 8	1
12	143-036	Screw, ½" - 13 x 3" HHC Grade 8	1
13	143-132	Screw, 10 - 24 x ¾" HHC s/s	1
14	094-034	Nut, 10 - 24 s/s Nylock	1
15	094-037	Nut, ½" - 13 Two Way Lock, Zinc Plated Steel	1

Figure 1-12: **Mix Tank Assembly**

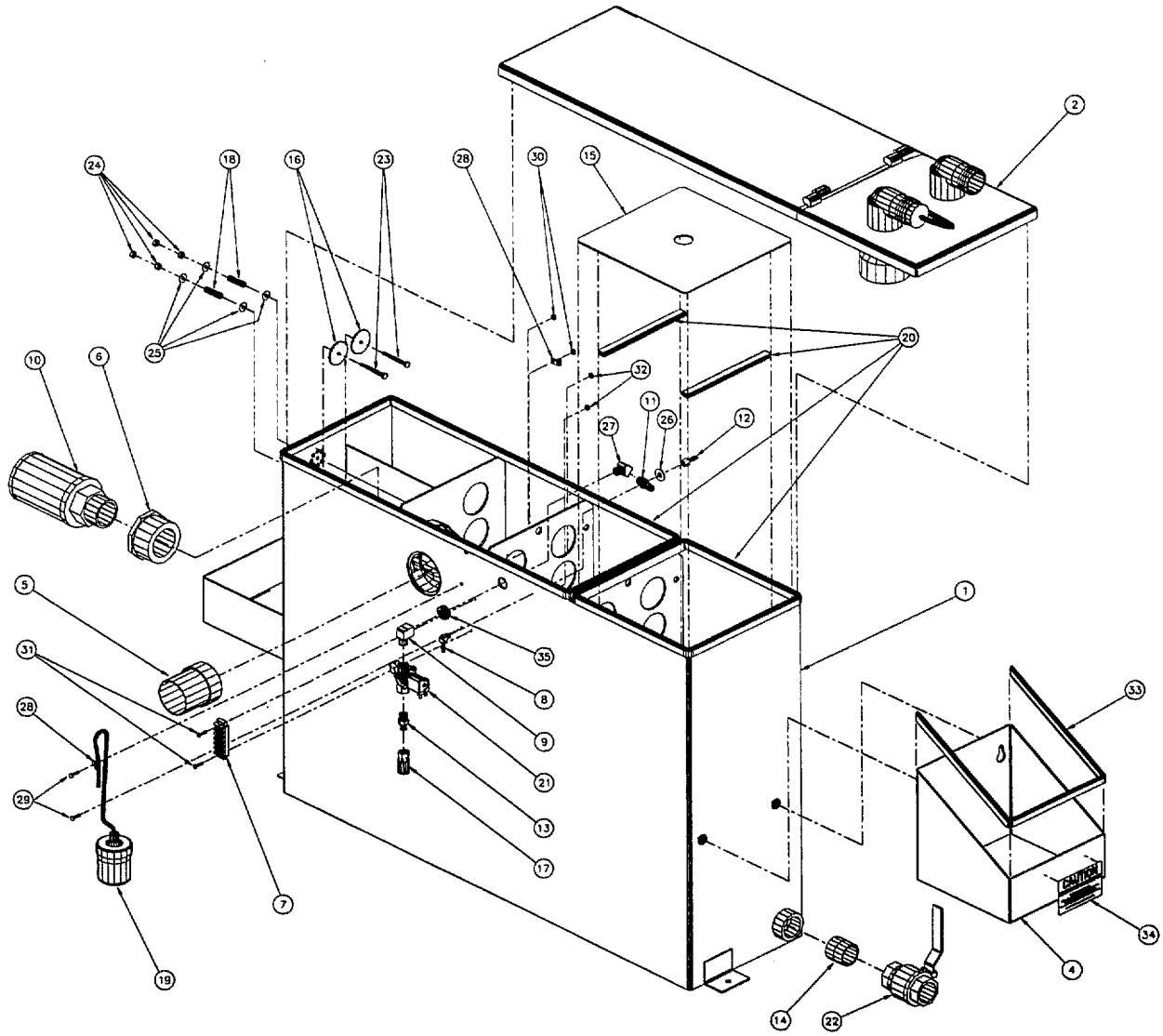


Mix Tank Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	159-059	Tank, '95 s/s Mix	1
2	041-159	Cover, '95 Chemical Mix Tank s/s	1
3	157-001	Switch, Tethered Mercury Float - 25°	2
4	169-120	Valve, Chemical System Solenoid - 12 Volt	1
5	181-008	Venturi, Low PSI Injector	1
6	068-326	Hose, ⅜ Clear with Braid Sol.	15"
7	033-004	Clamp, Size 6 Mini Hose	1
8	052-104	Insert, #66	1
9	052-087	Elbow, ½" Brass Street	1
10	052-086	Elbow, ⅜" Brass Street	1
11	052-142	Elbow, ⅜" F x F Brass	1
12	052-074	Nipple, ⅜ Brass Hex	2
13	052-019	6M-6UFS	3
14	108-050	Protector, Electric Cord Lock Bulk Head Fitting	1
15	060-008	Grommet, 5/16" ID Rubber - Mix Tank	2
16	033-021	Clamp, ¼ Nylon Hose	1
17	143-169	Screw, 10-24 x ½" HHCS	1
18	174-036	Washer, #10 SS Flat - Rubber Back	1
19	094-034	Nut, 10-24 s/s Nylok	1
Not Shown:			
	131-009	Insulation, 1' x ⅛" x 15' Duct	1

Figure 1-13: **Recovery Tank Assembly**

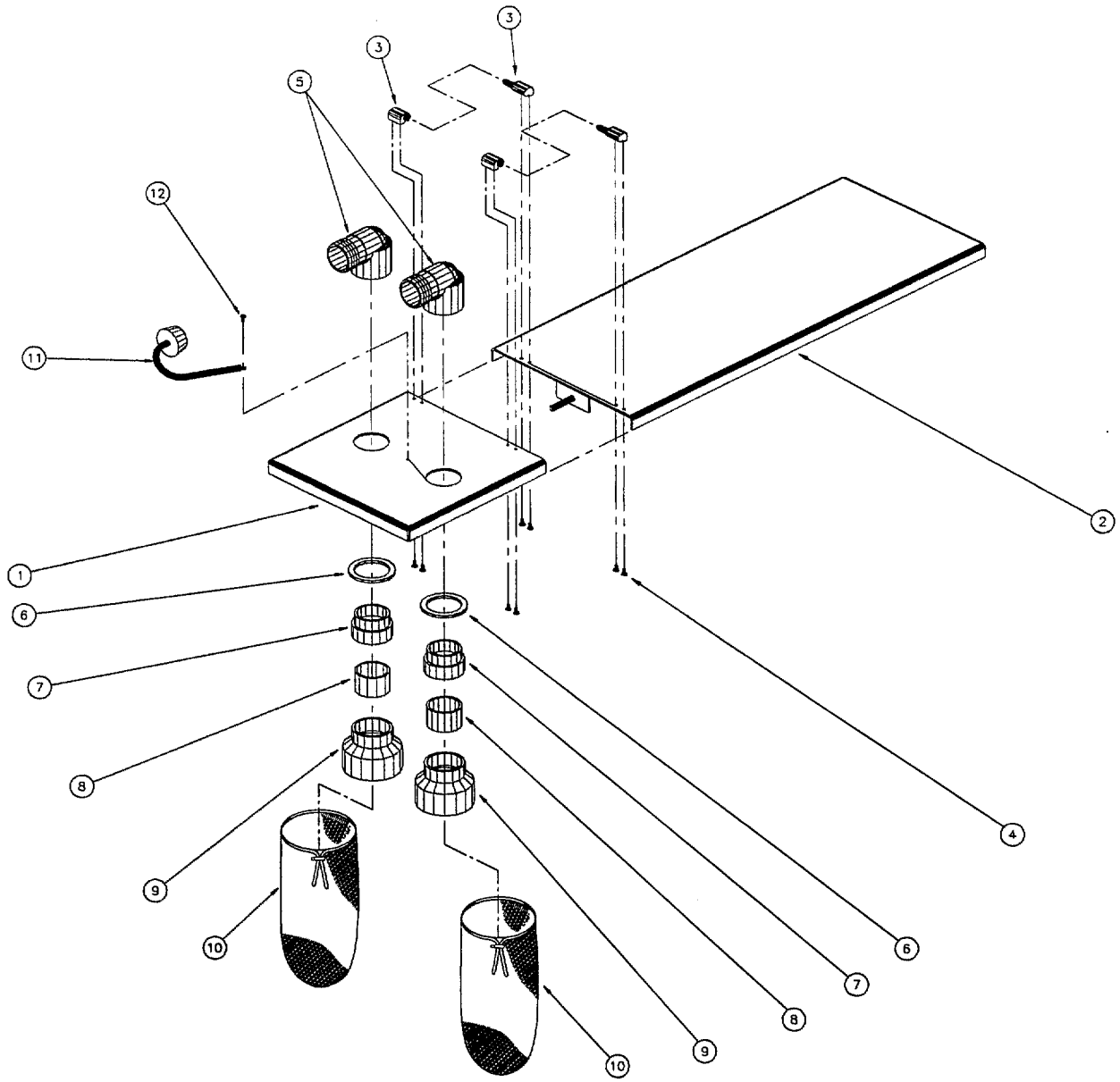
D2820, Rev B



Recovery Tank Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	159-040	Tank, Recovery	1
2	Figure 1-14	Dual Inlet Lid Assembly	1
4	166-002	Tray, Chemical Soap Jug	1
5	052-332	Adapter, Vacuum Tank Outlet	1
6	052-342	Adapter, 3" NPT x 2" FPT - PVC	1
7	012-002	Block, 6 Post Terminal	1
8	052-253	Elbow, ⅛" Male x ¼" Barb	1
9	052-086	Elbow, ⅜" Brass Street	1
10	049-007	Filter, s/s Vacuum Pump-Blower	1
11	052-105	Insert, #68	1
12	052-109	Insert, #F24	1
13	052-073	Nipple, ¼" x ⅜" Brass Hex	1
14	052-182	Nipple, 1½" Close - Galv. Steel	1
15	105-011	Plate, Filter Bag Support	1
16	105-005	Plate, Vacuum Relief	2
17	052-436	Quick Connect, ¼" F x ¼" FPT	1
18	155-002	Spring, s/s Vacuum Relief Valve	2
19	157-001	Switch, Tethered Mercury Floated - 25 Deg.	1
20	131-028	Gasket, Trimlok Recovery Tank	14 Ft
21	169-120	Valve, Chemical System Solenoid, 12 Volt	1
22	169-022	Valve, 1½" Full Port Brass Dump	1
23	143-009	Screw, ¼ - 20 x 2½" HHC s/s	2
24	094-010	Nut, ¼ - 20 s/s Hex	4
25	174-003	Washer, ¼" s/s Flat	4
26	174-005	Washer, ⅜" Flat	1
27	052-083	Elbow, ⅜" Brass 45 Street	1
28	033-021	Clamp, ¼ Nylon Hose	2
29	143-132	Screw, 10-24 x ¾" HHC s/s	2
30	094-034	Nut, 10-24 s/s Nylock	2
31	143-051	Screw, 8-32 x ¾" Phil Binder Head	2
32	094-059	Nut, 8-32 s/s Nylock	2
33	131-003	Gasket, Trim	32"
34	081-070	Label, Small Caution Label	1
35	060-002	Grommet, Large Wiring	1

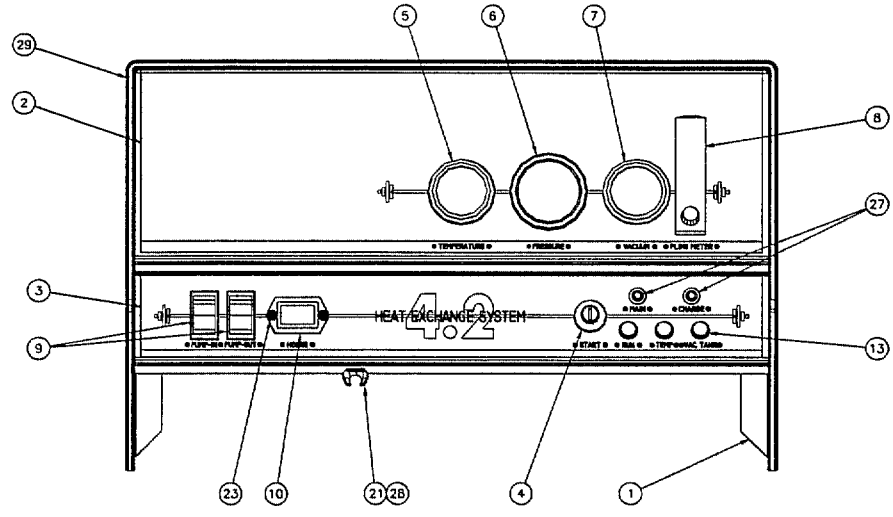
Figure 1-14: **Dual Inlet Lid Assembly**



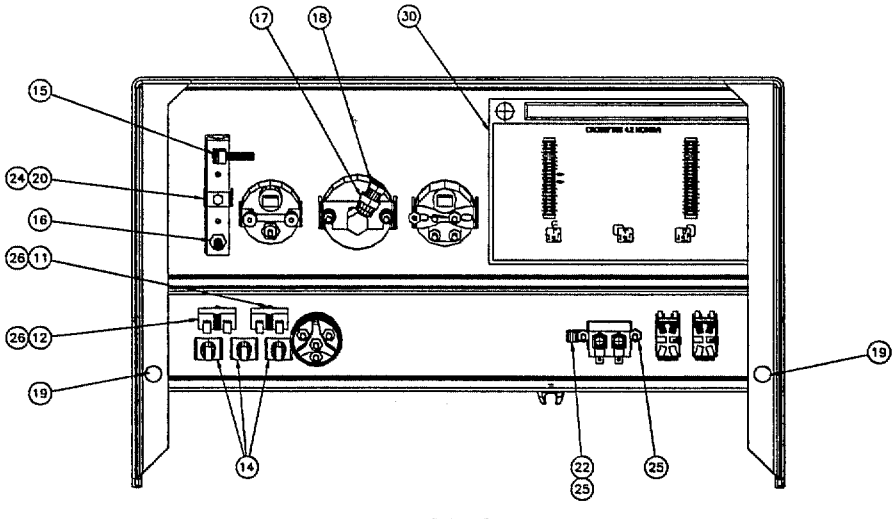
Dual Inlet Lid Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	041-087	Lid, Front Vacuum Tank	1
2	041-086	Lid, Rear Vacuum Tank	1
3	067-017	Hinge Set, Left - Recovery Tank	2
4	143-060	Screw, 10-24 x ⅜" Flat Head Machine	6
5	052-222	Elbow, 2" Comb - Insert x FPT	2
6	057-015	Gasket, 1½" Bulkhead Fitting	2
7	052-219	Adapter, 2" NPT x 2" F Slip ABS	2
8	125-014	Pipe, 2" Sch. 40, PVC x 20 Feet Long	2
9	052-404	Adapter, 3" F Slip x 2" F Slip	2
10	049-030	Filter Bag	2
11	078-039	Kit, Vacuum Inlet Stopper	1
12	143-166	Screw, 10-24 x ⅜ s/s HHC	1

Figure 1-15: **Dash Assembly**



FRONT VIEW

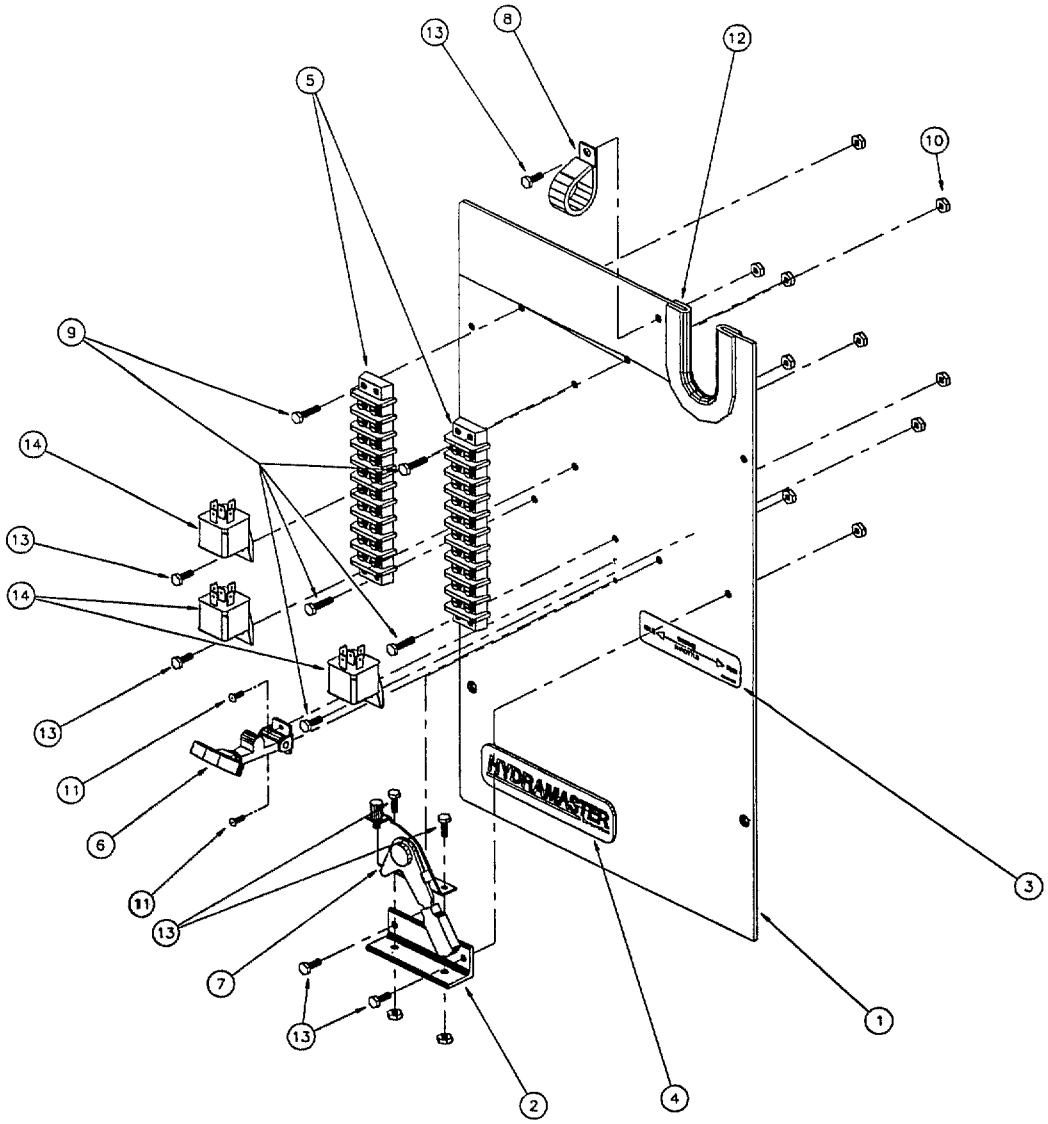


BACK VIEW

Dash Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	041-182	Cover, Brow	1
2	081-063	Label, CF 4.2 - Dash 2-Piece Set	1
3	081-063	Label, CF 4.2 - Dash 2-Piece Set	1
4	157-008	Switch, Ignition	1
5	074-001	Gauge, S/W Water Temperature	1
6	074-003	Gauge, High PSI (0-1000)	1
7	074-006	Gauge, Isspro Vacuum	1
8	074-020	Meter, Chemical Flow	1
9	157-007	Switch, 12 V DC Lighted Rocker	2
10	074-011	Meter, Rectangular Hour	1
11	018-004	Breaker, 25 Amp Circuit	1
12	018-005	Breaker, 20 Amp Circuit	1
13	084-006	Lamp, Red Pilot - Round	3
14	033-049	Clamp, Indicator Light	3
15	052-253	Elbow, ⅛" x ¼" Barb	1
16	052-097	Insert, #24	1
17	052-011	4FA - 4UFS	1
18	052-059	Bushing, ¼" M x ⅛" F Brass	1
19	108-024	Protector, Grommet Bumper	1
20	015-005	Bracket, Chem. Flow Meter	1
21	086-001	Latch, Cowling Hood	1
22	033-021	Clamp, ¼ Nylon Hose	1
23	143-061	Screw, 10-24 x ½" Rnd Phl Head	2
24	143-132	Screw, 10-24 x ¾" HHC s/s	1
25	094-027	Nut, 10-24 s/s Hex	2
26	094-025	Nut, ⅜ - 32 Half Nut Brass Nickle Plated	2
27	094-024	Nut, ⅜ - 32 Knurled Finish for Breakers	2
28	140-006	Rivet, ¼ x ⅛ s/s Pop	1
29	131-027	TrimLok, CF Brow Trim	1 Ft
30	081-081	Label, CF 4.2 Diagnostic Center	1

