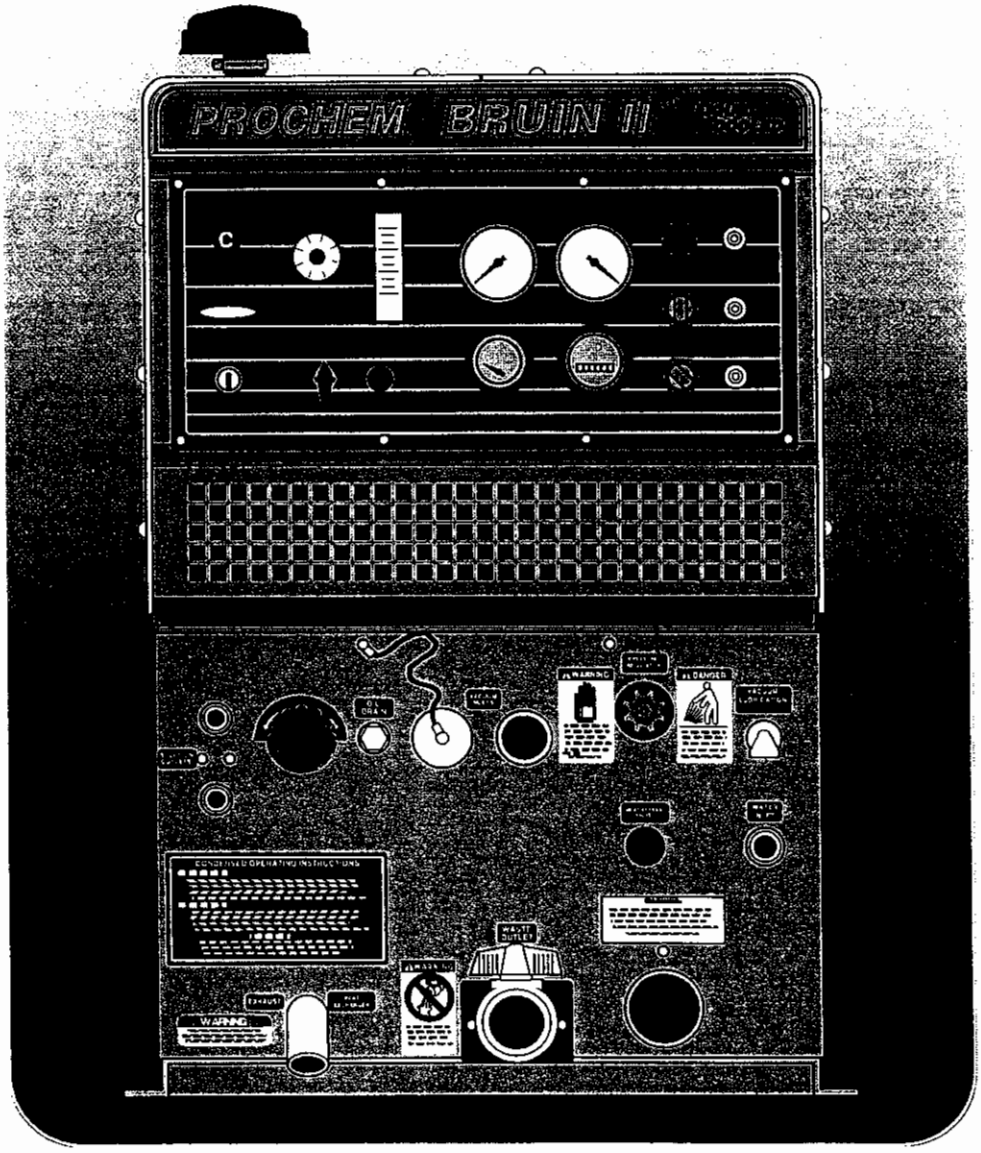
BRUIN II

Mobile Cleaning Unit



January 1997

OPERATION & SERVICE MANUAL

LIMITED WARRANTY

PROCHEM warrants your machine to be free of defects in material and workmanship. This warranty shall extend to the designated parts for the specific time period listed from the date of delivery to the user. If **PROCHEM** receives notice of such defects during the warranty period, **PROCHEM** will either, at it's option, repair or replace products which prove to be defective. Any local or distant transportation, related service labor and diagnostic calls are not included.

Gasoline Engine (through manufacturer or local dealer, terms on following page)	3 years
Vacuum Pump	18 months
Engine Heat Exchanger	1 year
Water Pump	2 years
Waste Pump	1 year
Wands (Except shut off valve and orifices)	1 year
Waste & Water Tanks	1 year
Pressure Regulator	1 year
All other components	1 year
Battery (through dealer only)(pro-rated)	1 year (1-800-350-8068)

Disposable filters, electrical components, belts, fittings, hoses, o-rings, and other maintenance items are not under warranty.

This warranty shall not apply to defects resulting from improper installation or operation, inadequate maintenance by the customer, unauthorized modification, misuse, a unit which is improperly repaired, exposure to freezing temperature conditions, or damage due to hard water scaling.

To obtain warranty service, products must be returned to a service facility designated by **PROCHEM**. Customer shall prepay shipping charges for products returned to **PROCHEM** for warranty service and **PROCHEM** shall pay for return of the products to customer.

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

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

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

Your **PROCHEM** unit is designed to give you years of reliable service. However, if a problem should arise after the warranty period, follow the troubleshooting procedures in the Operation and Service Manual. If you are still unable to determine the cause and solution to the problem, contact your nearest **PROCHEM** Service Center for details of the services available.

Components provided by **PROCHEM**, but supplied by other manufacturers, will only be warranted to the extent that they shall be warranted to **PROCHEM**.

ENGINE WARRANTY

Kubota TRACTOR CORPORATION
ENGINE DIVISION

LIMITED WARRANTY ON INDUSTRIAL ENGINES AND REPLACEMENT PARTS EFFECTIVE MAY 1, 1988

OUR WARRANTY TO YOU

We warrant to you, the original purchaser, that all parts (except those referred to below) of your new Kubota industrial engine, and replacement part purchased from an Authorized Kubota Industrial Engine or OEM Distributor in the United States will be free from defects in materials or workmanship during the following periods. (Refer to Service Policy Book for further details.)

1. Industrial engines excluding any oil field engine or application for 2 years or 2000 hours whichever occurs first.

1a. For 3 years or 3000 hours, excluding oil field engine or applications, a Major Component Warranty (M.C.W.) parts only, is offered. See Service Policy Book for details of coverage for M.C.W.

2. Replacement parts for 90 days.

WHAT WE WILL DO

We will, at our option, repair or replace any part covered by this warranty which becomes defective, malfunctions or otherwise fails to conform with this warranty under normal use and service during the term of the warranty at no charge for parts and labor. (Parts only for M.C.W.)

WHAT YOU MUST DO TO OBTAIN WARRANTY SERVICE

In order to obtain warranty repairs, you must deliver the product, together with proof of purchase, to an Authorized Kubota Industrial Engine Distributor or Dealer at your expense. The names and addresses of such Authorized Kubota Industrial Engine Distributors are listed in telephone directories or may be obtained by writing or telephoning us.

WHAT THIS WARRANTY DOES NOT COVER

This warranty **does not** cover: (See Service Policy Book for further details.)

1. Defects, malfunctions or failures resulting from accidents, abuse, misuse, modifications, alteration, improper servicing or lack of performance of required maintenance service.
2. Normal maintenance services or replacement of maintenance items such as light bulbs, preheater plugs, indicator or resistance coils, filter elements, lubricants, oils, spark plugs, coolant or belts.
3. Installation of replacement parts, unless originally installed be an Authorized Kubota Industrial Engine Distributor.

3a. Non-genuine Kubota parts.

4. Nihon CAV injection pumps are covered by separate warranties issued by their manufacturer or distributor.
5. Any engines damaged by use of ether, or any starting aid, or greater than 50/50% solution of antifreeze-water.
6. Injection nozzle wear or any engine damage caused by injection nozzle wear or sticking.
7. Damaged caused by water entering the engine due to any cause.
8. Used products.
9. Any damage cause by overheating that is not a direct result of a defect in materials or workmanship.
10. Any engine not application approved.

THIS IS THE ONLY EXPRESS WARRANTY ON OUR PRODUCTS

We neither assume nor authorize anyone to assume for us any other express warranty. The Distributor/Dealer has no authority to make any representation or promise on the behalf of Kubota Tractor Corporation or to modify the terms or limitations of this warranty in any way.

LIMITATIONS ON OUR RESPONSIBILITY WITH RESPECT TO PRODUCTS PURCHASED AND USED FOR PERSONAL, FAMILY OR HOUSEHOLD USE.

Our responsibility is to repair or replace defective parts as stated above; we will not be responsible for any other expenses, losses or inconvenience which you may sustain as a result of the purchase, use, malfunction or defective condition of our products. ANY IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED IN DURATION TO THE PERIOD SET FORTH ABOVE. Some states do not allow limitations on how long an implied warranty lasts or the exclusions or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

LIMITATIONS ON OUR RESPONSIBILITY WITH RESPECT TO PRODUCTS USED FOR RENTAL OR FOR COMMERCIAL, INDUSTRIAL OR AGRICULTURAL PURPOSES.

This warranty is in lieu of all other warranties, express or implied, and of any other obligations or liability on our part. WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. Our responsibility for any and all losses and damages resulting from any cause whatsoever, including our negligence, alleged damaged or defective goods, whether such defects are discoverable or latent, shall be limited to the repair or replacement of defective parts as stated above. IN NO EVENT WILL WE BE LIABLE FOR LOSS OF USE, LOSS OF PROFITS, LOSS OF OR DAMAGE TO CROPS, INCONVENIENCE, COMMERCIAL LOSS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER.

TABLE OF CONTENTS

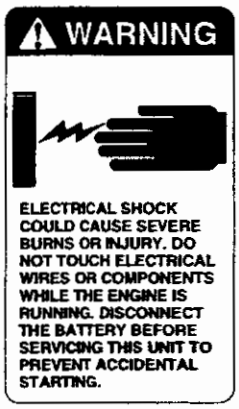
SECTION

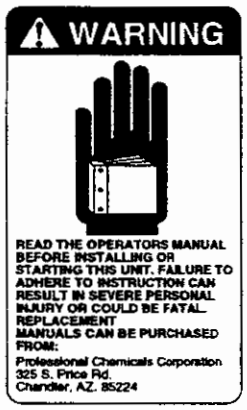
1 GENERAL INFORMATION

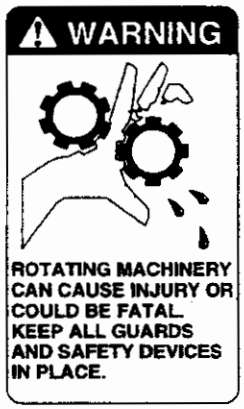
1 SAFETY

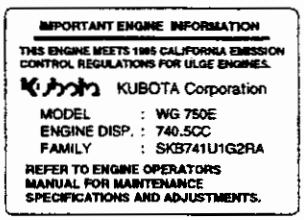
⚠ WARNING: For Your Safety!

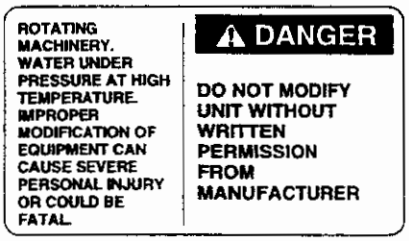
*The following **WARNING LABELS** are found on your BRUIN II console. These labels point out important **Warnings** and **Cautions** which should be followed at **all** times. Failure to follow warnings and cautions could result in fatality, personal injury to yourself and/or others, or property damage. Follow these instructions carefully! **DO NOT** remove these labels.*

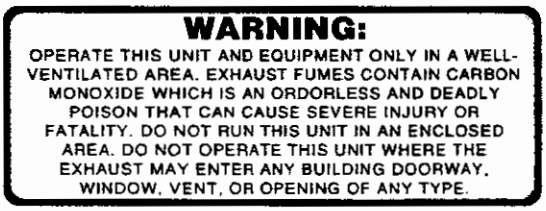


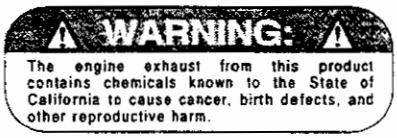






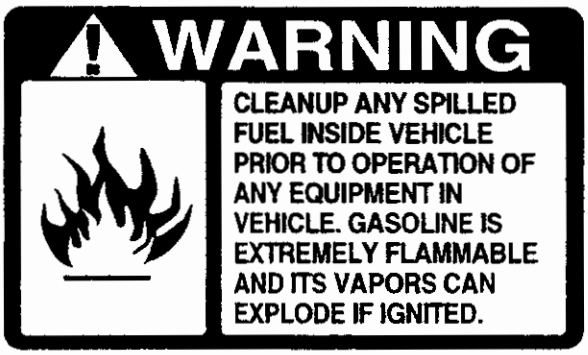




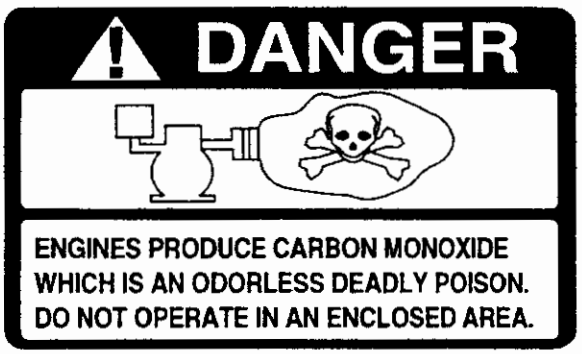


Order **#48-941212** to recieve a complete set of decals (safety and instrumentation) for your Prochem Bruin II. See page A-1 for other unit decals.

The following decals must be placed in a prominent spot on the vehicle into which this unit is installed. Placement should be nearest where access is given to operate the unit. See page 20 for suggested locations of these decals.



Decal, Fuel Clean-up
Part# 48-941317



Decal, Carbon Monoxide
Part# 48-941316

This symbol means WARNING or CAUTION. Failure to follow warnings and cautions could result in fatality, personal injury to yourself and/or others, or property damage. Follow these instructions carefully!

WARNING!

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

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

*3. **This unit must be operated with the vehicle or trailer doors open in order to ensure adequate engine ventilation.***

*4. **Gasoline is extremely flammable and its vapors can explode if ignited.** Store gasoline only in approved containers, in well-ventilated, unoccupied buildings away from sparks or flames. Never carry any gasoline or flammable material in the vehicle. Fumes may accumulate inside the vehicle and ignite, causing an explosion. **DO NOT** store any type of flammable material in the vehicle.*

*5. **DO NOT operate engine if gasoline is spilled.** Avoid creating any ignition until the gasoline has been cleaned up. Never use gasoline as a cleaning agent.*

*6. **DO NOT place hands, feet, hair, and clothing near rotating or moving parts.** Avoid any contact with moving parts! Rotating machinery can cause injury or fatality.*

*7. **Never operate this unit without belt guards.** The high speed moving parts, such as belts and pulleys, should be avoided while this unit is running. Severe injury, damage, or fatality may result.*

*8. **DO NOT service this unit while it is running.** The high-speed mechanical parts as well as high temperature components may result in severe injury or severed limbs.*

*9. **Never touch electrical wires or components while the engine is running.** They can be sources of electrical shock.*

*10. **Engine components can get extremely hot from operation.** To prevent severe burns, **DO NOT** touch these areas while the engine is running - or immediately after the engine is turned off.*

*11. **DO NOT touch the exhaust diverter valve while this unit is running.** Severe burns may result.*

*12. **Before servicing this unit, allow it to "cool down."** This will prevent burns from occurring.*

*13. **Water under high pressure at high temperature can cause burns, severe personal injury, or fatality. Shut down machine, allow to cool down, and relieve system of all pressure before removing valves, caps, plugs, fittings, filters, and bolts.***

*14. **DO NOT leave the vehicle engine running while operating this unit.***

*15. **Dangerous Acid, Explosive Gases!** Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well ventilated areas. Keep sparks, open flames, and other sources of ignitions away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries.*

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or gasoline vapors are present. When disconnecting the battery, ALWAYS disconnect the negative (-) terminal FIRST.

16. DO NOT smoke around the unit. *Gas fumes may accumulate and be ignited. The battery is also extremely flammable. This will prevent possible explosions.*

17. DO NOT damage the vehicle in any manner during installation.
When routing fuel lines ***DO NOT*** *place the hose in any location where damage may occur to the hose or vehicle. Avoid any contact with moving parts, areas of high temperature, brake lines, fuel lines, muffler, catalytic converter, or sharp objects.*

18. DO NOT cut or splice any of the vehicle fuel lines during fuel line installation. *This may result in fuel leaks and potentially dangerous conditions. There is no fuel solenoid shut off on this unit. Use only the provided abrasion resistant fuel hose for fuel lines. When traversing the vehicle floor with fuel lines, always use a bulkhead adapter. This will prevent leakage and ensure that the hose is not punctured by vehicle vibration abrasion.*

19. DO NOT exceed your vehicle's weight limit. *The console with waste tank and accessories weighs approximately 1093 lbs. Make certain that the vehicle has the correct axle rating. This will prevent unsafe vehicle driving conditions.*

20. We require high-back seats on all vehicles in which units are to be installed for head and neck protection. *We recommend using a metal partition between the seats and equipment.*

21. DO NOT operate this unit without the water supply attached and turned on. *The water pump and other vital components may be seriously damaged if this unit is permitted to operate dry without water. This unit is equipped with a low pressure shut-down device.* ***DO NOT*** *bypass or operate this unit without the low pressure shut-down switch.*

22. Keep your vehicle work area clean.
Wands, stair tools, and other accessories must be securely fastened before driving the vehicle. This will prevent damage to yourselves or your equipment in the event of sudden stops.

23. All high pressure hoses must be rated for 3000 PSI at 250°F. *Thermoplastic hoses do not meet these specifications and should not be used. Severe burns and injury may result if the hoses do not meet these requirements.*

24. Convenience outlet hose is for winterizing kit use only. *If used improperly, live steam may escape from this hose, causing it to whip around. Burns or injury may result.*

25. Make certain that you receive complete training by the distributor from whom you purchased this unit.

26. This unit uses high pressure and temperature. Improper or irresponsible use may result in serious injury.

27. Do not modify this unit in any manner. *Improper modification can cause severe personal injury or fatality.*

28. CALIFORNIA PROPOSITION 65
WARNING: *Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.*

SPECIFICATIONS:

Engine speed	2500 rpm (high speed in HEAT EXCHANGER position) 1200 rpm (idle speed in MUFFLER position - Water Pump "OFF")
Water pump rpm	1540 rpm
Vacuum pump rpm	2797 rpm
Water flow rate	3.4 GPM
Water pump pressure	1000 PSI (Max.)
Vacuum relief valve	14" Hg
Waste tank capacity	66 Gallons (55 Gallons to Shut-Off)
Console weight	848 lbs.
Console weight (with waste tank and accessories)	1093 lbs. (1551 lbs if waste tank is full)

TORQUE VALUES

Component	inch/lbs	foot/lbs
Engine hub	480	40
Vacuum pump hub	192	16

JET SIZING

Prochem recommends **floor tool** tip sizing not exceed a total of ".06".

Example: **Tri jet wand uses three 9502 jets.** (95° spray angle w/ 02 orifice)
02 x 3 = 06

When using two floor tools while cleaning with this unit, Prochem recommends that each tool tip size does not exceed a total of ".045".

Example: **Tri jet wand uses three 95015 jets.** (95° spray angle w/ 015 orifice)
015 x 3 = 045 .....045 x 2 tools = 09

Using larger jet sizes on your Bruin II may reduce cleaning temperatures.

Upholstery tool jet size: **80015**
Stair tool jet size: **9502**

INSTALLATION REQUIREMENTS

Prior to starting the installation, first read the **ENTIRE** "Installation Section" of this manual. Since the **Bruin II cleaning unit** (with waste tank and accessories) weighs 1093 pounds, consider the following recommendations **before** installing this unit.

1. The unit should **not** be mounted in any motor vehicle of less than **3/4 ton capacity**, or a minimum 1 ton capacity if equipped with an auxiliary fresh water tank or tanks.

⚠ CAUTION:

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

2. If mounting in a trailer, make certain that the trailer is rated for the total weight of the UNIT AND TRAILER. Electric or hydraulic brakes should be provided, and a strict compliance to any State and Federal vehicle laws must be maintained.

3. The vehicle tires should have a load rating above the **combined** vehicle and unit weight.

4. We do not recommend using flooring materials that absorb water. This could result in rust and corrosion of the vehicle floor.

5. Padding under rubber floor mats should be removed before installing this unit.

6. We highly recommend using a galvanized drip tray under the console. (#56-501845)

7. If using a trailer, the Bruin II console should be positioned so that it balances properly with respect to the axle. Ten percent (10%) of the overall unit weight (without accessories or water) should be on the tongue.

FUEL REQUIREMENTS

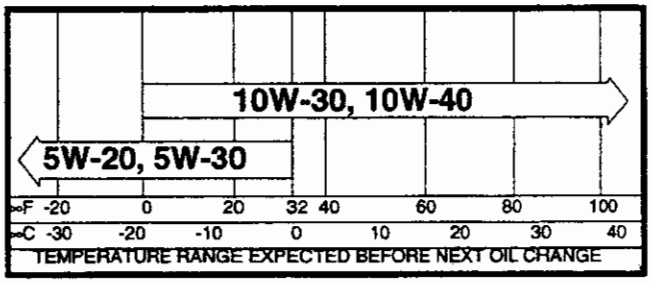
Use **unleaded gasoline ONLY. DO NOT** use any gasoline additives. We recommend the use of clean, fresh, unleaded gasoline intended for automotive use. High octane gasoline should **NOT** be used with the engine on this unit.

ENGINE OIL REQUIREMENTS

We recommend using the following chart for selecting the proper oil.

Use high-quality detergent oil of **API (American Petroleum Institute) service class SF or SG**. Select the viscosity based on the air temperature at the time of operation as shown in the following table:

RECOMMENDED SAE VISCOSITY GRADES



NOTE: Using other than service class SF or SG oil or extending oil change intervals longer than recommended can cause engine damage.

CHEMICAL REQUIREMENTS

The PROCHEM BRUIN II, due to its chemical injection pump design, can be used with a variety of water-diluted chemical compounds (either acid or alkaline), depending on the job to be done. However, to obtain optimum results with this unit, we recommend using the PROCHEM line of chemicals. For information on using the cleaning compounds, refer to the Prochem chemical manual #67-945186.

⚠ CAUTION:

NEVER use a solvent or petroleum base cleaning compound in the chemical system. They can cause severe damage to integral parts of the chemical system.

WATER REQUIREMENTS

Hard water deposits will adversely affect the plumbing and heat exchange systems on this unit.

The map below will give you an idea of where areas of high water hardness may occur. Any water supply obtained from a well is almost always hard water and a water softener will be needed to protect your equipment. Also the use of a sediment filter is recommended when obtaining water from a well.