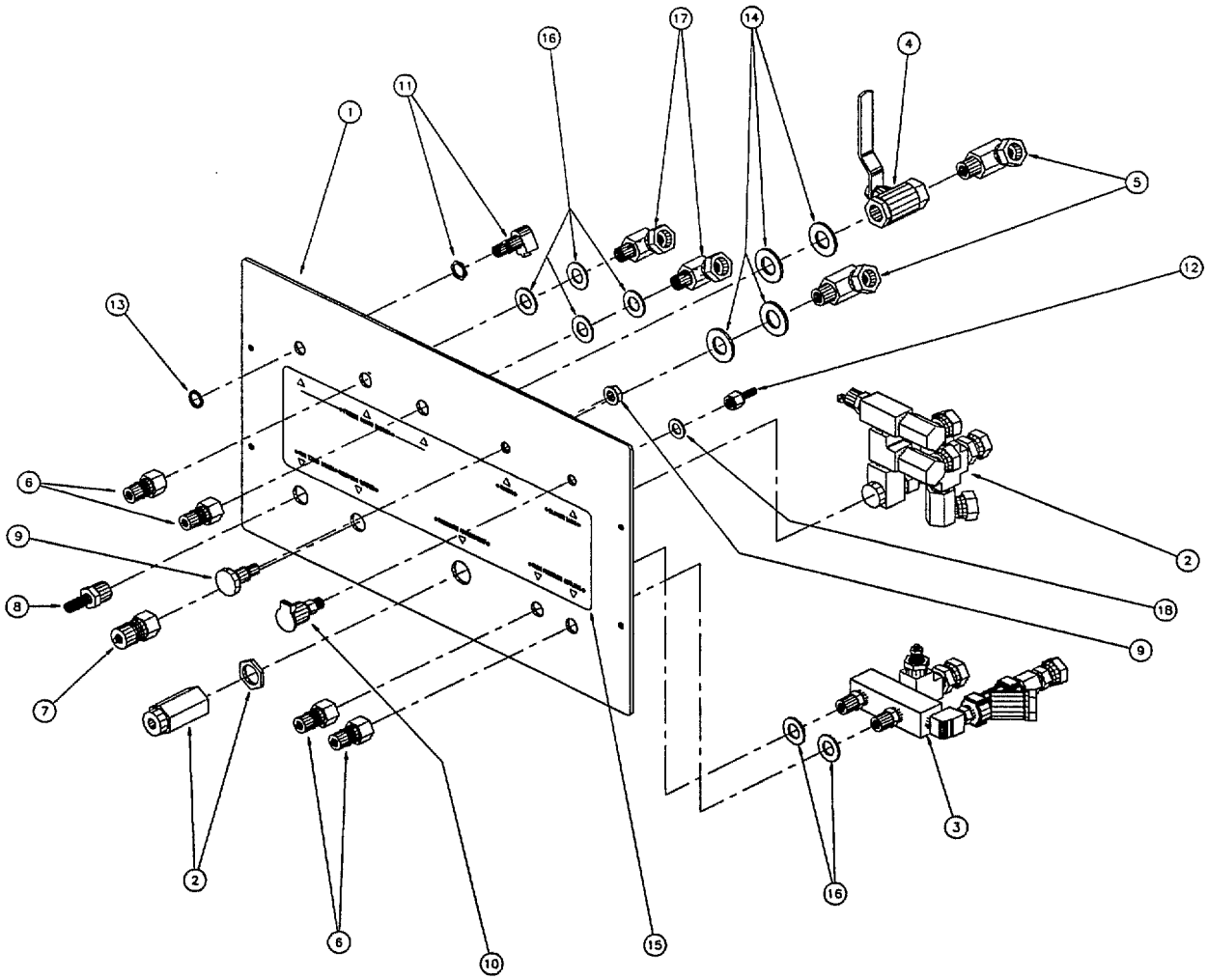
Figure 1-16: **Mid Panel Assembly**



Mid Panel Assembly Parts List

ITEM	PART NO	DESCRIPTION	QTY
1	100-041	Panel, Mid	1
2	015-248	Bracket, Throttle Assembly Mount	1
3	081-031	Label, Engine Throttle Adjustment	1
4	105-020	Plate, HydraMaster Cast Name	1
5	012-010	Block, 10 Post Terminal	2
6	086-001	Latch, Cowling Hood	1
7	029-004	Throttle, Adjustable Cable	1
8	033-057	Clamp, 1" Cushion Loop	1
9	143-132	Screw, 10-24 x ¾" HHC s/s	5
10	094-034	Nut, 10-24 s/s Nylock	12
11	140-006	Rivet, ¼ x ⅛ s/s Pop	2
12	131-027	Trimlok, CF Brow Trim	1 Ft
13	143-126	Screw, 10-24 x ½" s/s HHC	7
14	157-022	Switch, Relay	3
Not Shown:			
	161-009	Tape, 1" Double Back	5"

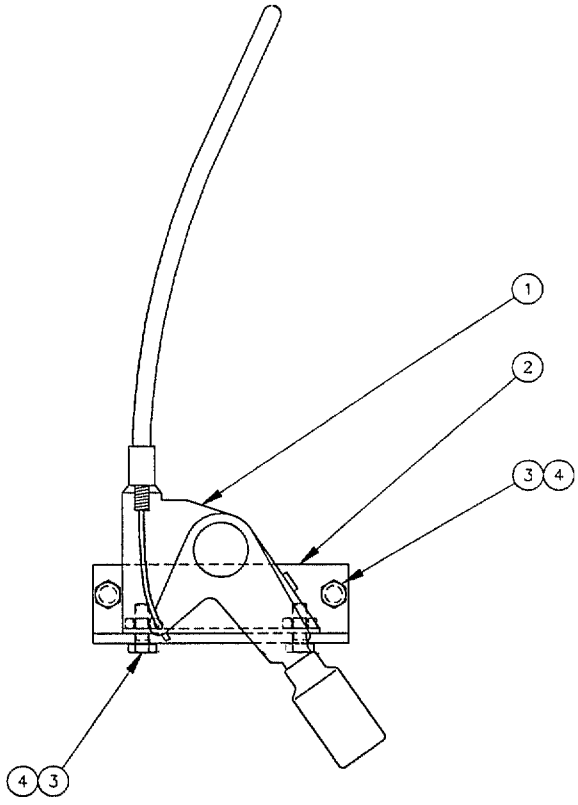
Figure 1-17: **Lower Panel Assembly**



Lower Panel Assembly Parts List

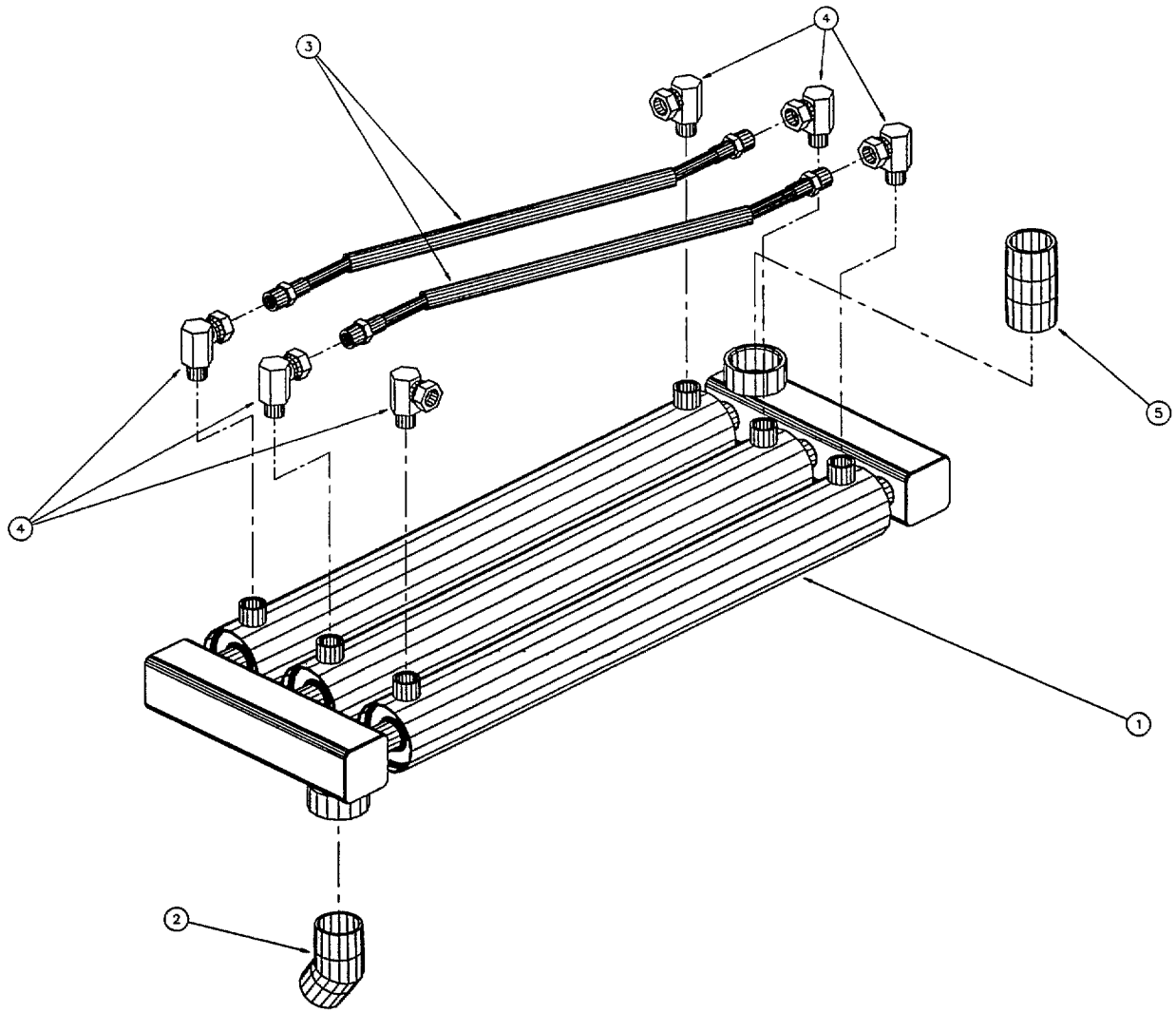
ITEM	PART NO	DESCRIPTION	QTY
1	100-030	Panel, Lower Front	1
2	Figure 1-23	By-Pass Manifold Assembly	1
3	Figure 1-22	High PSI Manifold Assembly	1
4	169-064	Valve, 3/8" Full Port Ball	1
5	052-020	6MA-6UFS	2
6	052-050	Quick Connect, 440 Male with Viton	4
7	052-052	Quick Connect, 660 Male with Viton	1
8	052-104	Insert, #66	1
9	025-011	Cable, Aqua 5' Choke	1
10	052-272	Cup, Gravity Feed Oil Blower Lubrication Port	1
11	157-111	Switch, Chrome Momentary 10224	1
12	052-096	Insert, #F23	1
13	094-055	Nut, Round Toggle Switch	1
14	174-008	Washer, 5/8 Flat	4
15	081-067	Label, CF Lower Panel	1
16	174-007	Washer, 1/2 Flat	6
17	052-014	4MA-6UFS	2
18	174-005	Washer, 3/8 Flat	1

Figure 1-18: **Throttle Control Assembly**
(Honda Equipped)



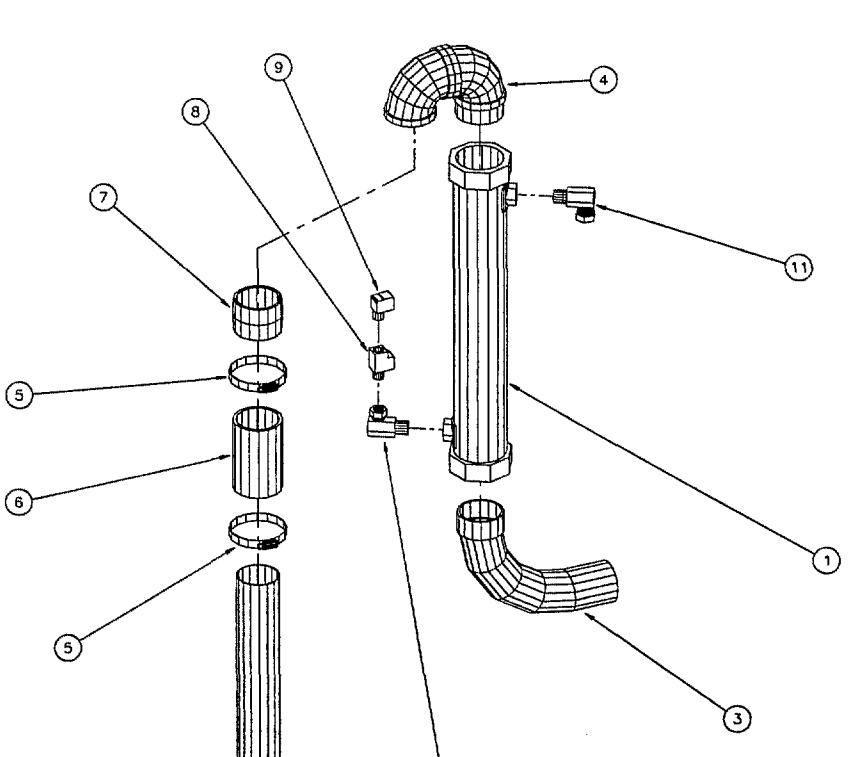
ITEM	PART NO	DESCRIPTION	QTY
1	029-004	Throttle Cable	1
2	015-248	Throttle Bracket	1
3	143-126	Screw, 10-24 x ½" HHCS	2
4	094-034	Nut, 10 - 24 Nylock	2

Figure 1-19: **Triple HX Assembly**



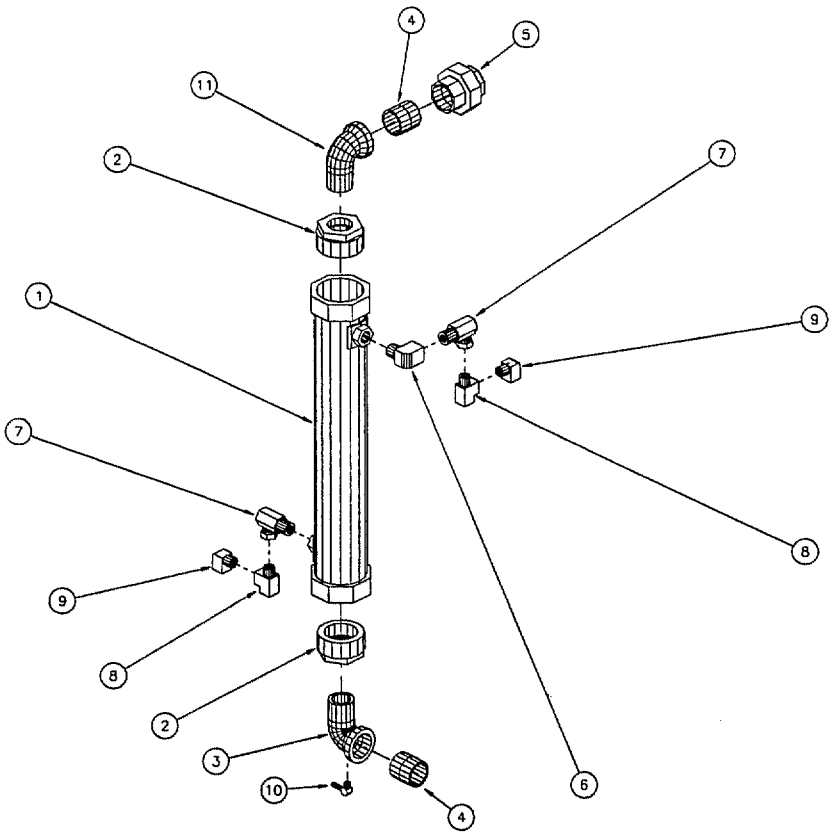
ITEM	PART NO	DESCRIPTION	QTY
1	038-020	Core, CF Triple s/s Heat Exchanger	1
2	052-265	Elbow, 1¼" Exhaust, 45°	1
3	068-232	Hose, ⅜" x 19" Teflon	2
4	052-020	6MA-6UFS	6
5	052-179	Nipple, 1¼" x 3" Black Steel	1

Figure 1-20: **Honda Preheater HX Assembly**



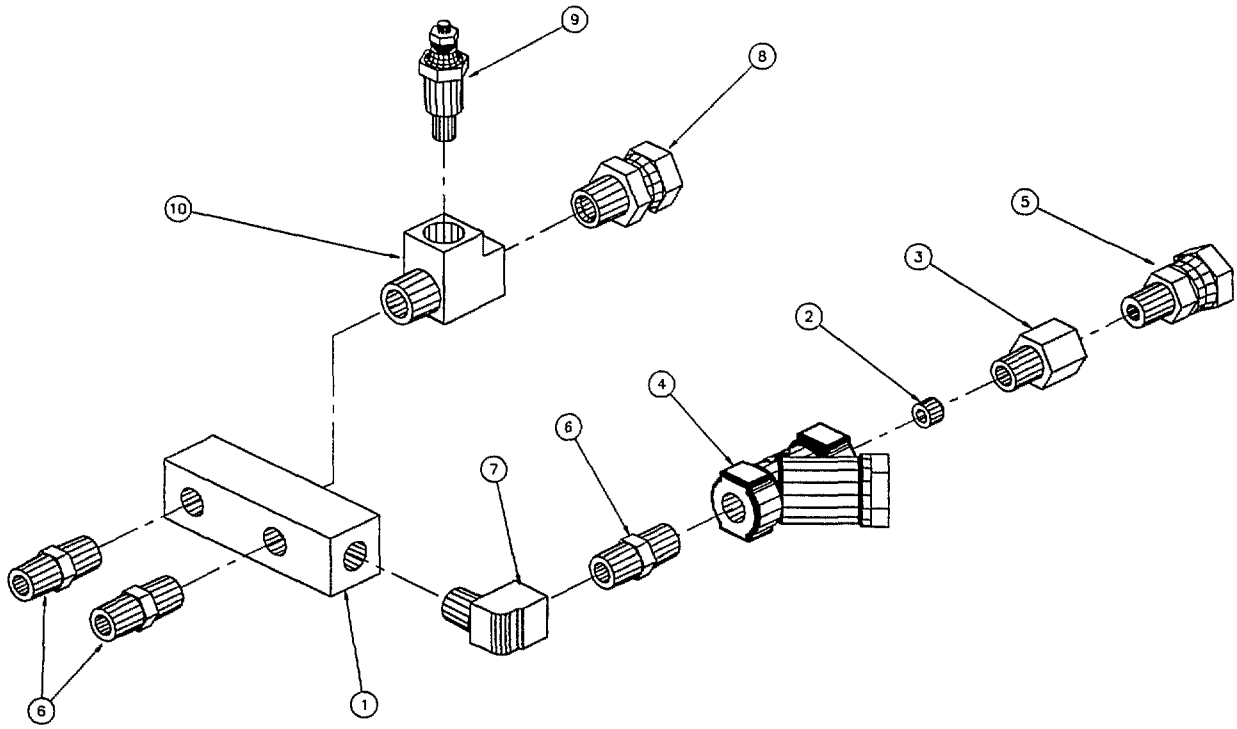
ITEM	PART NO	DESCRIPTION	QTY
1	038-018	Core, 3" Copper CF Heat Exchanger	1
2	001-015	Adapter, Final Exhaust - Honda	1
3	052-262	Elbow, 2½" NPT x 2½" Lower Blr. Exchanger	1
4	052-268	Elbow Assembly, 2" 180° W LDMNT	1
5	033-012	Clamp, Size 44 Hose	2
6	068-011	Hose, 2½" Red Stripe	4.5"
7	052-191	Nipple, 2½" Close Black Steel	1
8	052-023	6MT-6F-6F Brass	1
9	052-086	Elbow, ⅜" Brass Street	1
10	052-033	8MA-6UFS	1
11	052-036	8MA-8UFS	1

Figure 1-21: **By-Pass HX Assembly**



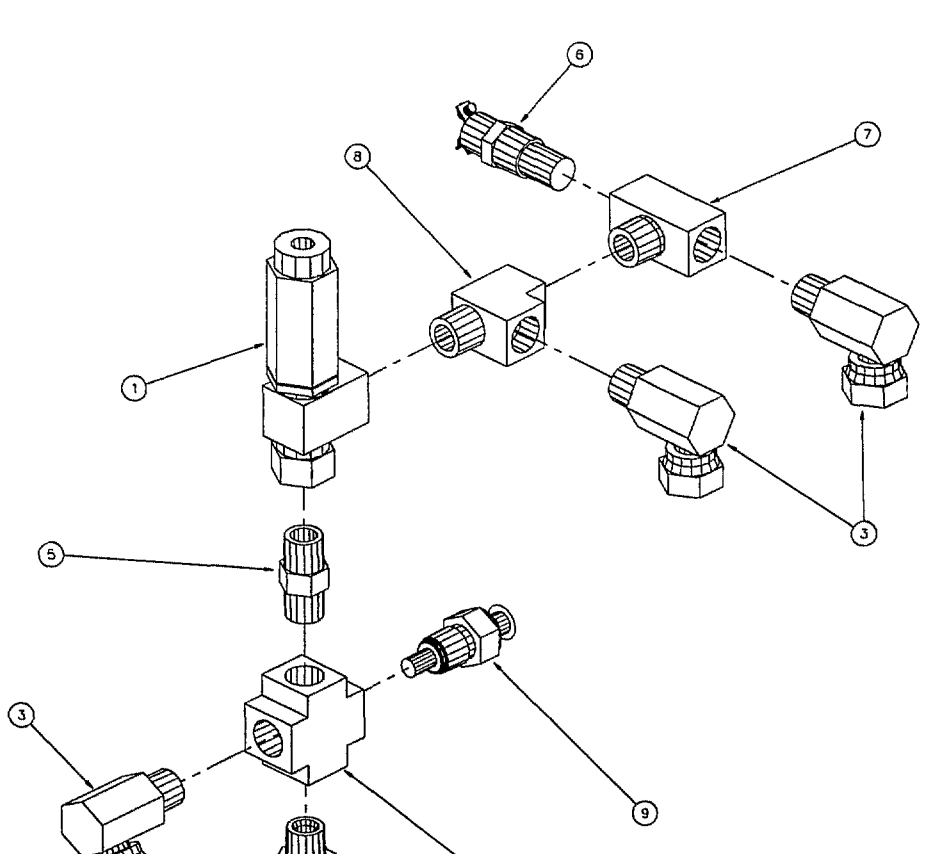
ITEM	PART NO	DESCRIPTION	QTY
1	038-018	Core, 3" Copper CF Heat Exchanger	1
2	052-255	Bushing, 2½" NPT x 1¼" NPT	2
3	052-209	Street Elbow, 1¼" IPS M x F, Galv., 150 lb.	1
4	052-180	Nipple, 1¼" Close	2
5	052-258	Union, 1¼" Galv. Steel	1
6	052-087	Elbow, ½" Brass Street	1
7	052-033	8MA-6UFS	2
8	052-023	6MT-6F-6F Brass	2
9	052-086	Elbow, ⅜" Brass Street	2
10	052-253	Elbow, ⅛" Male x ¼" Barb	1
11	052-209	Street Elbow, 1¼" IPS M x F, Galv., 150 lb.	1

Figure 1-22: **High PSI Manifold Assembly**



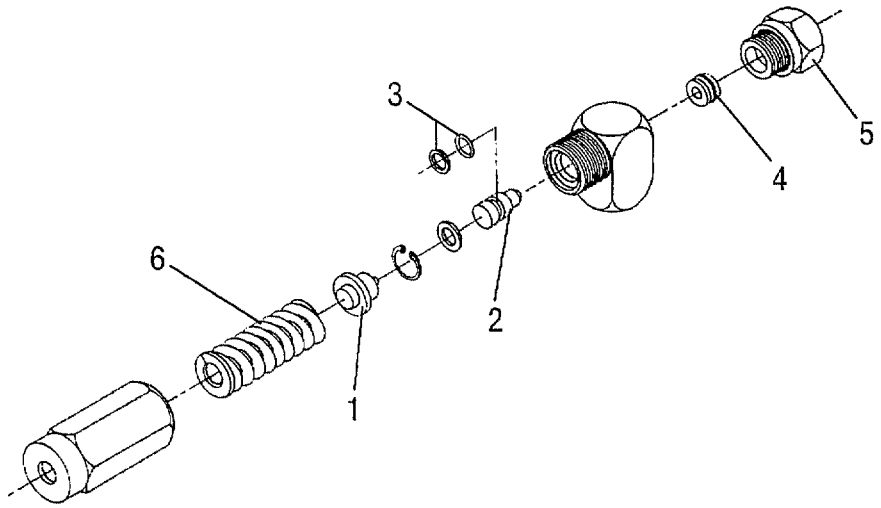
ITEM	PART NO	DESCRIPTION	QTY
1	090-008	Manifold, High Press Brass	1
2	180-002	Orifice, Set Screw - .039"	1
3	052-423	Bushing, Mod. Set Screw Orifice Housing	1
4	049-033	Filter, ¼" Inline Y	1
5	052-013	4M-6UFS	1
6	052-071	Nipple, ¼" Brass Hex	1
7	052-085	Elbow, ¼" Brass Street	1
8	052-019	6M-6UFS	1
9	149-001	Sender, S/W Temp - ⅜" Threads	1
10	052-023	6MT-6F-6F Brass	1

Figure 1-23: **By-Pass Manifold Assembly**



ITEM	PART NO	DESCRIPTION	QTY
1	169-101	Valve, By-Pass	1
2	052-113	Cross, ⅜" Female Brass	1
3	052-020	6MA-6UFS	3
4	052-019	6M-6UFS	1
5	052-074	Nipple, ⅜ Brass Hex	1
6	149-011	Thermostat, Aqua 185° Hot Water By-Pass	1
7	052-447	Tee, ⅜" Male Branch Brass	1
8	052-023	6MT-6F-6F Brass	1
9	149-013	Sensor, 245° Hot Water Kill	1

Figure 1-24: **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

Cleaning and Chemicals

CrossFire 4.2
Section 2-1

Your mobile carpet cleaning plant has been engineered using the latest and most sophisticated technology available to produce the finest carpet cleaning results possible. Despite this, however, it remains only a tool of the carpet cleaning trade, and it can produce only as good a job as the person operating it.

PRECAUTIONS

There are no short cuts to good carpet cleaning. It requires time, cleaning knowledge and the use of good chemicals. Therefore, the manufacturer recommends the use of spotting agents and traffic lane cleaners, as required, prior to the actual cleaning of carpeting.

The use of some chemicals through your mobile carpet cleaning plant can seriously damage the internal plumbing, high pressure pump and heater. These harmful chemicals include concentrated acid (see the pH chart at the end of this section), solvents, and some paint, oil, and grease removers with a high concentration of solvents.

The manufacturer recommends only the use of chemicals containing rust and corrosion inhibitors and water softening agents to prevent chemical build-up which may lead to component failure and warranty invalidation.

♦ CAUTION ♦

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 unprotected acid products that have obviously caused failures.

CLEANING STROKE PROCEDURE

Purpose: To eliminate excess moisture remaining in the carpet fiber and the sawtooth appearance which results from diagonal movement of the cleaning tool on all types of carpet.

Procedure: Always move the cleaning tool in smooth, forward and backward strokes. Apply slight pressure to the forward stroke while the solution is injected into the carpet. When extracting (drying), apply firm pressure on the forward stroke to ensure a positive "lock" for the vacuum and minimize the "hopping" effect resulting on carpet that is not smooth. During the forward and reverse strokes, movement to the right or left should only be accomplished at the extreme rear of the stroke. Overlapping is also important to ensure even application of solution and prevent saturation when cleaning wand is stopped twice at the same point at the rear of the cleaning stroke. This is illustrated at the end of this section.

Failure to adopt this procedure can result in increased chance of 'clean streaks', fiber shrinkage, brown-out and longer drying periods.

OVER-WETTING

Over-wetting is annoying to all concerned, and sometimes leaves a bad

impression of the cleaning process used.

THESE ARE SEVERAL AREAS THAT WILL CAUSE OVER-WETTING

1. Too few vacuum strokes or improper saw-tooth vacuum strokes as shown in the following illustration.
2. Obstructed, cut or kinked hoses.
3. Vacuum tank drain valve left partially open.
4. Clogged vacuum blower filter or vacuum tank lid not sealing properly.
5. Cleaning a heavily foam-saturated carpet without defoamer. (We recommend crystal type.)

Figure 2-1

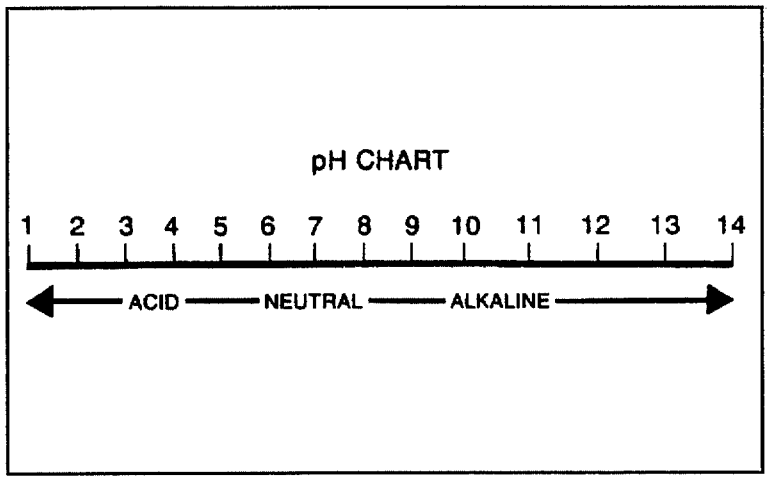
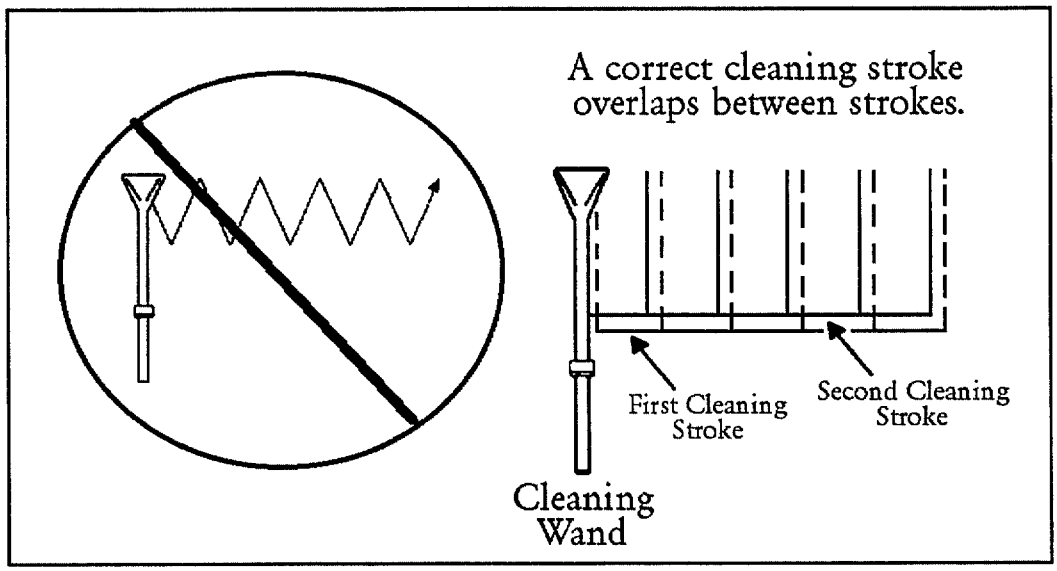


Figure 2-2: **CLEANING STROKE PROCEDURE**



Operating Instructions

CrossFire 4.2
Section 3-1

START UP

1. Perform daily/periodic maintenance as specified in this Owner 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. Start engine (choke as required). Engine may be started in either the run or idle throttle position. Idle RPM is approximately 2000. Run RPM is 3100.
   NOTE: The low speed (2000 RPM) throttle setting is for "start up" and "shut down" only. Do not run the machine for long periods of time at the "idle" setting. Damage to the throttle solenoid may occur.

6. 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.

7. Run the machine for several minutes under load (8 to 10" HG) until your desired temperature is achieved.

8. Commence cleaning operation.

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.

NOTE: The low speed (2000 RPM) throttle setting is for "start up" and "shut down" only. Do not run the machine for long periods of time at the "idle" setting. Damage to the throttle solenoid may occur.

5. Turn the machine off.

6. 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.

Precautions

CrossFire 4.2
Section 3-4

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 internal combustion 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.

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

♦ WARNING ♦

HEARING PROTECTION: The Occupational Safety and Health Administration (OSHA) recommends the use of hearing protection when an operator 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 known to the State of California to cause cancer, birth defects or other reproductive harm.

♦ WARNING ♦

CARBURETOR DRAIN: Under no circumstances should the drain in the carburetor bowl be utilized when the machine is hot.

♦ WARNING ♦

PORTABLE GAS TANK: 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 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

CrossFire 4.2
Section 4-1

VACUUM FREEZE GUARD PROCEDURE

1. Siphon a 50/50 mixture of anti-freeze and water through the chemical flow meter.

2. Disconnect the incoming water.

3. Remove the garden hose quick connect from the garden hose.

4. Plug the garden hose quick connect back onto the front of the machine.

5. Attach the freeze guard hose to the recovery tank.

6. Plug the other end of the freeze guard hose into the first freeze guard fitting (left hand) on the front of the machine.

7. Start the machine.

8. Allow the vacuum to pull the water out of the incoming water line.

9. Now plug the freeze guard hose into the second freeze guard fitting.

10. Allow the vacuum to pull the water out of the mix tank line. When the water stops flowing loosen the by-pass valve and run for 30 more seconds.
    NOTE: During this procedure the engine will stop. To continue the freeze guard procedure depress the freeze guard button and hold down while starting the engine and completing the procedure.

11. Plug the freeze guard hose into the cleaning solution quick connect.

12. Allow the vacuum to pull the water out of the s/s heat exchangers.

13. Turn off the machine as soon as all the water is evacuated.

ANTIFREEZE PROCEDURE

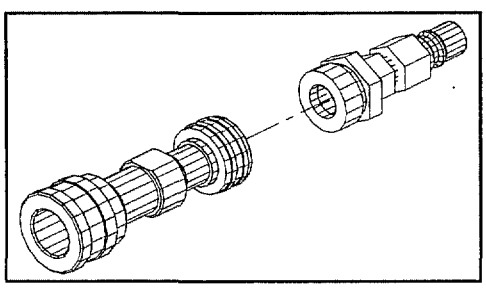
1. Begin by attaching your garden hose, or pump-in hose, to the machine. Now, remove the chemical line from the chemical jug and place it in a 50/50 mixture of antifreeze and water. Turn ignition switch on. Open the mix tank drain valve and allow the mix tank to drain to the point that it starts to demand water. Allow the mix tank to draw the antifreeze solution through the chemical flowmeter and the hoses back to the mix tank.

2. Remove the garden hose, or pump-in hose. Now, open the mix tank drain valve and drain all the water from the machine.

3. With the machine drained of water, close the mix tank drain and pour one (1) gallon of 50/50 antifreeze and water mix into the chemical mix tank.

   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 and allow it to run for two (2) minutes.

   With the recirculation kit, depress the freeze guard button and hold for 30 seconds. Turn the machine OFF. Leave the antifreeze in the system until the next time you use the equipment.

5. With the machine running, depress the dump solenoid manual override switch and hold for thirty (30) seconds.

6. Remove the garden hose inlet fitting from the end of your garden hose and plug it into the front of the machine. Leave it plugged in until the next time the machine is used.

   With the hoses and wand connected, run the machine and spray the water/antifreeze solution out of the wand until the 'low water' switch in the mix tank shuts the machine off. Your machine is now freeze-protected.

7. Solution hose and wand freeze guard procedure (optional): Attach the solution hoses and wand to the machine. (Dependent upon the amount of hose attached, more antifreeze solution may be needed in the chemical mix tank). With the machine running, spray the wand into a container to recapture the antifreeze solution. Continue to spray the wand until the machine shuts down by itself.

Recovering antifreeze for re-use:

Open the mix tank drain valve and allow the antifreeze solution to drain into a sealable container so that it may be used again.

Before cleaning with the machine again, flush the remaining antifreeze solution from the system by spraying water through

♦ 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

CrossFire 4.2
Section 5-1

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

WATER AND 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 two different float switches, the Water Level Float responds to the level in the tank and will maintain the proper volume of solution to be reserved for the water pump. The secondary, Low Water Float switch is a safety switch that is designed to protect your system from sudden or unexpected loss of water supply. If, for example, the water source at the house were turned off, the water level of the mix tank would drop, activating the secondary switch, which automatically disengages the system and prevents the water pump from running dry.

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.

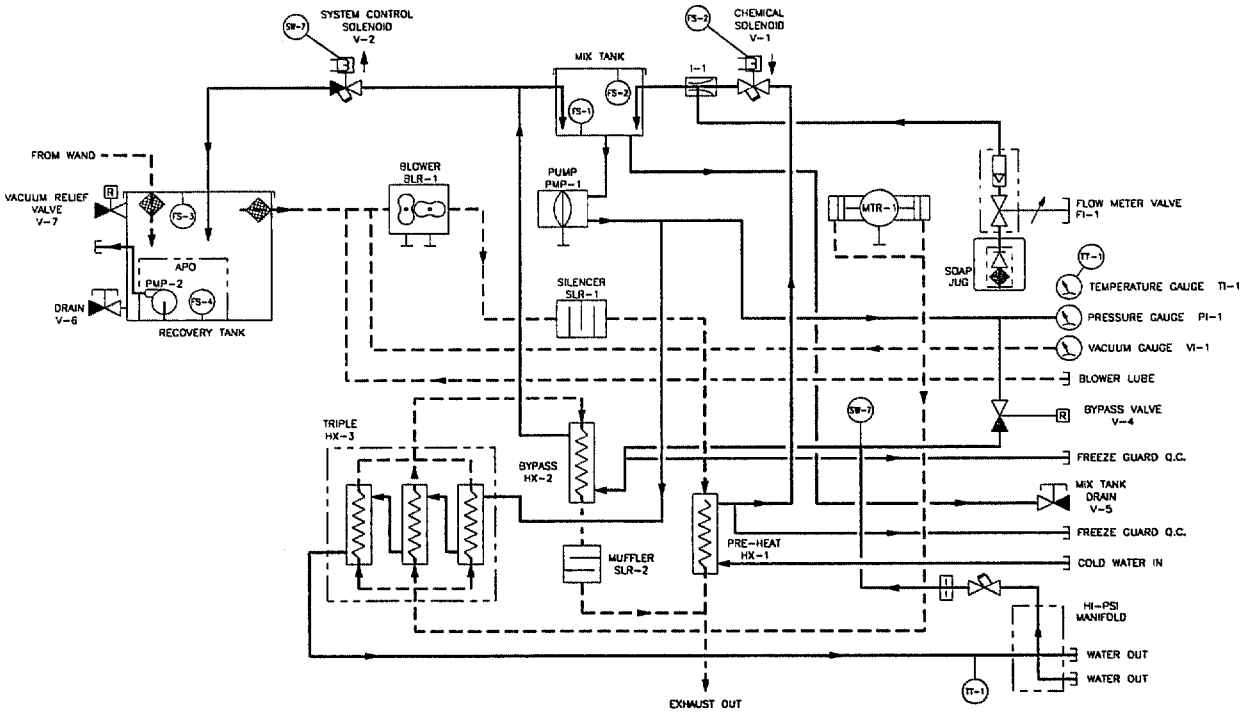
The chemical proportioning system will mix chemical with water at a 1 to 30 ratio when the Flowmeter is set at 5 GPH, or a 1 to 15 ratio when the Flowmeter is set at 10 GPH.

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.