NOTE:

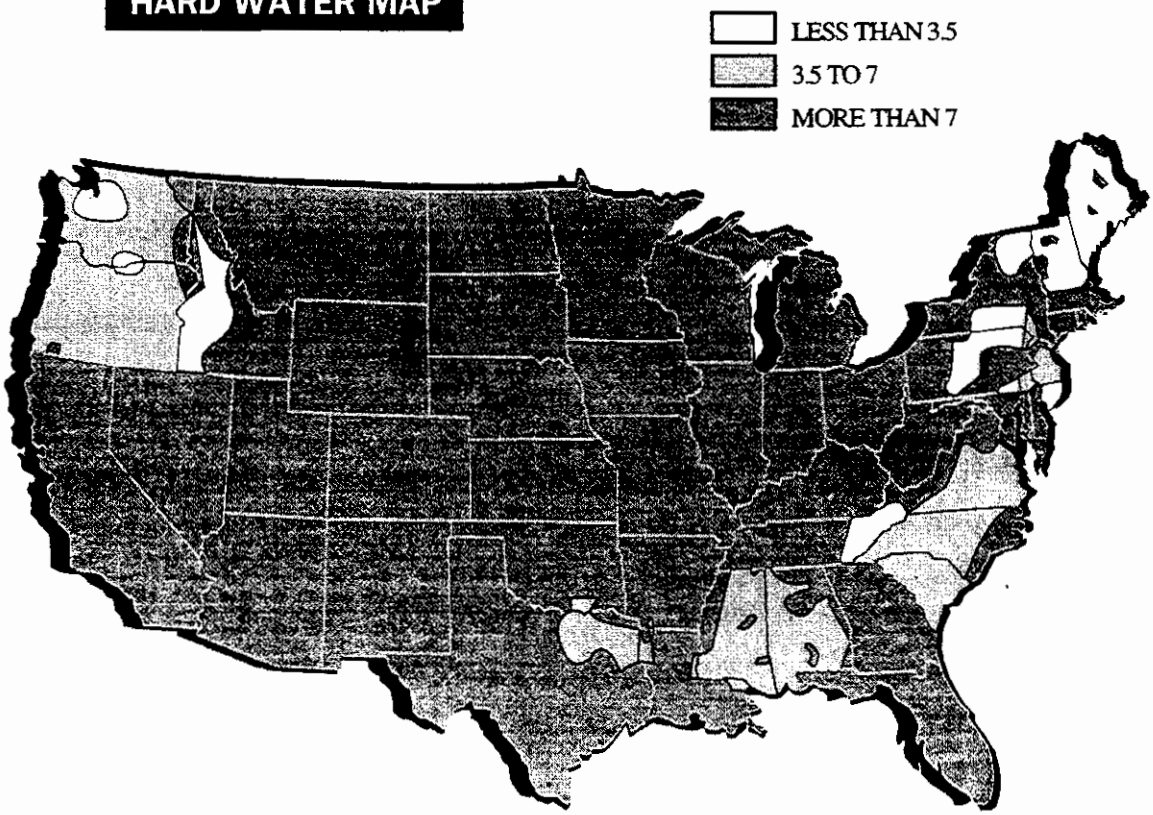
Equipment malfunction or component failure caused by hard water scaling is NOT covered under the warranty.

If you are operating this unit in an area where the unit will be using water in which the hardness exceeds 3-1/2 grains, we highly recommend a suitable water softener be installed. If using a water softener, it must have a five (5) GPM (or greater) flow capacity without any hose constrictions.

Using a water softener will reduce maintenance and decrease down time caused by hard water scaling. It will also allow cleaning chemicals to be more effective in lower concentrations.

If you require a water softener, Prochem has a model to meet your needs. Please contact your nearest distributor for information, price, and availability.

HARD WATER MAP



2 RECEIVING YOUR UNIT

This chapter of the manual contains information on receiving your PROCHEM BRUIN II .

DEALER RESPONSIBILITY

The Prochem distributor from whom you purchased this mobile cleaning unit is responsible for the correct installation of this machine and for initial training of your operators and maintenance personnel in the proper operation and maintenance of this unit.

ACCEPTANCE OF SHIPMENT

Every part of your PROCHEM BRUIN II cleaning unit was carefully checked, tested, and inspected, before it left our manufacturing plant. **Upon receiving the unit, make the following acceptance check:**

1. The unit should not show any outward signs of damage. If damaged, notify the common carrier IMMEDIATELY.

2. Check your equipment and packing list. The standard PROCHEM BRUIN II unit should arrive equipped with the following items (unless otherwise specified) and any optional accessories which were ordered:

EQUIPMENT LIST

A) **PROCHEM BRUIN II console.**

B) **Operation and service manual with engine, water pump, and vacuum pump manual.**

C) **Installation bolting kit.**

D) **Installation mounting plates.**

E) **Fittings and hoses for standard fuel supply installation.**

F) **Hose clamps for fuel & vacuum hoses.**

G) **External fuel pump installation kit.**

H) **Carpet wand.**

I) **Waste tank w/float switch.**

J) **Waste tank filter and strainer basket.**

K) **100 ft. vacuum hose.**

L) **1 vacuum hose connector.**

M) **100 ft. of 1/4" high pressure hose with quick connects.**

N) **50 ft. water supply hose with quick connects.**

OPTIONAL EQUIPMENT

O) **Winterizing loop hose. Part #10-805380**

P) **Upholstery tool**

Q) **Stair tool**

R) **Extra wands and hoses.**

S) **1992 (or later) Ford fuel line installation kit.**

T) **Auxiliary water tank(s) with demand pump.**

U) **Automatic waste pump kit.**

V) **Galvanized drip tray. Part #56-501845**

W) **Van storage unit**

X) **Hose reel**

Y) **Water softeners**

Z) **Start-up Maintenance Kit. Part #66-945288. For version "D" use Part #66-945435**

NOTES

SECTION

2 INSTALLATION

3 INSTALLATION

⚠ WARNING:

All units must be bolted to the floor of the vehicle by a PROCHEM DISTRIBUTOR.

1. LIFTING THE UNIT ON THE VEHICLE

Since the PROCHEM BRUIN II console weighs approximately 848 pounds, we recommend using a fork lift to lift the unit into the vehicle. Position the forks under the unit from the front and **MAKE CERTAIN** that the forks are spread to the width of the base.

2. POSITIONING THE UNIT IN VEHICLE

Because vehicles vary in size and openings, individuals have their own preference as to where they want their units installed.

We strongly recommend a side door installation for the BRUIN II and DO NOT recommend a rear door installation.

1. Enough space should be provided to assure adequate engine ventilation and room for service and maintenance.

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

3. DO NOT position the console closer than 12" from the bottom of driver and passenger seats.

NOTE: For individuals who wish to make an engineering layout prior to positioning the unit, refer to page 12, figure 1 for waste tank and console dimensions.

3. BOLTING DOWN THE UNIT AND WASTE TANK

NOTE: When positioning the waste tank with respect to the console, hook up the vacuum hoses to the waste tank. This will ensure that the waste tank is positioned correctly.

Once the unit and waste tank are positioned in the vehicle in the desired location, you may proceed.

⚠ CAUTION:

Before drilling any mounting holes in the vehicle floor, make certain that when drilling, you will not do any damage to the fuel tank, fuel lines, or any vital component which might affect the operation or safety of the vehicle.

1. Using the console and waste tank mounting holes as a template, drill six 13/32" diameter holes for mounting the console and six more 13/32" diameter holes for mounting the waste tank.

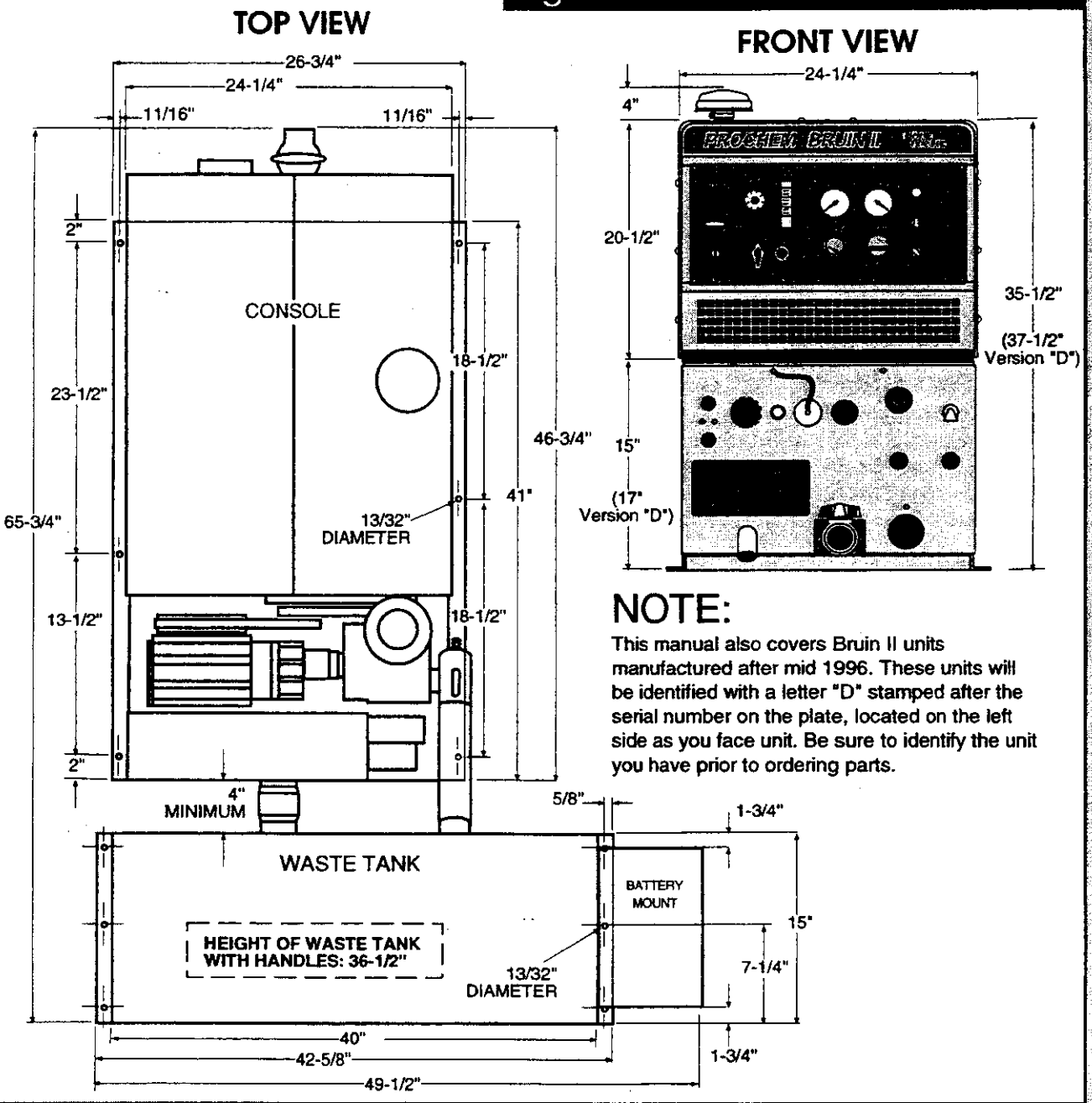
2. Using the installation hardware kit:

a) Insert six 3/8-16 x 2" hex head cap screws with flat washers through the mounting holes in the PROCHEM BRUIN II console, and six 3/8-16 x 2" hex head cap screws with flat washers through the mounting holes in the waste tank.

b) Install the mounting plates underneath the vehicle floor. (refer to page 12, Fig. 2)

c) Screw the 3/8-16 hex head locknuts on the mounting screws and tighten them until the console and the waste tank are firmly secured to the vehicle floor.

figure 1 DIMENSIONAL DATA



NOTE:

This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located on the left side as you face unit. Be sure to identify the unit you have prior to ordering parts.

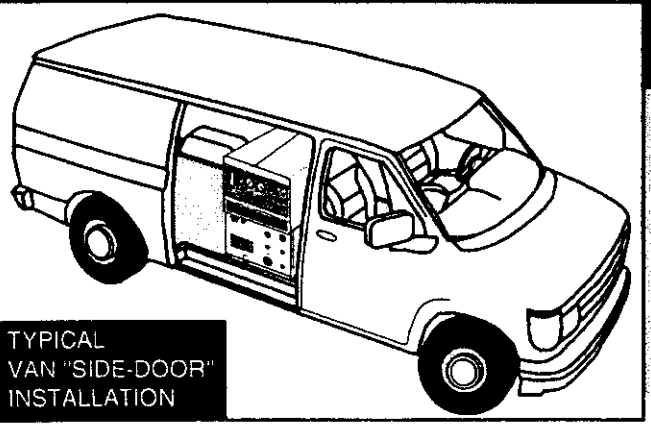
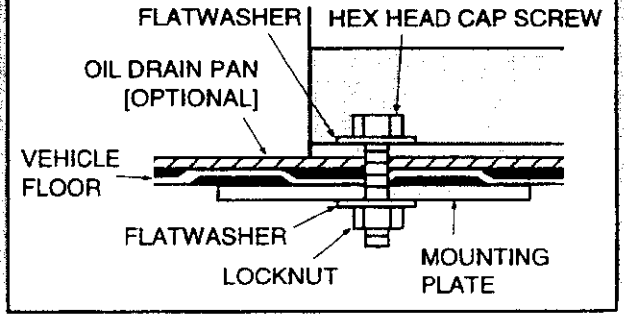


figure 2 MOUNTING PLATE INSTALLATION



4. INSTALLING FUEL LINE ON VEHICLE

READ THESE INSTRUCTIONS ENTIRELY BEFORE PROCEEDING.

⚠ WARNING:

Under NO circumstances should you splice any of the vehicle fuel lines. Severe injury or fatality may result.

⚠ CAUTION:

DO NOT damage the vehicle in any manner during installation. When routing fuel lines DO NOT place the hose in any location where damage may occur to the hose or vehicle. Avoid any contact with moving parts, areas of high temperature, brake lines, fuel lines, muffler, catalytic converter, or sharp objects.

⚠ WARNING:

Never carry any gasoline or flammable material in the vehicle. NEVER operate this unit off a portable fuel tank. NEVER store any type of flammable material in the vehicle.

The following text applies to vehicles other than 1992 (or later) Fords. See page 15 for 1992 (or later) Ford fuel line installation.

1. Select a location on the vehicle floor to drill a hole for the bulkhead adapter.

This location should be situated in a position that eliminates the possibility of fuel line contact by either the operator(s) or accessories during the working hours or maintenance periods. We supply steel braid fuel hose. Make certain that the hose will reach the location you choose.

⚠ CAUTION:

Before drilling the fuel line hole in the vehicle floor, make certain when drilling you will not do any damage to the fuel tank(s), fuel lines, brake lines, or any other vital component which might affect the operation or safety of the vehicle.

2. Drill a 5/8" (.625) diameter hole through the vehicle floor.

3. Install the 1/8" bulkhead adapter by inserting the adapter and tightening the nut on the opposite side of the van floor. (figure 3, p. 14).

4. Attach a 1/8P x 1/4T elbow to the bulkhead adapter on one end (figure 3, p. 14). Attach a 1/8" street elbow and a 1/8P x 5/16H barb fitting to the other end of the bulkhead adapter.

5. Connect one 45-1/2" stainless steel hose from the fuel inlet on the console to the bulkhead adapter.

6. Disconnect from the filler neck the 2 hoses which connect the filler neck and the fuel tank by loosening the hose clamps.

7. Remove the filler neck from the vehicle. Refer to the vehicle manual for instructions and cautions.

8. Select a suitable location for drilling the hole in the filler tank.

The desired location for this hole may vary. It is important that you are able to re-install the filler neck without interference from the fittings which you are adding. Therefore, choose this location wisely before proceeding.

9. Drill a 1/2" diameter hole in the filler neck after you are certain that you have chosen the proper location (figure 5, p. 14).

NOTE: When assembling pipe fittings, a thread sealant must be used.

10. Attach a 1/8" street elbow to one end of the short bulkhead adapter (figure 3, p. 14).

Slide one of the seals over the threads of the bulkhead adapter against the hexagon area.

Next, attach the 25", 36" or 45" stainless steel hose to the 1/8" steel elbow. Choose a length that will reach through the filler neck to the bottom of the fuel tank.

If the selected hose is too short or too long, the unit will run out of fuel before the vehicle fuel tank is empty.

FUEL LINE INSTALLATION

FUEL LINE INSTALLATION KIT
Part # 66-945153 (For Vehicles other than 1992 or Later Fords)

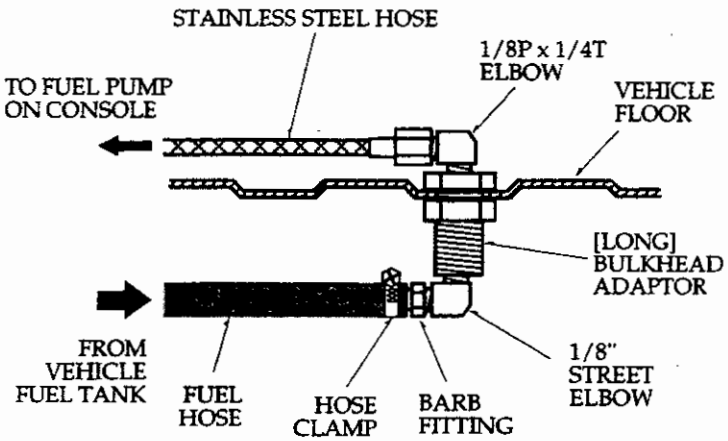
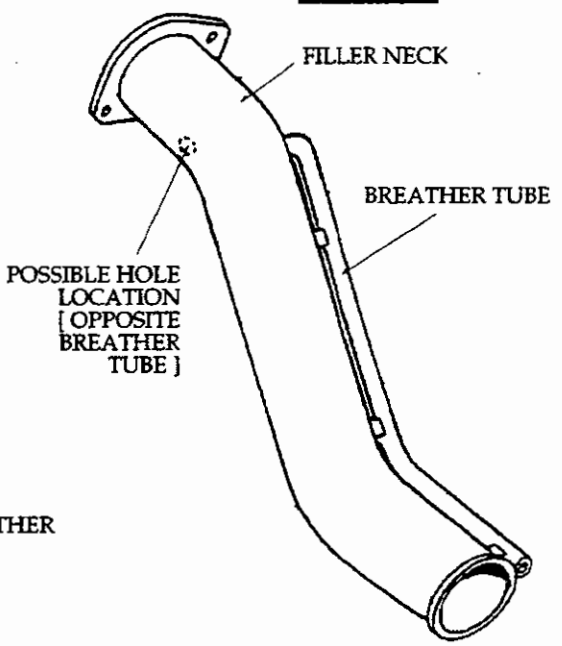


FIGURE 3

FIGURE 4



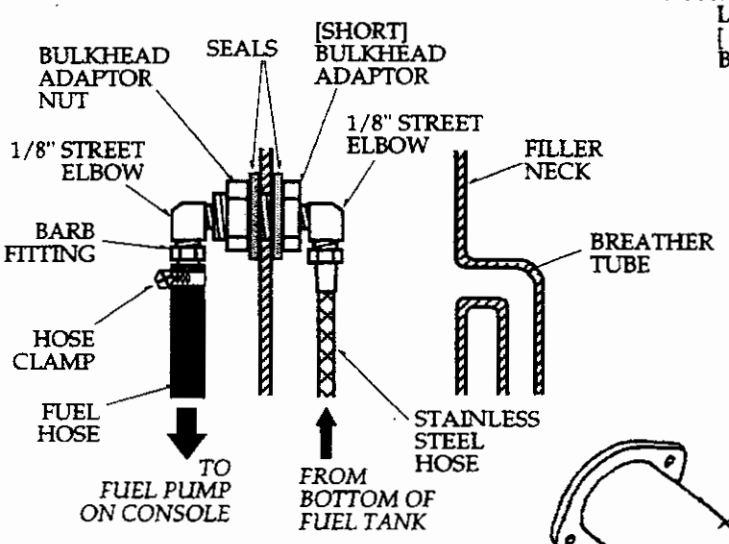


FIGURE 5

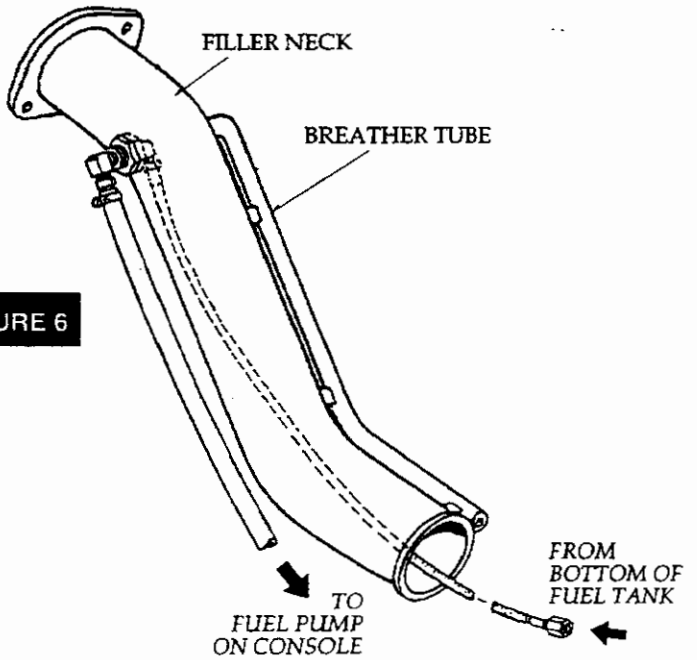
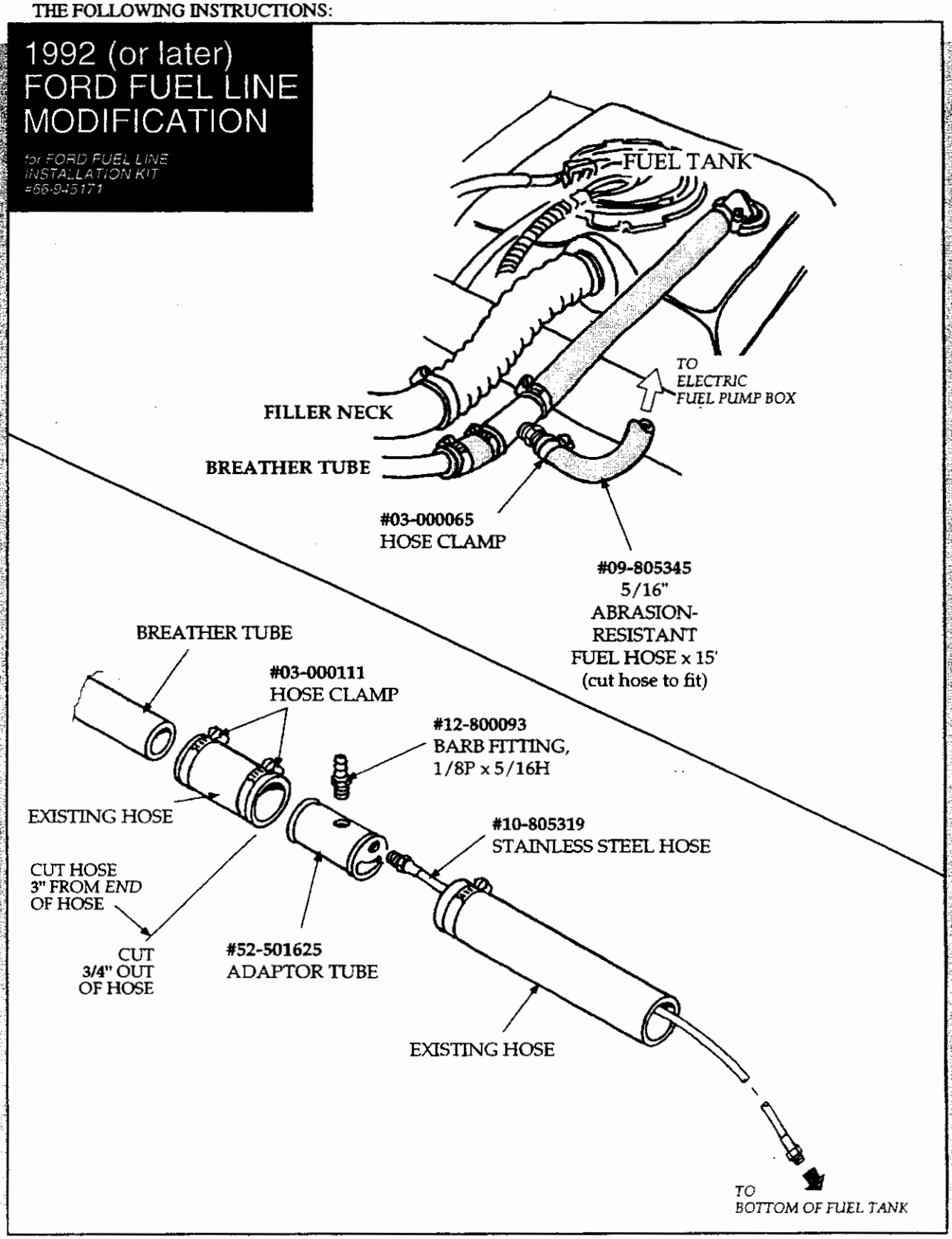


FIGURE 6

IF THE VEHICLE IN WHICH YOU ARE INSTALLING YOUR UNIT IS A 1992 (or later) FORD, IT WILL BE NECESSARY TO FOLLOW THE FOLLOWING INSTRUCTIONS:

1992 (or later) FORD FUEL LINE MODIFICATION

for FORD FUEL LINE INSTALLATION KIT #66-945171



11. Insert the stainless steel hose (bulkhead connector first) into the filler neck until the male threads on the bulkhead connector are protruding through the 1/2" hole.