Figure 5-1: **WATER FLOW DIAGRAM**

D2926, Rev B



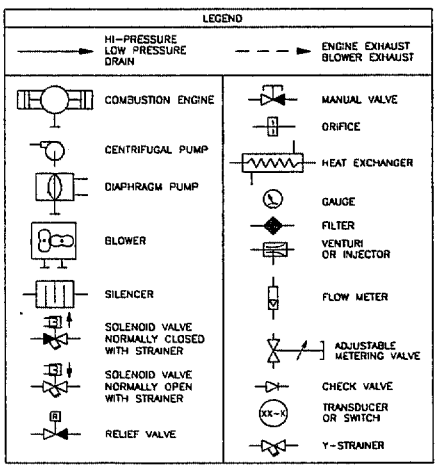
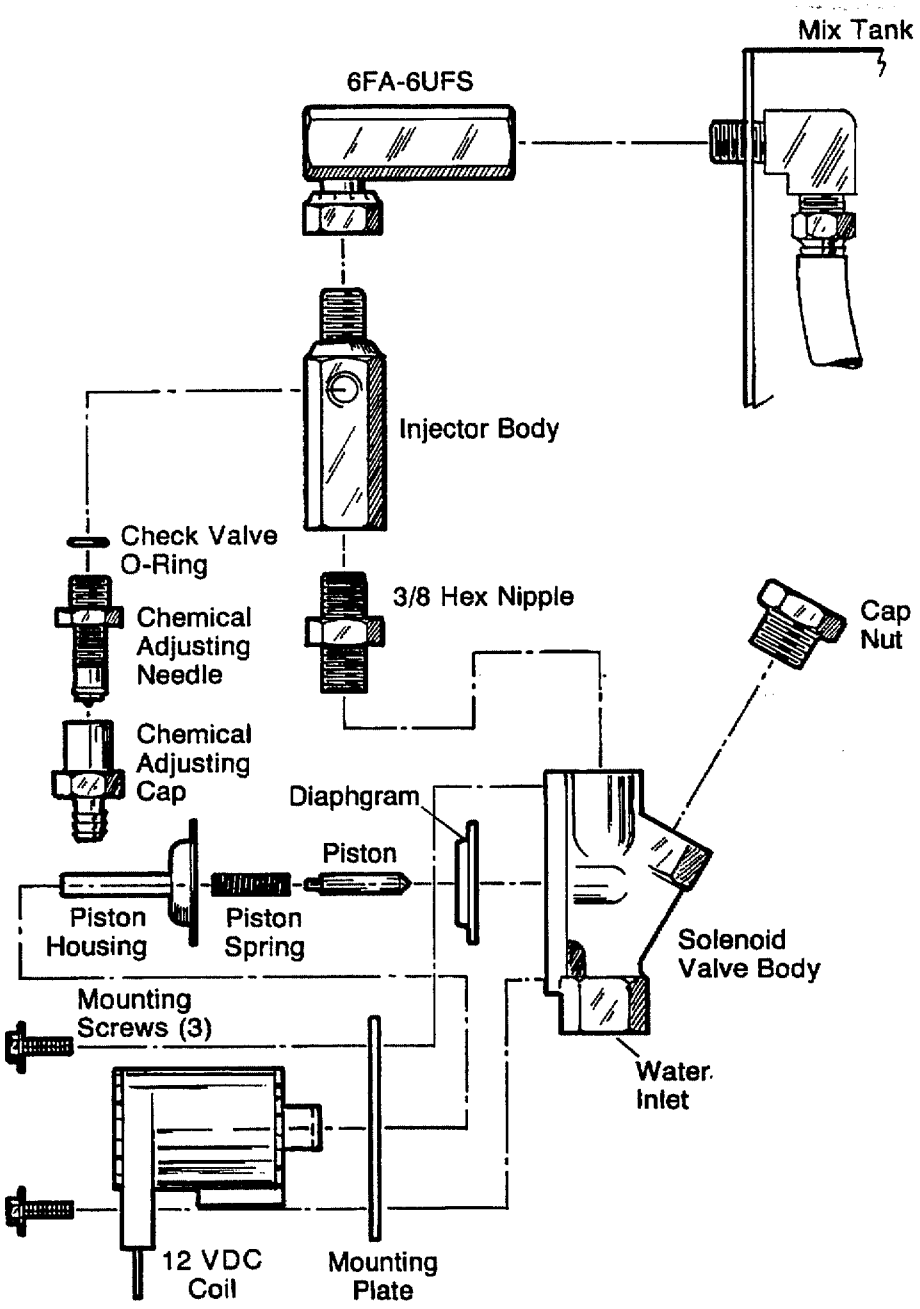


Figure 5-2: **PROPORTIONER DIAGRAM**



Chemical Tank Troubleshooting

CrossFire 4.2
Section 5-5

No	Problem / Possible Cause	Solution
1	**There is a loss of water pressure.**	
1.1	There is a clogged *filter* in the water supply to the pump.	If a filter is present in the water supply line to the pump, remove and discard it.
1.2	The *mix tank water supply hose* 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.
1.3	Foreign material is blocking the outlet hole for the pump in the bottom of the *mix tank*.	Inspect the outlet hole leading to the pump in the bottom of the mix tank. Remove any foreign material blocking the hole.
1.4	Foreign material is blocking the *water supply hose* 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.
1.5	The *water supply hose* 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.

No	Problem / Possible Cause	Solution
1.6	The end of the *mix tank water supply hose* 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.
1.7	The *mix tank supply hose* 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.
1.8	There is an air leak in the *water supply hose* 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.
1.9	The *water supply hose* 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. **NOTE:** Older model machines will require an additional 8M 12 UFS fitting for the pump end of the hose.
1.10	There is foreign material in the inlet or outlet valves of the *pump*.	Inspect the valves and remove any foreign material.

No	Problem / Possible Cause	Solution
1.11	The controlled *orifice* 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. **In the CrossFire 4.4 only**, remove the face mounted filter screen to get to the orifice behind the filter. Retighten the orifice with a 3/16" Allen wrench. **NOTE:** If your machine was built before 10/12/95, update the controlled orifice to the new style orifice with part numbers 180-002, 052-423 and 052-013.
1.12	The *by-pass valve* 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.
1.13	There is a loss of prime in the cells of the *pump* because the oil level is low.	Add oil to the pump reservoir. Adjust the pressure regulator for high pressure and run the pump for 20 to 30 minutes until it reprimes itself.

No	Problem / Possible Cause	Solution
1.14	There is a broken or cracked *diaphragm* in the pump.	Inspect the water in the mix tank. If there is oil in the water, a diaphragm has ruptured. Inspect the oil level in the pump. If there is no oil in the pump, a diaphragm has ruptured. For older model pumps, a new cushion plate should also be installed. Contact your HydraMaster distributor to determine if you machine requires a cushion plate. Order a diaphragm replacement kit from your HydraMaster distributor. Remove the pump. Replace the diaphragm. Refill and reinstall the pump. See your owner's manual for the procedure.
1.15	The *pump "O" rings* are forced out of their grooves from over-pressurization (freezing).	Inspect the "O" rings. Replace them if necessary. See your owner's manual for the procedure.
1.16	The *pump manifold* is warped from over-pressurizing the system (freezing).	Inspect the manifold with a straight edge. Replace it if necessary.
1.17	The *valve spring retainers* in the valve manifold are loose. (Retainers should fit snug.)	Install a valve kit.

No	Problem / Possible Cause	Solution
2	**The water temperature is too low.**	
2.1	The *water dump (system control) solenoid* is stuck open.	Remove the electrical wires from the solenoid. If the solenoid continues to dump, disassemble and check for residue. Clean and replace the solenoid.
2.2	The *orifice* (spray nozzle) in the cleaning tool is worn, defective, or the wrong size.	Replace or change the orifice size. The CrossFire uses a 8006E T-jet.
2.3	The incoming *water supply* is extremely cold.	Keep the incoming water supply hoses away from ice and snow during winter months.
2.4	There is an *exhaust* leak.	Inspect the exhaust system for leaks. Tighten any loose clamp welds or replace any broken parts.
2.5	There is excessive *pressure*.	Adjust the pressure regulator for less pressure.
2.6	There is *exhaust wrap* missing.	Replace any missing wrap.
2.7	The 185° *dump sensor* is shorted or is operating prematurely.	Test the sensor. Replace it if necessary.
2.8	**In the CrossFire 4.4 only**, the adjustable temperature control dial is set too low or malfunctioning.	If returning the temperature control dial to maximum does not work, check the water temperature in the mix tank. At maximum the system control light should come on at approximately 187° - 190°. If not, replace the temperature control unit.
2.9	**In the CrossFire 4.4 only**, the temperature control knob is turned to "On".	Turn the temperature knob to "Off".

No	Problem / Possible Cause	Solution
2.10	**In the CrossFire 4.4 only**, the preheating system is malfunctioning.	With a test light, determine which incoming solenoid is being activated (EV-1 or EV-2). If EV-1 is being activated and the outgoing water temperature is below 235°, check relay CR-3 and switch SW-6. The coil on CR-3 should not be activated. There should be a continuum between post 30 and 87a. SW-6 should be open. Repair or replace as necessary.
2.11	The *engine* speed is low.	Reset the engine speed. Refer to the Engine Operation and Maintenance manual.
2.12	A *heat exchanger* is scaled.	De-scale the heat exchanger or remove it and take it to a radiator shop to be boiled out.
2.13	A *heat exchanger* is carbon-coated.	a. For a **stainless steel heat exchanger**, clean it with a one inch wire brush and oven cleaner. 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.
2.14	The *temperature gauge* sending unit is defective.	Check the sending unit. The unit and temperature gauge must be manufactured by the same company (ie. an Isspro gauge works only with an Isspro sending unit and an S&W gauge works only with an S&W sending unit).

No	Problem / Possible Cause	Solution
2.15	The *temperature gauge* is defective.	Place the end of a grounded wire to terminal 9a on the Diagnostic Center while watching the temperature gauge. The ground should make the needle on the gauge read maximum temperature. Replace the gauge if necessary.

No	Problem / Possible Cause	Solution
3	**The water temperature is excessive.**	
3.1	The *filter* in front of the controlled orifice is clogged.	Inspect the filter. Clean it if necessary.
3.2	The controlled *orifice* is clogged.	Inspect the controlled orifice. Clean it if necessary.
3.3	The *dump solenoid (system control) valve* is not opening.	Short out the dump sensor. If the dump solenoid valve has 12 volts across the terminals and does not open, replace it.
3.4	The *dump (system control) sensor* is not working.	The sensor switch is normally open. It closes its hidden contacts at 185° F. Replace it if it is necessary.
3.5	The *engine* speed is too low or too high.	Reset the engine speed. Refer to the Engine Operation and Maintenance manual.
3.6	The *temperature gauge* is defective.	Place the end of a grounded wire to terminal 9a on the diagnostic center terminal block while watching the temperature gauge. The gauge should read maximum temperature. If it does not, replace the gauge.

No	Problem / Possible Cause	Solution
4	**There is pressure on the gauge, but no water coming out of the wand.**	
4.1	The *wand jet* is plugged.	Inspect and clean the jet.
4.2	The *quick connect* on one or more of the high pressure hoses is defective.	Remove and clean or replace the defective quick connect(s).
4.3	The *cleaning tool* 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 *quick connect* on the front of the machine is clogged.	Remove and clean or replace the quick connect.
4.5	The inner lining on a *hose* is constricted.	Remove the restriction or replace the hose.

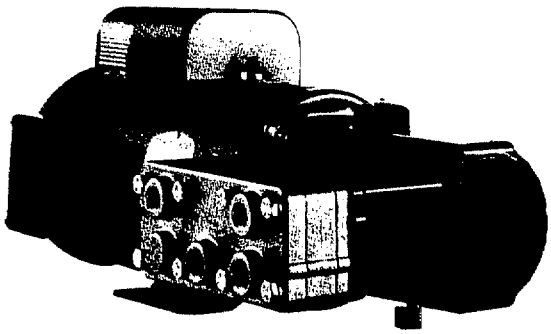
No	Problem / Possible Cause	Solution
5	**The water in the mix tank will not keep up with the wand.**	
5.1	There is dirt in the *solenoid valve* along side of the mix tank.	Take the valve apart and clean it.
5.2	The *upper float* is bad.	Remove the wire on terminal 17b at the Diagnostic Center. With a volt-OHM meter check for continuity from the end of the wire you removed and terminal 20 on the Diagnostic Center. There should be no continuity reading on the meter with the float in the down position. Replace the float if necessary.
5.3	The *mix tank relay* is bad.	With the upper float in the mix tank in the up position, there should be no voltage reading on terminal 16 at the Diagnostic Center. With the float in the down position, there should be +12 volts on terminal 16. Replace the relay if it is defective.
5.4	The *water supply* is improperly adjusted.	The water supply should be two (2) gallons per minute or more.
5.5	The *water inlet supply hose filter* is clogged or the hose is kinked.	Remove the obstructions.
5.6	There is a problem with the *pump-in pump*.	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. It should supply a minimum of 3 GPM if you use two wands.

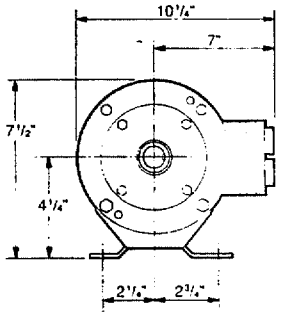
No	Problem / Possible Cause	Solution
6	**There is water coming out of the exhaust.**	
6.1	There are small amounts of water usually seen at start up.	This is *normal*! There is no solution! The water is condensation.
6.2	One of the *heat exchangers* is damaged from frozen water.	Determine which heat exchanger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

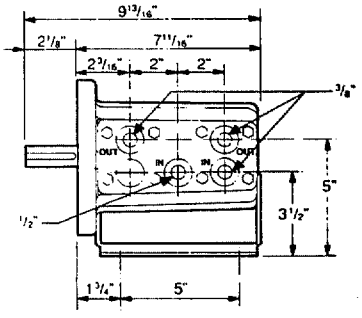
No	Problem / Possible Cause	Solution
7	**The mix tank overflows.**	
7.1	The *upper float in the mix tank* is malfunctioning.	With water in the mix tank, connect one end of a 12 inch piece of wire to terminal 20 (see the Diagnostic Center) and touch the other end to terminal 17. If the water stops flowing with the key on, replace the float.
7.2	There is dirt in the *solenoid valve* next to the mix tank.	Remove one of the wires from terminal 16 (see the Diagnostic Center) 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 *chemical relay* is bad or, **in the CrossFire 4.4 only**, the *CR-2 relay*.	Check the relay with a volt-OHM meter. With the ignition key turned on, there should be 12 volts between pin 85 and 86. If the voltage is present, check the voltage between ground and pin 87a on the relay. If voltage is present at 87a, replace the relay.

No	Problem / Possible Cause	Solution
8	**The water pump is pulsing.**	
8.1	The hoses are restricted due to *hard water deposits* and/or *chemical build-up*.	Descale the machine.
8.2	The *throb hose* is hardened due to age or heat and cannot absorb spikes.	Replace the throb hose.
8.3	The *inlet hose* is drawing air.	Reseal the fittings. Tighten the hose clamps. Or replace the hose.
8.4	The *valves* are obstructed.	Clean or replace the valves.
8.5	There is a pin hole in one or more of the *diaphragms*, small enough to lose the prime but not to leak any oil into the water or water into the oil.	Replace all of the diaphragms. One could be replaced temporarily, however all should be replaced.
8.6	The *valve spring* is broken.	Replace the valves.

Hydra Pump
High Pressure Pump







Pump Maintenance

CrossFire 4.2
Section 6-1

DAILY

Check the oil level and the condition of the oil. The oil level should be 3/4 inch from the top of the fill port to the line on the oil fill plug's dipstick (63).

Use a 5-30 weight synthetic motor.

♦ CAUTION ♦

If you are losing oil but don't see any external leakage, or if the oil becomes discolored and contaminated, one of the diaphragms (17) may be damaged. Refer to the Service Section.

Do not operate the pump with a damaged diaphragm!

♦ CAUTION ♦

Do not leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as 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 (60)

at the bottom of the pump so all oil and accumulated sediment will drain out.

♦ CAUTION ♦

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

♦ CAUTION ♦

Protect the pump from freezing.

Service of Wet End

CrossFire 4.2
Section 6-3

This section explains how to disassemble and inspect all easily-serviceable parts of the pump. Repair procedures for the hydraulic end (oil reservoir) of the pump are included in a later section of the manual.

♦ CAUTION ♦

Do not disassemble the hydraulic end unless you are a skilled mechanic. For assistance, contact HydraMaster (206-775-7275) or the distributor in your area.

1. **Remove Manifold (3) and Valve Plate (12)**

   a. Remove all eight bolts (1) around the manifold.

   b. Remove the manifold (3) and valve plate (12).

   c. Inspect the manifold for warping or wear around the inlet and outlet ports. If wear is excessive, replace the manifold.

      To check if the manifold is warped, remove the O-rings (4) and place a straightedge across it. A warped manifold (.003 inches or greater) should be replaced.

   d. Inspect the valve plate in the same manner as the manifold.

2. **Inspect Valves (5-11)**

The three inlet and three outlet valve assemblies are identical (but face in the opposite direction). Inspect each valve as follows:

a. Check the spring retainer (10), and replace if worn.

b. Check the valve spring (8). If it is shorter than a new spring, replace it (don't just stretch the old spring).

c. Check the valve poppet (7). If worn excessively, replace it.

d. Remove the valve seat (6).

   Inspect the valve seat for wear, and replace it if necessary. A new O-ring (5) should be installed.

e. Check the dampening washer (11), and replace if worn.

f. Reinstall the valve assemblies:

   - ▷ Clean the valve ports and shoulders with emery cloth, and lubricate them with lubricating gel or petroleum jelly.

   - ▷ Install the O-Ring (5) on the valve seat (6).

   - ▷ **Inlet (3 upper valves in the illustration below).** Insert the spring retainer (10) into the valve plate, then insert the spring, valve, Tetra seal, valve seat, and dampening washer (8,7,9,6.11). A flat O-Ring [Tetra seal] (5) goes between the retainer and seat.

   - ▷ **Outlet (3 upper valves in the illustration).** Insert the

dampening washer, valve and spring, then the retainer. Install the flat O-ring between the retainer and seat.

3. **Inspect and Replace Diaphragms (17)**

   a. Remove the two cap screws (14) from the valve plate (12).

   b. Lift a diaphragm by one edge and turn the pump shaft until the diaphragm moves up to "top dead center." This will expose machined cross-holes in the plumber shaft behind the diaphragms.

   c. Insert a hex wrench through one of the machined cross holes, to hold the diaphragm up. (Don't remove the tool until the new diaphragm is installed in step "g" below.)

   d. Unscrew the diaphragm. Use a 5/16 in. open end wrench, and turn counterclockwise.

   e. Inspect the diaphragm carefully. A ruptured diaphragm generally indicates a pumping system problem, and replacing only the diaphragm will not solve the larger problem. Inspect the diaphragm for the following:

      ▷ **Small Puncture.** Usually caused by a sharp foreign object in the fluid, or by an ice particle.

      ▷ **Diaphragm pulled away** from the side. Usually caused by fluid being frozen in the pump, or by over-pressurization of the pump.

      ▷ **Diaphragm becoming stiff** and losing flexibility. Usually caused by pumping a fluid which is incompatible with the diaphragm material.

- ▷ **Diaphragm edge chewed away.** Usually caused by over-pressurizing the system.

f. Clean away any spilled oil. Apply Loctite #242 Threadlocker to the screw of the new diaphragm (or the old one, as appropriate).

g. Install the diaphragm and tighten to 10 in-lbs.

h. Repeat the above inspection procedure (and replacement, if necessary) with the other two diaphragms.

4. **Flush Contaminant from Hydraulic End**
(only if a diaphragm has ruptured)

a. With the valve plate, manifold, and diaphragm cushion plate still removed (see above), remove the oil drain cap (63) and allow all oil and contaminant to drain out.

b. Fill the reservoir with kerosene or solvent. Manually turn the pump shaft to circulated the kerosene. Drain.

♦ CAUTION ♦

If you have EPDM diaphragms, or if food grade oil is in the reservoir, do not use kerosene or solvents. Instead, flush with the same lubricant that is in the reservoir. Pumps with EPDM diaphragms have "E" as the 7th digit of the Model Number.

c. Repeat the flushing procedure (step "B" above).

d. Fill the reservoir with fresh oil. Manually turn the pump shaft to circulate the oil. And drain once again.

e. Refill the reservoir. If the oil appears milky, there is still contaminate in the reservoir. Repeat the flushing procedure until the oil appears clean.

5. **Prime the Hydraulic Cells**

a. With the pump **horizontal**, fill the reservoir with the appropriate Hydra oil for the application.

b. All air in the oil within the hydraulic cell (behind the diaphragms) must be forced out by turning the shaft (and thus pumping the piston). A shaft rotator is included in the Wanner Tool Kit.

Turn the shaft until a **bubble-free** flow of oil comes from behind all the diaphragms. Watch the oil level in the reservoir. If it gets too low during priming, air will be drawn into the pistons (inside the Hydraulic end). This will cause the pump to run rough, and you will have to start over again with priming the hydraulic cells.

c. Wipe excess oil from the diaphragm plate and diaphragms.

6. **Reinstall Valve Plate (12) and Manifold (3)**

a. Reinstall the valve plate (12), with the valve assemblies installed as outlined above, onto the diaphragm plate (18).

b. Reinstall the O-rings (4) on the rear side of the manifold. Use petroleum jelly or lubricating gel to hold them in place.

c. Reinstall the manifold onto the valve plate.

d. Insert all bolts (1) around the edge of the manifold, and alternately tighten opposite bolts until all are secure. Torque to 15 ft-lbs.

e. Recheck all bolts for tightness.

Service of Hydraulic End

CrossFire 4.2
Section 6-9

This section explains how to disassemble and inspect the hydraulic end (oil reservoir) of the pump.

♦ CAUTION ♦

Do not disassemble the hydraulic end unless you are a skilled mechanic. For assistance, contact HydraMaster (206-775-7275) or the distributor in your area.

Depending on the repair you are attempting, you may or may not have to remove the motor from a direct-drive pump/motor unit.

Internal piston components (21 - 27) can be serviced without removing the motor or crankshaft. The motor and crankshaft must be removed to service the connecting rod (59), piston housing (20), crankshaft (57), front bearing (68), back bearing (55), or seal (54).

TO SERVICE PISTONS WITHOUT REMOVING MOTOR OR CRANKSHAFT

1. Disassemble Pistons

With the manifold, valve plate, diaphragm cushion, diaphragm plate, and diaphragm removed, and the oil drained from the pump (see the basic Service Section):

a. Remove the snap ring (27) from one of the pistons, using a standard

snap-ring pliers.

b. Pull out the valve plunger (24). This also removes the washer (26) and spring (35).

c. Insert a hook through the center hole of the valve cylinder (22), and pull the cylinder out of the piston. Be careful not to damage the piston.

d. Inspect all parts, and replace the O-ring and any other parts which are worn or may be damaged.

e. Repeat steps "a" through "d" for the remaining pistons.

2. **Reassemble Pistons**

a. Tip the pump so the pistons are vertical.

b. Drop a ball (21) into the opening in the bottom of the piston.

c. Insert a valve plunger (24) into a valve cylinder (22). Slide a spring (25) over the plunger, inside the valve cylinder.

d. Slide the assembled valve cylinder, plunger, and spring (22-25) into the piston (20).

e. Insert a washer (26) over the plunger.

f. Insert a snap ring (27) into the piston. Use the snap-ring pliers.

g. Repeat the above procedure for the other two pistons.

TO SERVICE THE REMAINDER OF THE HYDRAULIC END

1. Remove Pump Housing

a. Remove the manifold, valve plate, diaphragm cushion, and diaphragms, as outlined in the basic Service Section.

b. Drain the oil from the pump housing by removing the drain plug (60).

c. Stand the pump on end, with the drive shaft up.

d. Remove the bolts (50) that secure the back cover (52) to the housing (78). Use a 3/8 in. socket wrench. Save the O-rings (51).

e. Remove the cover and the cover O-ring (53).

f. Remove the crankshaft (57) by pulling it through the connecting rods (59).

2. Remove and Replace Pistons

To remove the pistons (20), first remove the connecting rod (59) and pin (58) by pressing the pin through the connecting rod.

Reverse the process to reinstall the pistons.

Refer to Step 5 and 6 below to replace the diaphragm and reassemble the pump.

3. Reassemble Housing and Casting

NOTE: Inspect the shaft seal (54) before continuing. If it looks damaged in any way, replace it. Refer to "Replace Shaft Seal"

below.

a. Stand the pump on end.

b. With the pistons and connecting rods in place, reinstall the crankshaft by threading it through the connecting rods.

c. Reinstall the back cover, cover O-ring, and bolts (with their O-rings).

4. **Replace Shaft Seal**

a. Press the back bearing (55) and seal (54) out of the back cover (52). Discard the seal.

b. Apply a coating to Loctite High-Performance Pipe Sealant with Teflon, or a comparable product, to the outer surface of a new seal and the inside surface of the opening in the back cover (52) where the seal will rest.

c. Press the new seal into the back cover.

d. Inspect the bearing (55). If pitted or damaged, replace it.

e. Apply a coating of Loctite Rc-609 retaining Compound or comparable product to the outer surface of the bearing. Press the bearing into the back cover until it rests on the shoulder. The shield on the bearing **must** face away from the back cover.

5. **Reinstall Diaphragms**

a. Screw the plunger puller (from the Tool Kit or Repair Kit) into the plunger (24). Pull out to expose the cross holes in the plunger. Rotate the shaft until the piston is at top dead center.

b. Insert a diaphragm hex wrench (from the Tool Kit), or similar dowel-type object, through the plunger holes to hold the plunger away from the diaphragm place (18), and to keep the plunger from turning when the diaphragm is being installed.

c. Apply a small amount of Loctite #242 to the threads of the diaphragm screw (be sure the threads are clean).

d. Set the diaphragm (17) on the plunger (24), ridge-side out. Screw the diaphragm onto the plunger.

e. Hold the diaphragm hex wrench, and tighten the diaphragm to 10 in.-lbs of torque.

f. Repeat the above procedure for the plungers and diaphragms of the other two cylinders.

g. Fill the reservoir with fresh oil and prime the pump, as outlined in the basic Service Section.

6. **Reassemble Pump**

Reassemble the pump as outlined in the basic Service Section.

Pump Troubleshooting

CrossFire 4.2
Section 6-14

Cavitation

Inadequate fluid supply because of:
-Inlet line collapsed or clogged
-Air leak in inlet line
-Worn or damaged inlet hose

Fluid too hot for inlet suction piping system.
Air entrained in fluid piping system.
Aeration and turbulence in supply tank.
Inlet suction vacuum too high.

Symptoms of Cavitation:
-Excessive pump valve noise
-Premature failure of spring or retainer (8, 10)
-Volume or pressure drop
-Rough-running pump.

Drop in Volume or Pressure

Air leak in suction piping.
Clogged suction line or suction strainer.
Suction line inlet above fluid level in tank.
Inadequate fluid supply.
Pump not operating at proper RPM.
Worn pump valve parts.
Foreign material in inlet or outlet valves.
Loss of oil prime in cells because of low oil level.
Ruptured diaphragm.
Cavitation.
Warped manifold from over-pressurized system.
O-rings forced out of their grooves from over-pressurization.

Air leak in suction line strainer or gasket.

Water Pulsations

Foreign object lodged in pump valve.
Loss of prime in hydraulic cells because of low oil level.
Air in suction line.
Valve spring broken.
Cavitation.
Aeration or turbulence in supply tank.

Valve Wear

Normal wear.

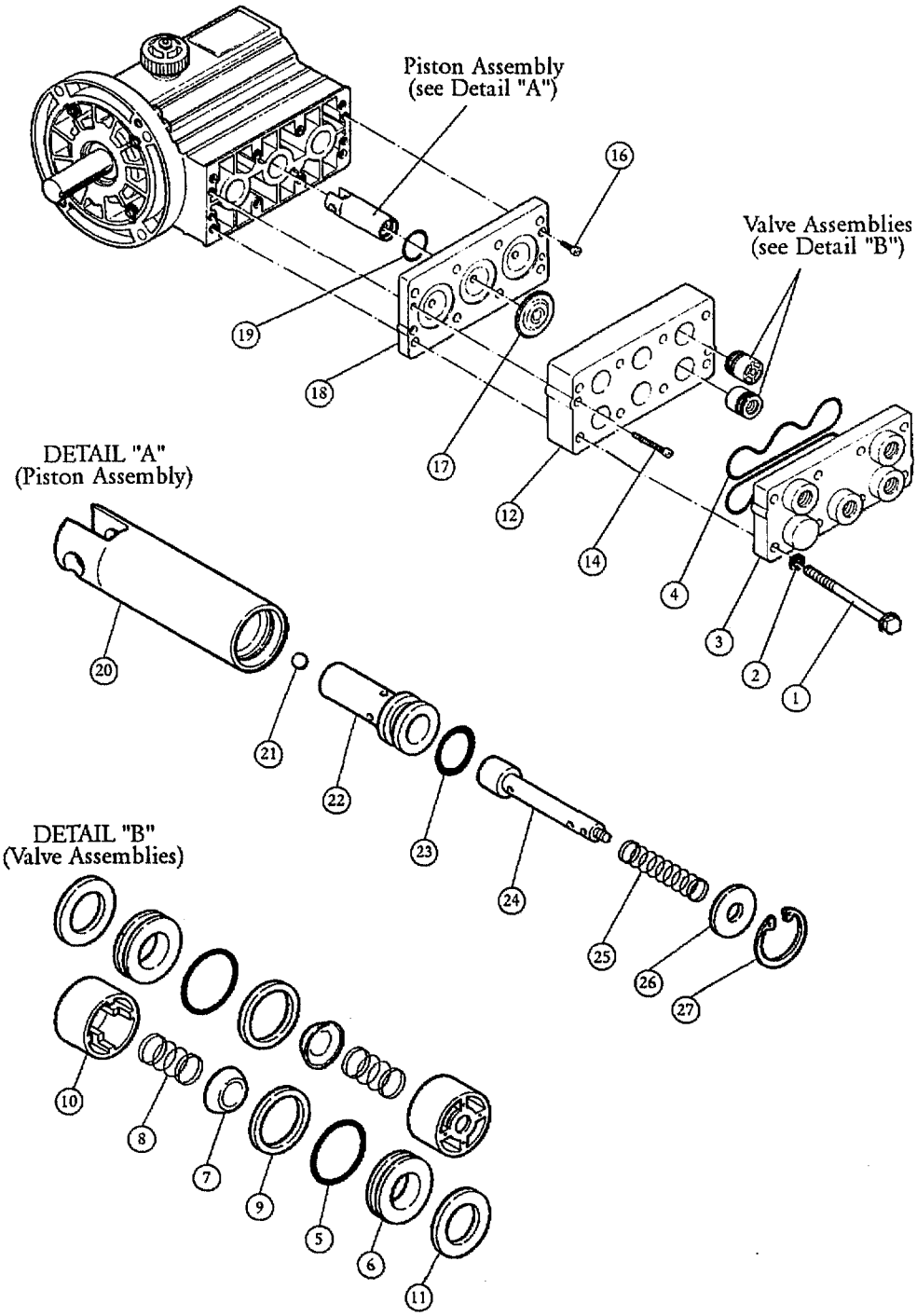
Loss of Oil

External seepage.
Rupture of diaphragm.
Frozen pump.
Worn shaft seal.
Oil drain piping or fill cap loose.
Valve plate and manifold bolts loose.

Premature Failure of Valve Spring or Retainer

Cavitation.
Foreign object in the pump.
Pump running too fast.
Spring/retainer material incompatible with fluid being pumped.
Excessive inlet pressure.

Figure 6-1


Piston Assembly
(see Detail "A")
Valve Assemblies
(see Detail "B")
DETAIL "A"
(Piston Assembly)
DETAIL "B"
(Valve Assemblies)
16
19
18
17
12
14
4
3
2
1
20
21
22
23
24
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27
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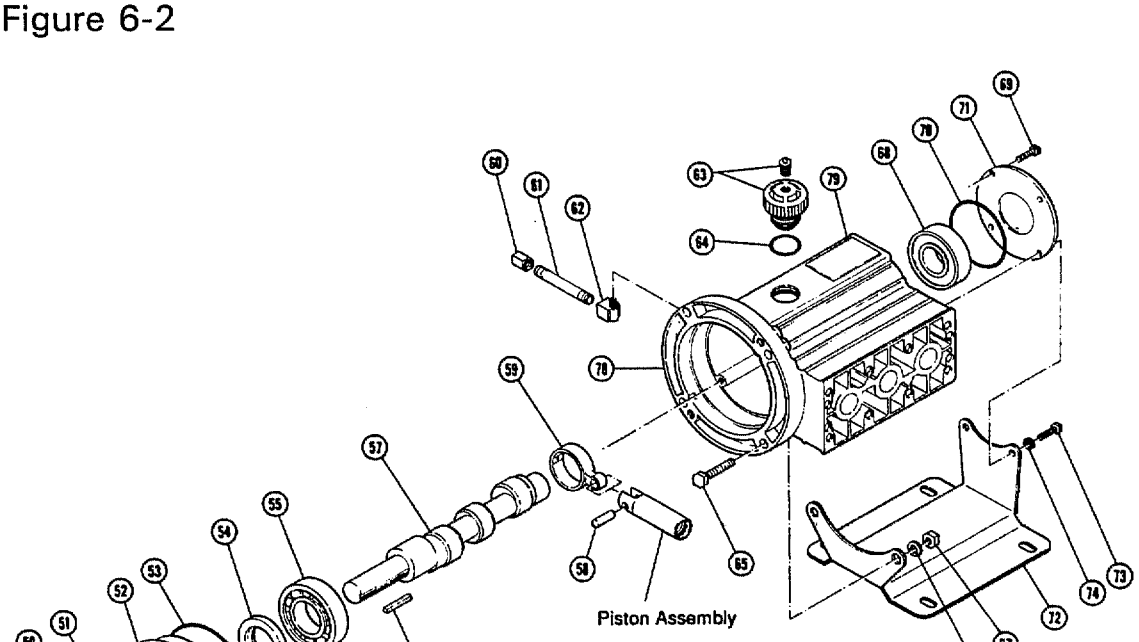
5
6
11

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	QTY. PER PUMP
1	D03-024-2010	Bolt, 3" hex-head	8
2	C22-014-2000	Washer, 5/16"	8
3	D03-004-1010	Manifold, brass, NPT	1
4	D03-073-2110	O-ring, manifold, Buna	2
5	C24-009-2110	O-ring, valve seat, Buna	6
6	D03-020-1002	Valve Seat, 17-4 SST	6
7	D03-021-1002	Valve, 17-7 SST	6
8	D03-022-3114	Valve Spring, Elgiloy	6
9	D03-092-2110	Tetra Seal, Buna	6
10	D03-023-2310	Retainer, valve spring, Celcon	6
11	D03-125-2310	Washer, dampening, Celcon	6
12	D03-003-1010	Valve Plate, brass	1
14	D03-029-2010	Cap Screw, socket-head, 1"	2
16	D03-088-2010	Cap Screw, socket-head 1/2"	2
17	D03-018-1220	Diaphragm, Buna-N-XS	3
18	D03-002-1000	Diaphragm Plate	1
19	D03-075-2110	O-ring, diaphragm plate, Buna	3
20	D03-014-1004	Piston	3
21	D10-015-3010	Ball	3
22	D03-043-1000	Valve Cylinder	3
23	D03-034-2110	O-ring, valve cylinder, Buna	3
24	D03-044-1000	Valve Plunger	3
25	D03-045-3110	Spring, sleeve valve	3
26	D03-049-1000	Washer	3
27	D03-048-2210	Snap Ring	3

Figure 6-2



PARTS LIST CONTINUED...

REF. NO.	PART NO.	DESCRIPTION	QTY. PER PUMP
50	D03-086-2010	Cap Screw, hex-head, with washer	4
51	D03-036-2110	O-ring, back cover screws, Buna	4
52	D03-131-1000	Back Cover	1
53	D03-037-2110	O-ring, back cover, Buna	1
54	D03-031-2110	Seal, Buna	1
55	D03-011-2910	Back Bearing	1
56	D03-085-2210	Key, shaft	1
57	D03-009-1003	Crank Shaft, shaft-driven, 3.0 GPM @ 1725 RPM	1
58	D03-133-1000	Pin	3
59	D03-132-1000	Connecting Rod	3
63	000-027-006	Cap, HydraPump w/ vent & O-ring	1
64	D10-080-2110	O-ring, oil fill, Buna	1
68	D03-010-2910	Front Bearing	1
69	D03-087-2010	Cap Screw, hex-head, 1/2"	4
70	D40-074-2110	O-ring, front cover, Buna	1
71	D03-130-1000	Front Cover	1
78	D03-001-1001	Pump Housing [D-03, M-03]	1
	M13-001-1001	Pump Housing [M-13]	1
79	D10-040-2410	Name Plate	1

Cleaning Wand Parts

CrossFire 4.2
Section 7-1

Figure 7-1: **VALVE ASSEMBLY**

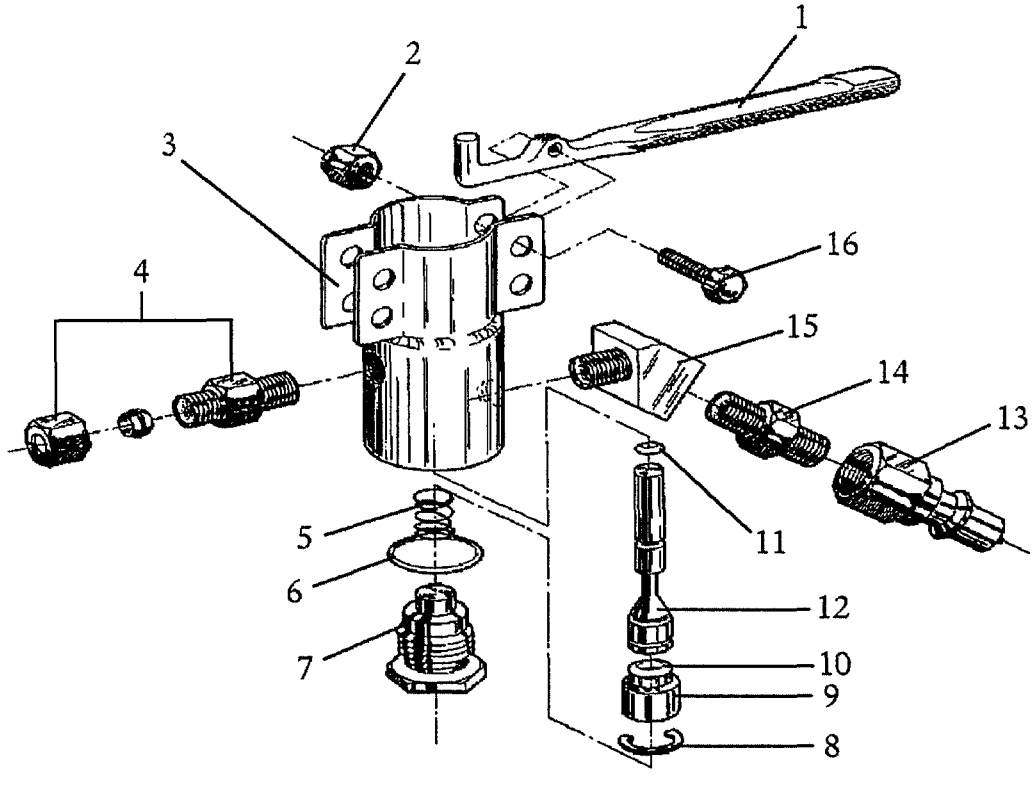


Figure 7-2: **JET ASSEMBLY**

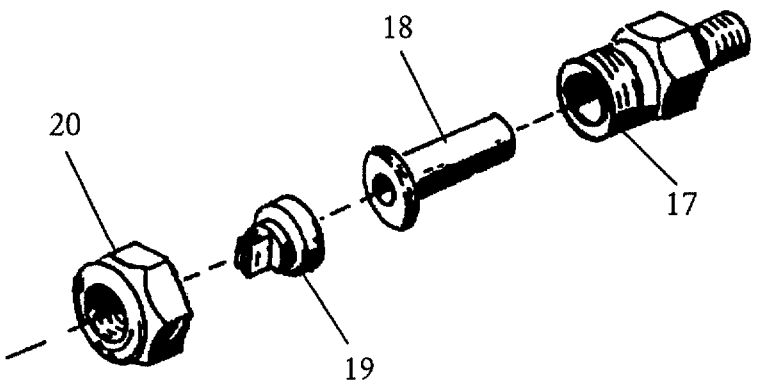
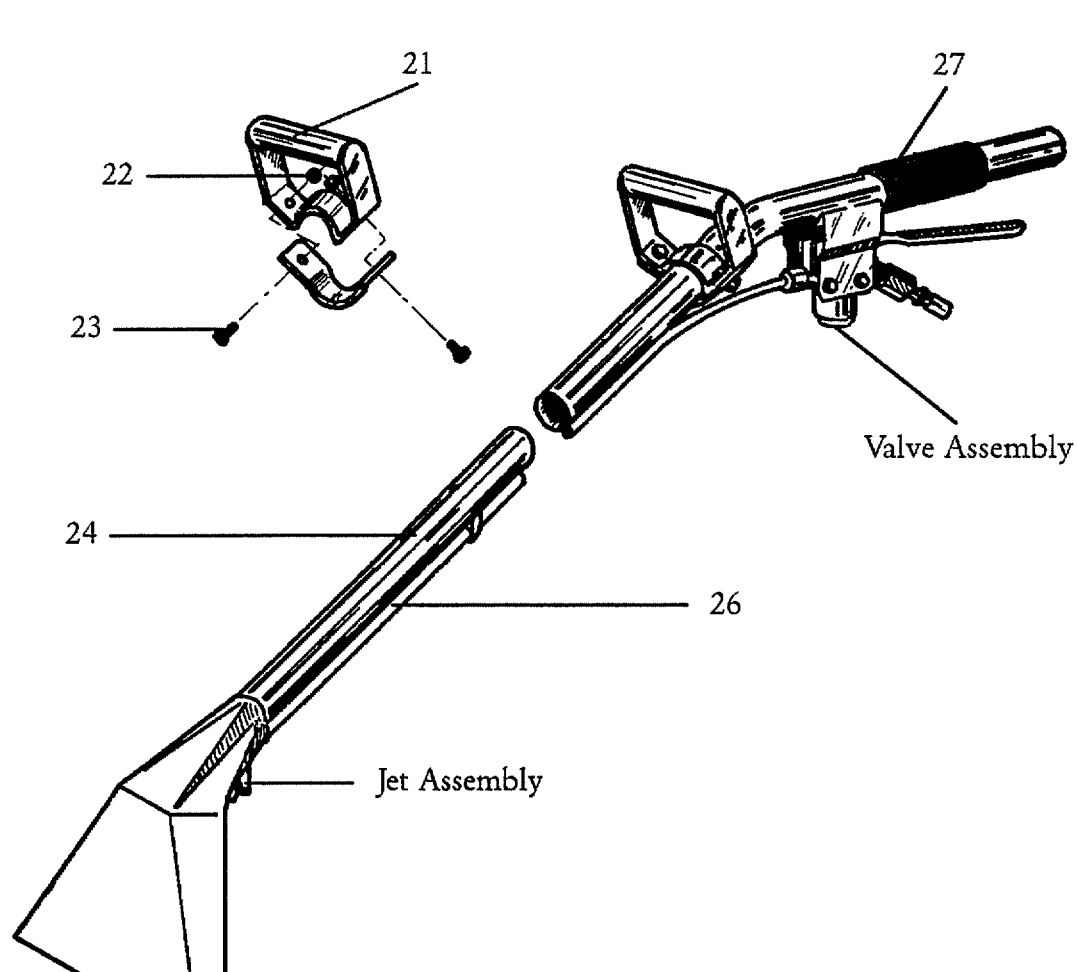


Figure 7-3: **WAND ASSEMBLY**



Valve, Jet, Wand Parts List

ITEM NO	PART NO	DESCRIPTION	QTY
1	167-013	Trigger, Cast Hydra Hoe Valve	1
2	094-009	Nut, 1/4 - 20 s/s Nylock	3
3	600-012-001	Valve Body - HydraMaster Valve	1
4	052-152	1/4 Male Comp. Fitting - Hydra Hoe	1
5	155-003	Spring, HydraMaster Solution Valve	1
6	097-011	O-Ring, HMaster Solution Valve Cap	1
7	027-001	Cap, s/s HMaster Solution Valve	1
8	139-004	Ring, Solution Valve Retaining	1
9	139-003	Ring Keeper, HMaster Solution Valve	1
10	097-010	O-Ring, HM Valve Plunger - Large	1
11	097-022	O-Ring, Solution Valve/Flowmeter - small	1
12	107-129	Plunger, HydraMaster Solution Valve	1
8-12	600-012-002	Valve Stem Sub Assembly (Incl. Items 8-12)	1
13	052-050	440 Male Quick Connect with Viton	1
14	052-071	Nipple, 1/4 Brass Hex	1
15	052-082	Elbow, 1/4 Brass 45 Street	1
16	143-002	Screw, 1/4 - 20 x 1" HHC s/s	1
17	052-153	Brass Stabilizer Housing	1
18	186-001	Stabilizer	1
19	076-005	Jet, #6 s/s Hydra Hoe	1
20	094-028	Nut, Brass - Jet Assembly Group	1
21	061-006	Handle, Pressure Guide Wand	1
22	094-035	Nut, 5/16 - 18 s/s Nylock Half Nut	2
23	143-012	Screw, 5/16 - 18 x 3/4" s/s HHC	2
24	173-001	Wand, s/s Hydra Hoe - Stock	1
25	082-004	Lips, 12" s/s Hydra Hoe (2 piece set)	1
26	168-001	Tube, s/s Hydra Hoe Solution	1
27	061-007	Handle Grip - Hydra Hoe	1
Not Shown:	154-001	Spacer, 1/4 x 5/16 - s/s Sol. Valve	5
	169-055	Valve Assembly, s/s Hydra Hoe	1
	143-005	Screw, 1/4 - 20 x 1.75" HHC s/s	2
	094-009	Nut 1/4 - 20 s/s Nylock	1
	052-151	Compression, ⅛" Female Hydra Hoe Fitting	1
	081-015	Label, "Hydra-Man" - Wand	1
	174-003	Washer, ¼" s/s	4
	174-065	Washer, .438" x 1" x .083" s/s	2

Vacuum System

CrossFire 4.2
Section 8-1

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 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 vac 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 truck-mounted 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.