Slide the other seal over the threads and tighten the hex head nut over the seal (figure 6, p. 14).

Attach the 1/8" street elbow and 1/8P x 5/16H barb fitting to the bulkhead connector, outside the filler neck.

Make certain the fuel hose and fittings remain positioned parallel to the filler neck (figure 5, p. 14).

12. Using a hose clamp, connect one end of the 5/16" fuel hose to the fittings on the outside of the filler neck (figure 5, p. 14).

13. Re-install the filler neck on the vehicle.

14. Insert the filler neck fuel hose into the fuel tank and make certain the end is at the bottom of the tank.

15. Re-connect the 2 hoses which connect the filler neck and the fuel tank. Make certain they are clamped correctly.

16. Route the 5/16" fuel hose underneath the van from the filler neck to the inlet side of the external electric fuel pump. (p. 17). Use the cable ties to secure the hose. Cut off any excess hose and attach to the barb fitting with hose clamp.

17. Attach the remaining hose to the outlet side of the external electric fuel pump with a hose clamp.

18. Using the 5/16" hose, and hose clamps connect the fuel pump box to the bulkhead adapter.

⚠ CAUTION:

When routing this hose underneath the vehicle, make certain that you DO NOT place the hose in any location where damage may occur to the hose or vehicle. AVOID any contact with moving parts, areas of high temperature, muffler, catalytic converter, or sharp objects.

5. INSTALLING THE FUEL TANK AND FUEL LINE (TRAILER)

For trailer installations we recommend the following.

1. Strict compliance to all Federal and State law must be maintained.

2. Provide a safe fuel tank which is manufactured specifically for gasoline, has a proper vented filling cap, and an outlet connection that is the same size as the inlet connection on the unit.

3. DO NOT mount the fuel tank inside an enclosed trailer or van.

⚠ WARNING:

Never carry any gasoline or flammable material in the vehicle. NEVER store any type of flammable material in the vehicle.

4. Mount the fuel tank where it will be protected from any vehicle collision.

5. When installing the fuel line from the tank to the unit, use the proper size fuel line.

EXTERNAL ELECTRIC FUEL PUMP MOUNTING INSTRUCTIONS

STUDY ALL FUEL LINE INSTALLATION INSTRUCTIONS COMPLETELY BEFORE PROCEEDING

⚠ WARNING:

DO NOT INSTALL THIS ASSEMBLY IN ANY MANNER OR POSITION WHICH, IN SO DOING, MAY CAUSE DAMAGE TO THE VEHICLE OR ANY COMPONENT WHICH MIGHT AFFECT THE OPERATION OR SAFETY OF THE VEHICLE.

1. DETERMINE THE POSITION WHERE THE BOX ASSEMBLY WILL BE MOUNTED.

NOTE: TRY TO MOUNT FUEL PUMP AS CLOSE TO THE VEHICLE FUEL TANK AS POSSIBLE.

WARNING! DO NOT MOUNT THIS ASSEMBLY NEAR THE CATALYTIC CONVERTER, EXHAUST, OR ANY AREAS OF HIGH-TEMPERATURE.

2. USING THE COVER AS A TEMPLATE, DRILL TWO 5/16" DIA. HOLES IN THE VEHICLE FRAME

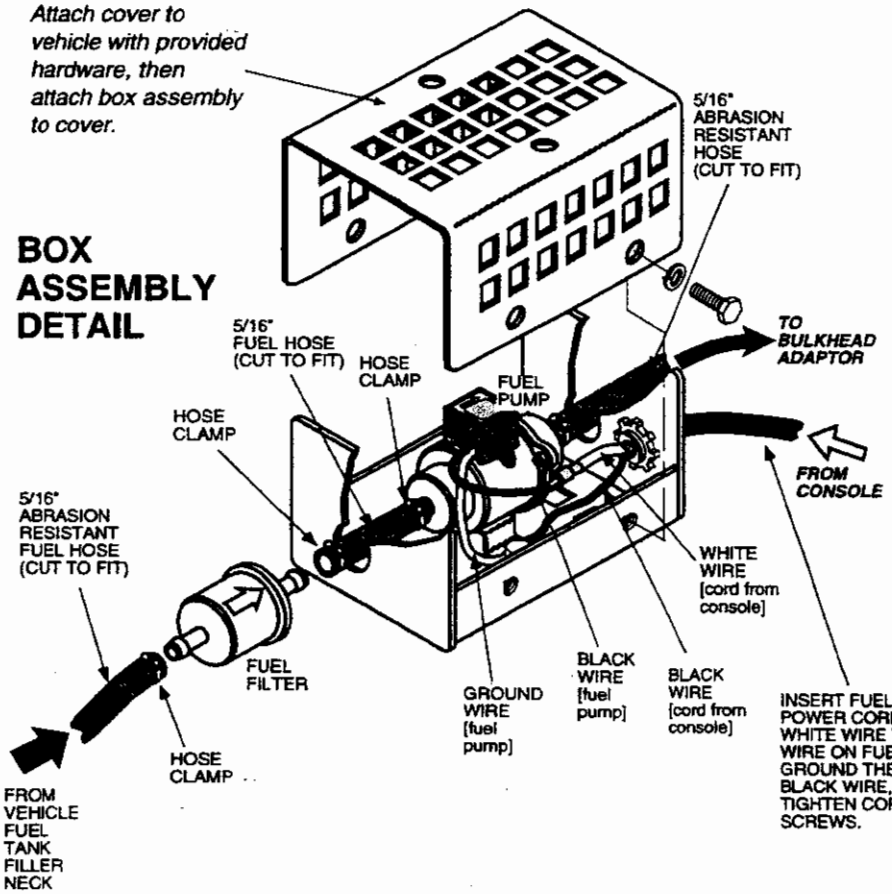
3. MOUNT THE COVER TO THE VEHICLE.

4. CONNECT THE HOSES AND CORD AS SHOWN. TIGHTEN HOSE CLAMPS.

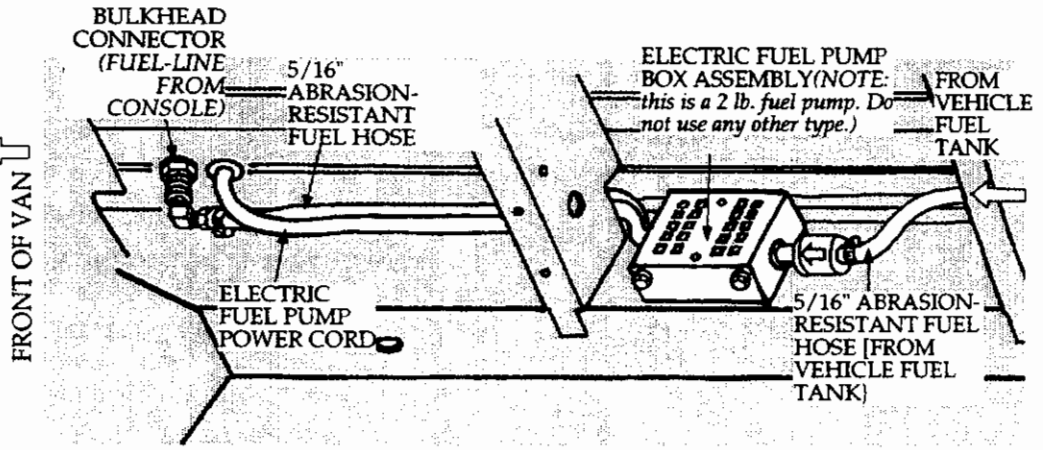
CAUTION: ***WHEN ROUTING THE HOSE AND CORD UNDERNEATH THE VEHICLE, MAKE CERTAIN THAT YOU DO NOT PLACE THEM IN ANY LOCATION WHERE DAMAGE MAY OCCUR TO THE HOSE, CORD, OR VEHICLE. AVOID ANY CONTACT WITH MOVING PARTS, AREAS OF HIGH TEMPERATURE OR SHARP OBJECTS.***

5. INSTALL THE FUEL PUMP ASSEMBLY ON TO THE COVER WITH THE PROVIDED HARDWARE.

BOX ASSEMBLY DETAIL



INSTALLATION *(viewed from underneath van)*



6. WASTE TANK TO CONSOLE CONNECTION

See illustration on following page.

NOTE: Before connecting any hoses to the waste tanks, make certain the hose clamps are on each hose.

1. Connect the 6" section of 2-1/2" I.D. internal vacuum hose to the 2-1/2" dia. vacuum inlet tube on the console and the 2-1/2" dia. inlet tube on the waste tank. Tighten the hose clamps.

2. Connect the 25" long section of 2-7/8" I.D. internal vacuum hose to the 2-7/8" dia. vacuum outlet tube on the waste tank and to the vacuum pump relief valve on the console. Tighten the hose clamps.

3. Connect the 2" I.D. waste removal hose from the console to the 2" dia. tube at the bottom of the waste tank. Tighten the hose clamps.

4. Connect the 5/16" I.D. water box hose to the barb fitting on the waste tank which is mounted on the outside of the waste tank. Tighten the hose clamps.

5. Connect the console engine shut-off cord to the waste tank level sensor cord.

6. Connect the 3/16 sst hose from the heat bypass valve to the waste tank.

7. Connect the 5/16" I.D. from the vacuum outlet fitting on the front of the console to the barb fitting (pointed downward) on the waste tank which is mounted on the outside of the waste tank. Tighten the hose clamps.

If the unit is equipped with a waste pump-out option, connect the 3/4" waste outlet hose from the outlet assembly on the side of the console to the fitting on the waste tank.

7. BATTERY CONNECTION

⚠ WARNING:

Dangerous Acid, Explosive Gases!

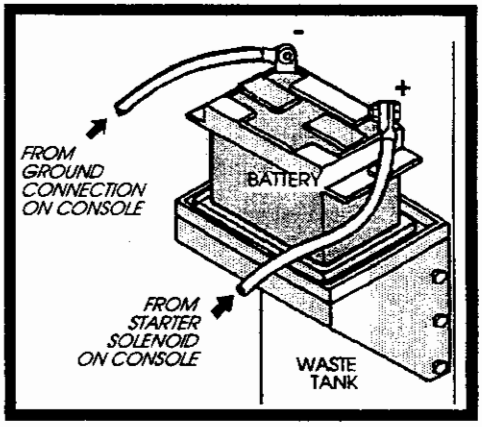
Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well-ventilated areas. Keep sparks, open flames, and other sources of ignitions away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries.

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or gasoline vapors are present. When disconnecting the battery, ALWAYS disconnect the negative (-) terminal FIRST.

1. Attach the red positive (+) battery cable from the console starter solenoid to the positive (+) terminal on the battery and tighten the holding nut.

2. Next, attach the black negative (-) battery cable from the console ground to the negative (-) terminal on the battery and tighten the holding nut.

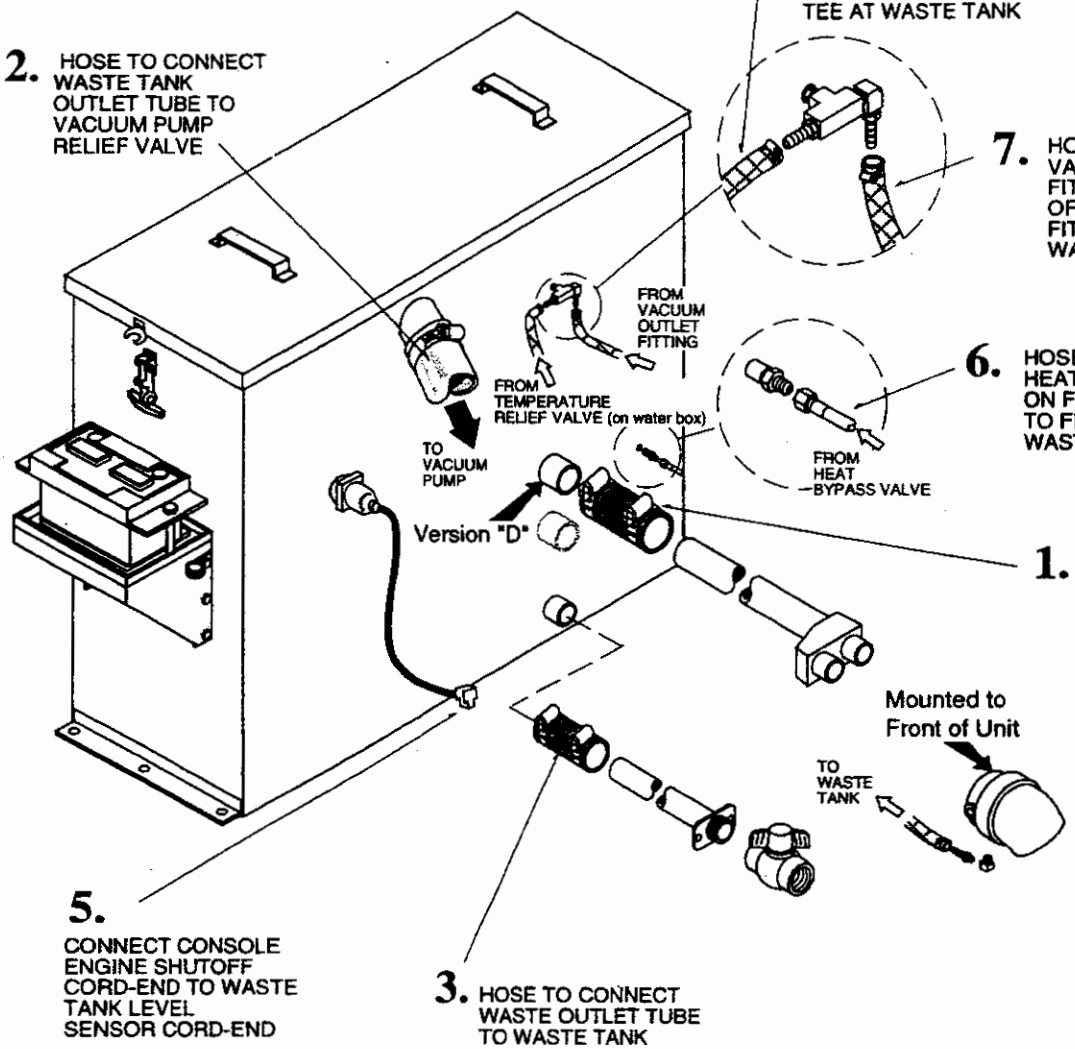
BATTERY HOOK-UP



8. FIRE EXTINGUISHER

We recommend that a fire extinguisher, preferably rated for A, B, & C type fires, be installed inside the vehicle.

WASTE TANK TO CONSOLE CONNECTION



SPECIAL INSTRUCTIONS:

1. Cut hoses to fit, if necessary.

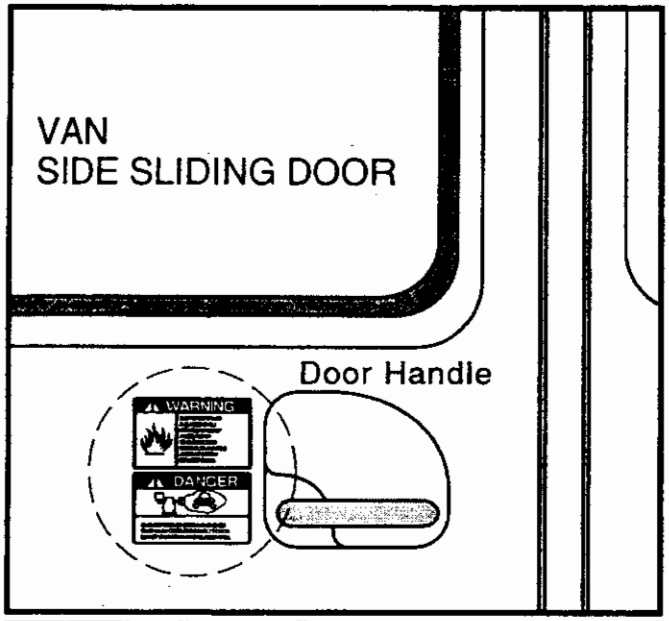
2. When cutting hoses, make certain that the cutting blade is facing away from your hands, fingers, or any other part of your body to avoid injury.

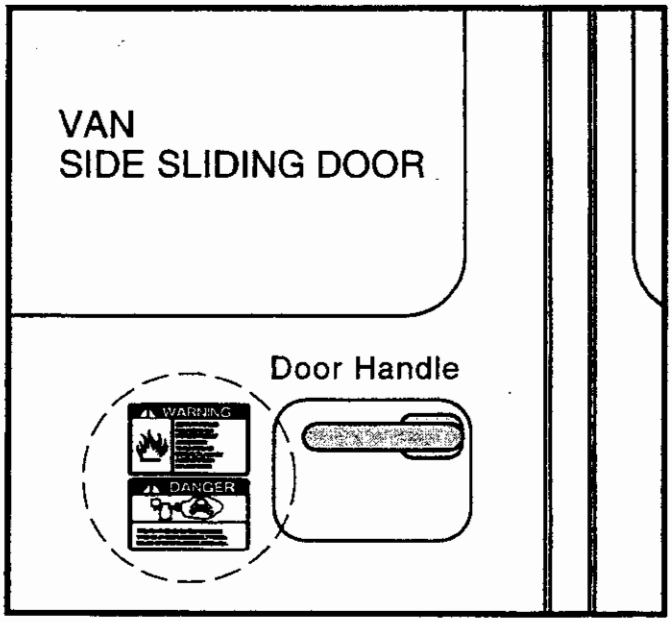
3. Do not install hoses with excessive bends or kinks.

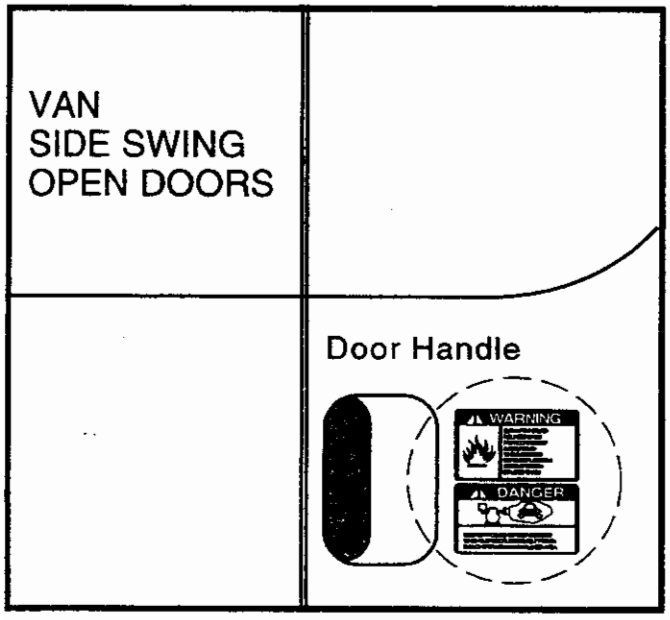
4. Place clamps on hoses before installing.

5. Tighten all hose clamps *firmly*.

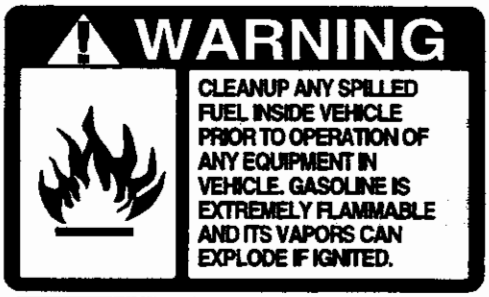
Placement of External Warning Decals

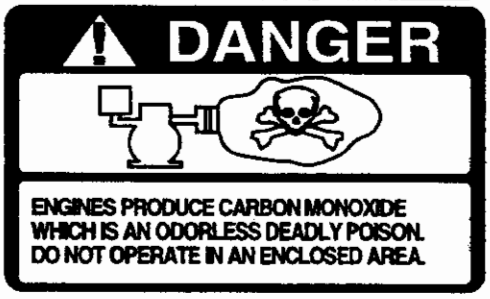






Decal, Fuel Clean-up
Part# 48-941317





Decal, Carbon Monoxide
Part# 48-941316

The decals should be placed in a prominent spot on the vehicle where access is given to operate the unit. The illustrations above suggest the location and placement of the decals.

When placing the decals, be sure the area is clean of any dirt and possible wax build-up. Place the decal by starting at one edge and smoothing the decal over to the other edge. This will help eliminate air bubbles and allow the decal to adhere better. After a time the decals may become damaged or worn. If they become unreadable, they should be replaced. The part numbers are shown above to help in ordering.

SECTION 3 OPERATION

4 SYSTEMS

This chapter of the operators manual divides the unit up into systems and explains how each system works. Before proceeding into the operational and maintenance section of this manual, we recommend acquiring a basic knowledge of how this unit functions. Read the next section of this manual carefully and completely.

1. WATER PUMPING SYSTEM

See illustrations on following pages.

Cold water enters the console through the water inlet connection located on the lower front panel. The water flows through two pre-heat radiator-type heat exchangers where heat is transferred from the vacuum pump exhaust.

Water then flows into the water box through a float valve, which shuts off water flow when the box is full.

Water then flows through a strainer into the water pump where it is pressurized. This pressurized water is pumped to the pressure regulator on the pressure regulator manifold which provides and maintains the desired pressure setting. This manifold contains a nitrogen-charged accumulator which helps reduce pressure fluctuations and dampen water pump pulsations. This manifold also contains a low-pressure switch and a high-pressure switch. These switches will shut the unit down if the pressure drops below 50 PSI or exceeds 1200 PSI.

Any volume of water not used in the cleaning process flows from the pressure regulator to the tube and shell heat exchanger where heat is transferred from the engine coolant. The heated water then returns to the water box.

If the temperature in the water box exceeds 180°F, a temperature relief valve will open and bleed a small amount of hot water into the waste tank, allowing cool water to flow into the water box. When the tool valve is open, water flows through the engine exhaust heat exchanger coils where it is super-heated from engine exhaust flowing through it.

Next the hot water flows through a check valve and Y-strainer to the outlet manifold. This is where chemical injection occurs. The hot solution then flows to the cleaning tool.

Temperature is adjusted using the thermostatic temperature control. This control opens a solenoid valve if the water exceeds the temperature setting. When open, this valve allows hot water to be drawn into the waste tank.

The temperature sensor for this control is located on the manifold next to the solution outlet. From this manifold a small amount of hot water constantly bleeds through the bypass manifold, which contains a small orifice, to the water box.

A heat bypass valve on the lower front panel lowers the solution temperature **manually** with a knob adjustment. When open, this valve allows hot water to be drawn into the waste tank through a 3/16 sst hose.

A temperature switch on the heat exchanger outlet will shut down the engine if the water temperature exceeds 285°F. If this occurs, consult the **Troubleshooting** section of this manual to determine the cause of overheating before restarting your unit.

2. HEAT TRANSFER SYSTEM

See illustrations on following pages.

Water is heated through a three stage heat exchange system which utilizes engine exhaust engine coolant and vacuum pump exhaust.

Inlet water flows through a hose to the **stage one** heat exchanger.

Stage one utilizes vacuum exhaust heat blowing over to radiator-type heat exchangers in series prior to discharging the exhaust into the atmosphere.