Blower Troubleshooting

CrossFire 4.2
Section 8-3

No	Problem / Possible Cause	Solution
1	**There is no vacuum or a loss of vacuum.**	
1.1	The *stainless steel filter* is clogged.	Clean or replace the filter.
1.2	The *filter bag* is clogged.	Clean or replace the filter bag.
1.3	The *vacuum tank dump valve* 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 *hose* on the live hose reels is collecting water.	Unroll the entire length of the hose each time you use it.
1.5	The *vacuum hose* is plugged.	Remove the obstruction by reversing the vacuum hose.
1.6	There is a restriction in the *cleaning tool.*	Remove the obstruction.
1.7	The *vacuum tank seal* is defective.	Replace the seal.
1.8	The *hose* 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 *recovery tank.*	Inspect the tank for leaks using smoke and weld the tank if it is required.
1.10	There is a hole in the *vacuum hose.*	Repair or replace the hose.
1.11	The *vacuum release* is loose.	Readjust the vacuum release.
1.12	The *engine speed* is too low.	Adjust the speed.

No	Problem / Possible Cause	Solution
1.13	The *vacuum blower's* end plates or lobes are worn.	Replace the worn components. **NOTE:** This must be accomplished by a qualified technician.
1.14	There are *vacuum leaks* 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.

No	Problem / Possible Cause	Solution
2	**The blower is noisy.**	
2.1	There is an *exhaust* leak between the blower and the silencer.	Inspect the fittings to determine where the air leak is. Repair as necessary.
2.2	The *blower* 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 *silencer* is bad.	Inspect it for an external hole. Repair or replace the silencer.
2.4	The *lobes* are hitting.	Replace the blower.
2.5	The *engine* 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 *bearings* are worn.	Remove and replace the bearings as required. **NOTE:** This process must be accomplished by a qualified technician.

No	Problem / Possible Cause	Solution
3	**The blower will not turn.**	
3.1	The *lobes* are locked up because of rust, burnt chemical foam, or a sugar-like substance has been vacuumed up from the carpet.	a. Most *burnt foam* and *rust* 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. b. Any *sugar-like substances* can be removed by soaking the lobes with hot water.
3.2	There is debris in the *blower*.	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 *gears* or shattered *lobes*.	Rebuild or replace the blower. **NOTE:** Rebuilding the blower must be accomplished by a qualified technician.

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

Honda GX620 Engine

CrossFire 4.2
Section 9-1

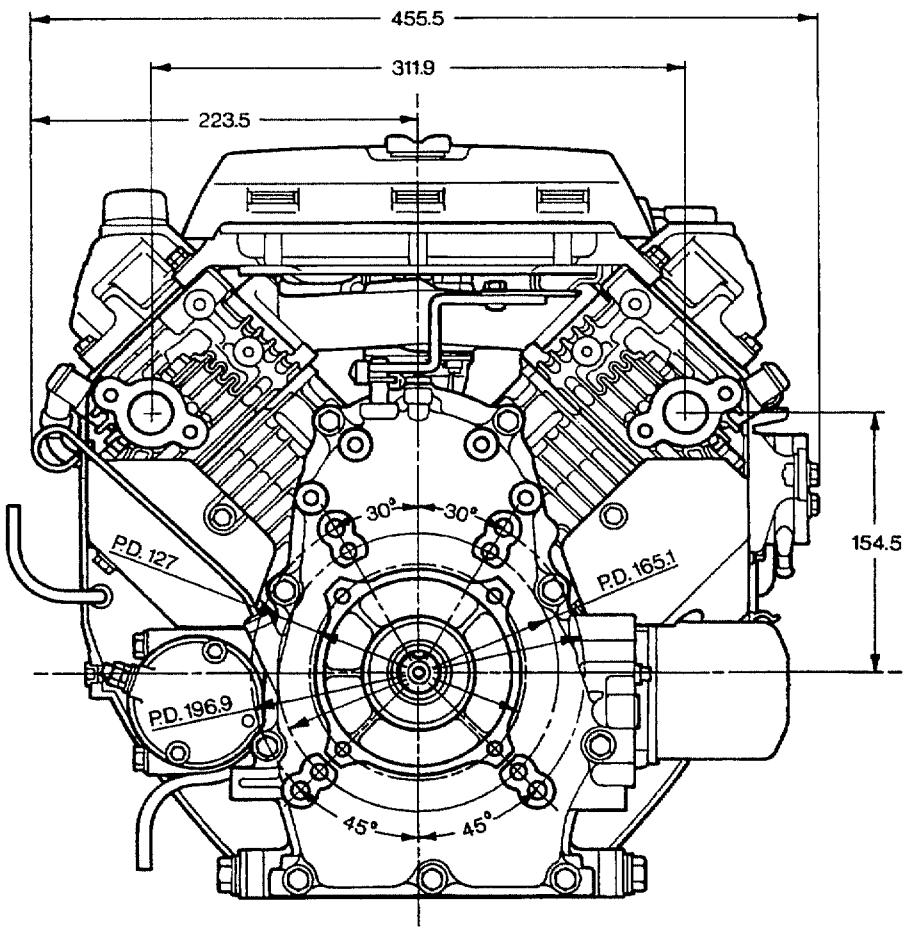


Figure 9-1

This information is taken from the Honda Engines, Owner's Manual.

Figure 9-2

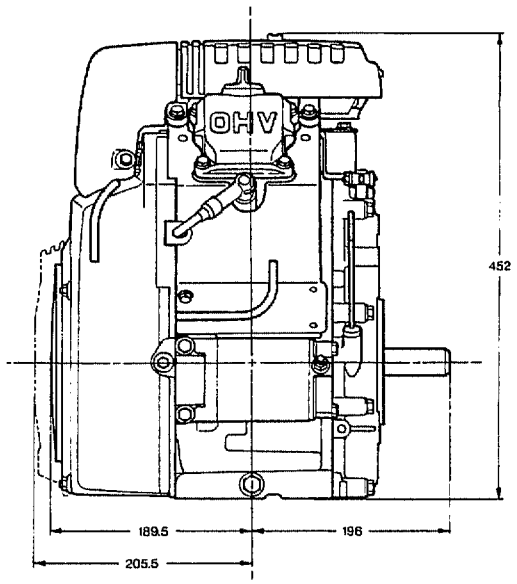


Figure 9-4

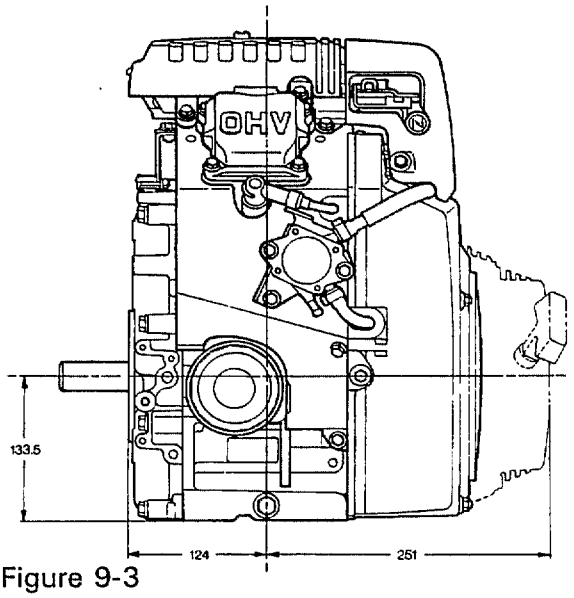


Figure 9-3

GX620 SPECIFICATIONS (Page 31)

Engine Type: 4-Stroke
Overhead Valve
2 Cylinders
(90° V-Twin)

Displacement: 37.5 cubic inches
(Bore x Stroke) 3.03 in x 2.6 in

Maximum Output: 20 HP
3,600 RPM

Maximum Torque: 32.5 ft-lb
2,500 RPM

Engine Oil Capacity: 1.2 liters
(1.3 quarts)

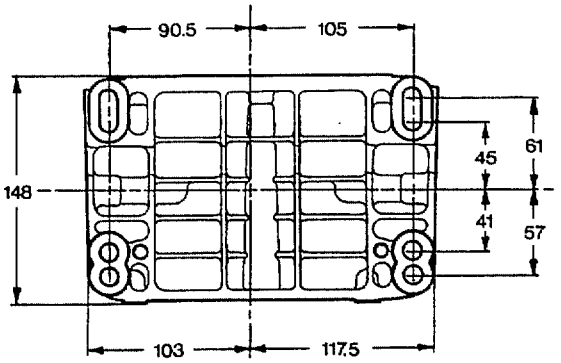
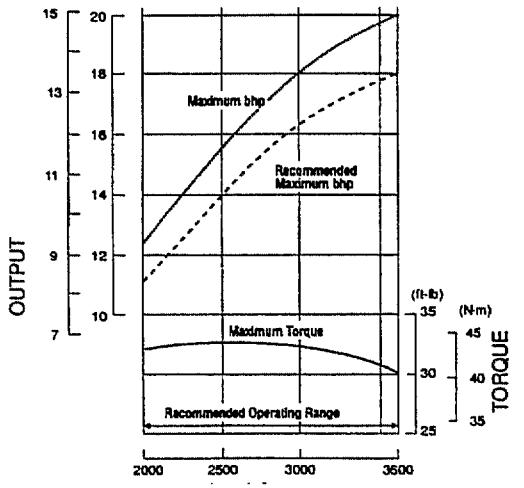


Figure 9-5: **GX620 Performance Curve**



Fuel Consumption: 0.51 lb/hph

Cooling System: Forced Air

Spark Plug: BPR6ES (NGK)
W20EPR-U (NIPPONDENSO)

Ignition System: Transistorized Magneto

PTO Shaft Rotation: Counterclockwise

PRE-OPERATION CHECK (Page 9)

Engine Oil

NOTICE: Engine oil is a major factor affecting engine performance and service life. Non-detergent oils and 2-stroke engine oils are not recommended because they have inadequate lubricating characteristics.

Check the oil level with the engine on a level surface and the engine stopped.

Use Honda 4-stroke oil, or an equivalent high-detergent, premium quality motor oil certified to meet or exceed US automobile manufacturer's requirements for Service Classification SG, SF/CC, CD. Motor oils classified SG, SF/CC, CD will show this designation on the container. SAE 10W-30 is recommended for general, all-temperature use.

Other viscosities may be used when the average temperature in your area is within the indicated range. In the Honda Engines, Owner's Manual see the chart on page 9.

1. Place the engine on a level surface.

2. Remove the dipstick and wipe it clean.
3. Fully insert the dipstick, then remove it to check the oil level.
4. If the oil level is near or below the lower limit mark on the dipstick, remove the oil filler cap, and fill with the recommended oil to the upper limit mark.
5. Reinstall the dipstick and filler cap.

Refer to the illustration on page 9 of the Honda Engines, Owner's Manual.

Fuel Recommendation

♦ WARNING ♦

- Gasoline is extremely flammable and is explosive under certain conditions.
- Refuel in a well-ventilated area with the engine stopped. Do not smoke or allow flames or sparks in the area where the engine is refueled or where gasoline is stored.
- Do not overfill the fuel tank (there should be no fuel in the filler neck). After refueling, make sure the tank cap is closed properly and securely. Be careful not to spill fuel when refueling. Spilled fuel or fuel vapor may ignite. If any fuel is spilled, make sure the area is dry before staring the engine.
- Avoid repeated or prolonged contact with skin or breathing of vapor.
- KEEP OUT OF REACH OF CHILDREN.

Use gasoline with a pump octane rating of 86 or higher.

We recommend unleaded gasoline because it produces fewer engine and spark plug deposits and extends exhaust system life.

Never use stale or contaminated gasoline nor oil/gasoline mixture. Avoid getting dirt, dust or water in the fuel tank.

Occasionally you may hear light "spark knock" or "pinging" (metallic rapping noise) while operating under heavy loads. This is no cause for concern.

If spark knock or pinging occurs at a steady engine speed, under normal load, change brands of gasoline. If spark knock or pinging persists, see an authorized Honda engine dealer.

NOTICE: Running the engine with persistent spark knock or pinging can cause engine damage.

Running the engine with persistent spark knock or pinging is misuse, and the Distributor's Limited Warranty does not cover parts damaged by misuse.

Oxygenated Fuels

Some conventional gasolines are being blended with alcohol or an ether compound. These gasolines are collectively referred to as oxygenated fuels. To meet clean air standards, some areas of the United States and Canada use oxygenated fuels to help reduce emissions.

If you use an oxygenated fuel, be sure it is unleaded and meets the minimum octane rating requirement.

Before using an oxygenated fuel, try to confirm the fuel's contents. Some states/provinces require this information to be posted on the pump.

The following are the EPA approved percentages of oxygenates:

ETHANOL (ethyl or grain alcohol) 10% by Volume
You may use gasoline containing up to 10% ethanol by

volume. Gasoline containing ethanol may be marketed under the name "Gasohol".

MTBE (methyl tertiary butyl ether) 15% by Volume
You may use gasoline containing up to 15% MTBE by volume.

METHANOL (methyl or wood alcohol) 5% by Volume
You may use gasoline containing up to 5% methanol by volume as long as it also contains co-solvents and corrosion inhibitors to protect the fuel system. Gasoline containing more than 5% methanol by volume may cause starting and/or performance problems. It may also damage metal, rubber and plastic parts of your fuel system.

If you notice any undesirable operating symptoms, try another service station or switch to another brand or gasoline.

Fuel system damage or performance problems resulting from the use of an oxygenated fuel containing more than the percentages of oxygenates mentioned above are not covered under warranty.

NOTICE: Oxygenated fuels can damage paint and plastic. Be careful not to spill fuel when filling your fuel tank. Damage caused by spilled fuel is not covered under warranty.

Air Cleaner

1. Remove the wing bolt, air cleaner cover, and the foam element.
2. Inspect the air cleaner elements. Clean or replace the elements if necessary. If the air cleaner elements need cleaning, follow the procedure described in the Honda Engines, Owner's Manual, page 21.
3. Reinstall the air cleaner elements and air cleaner cover. Tighten the

wing bolt securely.

NOTICE: Do not allow dust, dirt or debris to enter the air cleaner body when servicing the air cleaner.

For exploded view of air cleaner, see illustration on page 12 of Honda Engines, Owner's Manual.

OPERATION (Page 17)

High Altitude Operation

At high altitude, the standard carburetor air-fuel mixture will be too rich. Performance will decrease, and fuel consumption will increase. A very rich mixture will also foul the spark plug, cause hard starting and contribute to air pollution.

High altitude performance can be improved by installing a smaller diameter main fuel jet in the carburetor and readjusting the pilot screw. If you always operate the engine at altitudes higher than 6,000 feet above sea level, have your authorized Honda engine dealer perform these carburetor modifications.

Even with suitable carburetor jetting, engine horsepower will decrease approximately 3.5% for each 300 meter (1,000 feet) increase in altitude. The effect of altitude on horsepower will be greater than this if no carburetor modification is made. A reduction in engine horsepower will reduce performance.

NOTICE: When the carburetor is modified for high altitude operation, the air-fuel mixture will be too lean for low altitude use. Operation at altitudes below 1,800 meters (6,000 feet), with high altitude carburetor modifications, may cause the engine to overheat and result in serious engine damage. For low

altitude use, reinstall the standard main fuel jet, and readjust the pilot screw.

Oil Alert System (Applicable Models)
The Oil Alert system is designed to prevent engine damage caused by an insufficient amount of oil in the crankcase. Before the oil level in the crankcase can fall below a safe limit, the Oil Alert system will automatically stop the engine (the engine switch will remain in the ON position).

If the engine stops and will not restart, check the engine oil level before troubleshooting in other areas. (To check engine oil level, see page 9 of the Honda Engines, Owner's Manual.)

MAINTENANCE (Page 19)

The purpose of the Maintenance Schedule is to keep the engine in the best operating condition. Inspect and service as indicated in the Maintenance Schedule on page 19 of the Honda Engines, Owner's Manual.

♦ WARNING ♦

Shut off the engine before performing any maintenance. If the engine must be operated, make sure the area is well-ventilated. The exhaust contains poisonous carbon monoxide gas; exposure can cause loss of consciousness and may lead to death.

NOTICE: Use only genuine HONDA parts or their equivalent for maintenance or repair. Replacement parts which are not of equivalent quality may damage the engine.

Engine Oil Change

Drain the oil while the engine is warm to assure rapid and complete draining (see illustration on page 20 of the Honda Engines, Owner's Manual).

1. Remove the oil filler cap and drain bolt. Drain the oil into a suitable container.
2. Re-tighten the drain bolt securely.
3. Refill to the upper limit mark on the dipstick with the recommended oil. (See page 9 in Honda Engines, Owner's Manual.) Tighten the oil filler cap securely.

Engine Oil Capacity: 1.2 liters (1.3 US quarts, 1.1 imperial quarts)

NOTE: Please dispose of used motor oil in a manner that does not harm the environment. Do not throw it in the trash, pour it on the ground or down a drain.

Air Cleaner Service

A dirty air cleaner will restrict air flow to the carburetor. To prevent carburetor malfunction, service the air cleaner regularly. Service more frequently when operating the engine in extremely dusty areas.

♦ WARNING ♦

Never use gasoline or low flash point solvents for cleaning the air cleaner element because a fire or explosion could result.

NOTICE: Never run the engine without the air cleaner. Rapid engine wear will result from contaminants, such as dust and dirt, being drawn into the engine.

1. Remove the wing bolt and remove the air cleaner cover.

2. Remove the two 5 mm screws from the air cleaner cover and remove the paper element from the cover. Remove the foam element from the air cleaner body.

3. Foam element: Clean in warm, soapy water. Rinse and dry thoroughly. Or, clean in non-flammable solvent and dry.

   Dip the element in clean engine oil, then squeeze out all excess oil. The engine will smoke when started if too much oil is left in the foam.

4. Paper element: Tap the element lightly several times on a hard surface to remove excess dirt, or blow compressed (not exceeding 2.1 kg/cm^2 - 30 PSI) air through the filter from the air cleaner cover inside. Never try to brush the dirt off; brushing will force dirt into the fibers. Replace the paper element if it is excessively dirty. Replace the paper element and both gaskets.

5. Reinstall the air cleaner elements. Tighten the wing bolt securely.

NOTICE: Do not allow dust, dirt and debris to enter the air cleaner body when servicing the air cleaner.

See exploded view of air cleaner in Honda Engines, Owner's Manual, page 21.

Spark Plug Service

Recommended spark plug:

BPR6ES (NGK)
W20EPR-U (NIPPONDENSO)

To ensure proper engine operation, the spark plug must be properly gapped and free of deposits.

1. Remove the spark plug cap.
2. Clean any dirt from around the spark plug base.
3. Use the wrench supplied to remove the spark plug.

♦ CAUTION ♦

The muffler becomes very hot during operation and remains hot for a while after stopping the engine. Be careful not to touch the muffler while it is hot.