Water then goes into the water box and then to the water pump where it is pressurized. It then travels to the pressure regulator manifold.

Any volume of pressurized water not used in the cleaning process bypasses from the pressure regulator manifold to the **stage two** tube and shell heat exchanger.

Stage two utilizes engine coolant heat pumped over copper coils in the tube and shell heat exchanger . The heated water then returns to the water box.

When the tool valve is open, the water flows through the **stage three** engine exhaust heat exchanger where it is heated by extremely hot engine exhaust.

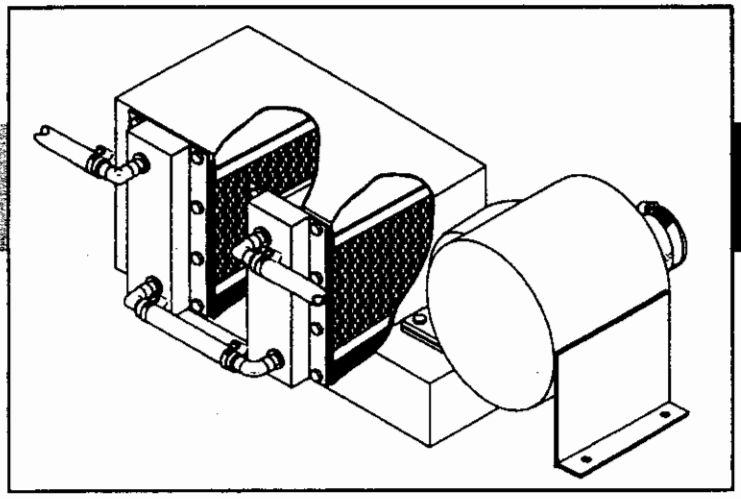
The **stage three** heat exchanger is an engine exhaust chamber containing a stainless steel heating coil. Water flows through the coil and is heated by the engine exhaust as it leaves the engine. The water, still under pressure and hot, is piped to the outlet manifold where chemical is injected and the mixture flows to the cleaning tool.

The optional catalytic heat exchanger utilizes a catalytic core in the **stage three** engine exhaust chamber.

The catalytic converter combined with the injection of air pumped into the exhaust manifold, re-burns the exhaust waste gases. This results in super-heated water flowing through the outlet manifold to the cleaning tools.

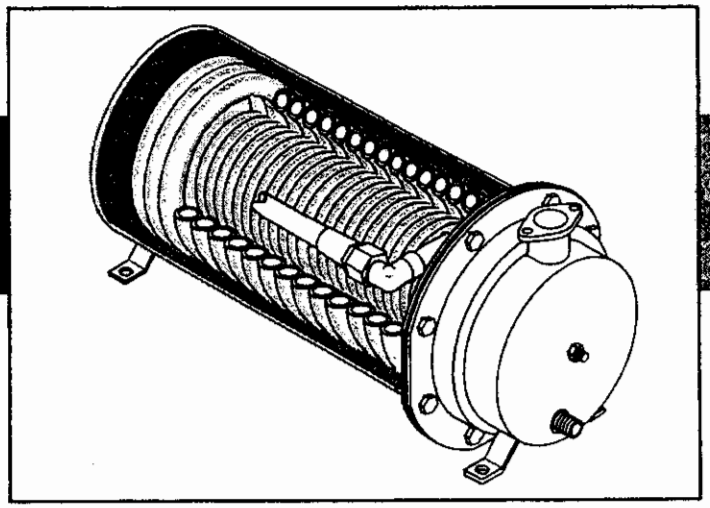
An exhaust diverter valve is located on the engine exhaust system. This allows you to direct the exhaust either to the heat exchanger for high temperature cleaning or to the exhaust muffler for low-temperature cleaning or extraction, such as flood restoration.

When the diverter valve is in the **MUFFLER** position, a microswitch automatically shuts off the water pump. An override switch on the control panel will enable you to turn the water pump **ON**, for low-temperature cleaning.

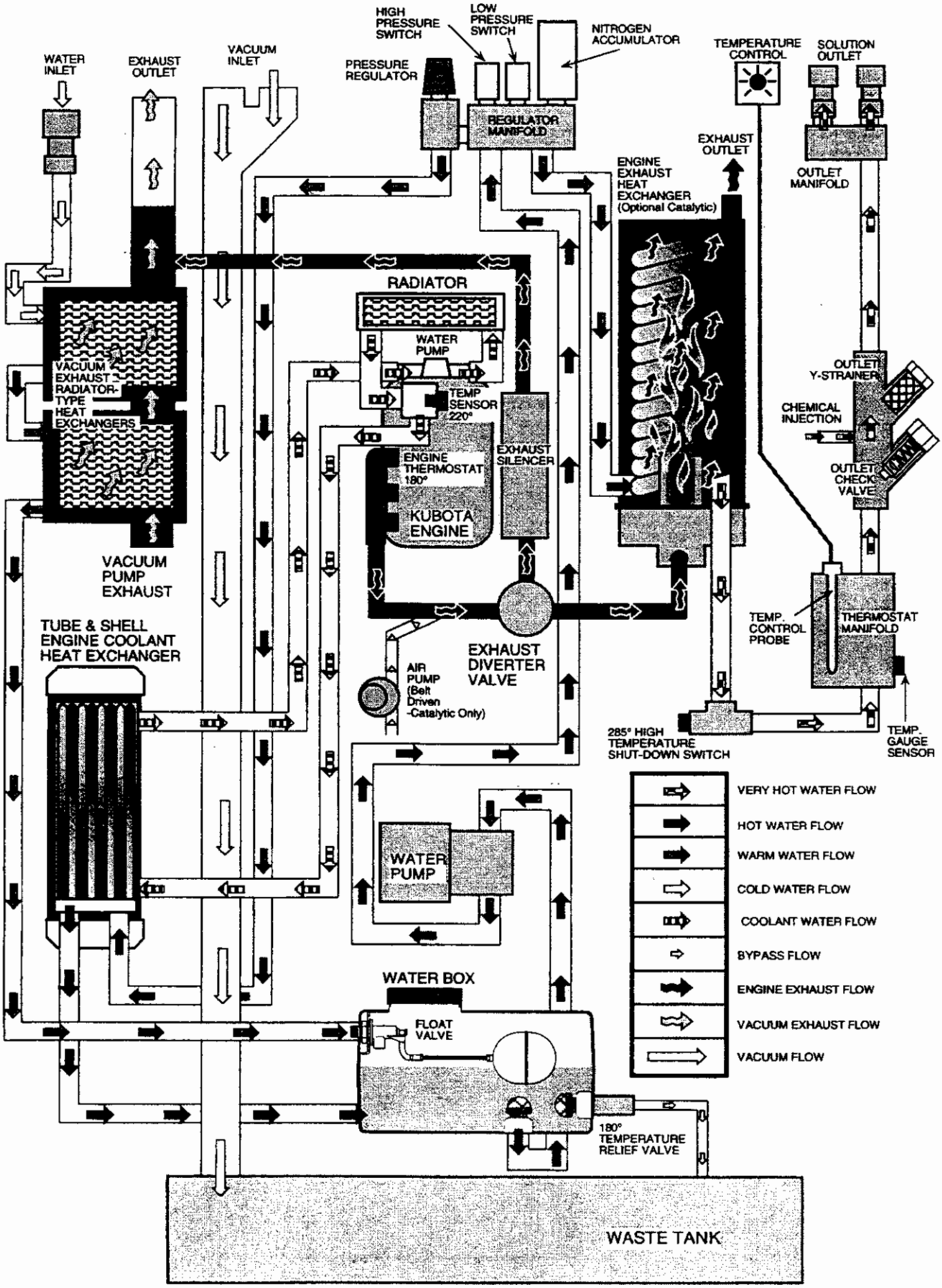


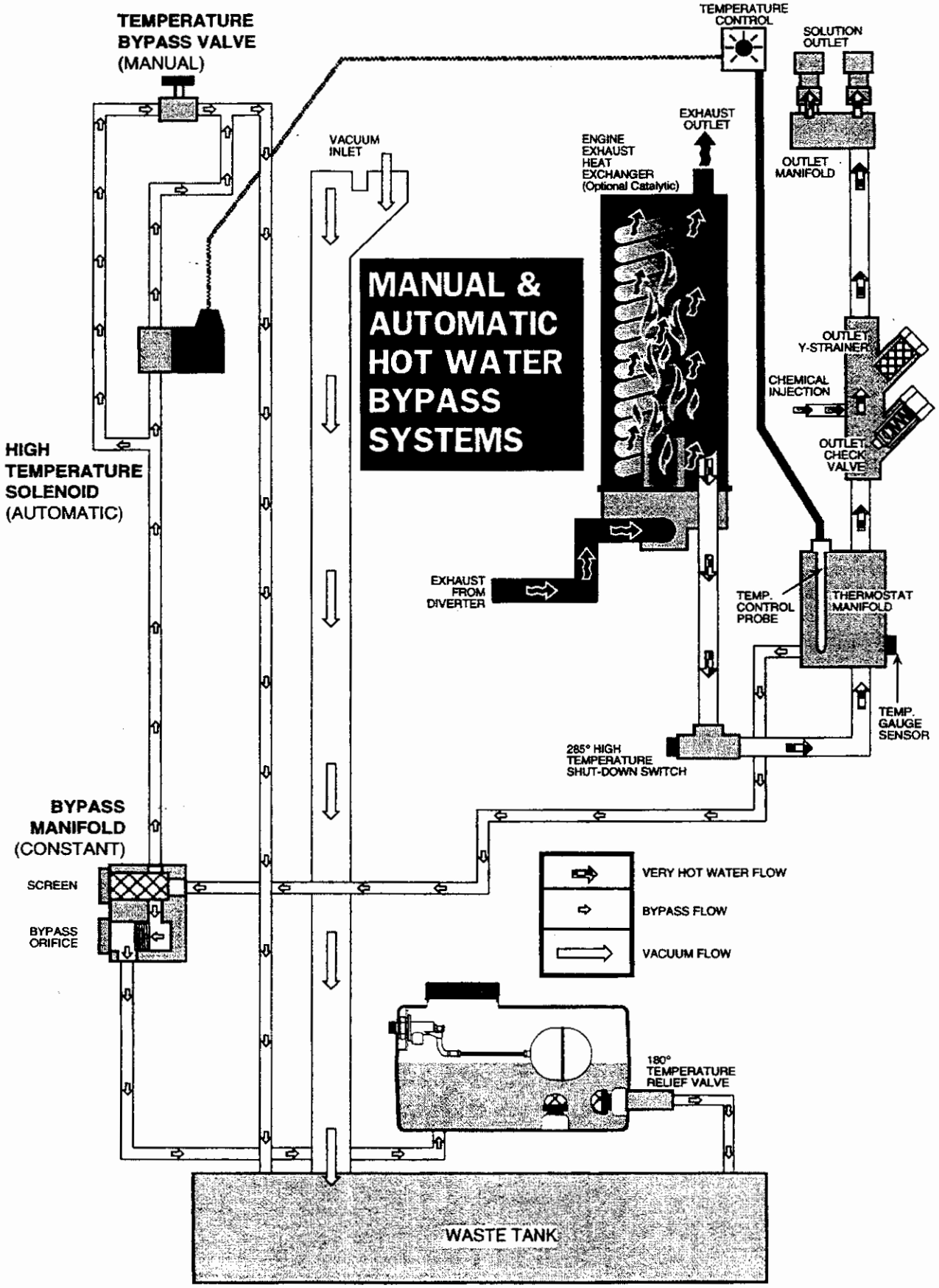
VACUUM EXHAUST HEAT EXCHANGER

CATALYTIC ENGINE EXHAUST HEAT EXCHANGER



HEAT TRANSFER & WATER PUMPING SYSTEM




TEMPERATURE BYPASS VALVE (MANUAL)
TEMPERATURE CONTROL
SOLUTION OUTLET
EXHAUST OUTLET
VACUUM INLET
ENGINE EXHAUST HEAT EXCHANGER (Optional Catalytic)
OUTLET MANIFOLD
MANUAL & AUTOMATIC HOT WATER BYPASS SYSTEMS
OUTLET Y-STRAINER
CHEMICAL INJECTION
OUTLET CHECK VALVE
HIGH TEMPERATURE SOLENOID (AUTOMATIC)
EXHAUST FROM DIVERTER
TEMP. CONTROL PROBE
THERMOSTAT MANIFOLD
TEMP. GAUGE SENSOR
285° HIGH TEMPERATURE SHUT-DOWN SWITCH
BYPASS MANIFOLD (CONSTANT)
SCREEN
BYPASS ORIFICE
VERY HOT WATER FLOW
BYPASS FLOW
VACUUM FLOW
180° TEMPERATURE RELIEF VALVE
WASTE TANK

3. VACUUM SYSTEM

Vacuum flow begins at the cleaning tool, with air and spent chemicals being drawn into the vacuum inlet at the front of the console.

The mixture then flows through a strainer basket in the waste tank. A 100 mesh filter and relief valve have been provided for vacuum pump protection.

The air then flows into the vacuum pump.

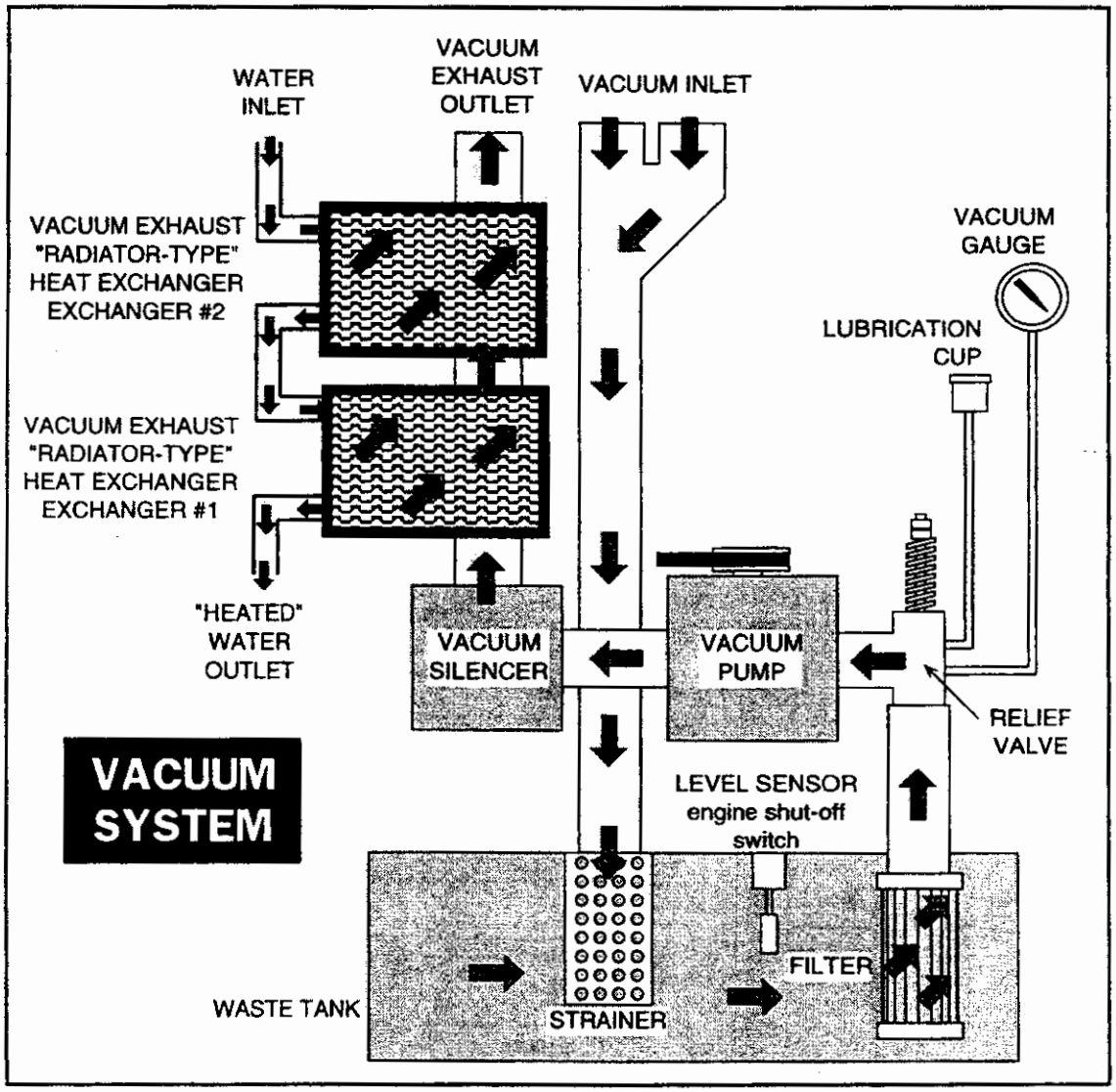
The vacuum pump is belt-driven by the engine.

The air is discharged from the vacuum pump through the **stage one** heat exchanger where the heated vacuum exhaust blows across two radiator-type heat exchangers before discharging into the atmosphere.

A level sensor switch located near the top of the waste tank will shut the unit down before the waste tank reaches its full capacity. This protects the vacuum pump from water damage.

CAUTION:

Use of a DEFOAMER will help prevent damage to the unit by a build-up of foam in the waste tank, which may be caused by some chemicals. (Foam build-up will not activate float switches)



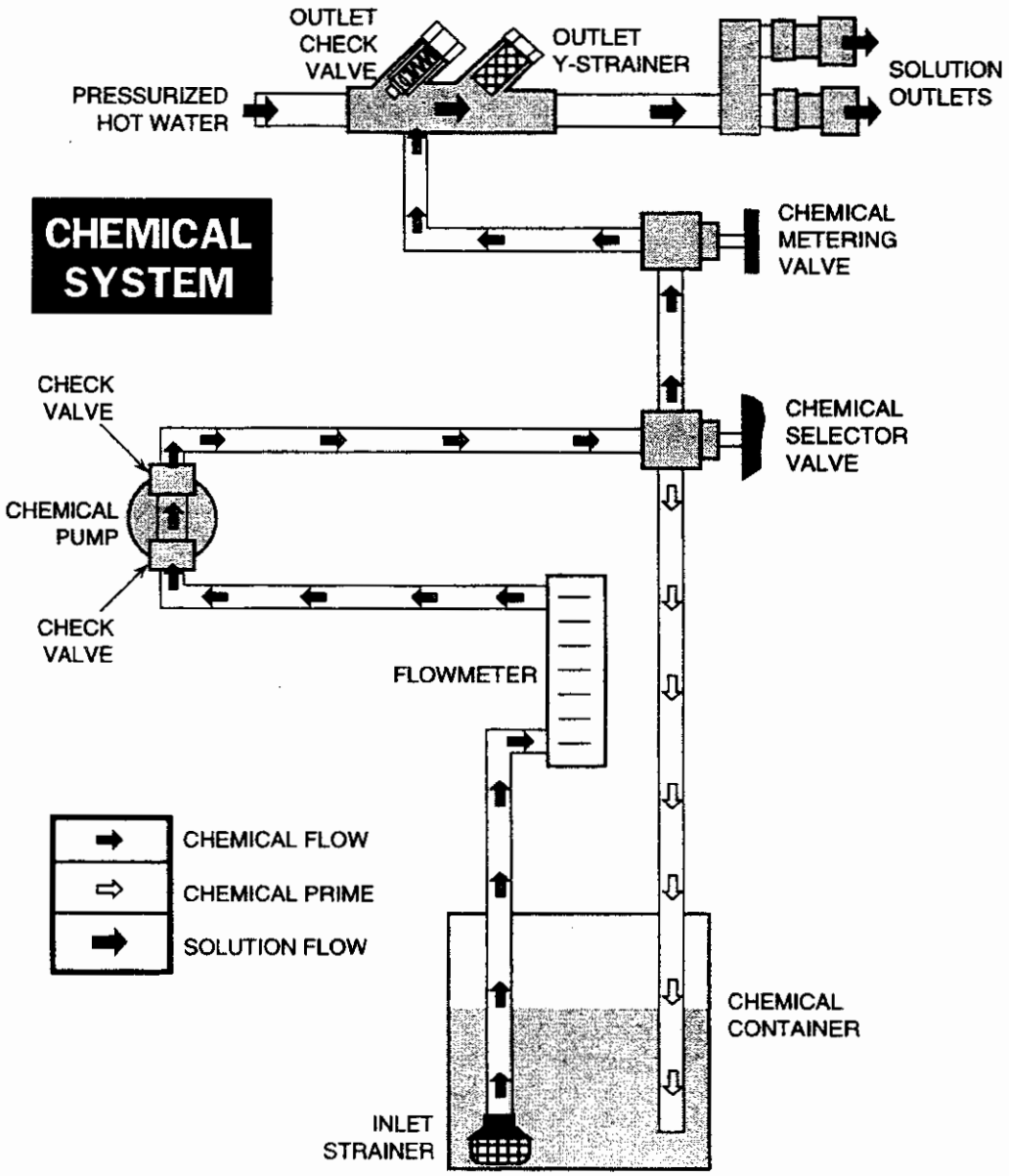
4. CHEMICAL PUMPING SYSTEM

The chemical is drawn from the chemical container through a strainer into the flow meter. The flow meter indicates the rate of chemical flow.

The chemical then flows through a check valve into a pulse-powered chemical pump.

Next, the chemical pump injects the chemical through a check valve to the 3-way selector valve on the control panel. This valve may turn the chemical flow **ON** (CHEMICAL), **OFF** or **PRIME** the chemical pump.

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



5 OPERATION

This chapter of the operators manual explains how to prepare, start, operate, shut down, and daily maintain the PROCHEM BRUIN II cleaning unit. Operation of the Bruin II is simple. However, only trained personnel should proceed.

⚠ CAUTION:

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

1. CHECK FOR ADEQUATE FUEL

Check the fuel tank to be certain there is adequate fuel to complete the job. This unit uses approximately 1.00 gallon per hour at the cleaning speed which is full RPM.

2. REMOVE TOOLS FROM VEHICLE

Remove any **tools** or **hoses** from the van which you will require.

3. WATER SUPPLY CONNECTION

NOTE: Before connecting your water hose to the supply faucet, flush out the faucet until the water is free of any debris. Flush out any debris which may be in your water inlet hose.

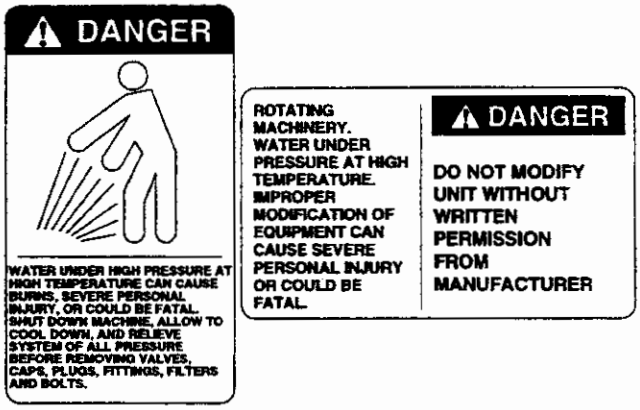
1. Connect the **water supply hose** to the **water inlet** quick-connect at the front of the unit. Connect the hose to the water supply faucet.

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

2. Turn the **water supply faucet** ***on***. The water will fill the **water box**.

4. HIGH PRESSURE HOSE

Connect the **pressure hose** to the **outlet connection** at the front of the unit. Connect the **cleaning tool** to the **pressure hose**.



5. VACUUM HOSE

Connect the **vacuum hose** to the **vacuum inlet** connection at the front of the unit. Connect the other end of the **vacuum hose** to the **cleaning tool**.

6. JET SIZING

Prochem recommends **floor tool** tip sizing not exceed a total of "06".

Example: Tri jet wand uses three 9502 jets. (95° spray angle w/ 02 orifice)

02 x 3 = 06

When using two floor tools while cleaning with this unit, Prochem recommends that each tool tip size does not exceed a total of ".045".