4. Visually inspect the spark plug. Discard it if the insulator is cracked or chipped. Clean the spark plug with a wire brush if it is to be reused.
5. Measure the plug gap with a feeler gauge. Correct as necessary by bending the side electrode.
   The gap should be: 0.70 - 0.80 mm (0.028 - 0.031 in)
6. Check that the spark plug washer is in good condition and thread the spark plug in by hand to prevent cross-threading.
7. After the spark plug is seated, tighten with a spark plug wrench to compress the washer.
   - If installing a new spark plug, tighten 1/2 turn after the spark plug seats to compress the washer.
   - If reinstalling a used spark plug, tighten 1/8-1/4 turn after the spark plug seats to compress the washer.

NOTICE:

- The spark plug must be securely tightened. An improperly tightened spark plug can become very hot and may cause engine damage.
- Use only the recommended spark plug or equivalent. A spark plug which has an improper heat range may cause engine damage.

See spark plug illustrations (Honda Engines, Owner's Manual, p. 22, 23).

Fuel Filter

1. Remove the two 6 mm special bolts from the control cover. Remove the control cover.
2. Check the fuel filter for water accumulation or sediment. If no water or sediment is found, reinstall the control cover.
3. If the fuel filter is found with excessive water accumulation or sediment, take the engine to your authorized Honda engine dealer.

Check fuel filter illustrations (Honda Engines, Owner's Manual, pg. 26).

TRANSPORTING / STORAGE (Page 28)

Keep the engine level to reduce the possibility of fuel leakage when transporting. If the fuel tank is equipped with a valve, turn the fuel valve to the CLOSED or OFF position.

♦ WARNING ♦

- To avoid severe burns or fire hazards, let the engine cool before transporting it or storing it indoors.

- When transporting the engine, turn the fuel valve to the OFF position and keep the engine level to prevent fuel spillage. Fuel vapor or spilled fuel may ignite.

Storage Time	Recommended Service Procedure to Prevent Hard Starting
Less than 1 month	No preparation required.
1 to 2 months	Fill with fresh gasoline and add gasoline conditioner*.
2 months to 1 year	Fill with fresh gasoline and add gasoline conditioner*. Drain the carburetor float bowl.
1 year or more	Drain the fuel tank. Drain the carburetor float bowl.

* Use gasoline conditioners that are formulated to extend storage life. Contact your authorized Honda engine dealer for gasoline conditioner recommendations.

Before storing the unit for an extended period:

1. Be sure the storage area is free of excessive humidity and dust.
2. Drain the fuel.
   a. Disconnect the fuel line to the engine, and drain the fuel tank into an approved gasoline container. If the fuel tank is equipped with a valve, turn the fuel valve to the OPEN or ON position to enable draining. After draining is completed, reconnect the fuel line.
   b. Remove the control cover (see page 26 in the Honda Engines, Owner's Manual), loosen the carburetor drain screw, and drain the carburetor into an approved gasoline container. After draining is completed, tighten the carburetor drain screw and reinstall the control cover.

♦ WARNING ♦

Gasoline is extremely flammable and is explosive under certain conditions. Do not smoke or allow flames or sparks in the area.

3. Change the engine oil (see page 20, Honda Engines, Owner's Manual).
4. Remove the two spark plugs and pour about a tablespoon of clean engine oil into the cylinders. Crank the engine several revolutions to distribute the oil. Reinstall the spark plugs.
5. Remove the battery and store it in a cool, dry place. Recharge it once a month.
6. Cover the engine to keep out dust.

TROUBLESHOOTING (Page 30)

The engine will not start:

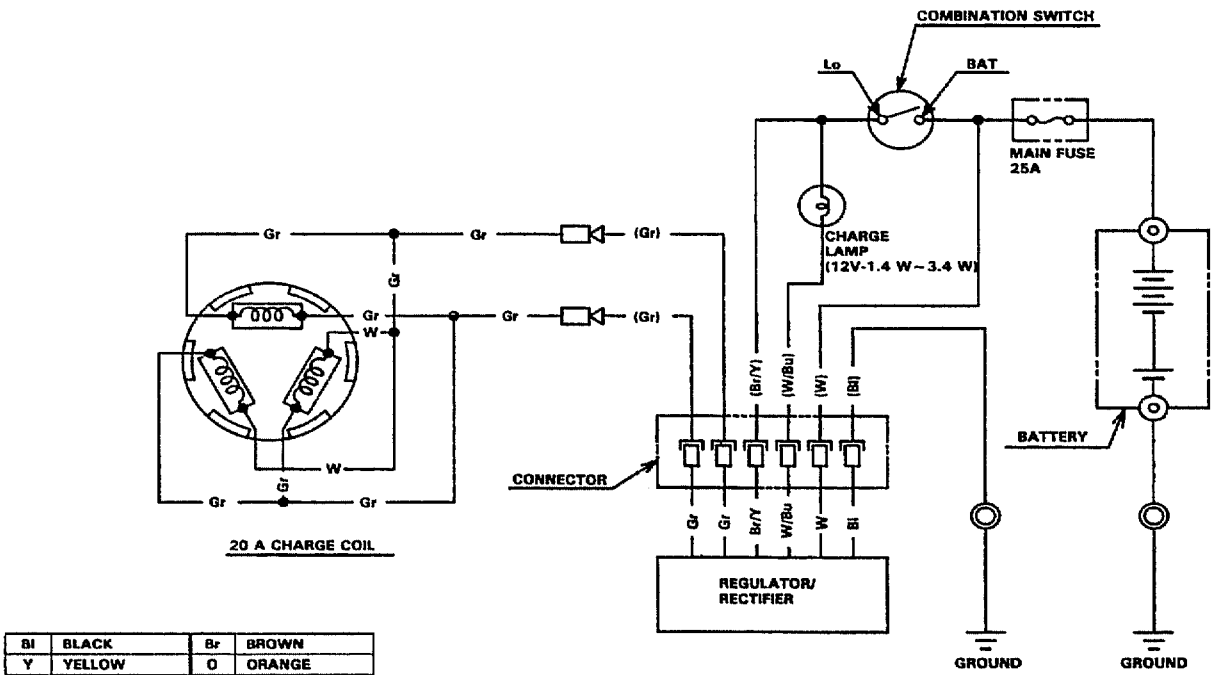
1. Are the battery cables securely connected and free of corrosion?
2. Is the battery fully charged?
3. Is the fuse good (if equipped with Honda engine switch)?
4. Is the engine switch in the ON position?
5. Is there enough oil in the engine?
6. Is the fuel valve ON (if fuel line is equipped with a valve)?
7. Is there fuel in the fuel tank?
8. Is fuel reaching the carburetor?
   To check, loosen the drain screw with the fuel valve on.

♦ WARNING ♦

If any fuel is spilled, make sure the area is dry before testing the spark plug or starting the engine. Fuel vapor or spilled fuel may ignite.

9. Is there a spark at the spark plugs? (See illustration on page 30, Honda Engines Owner's Manual.)
   a. Remove both spark plug caps. Clean any dirt from around the base of the spark plugs, then remove both spark plugs.
   b. Install the spark plugs in the spark plug caps and ground the side electrodes to any engine ground.
   c. Turn the engine switch on. Pull the recoil starter. See if there are sparks at the electrode gaps of both spark plugs.
   d. If there are no sparks, replace the spark plugs. If OK, reinstall the spark plugs. Try to start the engine again according to the instructions.
10. If the engine still does not start, take the engine to an authorized Honda dealer.

Figure 9-6: **Internal Wiring Diagram**



Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

Engine Troubleshooting

CrossFire 4.2
Section 9-17

No	Problem / Possible Cause	Solution
1	**The engine will not turn over.**	
1.1	The *circuit breaker* on the control panel has tripped.	Press the reset button. Inspect the unit to determine the cause of the tripped circuit breaker and correct the problem.
1.2	There is a loose *battery cable or* corroded battery *terminals*.	Clean and tighten the battery terminal connections.
1.3	The *battery* is dead.	Recharge or replace the battery.
1.4	There is a problem with the *fuse link*.	Check the link. If it is defective, replace it.
1.5	There is a problem with the *starter solenoid*.	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 blue 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.
1.6	The *ignition switch* is defective.	Test the switch for entering voltage. If there is voltage entering, but no voltage exiting the center post when the switch is fully engaged, replace the switch.
1.7	The *vacuum blower* has seized.	Refer to The Blower, Chapter 10.

No	Problem / Possible Cause	Solution
1.8	The *starter motor* is defective.	Remove the belt(s) from the engine. 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.
1.9	There is an *engine* problem.	Refer to the engine operation and maintenance in your owner's manual or see the local Honda engine repair facility.
1.10	The *ground cable* underneath the motor has fallen or broken off.	Reattach the cable.

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 a spark, see troubleshooting problem number 3 on the following page for possible fuel problems.
2.1	The *recovery tank* is full.	Empty the tank.
2.2	The *recovery tank float* is causing the engine to shut down.	Disconnect the float switch. If the unit starts, replace the defective switch.
2.3	The *oil pressure switch* 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 oil pressure switch. **NOTE:** The CrossFire machines with Honda engines built prior to May 1994 should have kit #078-087 (Oil Pressure By-pass).
2.4	The *high temperature switch* is causing the engine to shutdown.	Determine the cause of overheating before restarting the unit. See Chapter 6, CrossFire Water System, Problem 3.
2.5	The *high temperature shutdown switch* is defective.	Disconnect the switch. If the engine starts, then test the switch. The switch operates at 245° F. Replace it if necessary.
2.6	The *engine* is malfunctioning.	Refer to the Honda Engine Maintenance manual included in your owner's manual.
2.7	A *spark plug* 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.

No	Problem / Possible Cause	Solution
2.8	A *spark plug wire* is faulty.	While the engine is turning over with the starter, make a visual check to identify any bad spark plug wire. In a dark, well ventilated garage start the engine and look at the plug wires. If there is a break in the wire you will see arcing or sparking at the damaged area. If you notice arcing, replace the wire.

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 chemical mix tank is out of water caused by a defective *upper float in the mix tank.*	When the float is down, the circuit is open. When the float is up, the circuit is closed. Replace the float if it is defective.
3.2	The chemical mix tank is out of water caused by a dirty or defective *solenoid valve* along side of the mix tank.	The solenoid valve is normally closed and should open with 12 volts across its terminals. Remove any foreign matter from inside the valve. Replace the valve if it is defective.
3.3	The chemical mix tank is out of water caused by a defective *chemical relay.*	At the Diagnostic Center remove the wire going to terminal 17a. Turn the ignition switch on and check for +12 volts on terminal 16. If no voltage is present, replace the chemical relay.
3.4	The *lower float in the chemical mix tank*, which also activates the fuel solenoid at the carburetor, is defective.	Push in the freeze guard switch located on the lower control panel. (This is recommended because it is possible for the float switch to carry enough continuity to light a test probe but not enough to open the solenoid.) If the engine starts and runs with the switch engaged, then replace the defective float.
3.5	The *fuel pump* 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.
3.6	There is a poor *battery ground* to the fuel pump.	Repair the loose ground connection.

No	Problem / Possible Cause	Solution
3.7	The *fuel pump* 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.
3.8	The *fuel filter* is clogged.	Replace the filter.
3.9	The *quick connect* in the fuel line is clogged.	Clean or replace the quick connect.
3.10	Vapor lock.	Move the fuel pump to a cooler area. A vapor lock is caused from excessive heat.
3.11	The *carburetor solenoid* is defective.	Check for 12 volts at the solenoid valve. If the solenoid valve is not opening with 12 volts going to it, the valve must be replaced.

No	Problem / Possible Cause	Solution
4	**The engine runs poorly or dies after running for a while.**	
4.1	The *lower float in the mix tank* is bad.	If the engine runs better when depressing the freeze guard switch, then replace the float.
4.2	The *fuel pump* 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 pump if it is defective.
4.3	The *air or gas filter* is clogged.	Inspect both filters and replace the clogged one.
4.4	There is a poor *battery ground* to the fuel pump.	Inspect the electrical grounds. Repair any loose wires.
4.5	The *fuel pump* is sucking air between the gas tank and the fuel pump.	Inspect for air leaks between the pump and the gas tank. Repair or replace any leaking components.
4.6	A clogged *heat exchanger* is causing back pressure. The engine will spit gas from the carburetor and run slow.	Remove the hose from the blower silencer to the copper heat exchanger. If the engine runs better then remove the copper heat exchanger and clean the debris from it. If the engine still runs badly then remove the brass plugs from the top of the stainless steel heat exchangers. If the engine runs better then clean the debris from the copper heat exchanger that is attached to the stainless steel exchangers.
4.7	There is excessive *engine load*.	Clean and adjust the recovery tank relief valve. Adjust for 12 inches of lift under a full load.

No	Problem / Possible Cause	Solution
4.8	The engine overheats from poor *ventilation*.	Remove any air restriction from around the engine. Add a roof vent or external fan, if necessary.
4.9	The engine overheats from carbon build up in the *combustion chamber*.	Refer to a local Honda engine dealer.
4.10	The engine overheats from too much oil in the *crankcase*.	Check the oil level and correct it if necessary.
4.11	The *carburetor solenoid valve* is defective.	Check for 12 volts at the solenoid valve. If voltage is present the valve should be open. If the valve is not opening with 12 volts going to it, the valve must be replaced.
4.12	The *engine* is malfunctioning.	Refer to the Engine Operation and Maintenance manual included in your owner's manual or your local Honda engine dealer.
4.13	**On dual tank Fords**, the engine is pulling through the *'Tank Switching Valve'*.	Do not try to pull gas from both gas tanks.
4.14	The *PCV valve* is defective.	Remove and check the air cleaner for oil saturation. If it is saturated, replace the PCV valve and air filter.

Electrical System

CrossFire 4.2
Section 10-1

The CrossFire electrical system has been specifically designed with the operator in mind. Often the most difficult problem to trace is an electrical failure.

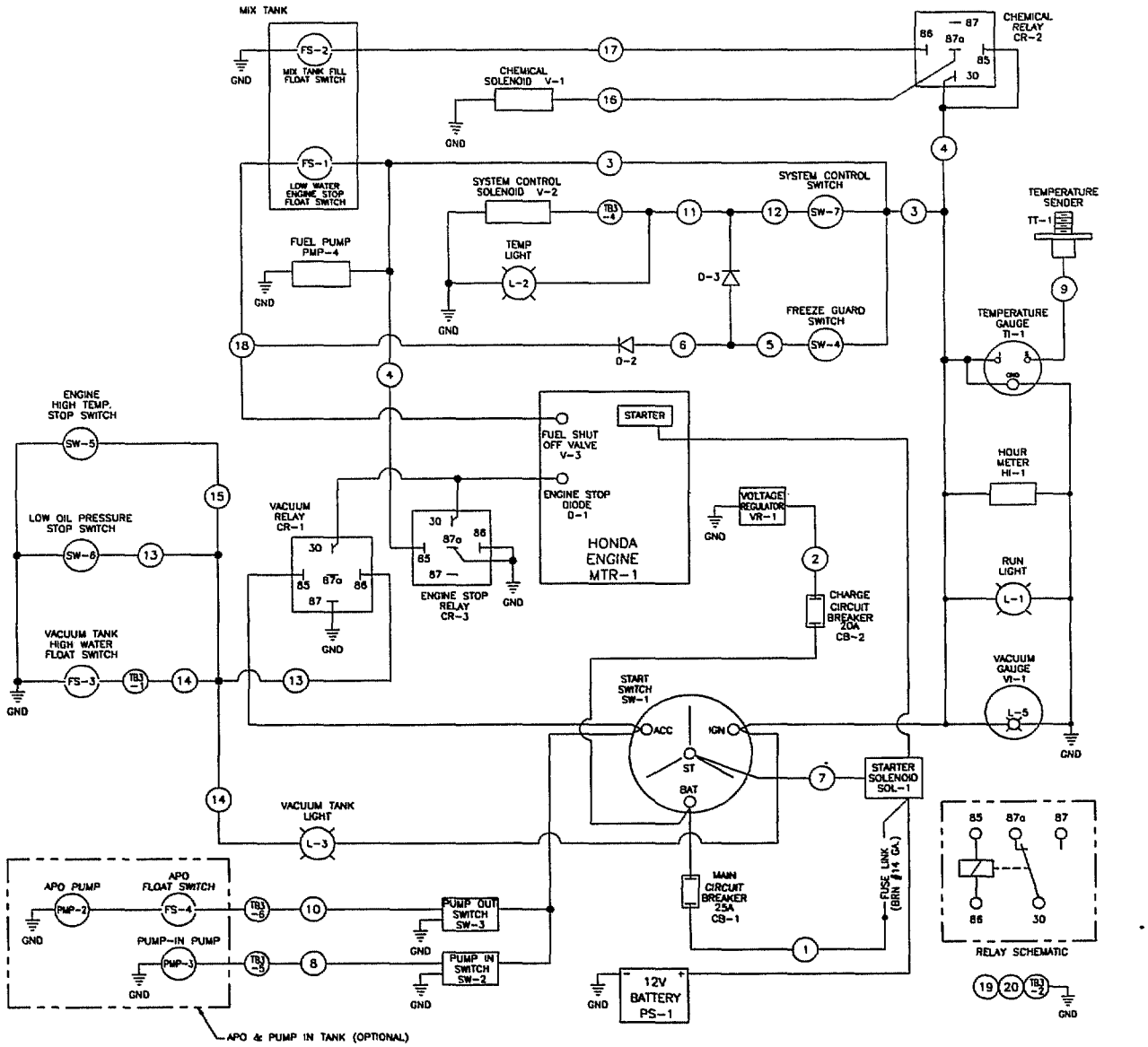
The CrossFire series of machines utilizes a wiring diagnostic center which allows the operator or mechanic to trace all the electrical circuits from the front of the machine.

The entire electrical system operates on 12 volts DC which is provided by a battery. Battery levels are sustained by a 20 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.

REFERENCE TO WIRING DIAGRAMS

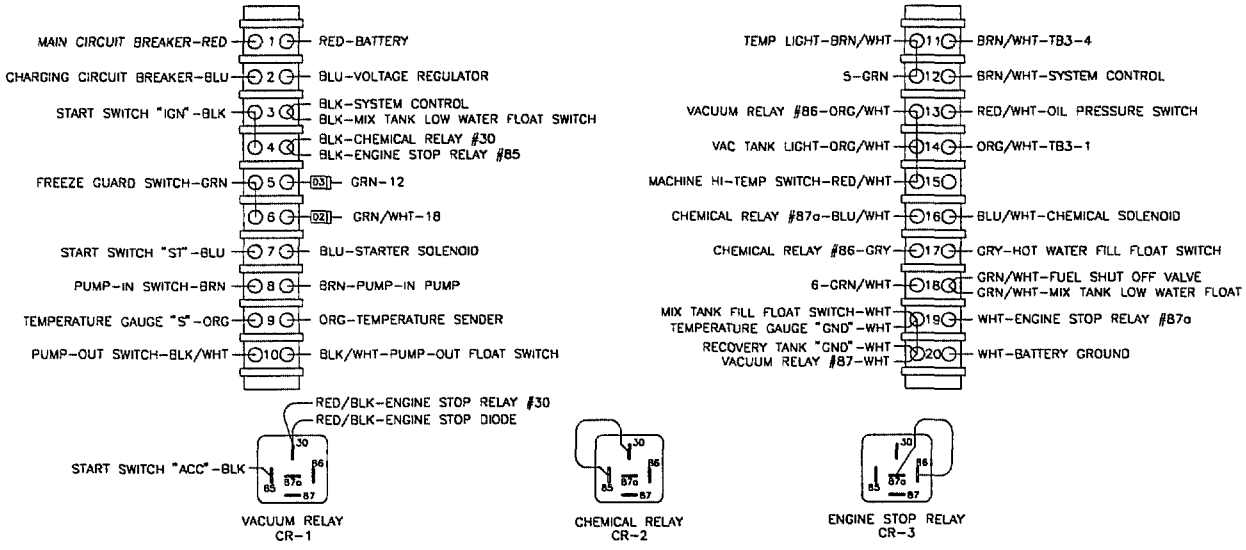
Ref.	Description	Ref.	Description
TB	Terminal Block	CB	Circuit Breaker
MTR	Motor	D	Diode
P	Plug	VR	Voltage Regulator
J	Jack or Recepticle	V	Valve
CR	Relay	FS	Float Switch
SW	Switch	PMP	Pump
HI	Hour Meter	B	Butt Connector
TI	Temperature Gauge	PS	Power Supply
PI	Pressure Gauge	SOL	Solenoid
VI	Vacuum Gauge	TT	Temperature Sender
L	Indicator Light or Light		

Figure 10-1: **HONDA Wiring Schematic**



HONDA

CrossFire Diagnostic Center



NOTE: The numbers above correspond to the circled numbers on the wiring diagram.

Machine Maintenance

CrossFire 4.2
Section 11-1

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 the date and machine hours on the maintenance log.