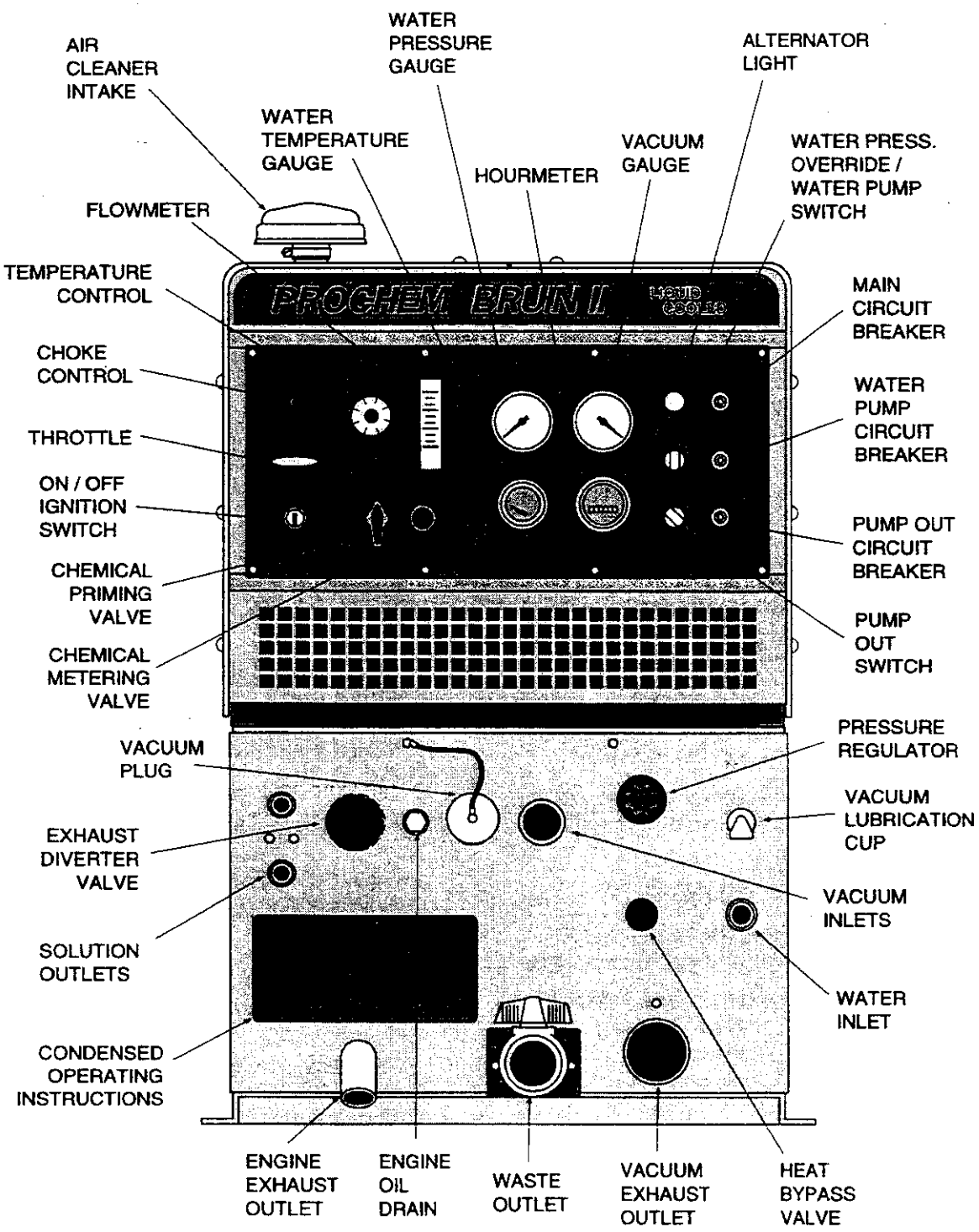
Example: Tri jet wand uses three 95015 jets.

015 x 3 = 045..... 045 x 2 tools = 09

Using larger jet sizes on your Bruin II may reduce cleaning temperatures.

Upholstery tool jet size: 80015
Stair tool jet size: 9502

INSTRUMENTATION



6. STARTING THE UNIT (CLEANING MODE)

1. Set the exhaust diverter valve to the **HEAT EXCHANGER** position. The diverter valve microswitch will automatically turn **ON** the water pump.

2. Set the **temperature control** on the control panel to the desired cleaning temperature. The thermostatic temperature control will allow you to increase or decrease the solution temperature automatically. Simply turn the **control knob** to the desired temperature setting.

3. Close the **heat bypass valve** by turning the knob clockwise. **DO NOT** over tighten.

The **heat bypass valve** allows you to decrease the solution temperature **manually.** Opening the valve (counter clockwise) decreases the temperature by allowing hot water to bypass to the waste tank.

⚠ CAUTION:

DO NOT operate this unit without constant water flowing into the console.

The water **low-pressure switch** will automatically shut this unit down if the water pressure in the system drops below 50 PSI.

The water **high-pressure switch** will automatically shut this unit down if the water pressure in the system exceeds 1200 PSI.

Before proceeding, be certain that the control panel indicators are at the following settings:

Engine ---IDLE (Throttle In)
Engine choke - PULL OUT

NOTE: It will **not** be necessary to pull the choke out if the engine is already warmed up.

4. Turn the **ignition switch** to the **START** position while holding the **water pump switch** to the left (override position). The engine will start. Continue to hold the switch in override position until pressure is indicated on the pressure gauge.

NOTE: If your unit fails to build water pressure after 15 seconds, check for adequate water supply. If necessary, see **Loss of Water Pump pressure** in the troubleshooting section of this manual.

5. After starting the engine, push the **choke** in. After the engine has warmed up, pull the **throttle** all the way out and turn it clockwise to lock it in the full throttle position.

Allow adequate time for the your unit to warm up before beginning the cleaning operation. **–approximately 5-15 minutes.**

7. PRIMING THE CHEMICAL PUMP

NOTE: Prochem recommends that the chemical pump be primed whenever the water pump is ON. This will eliminate possible pressure fluctuations and water pump pulsations related to a dry chemical pump.

1. Place the **chemical inlet tube** and the **chemical prime tube** into the chemical container.

NOTE: When placing the **chemical inlet tube** into the **chemical container**, make certain that is stays fully submerged since the chemical pump will **NOT** function if air is allowed to enter the inlet line. **DO NOT** operate the chemical pump without the inlet strainer properly installed.

2. Turn the **chemical selector valve** on the control panel to the **PRIME** position. The chemical will then flow from the chemical container returning through the chemical prime tube.

If the chemical does **not** flow, then:

a) Put the **chemical prime tube** into the **vacuum inlet** on the front of the unit and seal it off, the vacuum will quickly pull chemical from the chemical container. When the chemical starts to flow, place the **chemical prime tube** back into the container.

b) Once continuous chemical flow without air bubbles has been achieved, turn the **chemical selector valve** from **PRIME** to **ON (CHEMICAL)**. With the **cleaning tool valve** open, observe the **flow meter** and adjust the **chemical metering valve** until the desired rate of chemical flow is obtained. (the **chemical metering valve** is located on the control panel below the flow meter).

8. WASTE PUMP

If your unit is equipped with an **automatic waste pump**, connect one end of a garden hose to the **pump-out connection** on the console and the other end to an **appropriate waste disposal**.

Turn the pump out switch on the control panel to the ON position. The waste pump will operate automatically throughout the cleaning operation.

We recommend that you use a 3/4" I.D. water hose as a waste pump outlet hose. **DO NOT** use a hose smaller than 5/8" I.D.

Never use your automatic waste pump outlet hose as a water inlet hose. Cut the end off the hose that does not connect to the unit to prevent this from happening.

⚠ WARNING!

NEVER dispose of waste in storm drains, water ways, or on ground areas. Always dispose of waste in accordance with Local, State, or Federal law.

9. OPERATION

Once you have completed steps 1 through 9, proceed with the cleaning operation. Your unit should be in the full throttle position when cleaning or extracting. A **float switch** located inside the waste tank will automatically shut down the unit when it reaches its full capacity. When this occurs, empty the waste tank before continuing.

EXHAUST DIVERTER VALVE

The **exhaust diverter valve** allows you to direct exhaust through either:

A) The **exhaust HEAT EXCHANGER** – for high-temperature cleaning.....**or**

B) Through the **exhaust MUFFLER** – for extraction, such as flood restoration.

When the **exhaust diverter valve** is in the **MUFFLER** position, a microswitch automatically shuts off the water pump. This protects the water pump from excessive heat during flood restoration work.

An **override switch** on the control panel will enable you to turn the water pump **ON**, when in the **MUFFLER** position. Make certain that this switch is in the OFF position during flood restoration.

10. CLEANING

Observe the following guidelines, while cleaning:

1. Before proceeding make sure the nozzle is functioning properly.

a. To check, hold the wand about one foot above the surface to be cleaned and open the wand valve. A full spray should be observed from the cleaning nozzle.

b. If the nozzle is not showing a full spray pattern, adjust nozzle for proper pattern, clean, or replace nozzle.

2. Normally, chemical is applied on the push stroke of the wand when cleaning, and vacuuming is done on the pull stroke. For heavily soiled carpets the wand may be used in a scrubbing manner, applying chemical in both push and pull strokes. Always finish up an area with a vacuum pull stroke.

3. When cleaning, keep the working opening (mouth) flat on the surface being cleaned. Keep the wand moving when the valve is open.

4. The unit will automatically shut-down when the waste tank is full. This will prevent water being drawn into the vacuum pump. If shut-down occurs, empty the waste tank before proceeding.

⚠ WARNING!

NEVER dispose of waste in storm drains, water ways, or on ground areas. Always dispose of waste in accordance with Local, State, or Federal law.

11. UPHOLSTERY CLEANING

Upholstery Tool Part #60-950422
Multi-Head Tool Part #60-950464

1. Since either tool has a lower flow rate and smaller orifice, operate the unit with the diverter valve in the **MUFFLER** position and the water pump switch **ON**. This will prevent excessive heat in the water pumping system and limit bypass flow into the waste tank while cleaning upholstery.

2. To further reduce heat, slightly open the heat bypass valve located below the control panel.

NOTE. If the unit is equipped, use the automatic waste pump-out system. this will compensate for the extra bypass flow to the waste tank.

3. Use one (1) "80015" spray tip in either tool.

4. Pressure adjustment below 300 PSI should be made at the tool itself, by using the adjusting knob located on the valve.

12. STAIR TOOL CLEANING

1. Turn the **diverter valve** to the **HEAT EXCHANGER** position. Set the **temperature control** to the desired temperature setting.

2. To further reduce heat, slightly open the **heat bypass valve** located below the control panel.

NOTE: If your unit is equipped, turn the automatic waste pump **ON**. This will compensate for the extra bypass flow into the waste tank.

3. Use one (1) "9502" spray tip in your stair tool.

13. FLOOD RESTORATION

⚠ CAUTION:

1. Set the **temperature control** on the control panel to 150° and open the **heat bypass valve** by turning the knob counterclockwise. This will prevent excessive heat in the water pumping system.

2. During flood restoration, turn the **diverter valve** to **MUFFLER** position and extract. The water pumping system is now OFF. Make certain that the water pump override switch is "OFF" to prevent all water being exhausted out of the water box and running the pump dry.

14. SHUTDOWN AND DAILY MAINTENANCE

1. Run fresh water through the **chemical injection system** to flush out chemicals.

2. We recommend removing as much moisture from your **vacuum hoses** as is reasonable. This will prevent spillage of solution in your vehicle when replacing hoses.

3. Position the throttle control to approximately 3/4 of the way out, but no less than 1/2 out.

4. Disconnect the **vacuum hoses** from the unit.

5. Open the **heat bypass valve** two (2) turns and allow unit to cool down to 180° or less, and then close valve completely. **DO NOT** over tighten valve.

6. Push the throttle all the way in to idle and allow the unit to run for **1 minute** in order to remove all moisture from the **vacuum pump**.

NOTE: If finishing for the day:
Pull throttle all the way out, plug the **vacuum inlet** and spray WD-40 (or equivalent) into the **vacuum lubrication cup** (located at front of console). This will lubricate the **vacuum pump**. Push the throttle back to idle and continue to #7.

7. Turn the **ignition switch** to the "OFF" position.

8. Turn the **water supply faucet** off. Bleed the pressure out of the **water supply hose** by loosening the hose at the water supply. Unhook **water supply hose** and store in vehicle.

9. Relieve pressure from the **cleaning tools and pressure hoses** by activating the valve on the tool. Disconnect the **tools and pressure hoses** from the unit and store away all equipment.

10. Drain the **waste tank** and dispose of waste in a proper manner.

⚠ WARNING!

NEVER dispose of waste in storm drains, water ways, or on ground areas. Always dispose of waste in accordance with Local, State, or Federal law.

11. Remove the **strainer basket** from the waste tank, clean out any accumulated debris, and re-install. Inspect the **vacuum inlet filter** inside the **waste tank**. If there is any lint or debris, remove and clean filter.

NOTE: When removing the **vacuum inlet filter**, grip the plastic hexagonal section of filter. Grasping filter by the screen may collapse or ruin the filter. Re-install the filter

hand-tight. **NEVER operate this unit with this filter removed, damaged or improperly installed.**

NOTE: When replacing this filter, we recommend using the stainless steel **PROCHEM filter (#14-806518) only**. This will prevent rust and corrosion from entering the vacuum system.

12. At the end of your work day, rinse out the waste tank with fresh water. DUO Deodorizer may be added to the waste tank to inhibit the growth of bacteria.

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

15. FREEZING PROTECTION

⚠ WARNING:

If the unit is exposed to freezing weather the water in the unit may freeze causing SERIOUS DAMAGE to the unit. To avoid this, the following is recommended during the cold weather season:

When the unit is not in use, always park it in a heated building. If a heated building is not available, we recommend that you winterize the unit with anti-freeze. At present, it is only possible to winterize units which do **not** have an auxiliary water tank. Units with auxiliary water tanks must be stored in a heated building or completely drained when not in use.

While in operation, avoid long shutdowns as unit provides heat while running. Shut it down just prior to leaving for the next job.

ADDING ANTI-FREEZE TO YOUR UNIT:

1. Shut off the water supply. Disconnect the water inlet hose from the front of your console.

2. Connect all high pressure hoses and tools that may contain water in the lines, hoses, or valves.

3. Start your unit with the exhaust diverter valve in the **HEAT EXCHANGER** position.

4. Open the tool valve until the low pressure switch shuts the unit down.

5. Fill the water box with approximately two gallons of 100% glycol base anti-freeze.

6. Turn the diverter valve to the muffler position. Close the **heat bypass valve** by turning the knob all the way clockwise.

7. Turn the water pressure override switch to the override position and start your unit. Turn the water pump switch **ON**.

8. Open the tool valve until anti-freeze begins to come out of the tool. Recover **ALL** anti-freeze that comes out of the tools in an approved container.

We strongly recommend that you re-cycle and re-use the anti-freeze.

Repeat this procedure with all the remaining tools. After all tools and pressure hoses have been filled with anti-freeze, disconnect and store them.

9. Turn the water pump switch **OFF**. Attach the loop hose with attachment to the solution outlet connection and the water inlet connection. Turn the water pump switch **ON**.

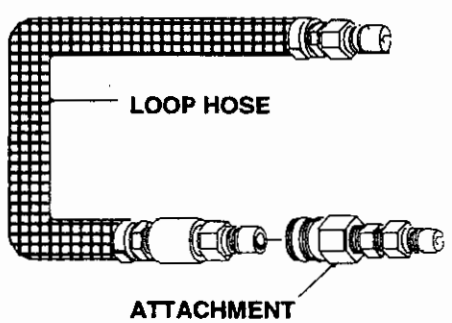
Allow the unit to run for approximately 3 minutes with the loop hose attached.

10. Prime the chemical system with anti-freeze. Insert the chemical inlet and prime tubes in to the anti-freeze container. Turn the chemical valve to **PRIME** until antifreeze begins to flow out of the prime hose. Turn the valve to the **ON (CHEMICAL)** position, making certain that the flow meter indicates flow. Make certain that all anti-freeze drains out of the chemical hose into an approved container.

After 20 seconds, turn the chemical valve to the **OFF** position.

#10-805380

WINTERIZING LOOP HOSE ASSEMBLY



11. Open the heat bypass valve by turning the knob counterclockwise. After 10 seconds, close the **heat bypass valve**.

Turn the **temperature control** on the control panel to 50° for 10 seconds.

After completing these procedures, shut the unit down. The unit is now "winterized".

REMOVING ANTI-FREEZE FROM THE UNIT:

1. Connect one end of the loop hose to the solution outlet connection. Place the other end of the loop hose in to an approved container.

2. Start the unit. The anti-freeze will flow in to the container until the low pressure switch shuts the unit down.

3. Fill the water box with fresh water and repeat step #2.

4. Connect the water inlet hose to the water inlet connection on the console. Turn the water supply on.

5. Connect all solution hoses and any tools which require purging of anti-freeze to the solution outlet connection(s).

6. Open the tool valves and drain the anti-freeze into an approved container until anti-freeze is purged from the tools and hoses until the flow is clear.

7. Place the chemical prime hose into the approved container. Submerge the chemical inlet hose in water. Turn the chemical valve to the **PRIME** position until clear water comes through the prime hose, and then remove prime hose from container.

Turn chemical valve to the **ON (CHEMICAL)** position. This will allow water to flow into the other side of the system.

Once all of the anti-freeze is removed, the unit is ready to use.

Eventually, the anti-freeze in the storage container will become diluted with water. If the anti-freeze level drops below 50%, dispose of it and start with fresh 100% anti-freeze.

⚠ WARNING:

When disposing of used anti-freeze, observe local laws and regulations. Where permitted, we recommend disposal in sanitary sewer systems. Do not drain on to the ground or into storm drainage systems.

SECTION 4 MAINTENANCE & SERVICE

MAINTENANCE CHART

daily maintenance

Engine	**daily**	Check engine oil level.*** Fill to proper level.
Engine	**daily**	Check coolant level in overflow bottle
Vacuum Pump	**daily**	Spray WD-40 in lubrication cup at front of console
Water Pump	**daily**	Check oil level.** Fill to proper level.
Vacuum Inlet Filter (in waste tank)	**daily***	Clean filter, inspect, replace if damaged.
Vacuum Hoses	**daily**	Wash out with clean water
(Optional) Automatic Waste pump	**daily***	Inspect and remove any debris or sediment
Vacuum Pump	**weekly***	Check oil level. Fill to proper level.
Water Pump Inlet Filter (in water box)	**weekly***	Check for debris and clean
Battery	**weekly***	Check for proper fluid level. Fill with distilled water **only.**
Bypass Manifold Orifice & Strainer	**weekly***	Inspect & remove any debris or blockage
Solution Outlet Y-Strainer	**monthly***	Inspect & remove any debris or blockage
High Pressure Hoses	**25***	Inspect for damage or impending damage
Pressure Regulator	**100**	Lubricate O-rings
Engine	**100**	Service air cleaner element*
Engine	**100**	Change engine oil***
Engine	**100**	Change oil filter***
Battery	**100***	Clean battery terminals
Engine	**100**	Check fan belt tightness
Engine	**100**	Check fuel filter. Replace if necessary.
Engine	**200**	Check radiator hoses and clamp tightness
Heat Bypass and Chemical Valves	**200***	Inspect and/or Adjust Packing Nuts
Temperature Solenoid	**200***	Remove any hard water deposits
Vacuum Exhaust Heat Exchanger	**200**	Inspect core and remove debris
Engine	**400**	Check spark plugs for carbon deposit and proper gap
Water Pump	**500**	Change oil**
Vacuum Pump	**500**	Lubricate bearing on pulley end with grease
Sheave Set Screws & Bushing Cap Screws	**500**	Check for proper torque values. Re-torque, if required****
Drive Sheaves	**500**	Inspect, clean and check for sheave groove wear****
Drive Sheaves	**500**	Check sheave alignment****
Drive Belts	**500**	Inspect and clean****
Drive Belts	**500**	Check belt tension****
Engine	**1000**	Replace spark plugs
Engine	**1000**	Replace thermostat
Engine	**1000**	Flush radiator and change engine coolant.
Chemical Pump and Check Valves	**1000**	Replace Diaphragm and Check valves.
Check Valve (Solution Outlet)	**1000**	Inspect, Clean and Repair, if needed.
Vacuum Pump	**1500**	Drain, flush, and replace oil*****
Engine	**yearly**	Check valve clearance
Engine	**yearly***	Replace fuel filter on engine
Engine	**yearly***	Replace air cleaner element
Nitrogen Accumulator	**yearly***	Check and have re-charged with nitrogen, if required
Engine	**2 years**	Replace radiator hoses and hose clamps
Engine	**3 years**	Replace ignition wires

* Or as often as required.

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

*** Change engine crankcase oil and filter after the **first 35 hours** of operation.

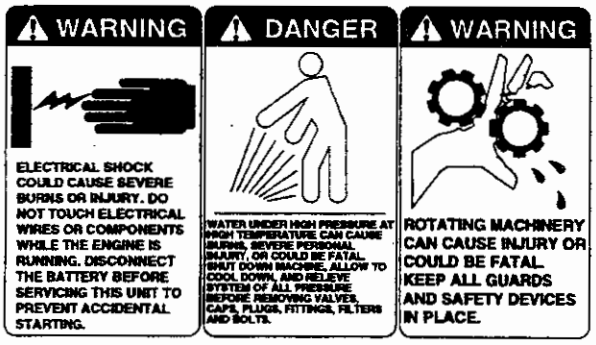
**** Perform drive belt, sheave, & bushing maintenance after **first 25 hours** of operation, and then again at **100 hours**.

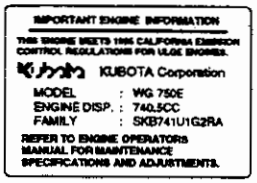
***** If using **AEON PD** synthetic lubricant, **4500 hours or every 2 years, whichever comes first.**

6 MAINTENANCE

This chapter of the operator's manual contains the maintenance information for this unit.

Initiation of a planned PREVENTATIVE MAINTENANCE PROGRAM will assure that your **Prochem Bruin II** has optimum performance, a long operating life, and a minimal amount of "down" time.





⚠ WARNING:

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

NOTE: Use the hour meter as a guide for coordinating the maintenance schedule.

1. ENGINE:

Major engine repairs should **NOT** be attempted without a thorough knowledge of all components of the engine. Therefore, we strongly **RECOMMEND** having service or repairs performed by an authorized engine dealer.

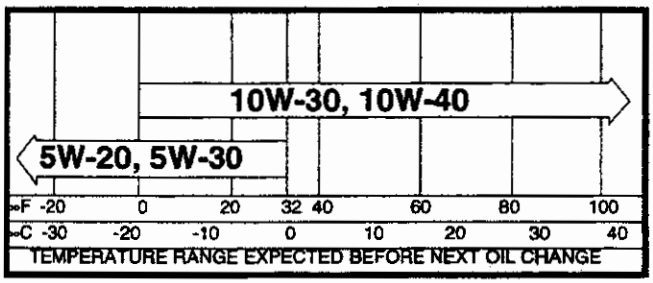
General maintenance, filter changes, oil change, etc., should be performed as recommended by the ***Kubota Engine Operator's Manual.*** Use the engine manual as a detailed guide for ALL matters concerning the engine. Following is a condensed version of maintenance procedures:

1. Check the engine oil level **daily,** when in use.

We recommend using the following chart

Use high-quality detergent oil of **API (American Petroleum Institute) service class SF or SG.** Select the viscosity based on the air temperature at the time of operation as shown in the following table:

RECOMMENDED SAE VISCOSITY GRADES



NOTE: Using other than service class SF or SG oil or extending oil change intervals longer than recommended can cause engine damage.

2. It is important that the engine break-in oil is changed after the **first five (35) hours** of operation. Afterwards, change the engine oil **every 100 hours.**

3. Check the coolant level in the overflow container daily. If no coolant is seen, remove cap on container and add coolant.