We have provided a maintenance log for your convenience at the end of this section. The ⏲ symbol means to see this General Maintenance Log for specific maintenance intervals. *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.
Inspect garden hose screen. Clean as needed.
Visually inspect machine for loose wires, oil leaks, water leaks, etc.
Inspect recovery 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.
One time check of the belt tensioning ***after first 25 hours*** of use.
Check oil level in blower.
Check high pressure pump oil. Add as necessary.
Check drive system screws. Tighten as needed.
Check pump drive belt for wear.
Check pump pulleys for wear.
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 any chafing.
Flush water and chemical system with 50/50 white vinegar solution.

MONTHLY

Change engine oil.
Check engine air cleaner. Clean foam element as necessary.
Remove pressure By-pass Valve piston plate. Grease plate. Reinstall.
Check water level in battery. Clean connections as needed.
Change oil filter every 2 months.
Check the belt tensioning every 2 months.

The single belt drive system tension is approx. 3/8" deflection with 8 to 9 lbs of force, measured at midspan. The dual belt system tension is approx. 3/8" deflection with 4 to 5 lbs of force per belt, measured at midspan.

QUARTERLY

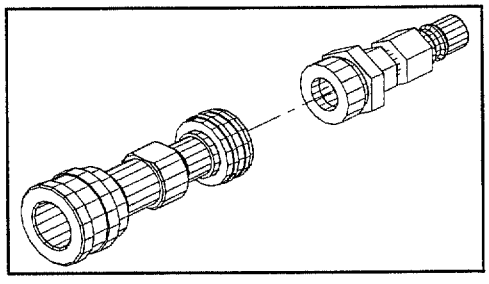
Check fuel lines for wear.
Clean and gap spark plugs.
Grease blower bearing fittings.
Change oil in blower.
Change oil in pump.

DE-SCALING, As Required

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, 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. Depress the freeze guard button and hold for 30 seconds. 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, stainless steel 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.

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/adapter screen for debris. Remove and clean thoroughly.

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

GENERAL MAINTENANCE LOG

MAX HRS	DAILY SERVICE	OIL RECOMMENDATIONS	
8	ENGINE OIL check	BLOWER	40 weight non-detergent
8	GARDEN HOSE SCREEN clean	PUMP	5 - 30 weight synthetic motor oil
8	MACHINE general inspection	ENGINE	30 weight motor oil
8	RECOVERY TANK FILTER BAG clean		NOTE: Overhead valve engines can use multi-viscosity oil, but will experience increased oil consumption.
8	BLOWER INLET spray with lubricant		

	WEEKLY SERVICE	DATE & HOURS						
20	OIL change with filter		Break-in. One time only.					
25	BELTS check tension		Break-in. One time only.					
25	BLOWER check oil level							
25	PUMP OIL check							
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							
	MONTHLY SERVICE							
100	ENGINE OIL change							
100	ENGINE AIR CLEANER clean							
100	BY-PASS VALVE grease piston and o-rings							
100	BATTERY WATER LEVELS check							
200	OIL FILTER change							
200	BELTS check tension							
	QUARTERLY SERVICE (3 MONTHS)							
300	FUEL LINES check for wear							
300	SPARK PLUGS clean and gap							
400	BLOWER grease bearing							
400	BLOWER OIL change							
400	PUMP OIL change							

For a detailed engine maintenance table, see page 19 in **Honda's GX620 Owner's Manual** *located in Section 9 of your* **CrossFire 4.2 Owner's Manual.**

How to Order Parts

CrossFire 4.2
Section 12-1

To obtain a proper diagnosis of your malfunction, and to order warranty replacement parts, it is important that you proceed in the following manner:

WARRANTY PARTS ORDERS

1. Call HydraMaster Warranty/Service Department at (206) 775-7275.

2. Give the Warranty/Service representative the following information:
   A. Your Company Name and Address
   B. Equipment Model
   C. Date of Purchase
   D. Hours on the Unit
   E. Unit Serial Number
   F. Name of Person Authorized to Order Parts
   G. Sales Representative from which Unit was Purchased
   H. Description of Malfunction
   I. High Pressure Gauge Readings with the Wand Turned On and Off

3. If warranty replacement parts are needed, please specify method of shipment desired. HydraMaster will pay for ground UPS. If you require replacement parts overnight they will be sent freight collect, via: Air Freight, Air Mail, or Air Express.

4. Do not give malfunctioning parts to a HydraMaster sales or service representative. **All parts must be returned directly to HydraMaster, freight prepaid.**

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, i.e. UPS, Blue Label, Air Freight, Air Express, etc.

HydraMaster Parts Dept. Phone . . . . . (206) 775-7276
HydraMaster Parts Dept. Toll Free Fax 1-800-426-4225

HydraMaster has a $40 minimum on parts orders. Orders below the minimum will be charged a $15 expediting fee.

ONE FINAL NOTE

Any questions you have regarding the warranty program should be directed to the Warranty/Service Department personnel at HydraMaster Corporation.

We shall always endeavor to be fair in our evaluation of your warranty claim, and shall provide you with a complete analysis of our findings.

HydraMaster warranty covers only defective materials and/or workmanship for the periods listed. **Labor and/or diagnostic reimbursement is specifically excluded.**

Warranty Information

CrossFire 4.2
Section 13-1

To avoid misunderstandings which might occur between machine owners and manufacturer, we are listing causes of component failure that specifically voids warranty coverage. Such causes as listed below shall constitute **abuse or neglect.**

BLOWER: Failure to lubricate impellers daily with an oil based lubricant. Failure to lubricate bearings as recommended in blower manual. Failure to maintain proper oil levels in the blower. Failure to use the correct oil grade and viscosity as recommended in blower manual. Failure to properly maintain blower safeguard systems such as waste tank filter screen, vacuum safety relief valve and waste tank automatic shut-off system. Allowing foam to pass through blower.

HIGH PRESSURE WATER PUMP: Failure to maintain proper oil level as recommended in pump manual. Failure to change oil in pump at recommended intervals. Failure to protect pump against freezing. Failure to maintain pump protection shut-off system. Failure to use water softener in hard water areas. Use of improper chemicals.

VAC TANK: Failure to properly maintain filtering devices in tank. Failure to clean tank as recommended by manufacturer. Failure to maintain vacuum safety release in tank lid. Use of improper chemicals.

CHEMICAL PROPORTIONER: Use of improper chemical. Failure to use water softener in hard water area. Operating machine without proper chemical filter screen. Failure to protect against freezing.

CONTROL PANEL: Failure to protect flowmeter and water pressure gauge against freezing.

VACUUM AND SOLUTION HOSES: Failure to protect hoses against freezing. Failure to protect hoses against burns from engine/blower exhaust. Damage to hoses from being run over by vehicles. Kinking or cracking from failure to store or unroll hoses correctly. Normal wear and tear from everyday use.

CLEANING WAND: Failure to protect against freezing. Obvious physical abuse of wand.

WATER HEATING SYSTEM: Over pressurization of the system (recommended maximum working pressure - 800 PSI). Failure to protect against freezing.

WARRANTY PROCEDURE

Warranty coverage is available to you ONLY through HydraMaster Corporation, 11015 47th Avenue W, Mukilteo, WA 98275. When warranty parts are needed, write **HydraMaster Warranty Dept.** at the above address, or call the Warranty/Service Dept. at (425) 775-7275. **No collect calls will be accepted.** When calling, be sure to have machine information and serial number ready for the service representative. **Hours of Warranty/Service Dept. are 8:00 am to 5:00 pm Pacific Time.**

IMPORTANT: HydraMaster's warranty policy provides replacement parts without charge for thirty (30) days to customers maintaining current account status. An invoice will be sent to the customer for the amount of the parts sent. The customer's faulty parts **must be** returned for evaluation prior to the expiration of the thirty (30) day period. Upon warranty approval, a credit will be issued the customer for the replacement parts invoice. **Warranty disapproval or failure to return the faulty parts within the thirty (30) day period allowed will result in the customer being charged for the replacement parts sent.**

Accessories

CrossFire 4.2
Section 14-1

Genuine HydraMaster Accessories & Detergents

This section of your Owners Manual is devoted to Accessories and Detergents which we have found to be helpful and useful. *These products can enhance your cleaning and reduce your labor costs!*

HydraMaster Machine accessories are the most innovative collection available in the cleaning industry. Our patented **RX-20 Rotary Extractors** have changed the shape of steam cleaning. Our hoses and tanks are of the finest quality construction.

SafeClean Detergents have been specially prepared, not only to give you exceptional cleaning, but also to optimize your truckmount's operation and reliability. *Most detergents don't work well under the high heat, high pressure conditions of truckmount use.* **SafeClean** will maintain your machines's water pump and water heating systems at peak efficiency and help ensure fewer breakdowns.

For more information, or to order Genuine HydraMaster Accessories and Detergents Call your nearest authorized HydraMaster Distributor.

HYDRAMASTER
Corporation
6323 204th Street SW, Lynnwood, WA 98036

PRODUCT SUPPORT BULLETIN

TO: All HydraMaster Machine Owners

DATE: 8 Oct 1993

RE: Acid Rinse Products Precautions

PSB #: 93102

As most of you are aware, there is increasing interest in a process of cleaning using acid rinse products. Sometimes known as "fibre rinse," these products have an acid base and can cause problems for carpet cleaning equipment.

HydraMaster Corporation, in response to market demand, has recently introduced a new SafeClean chemical called "ClearWater Rinse". Extensive testing was conducted during the design phase because this is an acid based product. The testing showed that the acid based solutions used in most rinse products is very aggressive in attacking water system components. As a result of testing, special protectants were added to our "ClearWater Rinse" to make it safe for commercial use.

HydraMaster advises that if you are using, or considering the use of, a "rinse" product, that you first determine its compatibility with your equipment. HydraMaster does not warranty equipment against the use of unprotected acid products.

HYDRAMASTER
Corporation
6323 204th Street SW, Lynnwood, WA 98036

PRODUCT SUPPORT BULLETIN

TO: All CrossFire Owners DATE: 31 May 1994

RE: Over-Temperature Situation PSB #: 94051

HydraMaster is issuing this maintenance tip: A clogged filter can cause excessively heated water in CrossFires.

CrossFire machines have a "Y" type filter located on the front, lower right corner of the machine. It is behind the front panel, in back of the pressurized water quick-connect. This filter should periodically be cleaned!

If the filter becomes clogged, the pressurized water is restricted from circulation through the heat exchangers and becomes extremely hot when the cleaning wand is at rest.

Checking and cleaning this filter should be part of your weekly maintenance schedule.

HYDRAMASTER
Corporation
6323 204th Street SW, Lynnwood, WA 98036

PRODUCT SUPPORT BULLETIN

TO: All HydraMaster Distributors DATE: 9 Jun 1994

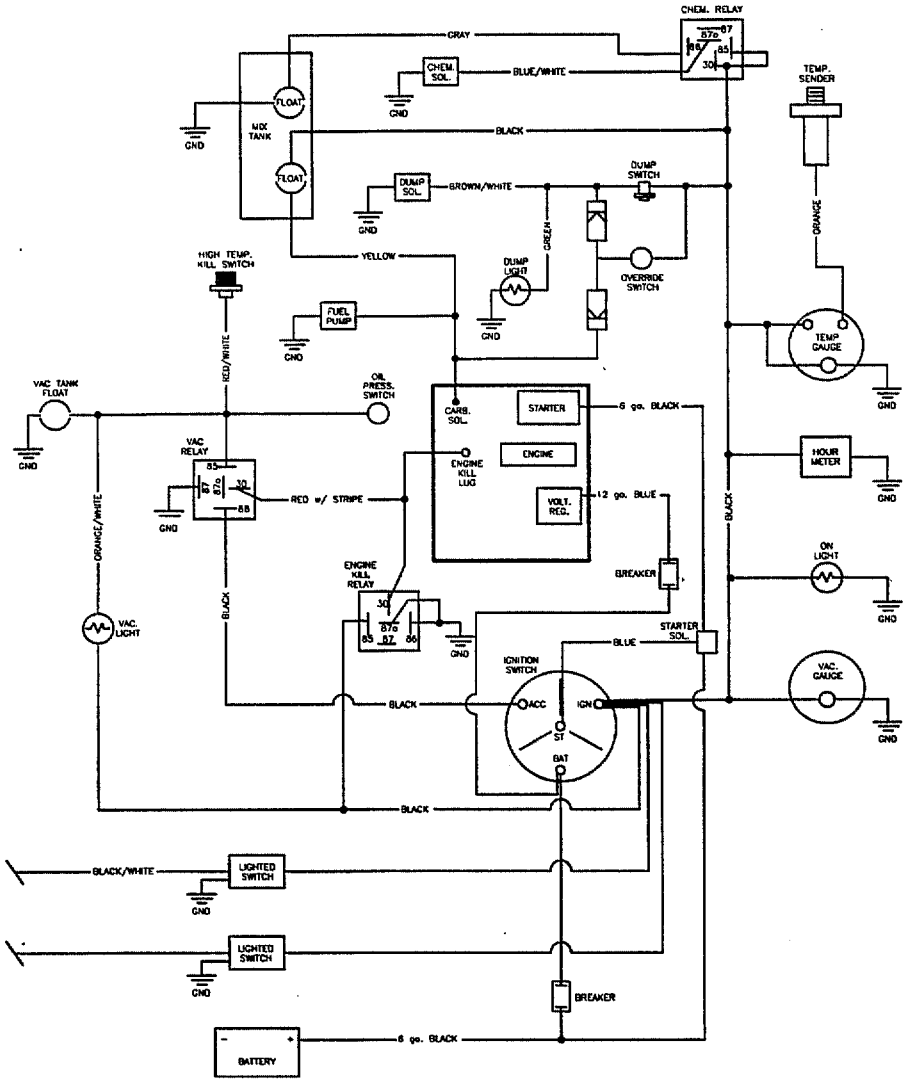
RE: Oil Pressure Switch Wiring Change on CF 4.2 PSB #: 94061

HydraMaster has changed the wiring on the CrossFire 4.2 to eliminate the need for the oil pressure by-pass switch. *The oil pressure switch is now wired to the engine kill relay.* The vacuum tank float switch and the high temperature kill switch also operate the engine kill relay.

The system operates as follows:

> When the key is turned to the run position, the "RUN" and the "VAC TANK" lights will illuminate. When the key is turned to the start position, the "VAC TANK" light will stay on until the oil pressure is built up. If the key is returned to the run position while the "VAC TANK" light is still on, the engine will not continue to run.

New CrossFire 4.2 Wiring Diagram



HYDRAMASTER
Corporation
6323 204th Street SW, Lynnwood, WA 98036

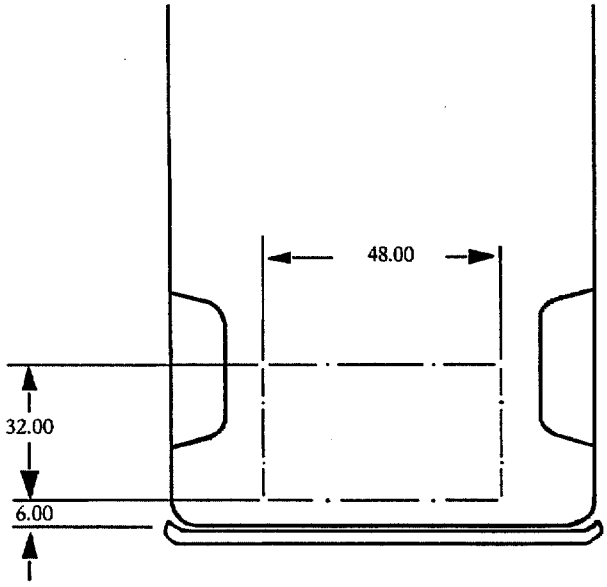
PRODUCT SUPPORT BULLETIN

TO: All HydraMaster Distributors DATE: 14 Jun 1994

RE: '93 Dodge Vans PSB #: 94062
Location of Fuel Tanks

It has come to our attention that the fuel tanks on 1993 and newer Dodge vans are located directly against the floor of the van. Caution must be used when drilling any holes through the floor. The attached illustration indicates the area in the rear of the van where no screws may penetrate the floor.

Anyone who has installed flooring in a 1993 or newer Dodge van may need to check to see that no damage was done to the fuel tank. The fuel tanks are rotationally molded polyethylene plastic. If any holes were made in the tank they can be easily sealed with a hot knife. Please do not use an open flame.



HYDRAMASTER
Corporation
6323 204th Street SW, Lynnwood, WA 98036

PRODUCT SUPPORT BULLETIN

TO: All 1993-94 Truck-Mounts DATE: 1 Sep 1994

RE: Fuel Pumps PSB #: 94091

HydraMaster has available three fuel pumps (Nos. 111-001, 111-045 and 111-002). These pumps have different flow rates and pressure capability. In order to determine which pump is appropriate for a particular application it must be "sized". Each engine has a particular flow and pressure limitation.

The mounting location of the machine and the fuel pump can effect how much fuel flow and pressure the engine sees. Therefore sizing a pump is important. The accompanying chart shows the options available for each machine and fuel pump.

If you are not able to mount the fuel pump within the required ranges shown below, please call HydraMaster Service for other mounting options.

Machine & Engine	Standard Fuel Pump	Required Installation
3.2 Briggs and Stratton	111-001 Square	Mount 12 to 32 inches below the carburetor.
3.7 Briggs and Stratton	111-001 Square	
4.2 Honda	111-045 Round	Mount 32 to 48 inches below the carburetor.
4.2 Kawasaki	111-002 Round	
4.7 Onan	111-045 Round	

Figure 10-3: **Honda Wiring Diagram**

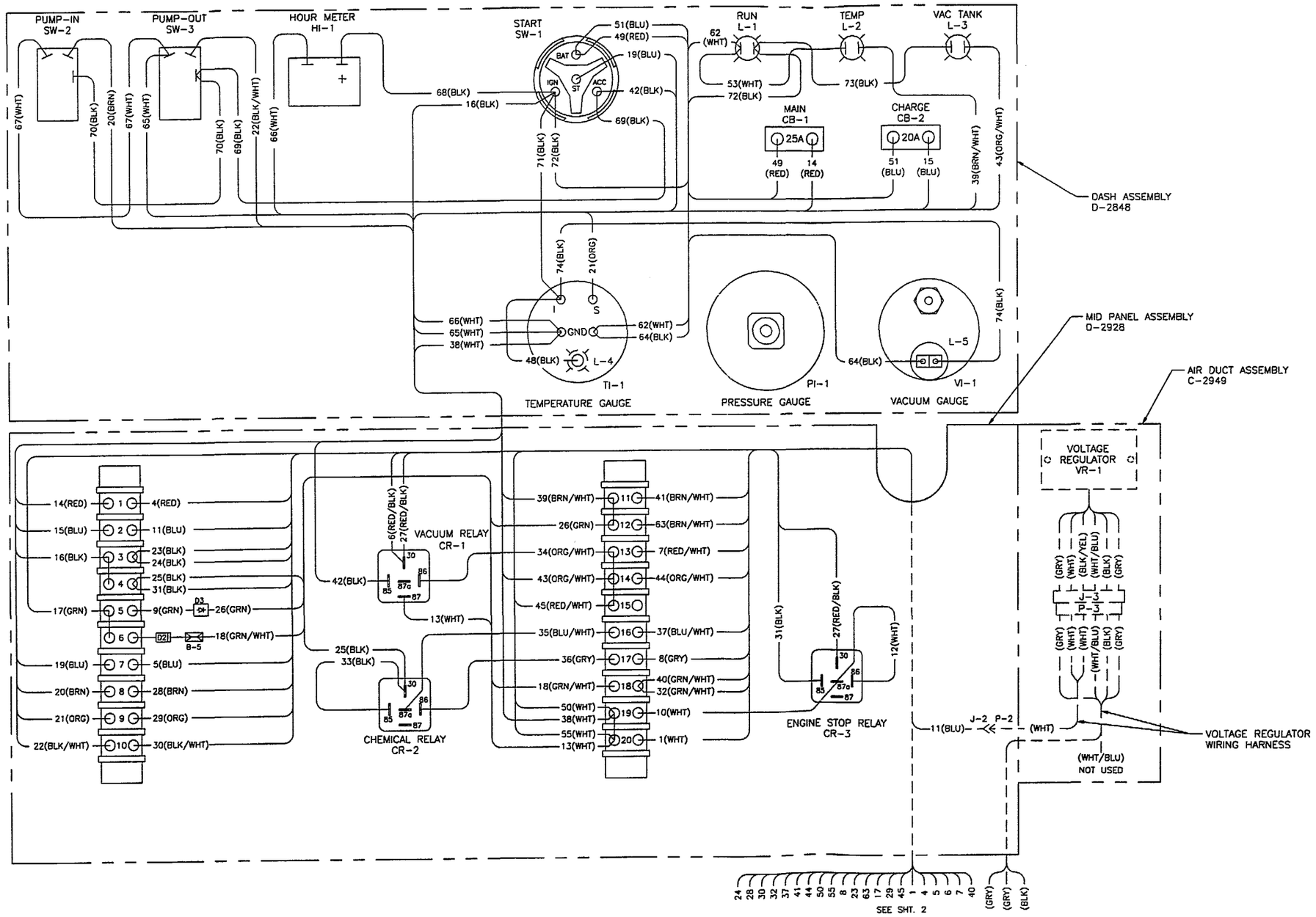


Figure 10-4: **Honda Wiring Diagram**