⚠ WARNING:

Engine coolant can be extremely hot. Never open the radiator cap while the unit is running or hot. Allow the unit to cool down prior to adding coolant. Failure to do so may result in severe injury.

4. Check the air cleaner **weekly** for dirty, damaged, or loose parts.

5. Check fan belt tightness **every 100 hours.**

6. Service the air cleaner element **every 100 hours.**

7. Check the fuel filter **every 100 hours.** Replace, if necessary.

8. Change the engine oil **every 100 hours.**

9. Change the oil filter **every 100 hours.**

10. Check the radiator hoses and clamp tightness **every 200 hours.**

11. Check condition of the spark plugs and gap **every 400 hours.**

12. Replace the spark plugs **every 1000 hours.**

13. Change the engine thermostat **every 1000 hours.**.

14. Flush and change the engine coolant with 50/50 coolant/water ratio **every 1000 hours.**

15. Check the engine valve clearance **once a year.**

16 Replace the fuel filter **once a year.**

17. Replace the air cleaner element **once a year.**

18. Replace the radiator hoses and hose clamps **every 2 years.**

19. Replace the ignition wires **every 3 years.**

NOTE: Perform these maintenance operations more frequently under **extremely dirty or dusty conditions.**

2. VACUUM PUMP:

Refer to **Vacuum Pump Operation and Service Manual** for specific instructions.

Lubrication: We recommend that you use AEON PD Synthetic Blower Lubricant in the gear end of the vacuum pump for ALL operating temperatures. AEON PD is formulated especially for positive displacement blower service to provide maximum blower protection at any temperature. One filling of AEON PD will last a minimum of 2 times longer than a premium mineral oil.

AEON PD (Part# 05-008039) is the oil which Prochem puts in the vacuum pump at the factory. Topping off or adding petroleum oil to synthetic oil is NOT recommended.

If **not** using AEON PD synthetic blower lubricant, use oils with rust and oxidation inhibitors, anti-foam additives and the viscosity's listed on the chart on this page.

VACUUM PUMP LUBRICANT

Blower Discharge Temperature	Oil Grade U.S.A.*	Oil viscosity, Centistokes @ 40° C
-40° to 32°F (-40° to 0°C)	SAE 10W	45
32° to 100°F (0° to 38°C)	SAE 20	100
100° to 275° F (38° to 135°C)	SAE 40	200
over 275° F (135° C)	SAE 50	250

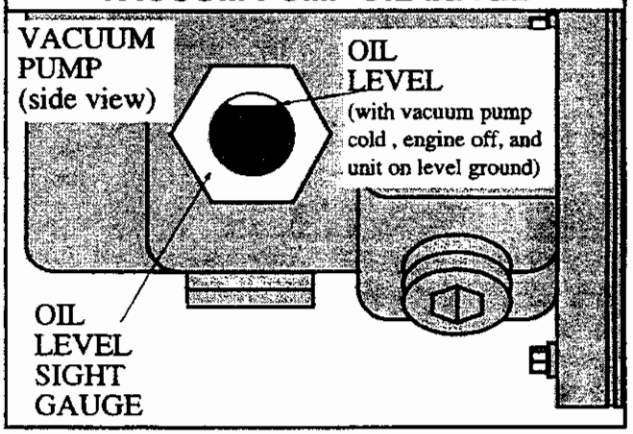
* In applications with extreme variations in ambient temperature a 20W-50W multiple viscosity is recommended.

For Grease Lubricated Bearings
Service every 500 hours of operation

Blower Discharge Temperature	Type Grease
-40° to 275° F (-40° to 120° C)	No. 2 Non-Corrosive Bearing Grease

1. Check the oil level **weekly** to assure the proper level. **PROPER LEVEL** cannot be overemphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating. Use the chart provided on this page as a guide when adding oil.

VACUUM PUMP OIL LEVEL



2. To prevent rust from building up inside the vacuum pump (if moisture exists) we have provided a lubrication cup on the front of the unit.

First run the unit at least 1 minute to remove any moisture from the vacuum pump.

Next, fill the lubrication cup with WD-40 or a similar lubricant while the unit is running and

the vacuum inlet is sealed. Do this at the end of **each working day**.

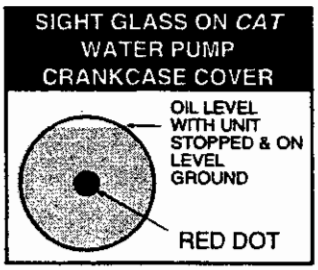
3. Drain, flush and replace oil **every 1500 hours or yearly, whichever comes first.** Change oil more frequently if inspection so indicates. With AEON PD synthetic lubricant, perform the oil change maintenance **every 4500 hours or every 2 years, whichever comes first.**

4. The bearings on the pulley end of the vacuum pump requires grease lubrication **every 500 hours**. Pack the bearings until grease comes out of the vent holes. (Use extreme pressure bearing grease of the specification NLGI Grade 2 EP)

3. WATER PUMP:

Refer to the **Water Pump Operation and Service Manual** for specific instructions.

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



Refill the oil to the proper level, if required, with Cat Pump Oil (Part# 05-008016), SPECIAL FORMULA PREMIUM 10W30 GRADE NON-DETERGENT HYDRAULIC Oil. Other CAT approved oil equivalents are:

Mobil DTE 16
Amoco Rykow 68
Shell Tellus T68

2. Change the crankcase oil with Cat Pump Oil after the **first 50 hours** of operation. Drain and refill the crankcase oil **every 500** hours thereafter.

4. VACUUM INLET FILTER (in waste tank):

The vacuum filter in the waste tank should be removed and cleaned **daily**. Re-install the filter *hand-tight.* If this is done, the filter will last for a long period of time.

⚠ CAUTION:

When removing the vacuum inlet filter, grip the plastic hexagonal section of filter. Grasping filter by the screen may collapse or ruin the filter. NEVER operate this unit with this filter removed, damaged or improperly installed.

Replace this filter if damaged or as needed.

NOTE:
When replacing this filter, we recommend using a stainless steel **PROCHEM filter (#14-806518) only**. This will prevent rust and corrosion from entering the vacuum system.

5. DRIVE BELTS, SHEAVES, & BUSHINGS:

1. Check sheave set screws and/or bushing (hub) cap screws after the **first 25 hours** and then again at **100 hours**.

Re-torque these screws with a torque wrench, using the values on the chart below.

Check sheave set screws and/or bushing (hub) cap screws **every 500 hours** thereafter.

⚠ WARNING:

Make certain that when you re-torque these screws, that you use a clockwise pattern and continue until proper torque is achieved.

TORQUE VALUES

Component	inch/lbs	foot/lbs
Engine hub	264	22
Vacuum pump hub	192	16

2. Check for sheave groove wear, clean belts and sheave grooves, check for worn belts, proper belt tension, and sheave alignment after the **first 25 hours** and then again at **100 hours**.

Check for belt ride in the groove. In multiple groove drives, belt ride should be uniform, not more than 1/16" above or below top of sheave groove.

Check groove wear area for wear. Side wall of groove should be straight, not dished out. Bottom of groove should show no signs of belt contact.

Inspect belts for contaminates, such as oil or grease. Wipe belts clean with detergent and water. Inspect sheave grooves for buildup of such material and remove, if necessary.

Check wear surfaces of belt for excessive wear. If have a slick, glazed look, belts are slipping. Check belt tension. Never replace one belt in a used set, as used belts will elongate. Replace entire set if replacement is necessary.

Place a straight-edge across the top of belt. There should be no more than 1/2" deflection in the center of the belt, halfway between the sheaves. If there is too much slack, tighten belt, making sure that it stays properly aligned.

See "General Service Adjustments Section" in this manual for details.

Check alignment with straight-edge, string, or machinist level. Correct alignment to as near perfect as possible.

6. FLOAT VALVE (water box):

Check the float valve at least once a month for proper operation. If overfilling is a problem, check the plunger for a proper seat. Replace tip on plunger if needed or damaged. Water level in the water box should be about 6-1/2".

For procedure, see "General Service Adjustments Section" in this manual for details.

7. INLET FILTER (to water pump):

The filter inside the water box on the bottom is rubber with a stainless steel screen. This should be inspected and cleaned on a **weekly** basis, if damaged, replace.

NOTE: Vacuum all excess water and debris from water box prior to removing strainer.

8. WASTE TANK STRA

The strainer basket located i
tank should be removed and
it is full of debris. This shou
least a **daily** basis.

9. BYPASS MANIFOLD (strainer and jet blo

Check the strainer and the je
any debris or blockage.

**For procedure, see "Gene
Adjustments Section" in t
details.**

10. Y-STRAINER (outlet

Inspect the Y-strainer after
running the unit by unscrew
remove any accumulated de

Inspect the strainer again at

The Y-strainer should then
month. However, if the Y-s
frequent build-up of debris
inspected and cleaned more

11. CHECK VALVE (out

Inspect the check valve whe
chemical pump or as needed
disassemble the check valve
seat for debris or abnormal
replace seat if needed.

NOTE: Improper seating o
poppet, damaged spring or
poor operation of the chemi

**For procedure, see "Gene
Adjustments Section" in t
details.**

12. CHEMICAL PUMP:

Rebuild the chemical pump
This involves changing the
check valves.

**For procedure, see "Gene
Adjustments Section" in t
details.**

13. CHEMICAL & HEAT BYPASS VALVES:

Examine the packing nut on the chemical selector valve, heat bypass valve, and chemical metering valve **every 200 hours.** Keeping these valve packings properly adjusted will eliminate possible leakage from the valve stems and add to overall valve life.

For procedure, see "General Service Adjustments Section" in this manual for details.

14. NITROGEN ACCUMULATOR:

Check the nitrogen pre-charge **at least once a year**. Recharge the accumulator and replace the bladder, when needed. This should be performed by an **Authorized Service Center.**

⚠ WARNING:

Recharge accumulator with nitrogen ONLY. DO NOT charge accumulator over 250 PSI.

15. PRESSURE REGULATOR:

Lubricate the o-rings **every 100 hours.** Use **O-ring** lubricant #05-008035.

For procedure, see "General Service Adjustments Section" in this manual for details.

16. VACUUM HOSES:

To assure maximum hose life, we recommend that the hoses be washed out with clean water at the end of **each working day.**

17. CATALYTIC AIR PUMP:

Check and/or replace the air pump **every 1500 hours.** When replacing, it will also be necessary to replace the air pump **pulley**.

18. TEMPERATURE SOLENOID:

Remove hard water deposits from the temperature solenoid **every 200 hours or as often as required.**

For procedure, see "General Service Adjustments Section" in this manual for details.

19. BATTERY:

⚠ WARNING:

Dangerous Acid, Explosive Gases!

Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well ventilated areas. Keep sparks, open flames, and other sources of ignitions away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries. Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or gasoline vapors are present. When disconnecting the battery, ALWAYS disconnect the negative (-) terminal FIRST.

1. Check the fluid level in the battery **every 25** hours or **once a week.** If low, fill to the recommended level with **distilled water** ONLY.

⚠ NOTE:

DO NOT overfill the battery. Poor performance or early failure due to loss of electrolyte will result.

2. Keep the cables, terminals, and external surfaces of the battery clean. A buildup of corrosive acid or grime on the external surfaces can cause the battery to self-discharge. Self discharge occurs rapidly when moisture is present.
The battery terminals should be cleaned **every 100** hours to prevent corrosion build-up. Wash the cables, terminals and external surfaces with a mild baking soda and water solution. Rinse thoroughly with clear water.

⚠ WARNING:

DO NOT allow the baking soda to enter the battery cells as this will destroy the electrolyte.

20. ENGINE EXHAUST HEAT EXCHANGER:

If the engine and/or air pump are not properly maintained, the exhaust gases may deposit carbon on the outside of the heat exchanger coil and continuous running will effect the cleaning solution temperature and may cause damage to the catalytic converter. If this condition exists, remove the heat exchanger from the unit and clean the carbon off the coil. This may be done by taking it to a machine shop and having it boiled out. **The catalytic converter must be completely removed before cleaning carbon deposits or damage may result.**

Proper maintenance of the unit, such as regular tune-ups, proper fuel and a properly operating air pump will help prevent carbon build-up on the coil and increase the life of the unit.

In case of carbon build-up use of A212 ULTRA CLEAN INDUSTRIAL CLEANER will greatly enhance the removal of carbon deposits. Soak the coil and casing **only. (NEVER soak the catalytic converter core).** This should be performed **as needed.**

21. VACUUM EXHAUST HEAT EXCHANGER:

Removing and cleaning the vacuum exhaust pre-heater core is recommended as needed or if the unit was operated with the vacuum inlet filter damaged, removed or improperly installed. Pull out the core and remove all debris, being **careful not to drive debris deeper into the core.** Remove the debris with water by either submerging the core and moving it back and forth until the debris loosens and falls off or by spraying the debris out of the core. Allow the core to dry before reinstalling.

22. HIGH PRESSURE HOSES:

Inspect your high pressure hoses for wear after the **first 100 hours** of use. Inspect **every 25 hours thereafter.** If hoses show any signs of damage or impending rupture, **replace the hose.**

⚠ CAUTION:

DO NOT attempt to repair high pressure hoses! Repairing high pressure hoses may result in severe burns and serious injury!

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

23. OPTIONAL WASTE PUMP–OUT:

At the end of each work day, make certain that you remove any debris or sediment which may be inside the waste pump.

Remove waste pump unit from waste tank and clean inside underneath screen at least **once a week, or more frequently if required.**

24. TEMPERATURE UNION PACKING:

Examine the temperature union assembly for leaks **every 200 hours.** Tighten the union fitting just enough to stop leaks. **DO NOT** over tighten.

For procedure, see "General Service Adjustments Section" in this manual for details.

7 SERVICE GENERAL ADJUSTMENTS

⚠ WARNING:

DO NOT service this unit while it is running unless specifically directed to do so in this manual. The high-speed mechanical parts as well as high temperature components may result in severe injury, severed limbs, or fatality.

1. ENGINE SPEED:

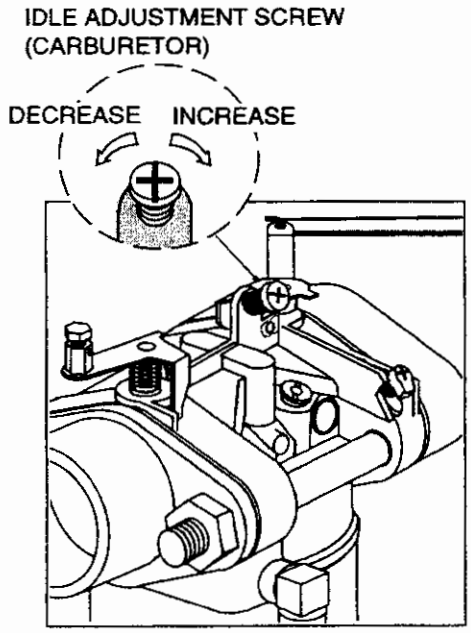
Connect your tachometer prior to starting engine.

Allow the unit to warm up prior to doing any adjustments to engine RPM.

IDLE SPEED ADJUSTMENT (Engine running, diverter valve in the **MUFFLER** position and with the water pump **OFF**)

Push the throttle control all the way in.

While verifying the speed with a tachometer, turn the idle adjustment screw (see below) until 1200 RPM is indicated.



⚠ WARNING:

DO NOT attempt to adjust without a tachometer and NEVER adjust the engine above 2500 RPM.

HIGH SPEED ADJUSTMENT (Engine running, diverter valve in the **HEAT EXCHANGER** position and with the water pump **ON**)

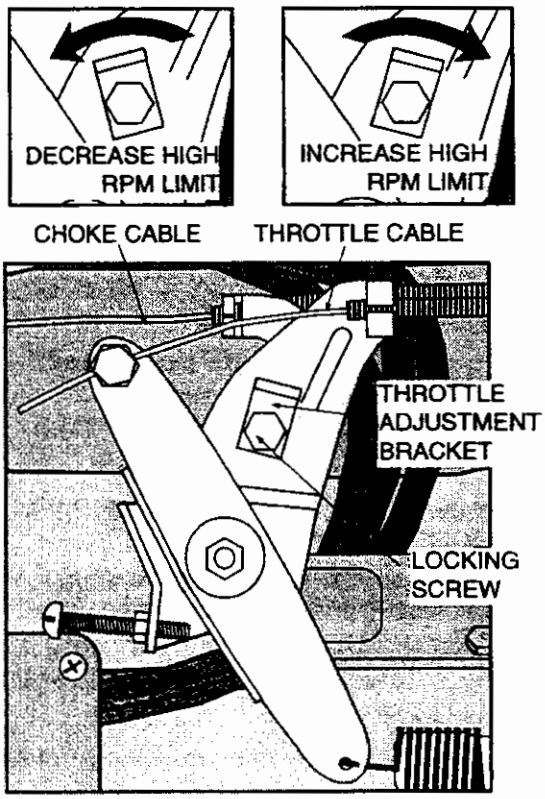
1. Pull the throttle all the way out and check the engine RPM. The engine RPM at full speed with the water pump **ON** should be 2500 RPM.

2. Adjust by loosening the locking screw and moving the throttle adjustment bracket to increase or decrease the throttle limit as needed (see below).

You may need to push the throttle in slightly to adjust the throttle adjustment bracket. Be sure to pull the throttle all the way out when checking the high RPM.

3. Repeat this process until the proper RPM is obtained.

4. Shut down unit and remove tachometer.



2. VACUUM RELIEF VALVE:

While the unit is running at full RPM, block the air flow at the vacuum inlet connection and read the vacuum gauge. If adjustment is required, shut the unit down and adjust the locking nut tension. Start your unit and read the vacuum gauge. Repeat this process until the relief valve opens at 14" Hg.

3. VACUUM PUMP DRIVE BELTS:

To tighten the vacuum pump belts:

1. Loosen the 2 nuts which hold the air pump mount in place.

2. Loosen the 4 locking-nuts which hold the vacuum pump mount in place.

3. Turn the adjusting bolts until the proper belt tension is achieved (1/2" deflection in the center of the belt) halfway between the sheaves.

CAUTION: When adjusting belt tension, make certain that the engine shaft and vacuum pump shaft remain parallel, and the belt tension is equal throughout the belt width.

4. After adjusting, re-tighten the 4 nuts which hold the vacuum pump in position. Check belt alignment with straight edge.

5. Readjust and check air pump belt. **DO NOT** over tighten belt. Re-tighten the 2 mounting nuts. Check alignment with straight edge.

4. WATER PUMP DRIVE BELT:

To tighten the water pump belt:

1. Loosen the nuts which hold the water pump mount to base.

2. Adjust the belt tension adjusting bolt until the proper belt tension is achieved. (1/2" deflection in the center of the belt halfway between the sheaves).

3. While checking the alignment, tighten the pump mount hold-down nuts.

5. FLOAT VALVE (water box):

The float valve should only be adjusted if the water box is overflowing or the water level in the box is lower than 5-1/2":

1. If the box is overflowing, remove, and check the float valve for debris or damage.

NOTE: If the float ball has any water inside it must be replaced.

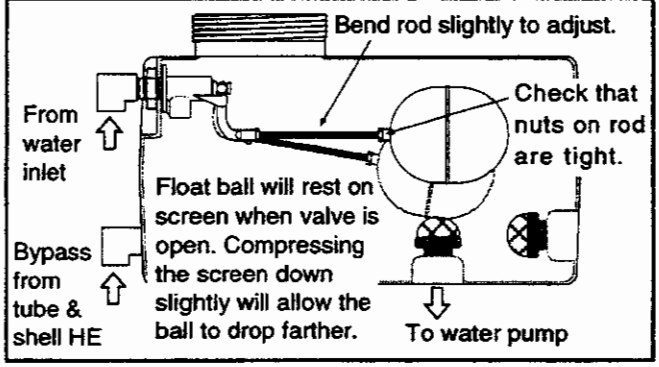
⚠ CAUTION:

When replacing float ball, DO NOT over tighten, the rod can puncture ball. Make sure to tighten nuts on rod.

2. Disassemble the valve and check the piston and seat for damage, replace if needed. See page A-13 for break-down.

3. Reassemble and reinstall valve, adjust shut-off by bending the rod slightly either up or down. Down will shut the valve sooner (lower water level).

FLOAT VALVE DETAIL



6. BYPASS MANIFOLD:

Clean the bypass strainer and orifice **weekly**, using the following guidelines:

1. Remove the **strainer**. Clean and re-install. **DO NOT** over tighten **strainer**.

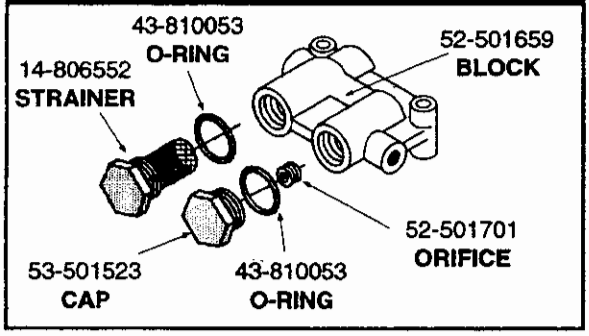
2. Remove the **cap**. Remove the **orifice**, using a 3/16" Allen wrench. **(The 3/16" Allen wrench is provided with the bypass maintenance kit #66-945280.)**

3. Re-install the **cap** and run the unit with the water pump ON for 15 seconds to flush out the bypass block.

4. Remove the **cap** and re-install the cleaned **orifice**, using the 3/16" Allen wrench. Tighten **orifice** just enough to seat. **DO NOT** over tighten. Re-install **cap**. **DO NOT** over tighten **cap**.

NOTE: If o-ring seals leak, replace them. If strainer is damaged, replace strainer.

#15-808112
BYPASS MANIFOLD DETAIL



7. CHECK VALVE (solution outlet):

Inspect the check valve whenever doing service on the chemical pump or if flow problems occur in the chemical system:

1. Remove the **check valve.** Be sure the small o-ring for the seat comes out with the check valve.

2. Remove the **seat**, using a 5/16" Allen wrench.

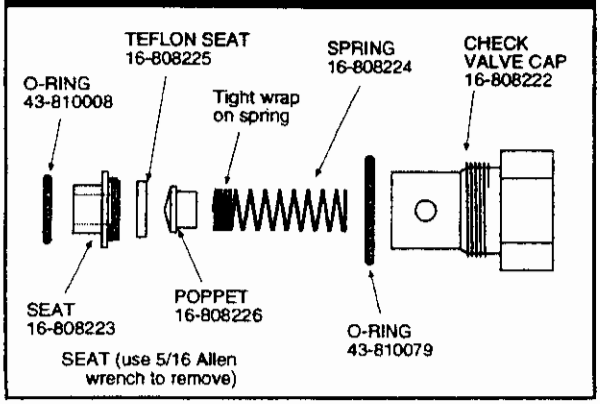
3. Check the Teflon seat for debris or wear. Clean or replace Teflon seat if needed.

4. Clean the poppet and spring, inspect for wear or damage, replace as needed.
5. Re-assemble the check valve. Start the seat by hand, tighten using a 5/16" Allen wrench. **DO NOT** over-tighten seat.

NOTE: Improper seating of the check valve poppet, damaged spring or o-rings will cause poor operation of the chemical system.

6. Lubricate the o-rings with **O-ring** lubricant #05-008035 and reinstall.

CHECK VALVE #15-808094



8. CHEMICAL PUMP:

The only repairs which the chemical pump may require is the replacement of the diaphragm or check valves. To replace the diaphragm, unscrew the cover from the body. When replacing the diaphragm, lubricate the outer edges of the diaphragm with **O-ring** lubricant #05-008035 and reassemble. To replace the check valves, unscrew the check valve caps. Replace the check valves and reassemble, using new o-rings and Teflon washers.

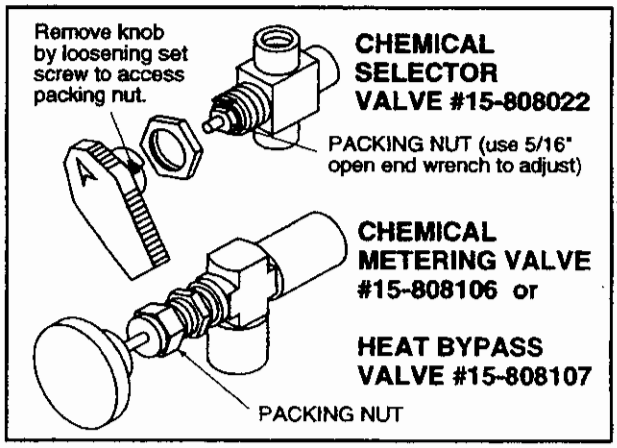
NOTE: Teflon washers were used on units prior to July 1, 1996.

DO NOT attempt to re-use the Teflon washers once the check valves have been removed.

See page A-9 in the Illustrated Parts Listing for a parts breakdown on the chemical pump.

9. PACKING NUT ADJUSTMENT for CHEMICAL METERING, CHEMICAL SELECTOR, & HEAT BYPASS VALVES:

Examine the packing nut on the metering and selector valves for proper tension every **200 Hours**. When turning the knob, there should be a small amount of resistance. If not, slightly tighten the packing nut. **DO NOT** over tighten. Keeping the valve packings properly adjusted will eliminate possible leakage from the valve stem and add to overall valve life.



10. PRESSURE REGULATOR:

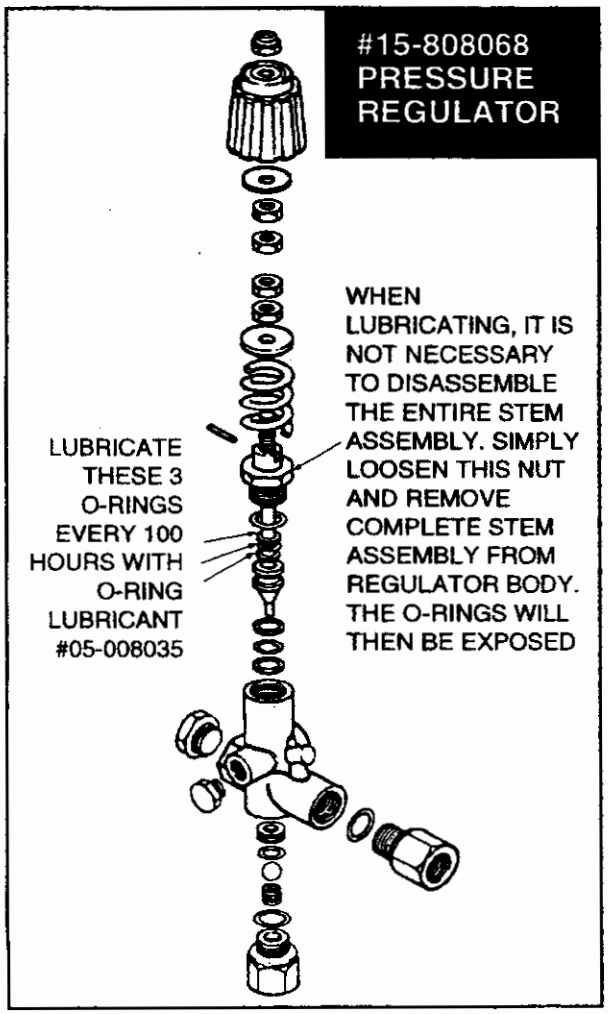
The pressure regulator serves only to hold locked up water pressure at a preset point and to bypass this water back to the water box. Adjust as follows:

To adjust:

1. With your unit running, close the cleaning tool. Check the pressure gauge. Open the tool valve. We **recommend** setting the pressure regulator so that the pressure gauge reads 400 PSI with the tool valve **open**.

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

2. If the pressure regulator requires adjustment, turn the adjusting knob (while observing the pressure gauge on the control panel) until the desired pressure is obtained.



11. TEMPERATURE SOLENOID:

The temperature solenoid may become seized, due to hard water deposits.

The core must move freely in the stem. The plunger must move freely within the guide.

Check the seat to make sure that it is not distorted.

Using the illustration on the following page, follow these guidelines when servicing the temperature solenoid:

1. Remove the **coil housing** from the solenoid body.

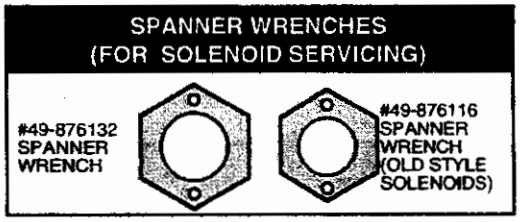
2. Using the spanner wrench, remove the **stem, spring core, plunger, guide**, and **seal washer**. NOTE: **DO NOT** attempt to remove **seat. (The spanner wrench is provided with the bypass maintenance kit #66-945280.)**

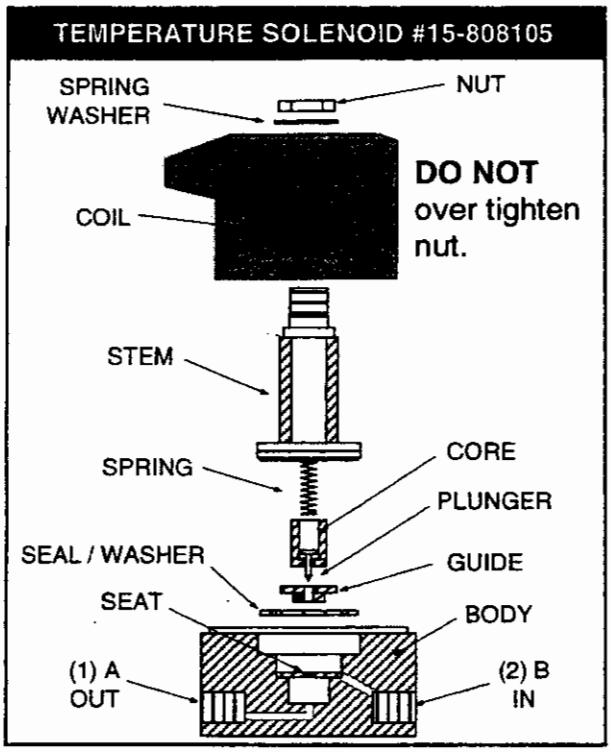
3. Make certain that the **plunger** moves freely in the **core** and the **guide**. The **core** must also move freely in the **stem**.

These parts may be soaked in de-scaler or cleaned with #0000 steel wool.

4. Clean **seat** by gently rotating a 3/64" drill bit with fingers through the center of the **seat**. **(The 3/64" drill bit is provided with the bypass maintenance kit #66-945280.)**

5. Reassemble the **solenoid. DO NOT** over tighten **stem or coil mounting nut**. Doing so may cause damage to the solenoid or improper operation.





12. TEMPERATURE CAPILLARY & PACKING ASSEMBLY:

INSTALLATION INSTRUCTIONS for OLD STYLE UNION #12-800130

1. Using thread sealant, thread the tapered end of the union into the thermostat manifold and tighten.

2. Slide the jam nut over the capillary bulb with the threaded end towards the bulb.

3. Insert bulb through union fitting into the thermostat manifold.

4. Slide the compression slugs on to the capillary with the concave surfaces facing each other. **(see illustrations on this page and the following page.)**

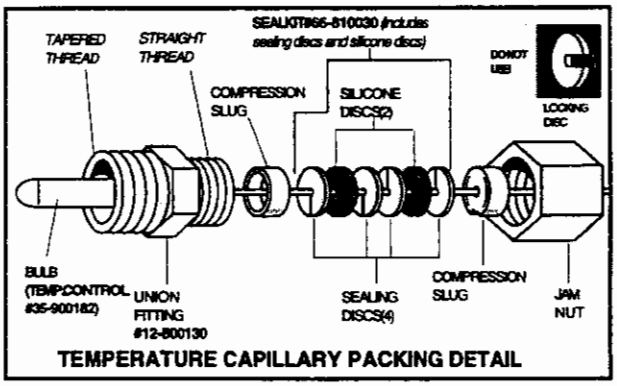
5. Fit the (2) silicone discs and (4) sealing discs on to the capillary between the slugs in the order shown in the illustration. Align slits 180° apart.

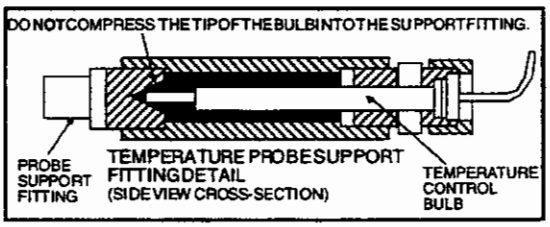
6. Insert slugs and discs into the union fitting hand tight.

7. Position bulb in manifold as shown in the illustration on the following page. When positioning the bulb in the support fitting, do not allow bulb to compress against the support fitting.

8. Tighten jam nut lightly approximately 1-1/2 turns.

9. Examine the union assembly for leaks and tighten union fitting just enough to stop leaks. **DO NOT OVER TIGHTEN.**





INSTALLATION INSTRUCTIONS for NEW STYLE UNION #12-800391

1. Using thread sealant, thread the tapered end of the union into the thermostat manifold and tighten.

2. Slide the jam nut over the capillary bulb with the threaded end towards the bulb.

3. Insert bulb through union fitting into the thermostat manifold.

4. Place the rubber seal on to the capillary with the split facing 90° from top. **(see illustration on the following page).**

5. Fit the (4) brass disks on to the capillary on either side of the rubber seal. Face notch on disk towards other disk.

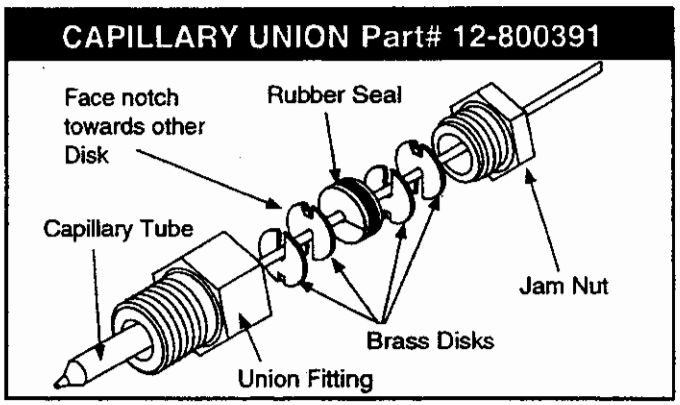
NOTE: Lubricating the facing sides of the brass disks will hold them together on the capillary tube during installation.

6. Insert rubber seal and discs into the capillary union fitting hand tight.

7. Position bulb in manifold as shown in the illustration above. When positioning the bulb in the support fitting, do not allow bulb to compress against the support fitting.

8. Tighten jam nut lightly approximately 1-1/2 turns.

9. Examine the union assembly for leaks and tighten union fitting just enough to stop leaks. **DO NOT OVER TIGHTEN.**



8 TROUBLESHOOTING

⚠ WARNING:

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

This chapter of the operation manual explains how to look for and repair malfunctions which may occur.

Intelligent, accurate troubleshooting is based on a complete and thorough understanding of the **WATER, VACUUM, CHEMICAL, HEAT TRANSFER, SAFETY and WIRING** systems on this unit.

If there is a malfunction occurring in a system which you do not fully understand, turn back to **"OPERATION"**, section **3** of this manual and **REVIEW "SYSTEMS".**

In addition, prior to proceeding, you can save time by checking that:

1. The water supply is ON.

2. The engine speed at full throttle at full speed is 2500 RPM, with the diverter in the **HEAT EXCHANGER** position.

3. To check if water pump volume is correct. Check the pump volume with the cleaning tool closed. Measure the water flow returning to the water box from the pressure regulator. The flow rate should be 3.4 GPM. An additional .25 GPM of water should be flowing through the bypass manifold orifice, which is adjacent to the water box. If you block the bypass manifold flow, the flow rate will be 3.65 GPM.

SPECIFIC PROBLEMS

1. LOSS OF WATER PUMP PRESSURE

With the cleaning tool open, the water pressure gauge reads below the normal operating pressure.

***Note:** If the pump pressure drops below 50 PSI or exceeds 1200 PSI, the unit will automatically shut down!*

PROBABLE CAUSES	CORRECTIVE ACTION
Water supply is turned off or the float valve is stuck or improperly adjusted. **NOTE:** This may also cause the water pressure switch to shut the unit down.	Turn the water supply on or up. Check for kinks in the water supply hose. Examine the float valve and adjust or replace.
Water pump inlet supply line is plugged or drawing air. **NOTE:** This may also cause the water pressure switch to shut the unit down.	Examine the water inlet filter inside the water tank. Remove accumulated debris and replace if required. Check for suction leaks and loose clamps or fittings. Tighten any loose fittings or clamps. Replace any ruptured hose(s).
Improper engine speed	Using a tachometer, check the engine speed. Full throttle engine speed is 2500 RPM. Re-adjust in accordance with the **Kubota Engine Operator's Manual.**
Pressure regulator O-rings are dry.	Lubricate O-rings, using **O-ring** lubricant #05-008035.
Pressure regulator has worn O-rings.	Check O-rings. If necessary, replace.
Pressure regulator is dirty, stuck open, or improperly adjusted.	Clean or repair pressure regulator. Adjust to working pressure. Lubricate O-rings, using **O-ring** lubricant #05-008035
Low pump volume. (Measure the amount of water being returned to the water box from the pressure regulator. It should fill a gallon container every 17.6 seconds.)	Examine the check valves, plunger cups, and cylinder head on the water pump. Repair whenever required. (Refer to the water pump service manual)
Defective water pressure gauge.	Replace gauge.
Orifice (spray nozzle) in the cleaning tool is worn, defective, or the wrong size	Replace nozzle or change nozzle size.
Bypass manifold orifice not installed or installed improperly. (Threads damaged in manifold)	Check bypass manifold and orifice for proper installation and repair, if necessary.
Debris clogging water lines, vacuum exhaust heat exchangers or water inlet disconnect.	Clean or replace as needed.

2. LOSS OF SOLUTION VOLUME AT CLEANING TOOL ORIFICE

Water pressure gauge reads normal.

PROBABLE CAUSES	CORRECTIVE ACTION
Plugged orifice in the cleaning tool.	Unplug orifice.
Internal block between the regulator manifold and the outlet Y- strainer or the Y-strainer screen is clogged.	Inspect all lines, remove accumulated debris which is blocking proper flow. Replace any defective hoses. Remove, inspect, and clean the Y-strainer screen. De-scale unit and install a water softener, if necessary.
Outlet valve is plugged.	Examine the check valve, remove any debris.
Defective quick-connect on one of more of the high pressure hoses.	Replace defective quick-connect(s) on high pressure hose(s).
Cleaning tool valve is malfunctioning.	Repair or replace valve.
Hose inner lining is constricted.	Remove restriction or replace hose.
Heat exchanger is scaled on inside of coil.	De-scale coil, and install a water softener, if necessary, to protect the equipment. If water contains 3-1/2 grains or more of water hardness, a water softener is needed.

3. LOSS OF VACUUM

While cleaning, the vacuum is not up to par. Engine RPM is normal.

PROBABLE CAUSES	CORRECTIVE ACTION
Vacuum gauge is giving an improper reading.	Examine the tubing between the vacuum relief valve and the vacuum gauge and remove any blockage.
Vacuum hose(s) is damaged, causing a suction leak.	Inspect the vacuum hose(s). Repair any damage or replace.
Waste tank gasket not sealing properly, lid not positioned properly.	Inspect the gasket. Repair seal or replace. Re-position lid.
Plugged vacuum hose or vacuum plumbing between vacuum inlet and strainer basket.	Unplug vacuum hose or inlet plumbing.
Waste tank filter or strainer basket is plugged.	Clean or replace filter. Clean strainer basket.
Loose vacuum pump drive belts.	Tighten the drive belts.
Waste tank drain valve is damaged or left open, causing a vacuum leak.	Drain the waste tank. Close drain valve, if open Remove the dump valve and, after inspecting, replace the defective components.
Vacuum relief requires adjustment or has a vacuum leak due to damaged diaphragm.	Re-adjust the vacuum relief valve. If the vacuum does not increase, remove and inspect the relief valve diaphragm. If damaged, replace.

3. LOSS OF VACUUM *(continued from previous page)*

While cleaning, the vacuum is not up to par. Engine RPM is normal.

PROBABLE CAUSES	CORRECTIVE ACTION
Vacuum exhaust heat exchangers are plugged with lint.	Remove and clean.
Vacuum pump is worn out.	Replace the vacuum pump.

4. LOSS OF CHEMICAL

With the cleaning tool valve open, no chemical.

PROBABLE CAUSES	CORRECTIVE ACTION
Chemical pump is improperly primed.	Refer to chemical pump priming instructions.
The strainer at the inlet end of the chemical inlet line is clogged.	Unclog the strainer. If damaged, replace.
Suction leak in the inlet line leading into the chemical pump.	Inspect inlet lines and flow meter for damage and replace, if required.
Chemical pump check valve(s) is clogged.	Remove any debris from the chemical check valve(s). Replace chemical check valve(s) or seals, if necessary.
Chemical prime/on-off valve or chemical metering valve is defective.	Replace valve(s).
Chemical pump diaphragm is ruptured.	Disassemble the chemical pump and replace the damaged diaphragm.
Defective cylinder in the water pump.	Measure the pump volume. If the pump volume is less than normal, refer to "Loss of Pump Volume" in the troubleshooting section in this manual.

5. CHEMICAL FLOW METER INDICATES FLOW WITH THE TOOL VALVE CLOSED

PROBABLE CAUSES	CORRECTIVE ACTION
External leak in piping.	Tighten fittings. Re-apply thread sealant where required. If any fittings are damaged, replace.
Outlet check valve is full of debris or damaged, not allowing it to close properly.	Close the chemical valve on the instrument panel. If the flow meter does not indicate flow, remove debris or replace check valve, if necessary.
Chemical pump diaphragm is ruptured.	Close the chemical valve on the instrument panel. If the flow meter still indicates flow, replace the chemical pump diaphragm.
Internal leak in chemical prime valve causing continual flow through prime tube returning to container.	Tighten valve packing nut. (See general service adjustments section in this manual) Replace valve, if necessary.

6. PUMP DOES NOT ENGAGE WHEN THE DIVERTER VALVE IS IN THE "HEAT EXCHANGER" POSITION

PROBABLE CAUSES	CORRECTIVE ACTION
Water pump clutch circuit breaker has been tripped.	If the blue light is OFF, check the "water pump clutch" circuit breaker on the control panel. Press RESET button.
Defective electrical connection in the console wiring or defective microswitch.	If the blue light is OFF and the circuit breaker is not tripped, examine switch, electrical connections, and wiring. Repair any defective connections. If there is power going to the switch but not going out, replace the defective microswitch.
Microswitch is not being activated, activating lever not adjusted properly.	Readjust and re-tighten activating lever.
Defective water pump clutch.*	If the blue light is ON, check the white wire which leads from the switch to the clutch. If there is power in the switch, but no power at the clutch, replace the defective wire. If there is power at the clutch, replace the defective microswitch.

* **NOTE:** The clutch may be MANUALLY set by inserting two 1/4-20 x 1/2" bolts. Line up the holes and insert the bolts. To disengage the pump, remove the bolts.

7. ENGINE WILL NOT START

The engine does not turn over.

PROBABLE CAUSES	CORRECTIVE ACTION
Main circuit breaker on the control panel has been tripped.	After inspecting the unit to determine the cause of the tripped circuit breaker, press the reset button.
Loose or corroded battery.	Clean, tighten, or replace the battery terminals.
Dead battery.	Recharge or replace battery.
Defective ignition switch.	Test ignition switch for power going into the switch. If there is power going in but NO power going out, replace the switch.
Defective starter motor.	Test the starter motor. If necessary, replace.
Engine problem.	Refer to the **Kubota Engine Operator's Manual**
Vacuum pump is seized.	Refer to **Sutorbilt service & repair manual.**

8. STARTER TURNS OVER ENGINE, BUT ENGINE WILL NOT START

PROBABLE CAUSES	CORRECTIVE ACTION
Waste tank is full.	Empty the waste tank.
Water pressure has not reached 50 PSI, triggering the pressure switch to prevent starting.	Turn water pump switch to "override" position. position. If unit shuts back down, refer to "Loss of Water Pump Pressure" in the *Troubleshooting Section* of this manual.
Engine coolant temperature has exceeded 220°F, Triggering the high temperature switch to shut the unit down.	Determine the cause of overheating **before** restarting the unit. Refer to **Kubota Engine Operator's Manual**
Defective fuel pump.	Replace the fuel pump.
Defective upper float switch in the waste tank.	Disconnect the float switch plugs and bypass the switch. If the unit starts, replace the defective float switch.
Oil pressure switch, (located on engine) fuel shut-off solenoid, (located on engine) high temperature switch.	Test these components, if any are defective, replace. Consult engine service manual.
Defective 220° engine high-temperature shutdown switch	Test. If necessary, replace.
Engine is malfunctioning.	Refer to the **Kubota Engine Operator's Manual**

9. ENGINE STOPS RUNNING

While doing normal cleaning, the engine stops running.

PROBABLE CAUSES	CORRECTIVE ACTION
Engine is out of gasoline.	Add gasoline to the fuel tank.
Waste tank is full.	Empty waste tank.
Water pressure has dropped below 50 PSI, triggering the pressure switch to shut the unit down.	Increase the incoming water pressure to your unit. Check hose for kinks.
Water pressure has exceeded 1200 PSI, triggering the pressure switch to shut the unit down.	Check pressure regulator for proper setting.
Main or water pump circuit breaker on the control panel has been tripped.	After inspecting the unit to determine the cause of the tripped circuit breaker, press the reset button.
Cleaning solution temperature has exceeded 285°F, Triggering the high temperature switch to shut the unit down.	Determine the cause of overheating **before** restarting the unit. See "Excessive Heating" in the *Troubleshooting Section* of this manual.
Defective fuel pump.	Replace fuel pump.

9. ENGINE STOPS RUNNING *(continued from previous page)*

While doing normal cleaning, the engine stops running.

PROBABLE CAUSES	CORRECTIVE ACTION
Defective float switch inside the waste tank.	Disconnect the float switch plugs and put a jumper wire on plug from console. If the unit starts, repair or replace the defective float switch.
Defective 285° solution high-temperature shutdown switch.	Test switch, if necessary, replace.
Engine coolant temperature has exceeded 220°F, Triggering the high temperature switch to shut the unit down.	Determine the cause of overheating **before** restarting the unit. Refer to **Kubota Engine Operator's Manual**
Loss of oil pressure in engine.	Check for proper oil level or wrong type of oil being used. See page 38 for oil chart.
Defective engine oil pressure switch.	Test switch, if necessary, replace.
No ignition in the engine or engine is malfunctioning.	Refer to **Kubota Engine Operator's Manual**

10. EXCESSIVE HEATING

PROBABLE CAUSES	CORRECTIVE ACTION
Strainer or orifice in bypass manifold is plugged.	Clean strainer screen and orifice. Replace, if necessary.
Defective solenoid; remains in closed position.	Inspect solenoid for proper operation, clean or replace, if necessary.
Bypass valve is completely closed and unit is left running for a long period of time without using water.	Open bypass valve and allow system to cool down.
Defective temperature control or temperature control microswitch	Inspect temperature control for proper operation, repair or replace, if necessary.
Flow restriction caused by hard water scaling.	Descale unit, repair or replace damaged plumbing components as necessary. Install water softener.

11. HEAT EXCHANGER LEAKS

PROBABLE CAUSES	CORRECTIVE ACTION
Exhaust heat exchanger is damaged from frozen water.	Inspect heat exchangers for leaks. On pre-heaters visually inspect for damage. Pressure check both styles after removing them from the unit. (Maximum test pressure engine exhaust H.E. 1200 PSI, vacuum pre-heaters 300 PSI)

NOTE: The engine exhaust heat exchanger will produce water condensation discharge at times during normal operation. DO NOT confuse this with a water leak.

12. LOSS OF TEMPERATURE

The heat output of the unit is LESS than normal.

PROBABLE CAUSES	CORRECTIVE ACTION
Heat bypass valve on the lower front of console is opened or does not seat properly.	Close the heat bypass valve by turning the knob clockwise. Inspect valve, replace if necessary.
Defective solenoid; remains in open position.	Inspect solenoid for proper operation, clean or replace, if necessary.
Defective temperature control or temperature control microswitch.	Inspect temperature control for proper operation, repair or replace, if necessary.
Temperature relief valve on water box is stuck open.	Clean valve and test. If necessary, replace.
Engine RPM is low.	Reset engine RPM. Refer to **Kubota Engine Operator's Manual**
Defective temperature gauge.	Test gauge and sensor. Replace failed component.
Defective air pump (Catalytic only).	Replace air pump.
Heat exchanger is carbon-coated on outside of coil.	Soak coil section at a machine shop. Boil tank or soak in PROCHEM Industrial cleaner.
	⚠ CAUTION: DO NOT SOAK CATALYTIC CORE.
Heat exchanger has hard water scaling on inside of coil..	De-scale coil.

13. AUTOMATIC WASTE PUMP IS MALFUNCTIONING OR NOT OPERATING NORMALLY

(for units equipped with an automatic waste pump)

PROBABLE CAUSES	CORRECTIVE ACTION
Debris interfering in the normal operation of pump, pump check valve or float switch.	Remove pump-out from waste tank, thoroughly clean all components. Inspect for proper operation.
Pump out circuit breaker on the control panel has been tripped.	After inspecting the waste pump to determine the cause of the tripped circuit breaker, press the reset button. (Check for debris in the impeller inside the pump head)
Defective waste pump float switch.	Replace float switch.
Worn out waste pump.	Check for voltage at the pump. If there is voltage and the pump does not run, replace the pump.
NOTE: When replacing either the pump or float switch, use new electrical connectors and heat shrink. Inspect connection for water tight seal.	
Water has penetrated the electrical connectors.	Reseal or replace electrical connectors.
Broken wiring leading to the waste pump.	Check for voltage at the pump. If no voltage, find the broken connection and repair.
Weak battery. Battery charge too low to maintain pump-out operation.	Charge or replace battery if needed.
Pump wired incorrectly. Pump impeller rotates backwards.	Verify rotation using arrow marking on bottom of pump housing. Inspect wiring using a voltage meter.

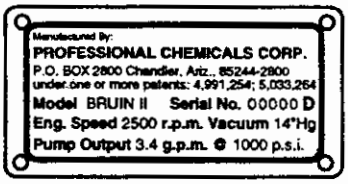
ILLUSTRATION INDEX (in alphabetical order)

FRONT VIEW ASSEMBLY

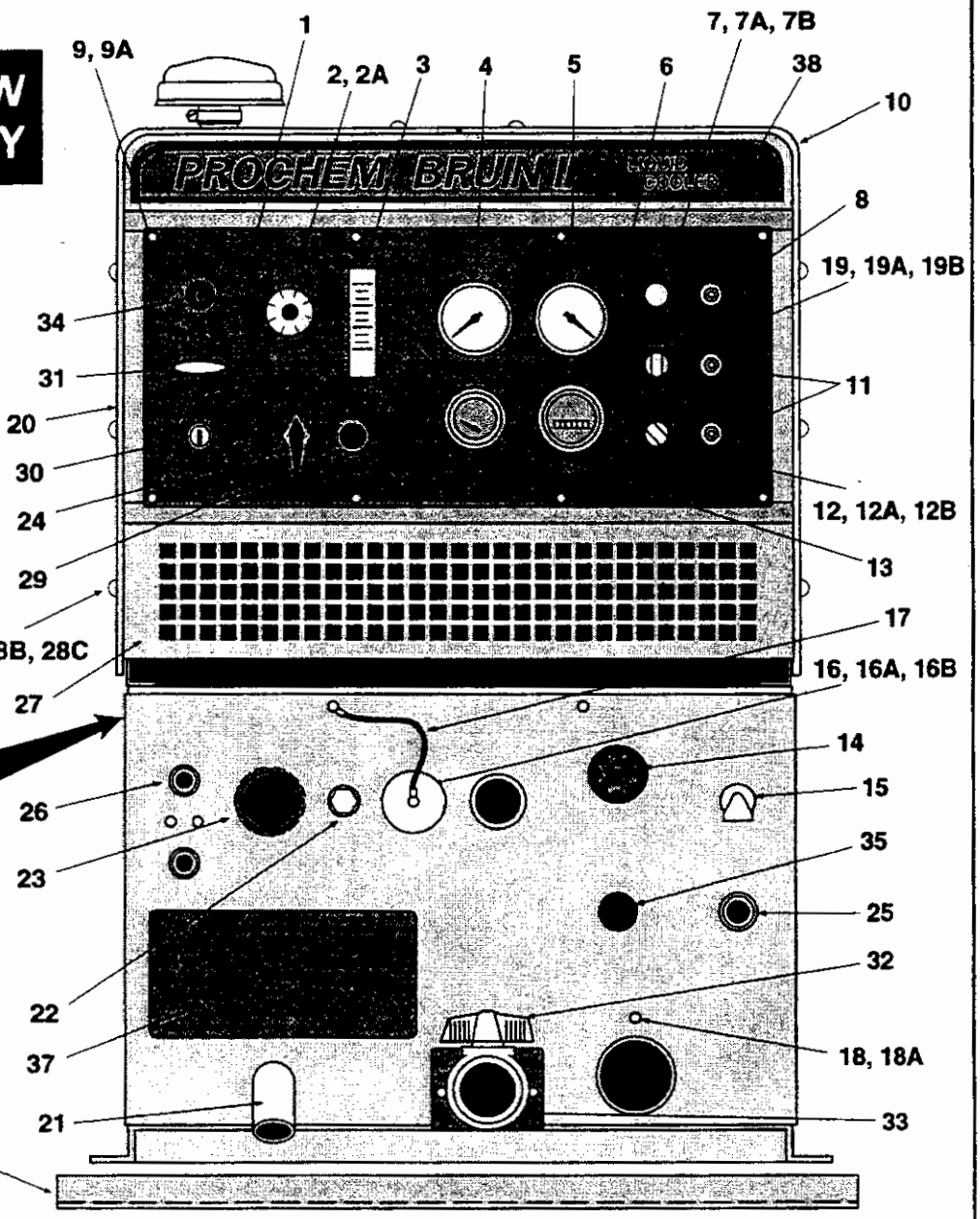
NOTE: View is of the "D" version, older versions may differ slightly.

This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located as shown below.

SERIAL PLATE LOCATION



Be sure to identify the unit you have prior to ordering parts.



1	50-501727.....CONTROL PANEL	19	61-950738.....SWITCH, PUMP/ OIL & WTR OVERRIDE
2	35-900182.....TEMPERATURE CONTROL	19A	33-900169.....REPLACEMENT BULB
2A	33-900193.....MICROSWITCH, TEMP. CONTROL	19B	34-900101.....REPLACEMENT LENS
3	18-808513.....FLOWMETER	20	61-950721.....HOOD ASSEMBLY, LEFT
4	18-808526.....PRESSURE GAUGE	21	55-501672.....EXHAUST DEFLECTOR TUBE
5	18-808525.....VACUUM GAUGE	22	11-800168.....PLUG, ENGINE OIL DRAIN
6	34-903000.....HOURMETER	23	04-000285.....HANDLE, EXH. DIVERTER VALVE
7	34-900099.....DOME INDICATOR LIGHT (RED)	24	15-808022.....CHEMICAL PRIMING VALVE
7A	33-900169.....REPLACEMENT BULB	25	13-806008.....DISCONNECT, 3/8F
7B	34-900103.....REPLACEMENT LENS (RED)	26	13-806001.....DISCONNECT, 1/4F
8	33-900161.....CIRCUIT BREAKER, 30 amp	27	56-502013.....MOUNT, CONTROL PANEL
9	00-000337.....SCREW,CONTR. PANEL MOUNT	28	01-000259.....RECEPTACLE, 1/4 TURNFAST
9A	01-000273.....WELL NUT	28A	00-000272.....STUD, 1/4 TURNFAST
10	61-950720.....HOOD ASSEMBLY, RIGHT	28B	02-000268.....RETAINER, 1/4 TURNFAST
11	33-900163.....CIRCUIT BREAKER, 20 amp	28C	58-700023.....VIBRATION PAD
12	32-900180.....SWITCH W/ LIGHT	29	15-808106.....CHEMICAL METERING VALVE
12A	33-900169.....REPLACEMENT BULB	30	32-900086.....IGNITION ON/OFF SWITCH
12B	34-900101.....REPLACEMENT LENS	31	49-802505.....THROTTLE CABLE
13	18-808530.....TEMPERATURE GAUGE	32	15-808080.....VALVE, WASTE OUTLET
14	15-808068.....PRESSURE REGULATOR	33	56-501738.....WASTE DUMP TUBE
15	19-800075.....VACUUM LUBRICATION CUP	34	49-802518.....CHOKE CABLE
16	66-945236.....VACUUM PLUG ASSY (Includes Part #16A, 16B & 17)	35	15-808107.....TEMP. BYPASS VALVE
16A	52-501679.....PLUG, VACUUM INLET	36	56-501845.....GALVANIZED DRIP PAN (OPTIONAL)
16B	43-810081.....O-RING, VACUUM INLET PLUG	37	48-941197.....COND. OPER. INSTRUCT. DECAL
17	64-950383.....HOLDER, VACUUM INLET PLUG	38	48-941193.....BRUIN II PANEL DECAL
18	00-000210.....SCREW,1/4-20 x 3/4"		
18A	02-000038.....LOCKWASHER, 1/4	NOT SHOWN	48-941195.....HOOD DECAL
			48-941212.....WARNING & INSTRUMENTATION DECAL SHEET

STRUCTURAL FRAMEWORK ASSEMBLY

1	56-501902	TRAY, WATER BOX
2	00-000055	SCREW, 1/4-20 x 3/4 HXHD
3	02-000038	LOCKWASHER, 1/4
4	02-000066	FLATWASHER, 1/4
5	00-000122	SCREW, 1/4-20 x 1-3/4 HXHD
6	56-502020	CENTER HOOD BRACKET
7	56-502014	FRAME, RADIATOR MOUNT
8	00-000009	SCREW, 1/4-20 x 3-1/2" HXHD
9	00-000286	SCREW,1/4-20 x 2-3/4 HXHD
10	56-502013	MOUNT, CONTROL PANEL
11	00-000210	SCREW,1/4-20 x 3/4 SOCHD SST
12	56-501848	PANEL, LOWER FRONT
12A	56-502111	PANEL, LOWER FRONT (Version "D")
13	56-501840	BASE
13A	56-502110	BASE (Version "D")
14	56-501867	BELT GUARD
14A	56-502113	BELT GUARD (Version "D")
15	56-502019	REAR HOOD BRACKET
16	00-000226	SCREW, 8mm-1.25mm x 20mm HXHD
17	02-000040	LOCKWASHER, 5/16
18	58-700024	VIBRATION PAD
19	56-502050	HOOD MOUNTING BRACKET
20	56-501859	REAR BELT GUARD-ENGINE
21	00-000216	SCREW, 1/4-20 x 1/2 FLTSOCHD
22	01-000037	NUT, 1/4-20 HXHD
23	56-501686	WASTE DUMP TUBE

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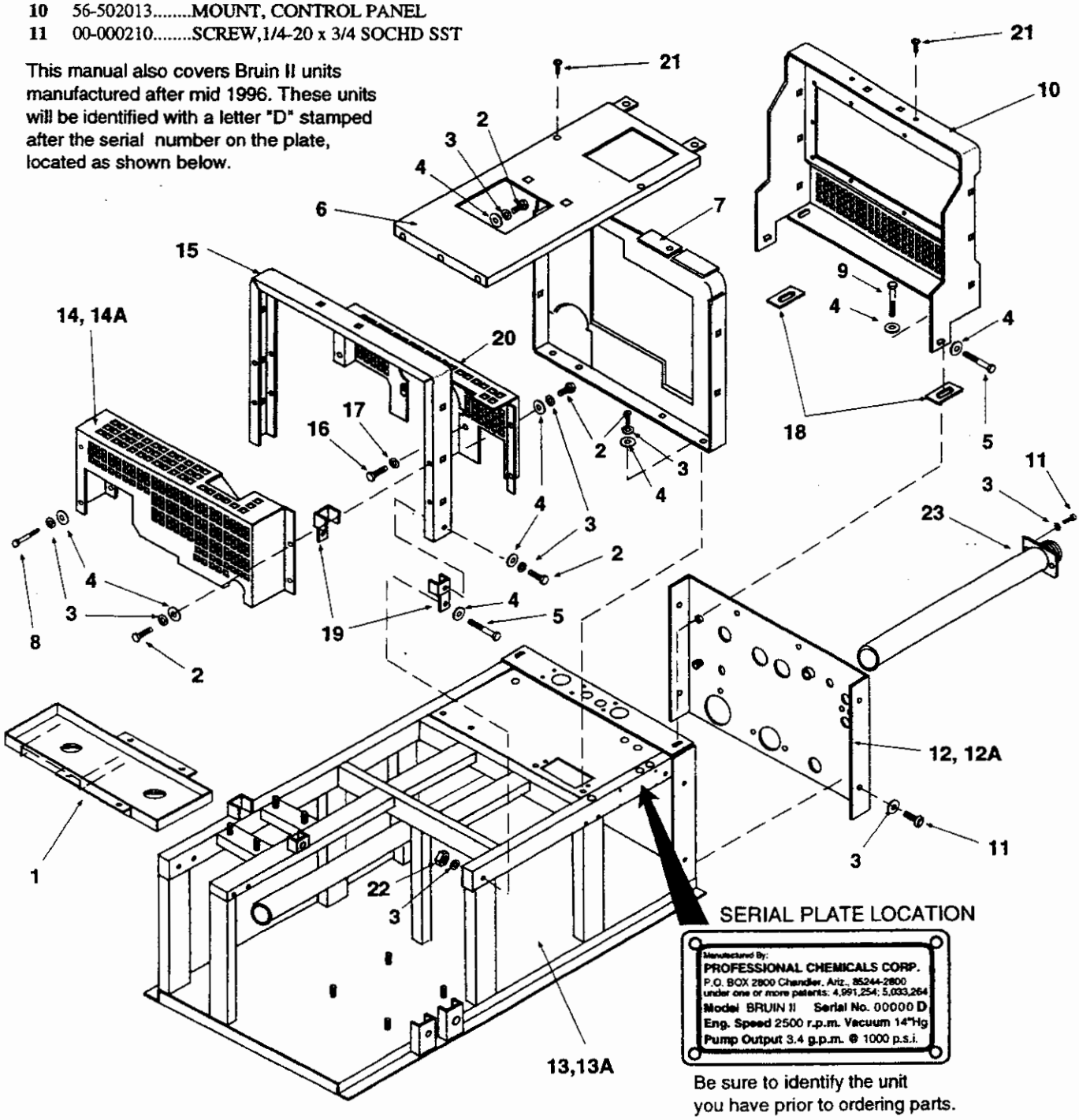
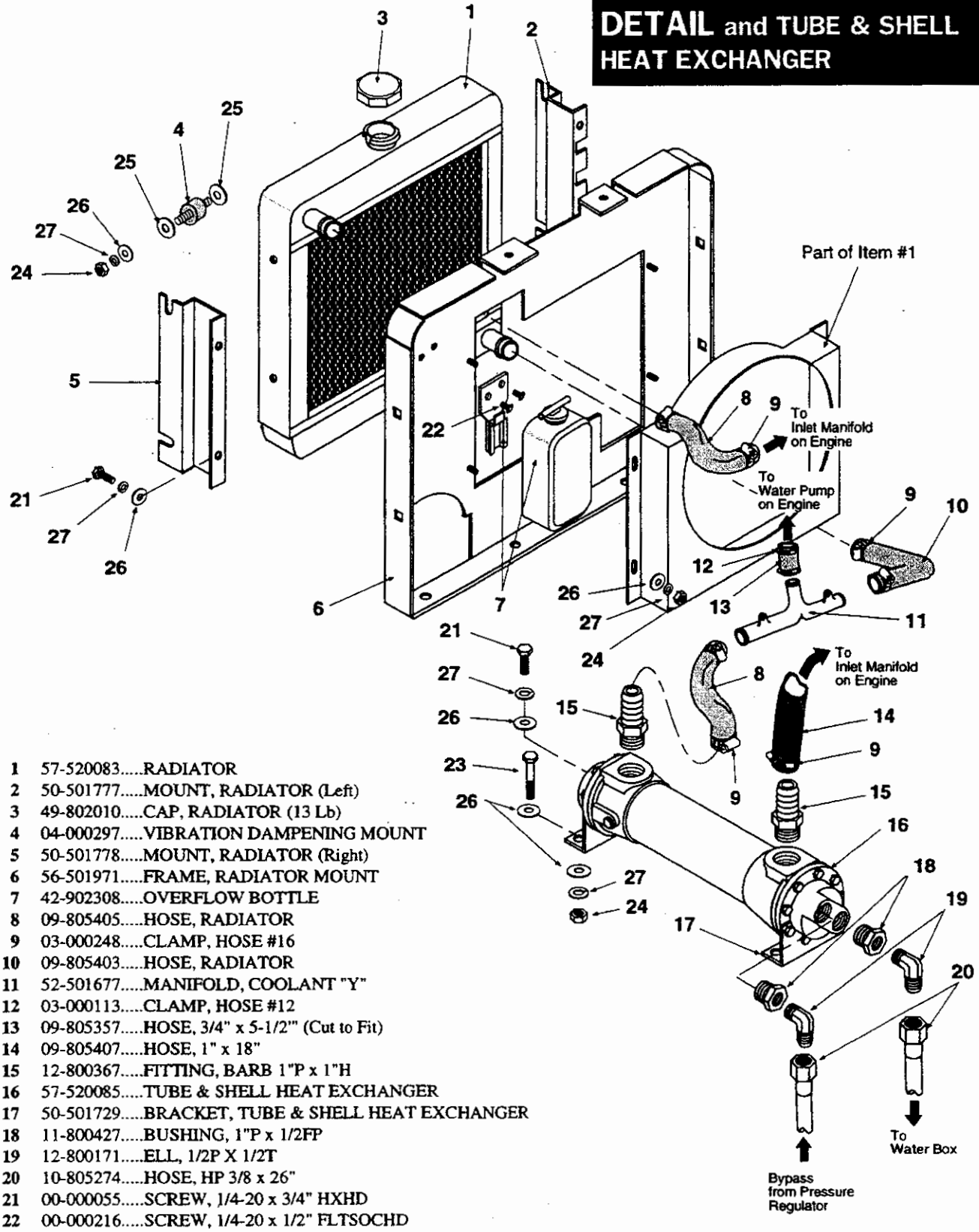


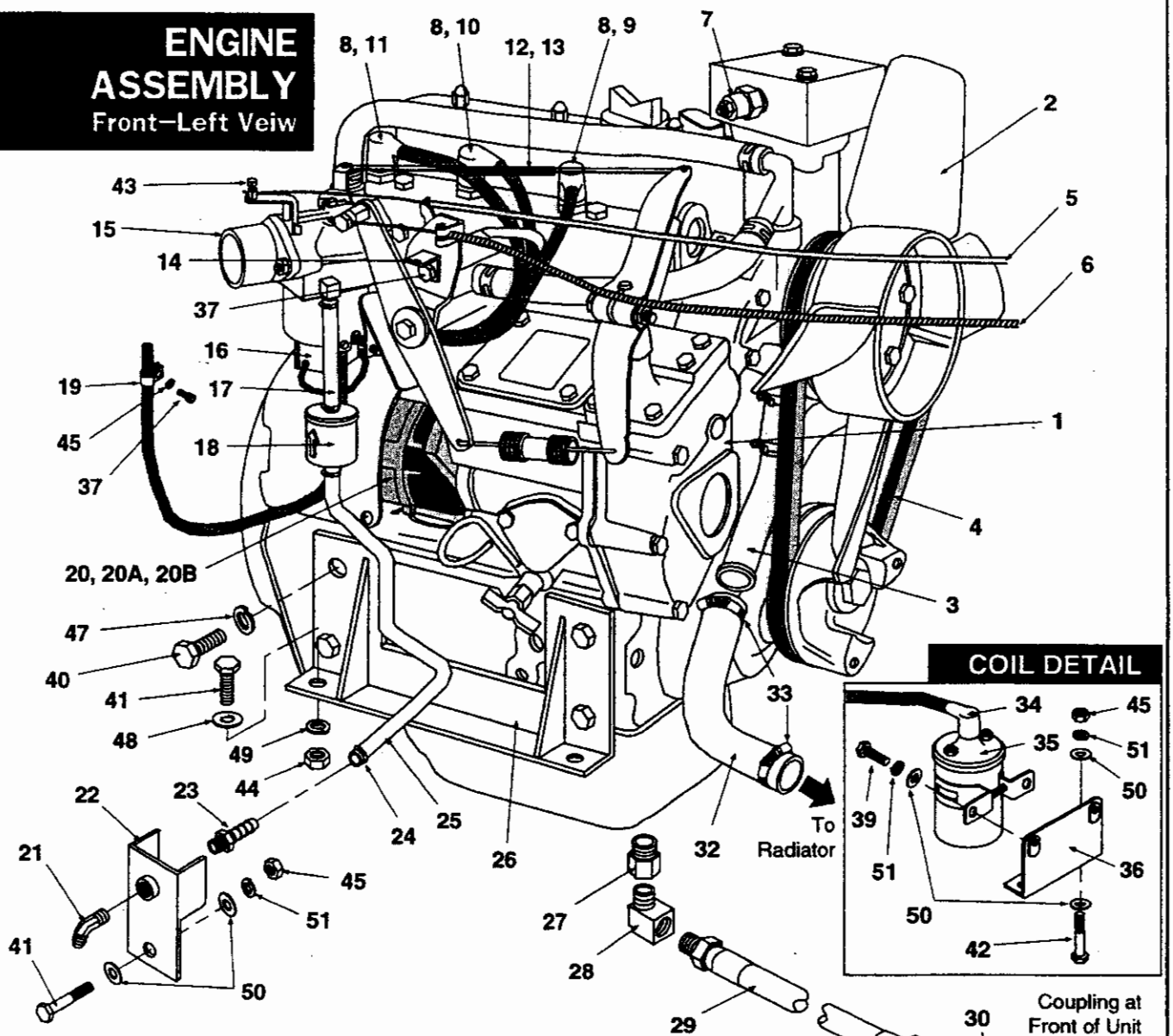
Be sure to identify the unit you have prior to ordering parts.

ENGINE COOLANT DETAIL and TUBE & SHELL HEAT EXCHANGER



1	57-520083.....RADIATOR
2	50-501777.....MOUNT, RADIATOR (Left)
3	49-802010.....CAP, RADIATOR (13 Lb)
4	04-000297.....VIBRATION DAMPENING MOUNT
5	50-501778.....MOUNT, RADIATOR (Right)
6	56-501971.....FRAME, RADIATOR MOUNT
7	42-902308.....OVERFLOW BOTTLE
8	09-805405.....HOSE, RADIATOR
9	03-000248.....CLAMP, HOSE #16
10	09-805403.....HOSE, RADIATOR
11	52-501677.....MANIFOLD, COOLANT "Y"
12	03-000113.....CLAMP, HOSE #12
13	09-805357.....HOSE, 3/4" x 5-1/2" (Cut to Fit)
14	09-805407.....HOSE, 1" x 18"
15	12-800367.....FITTING, BARB 1"P x 1"H
16	57-520085.....TUBE & SHELL HEAT EXCHANGER
17	50-501729.....BRACKET, TUBE & SHELL HEAT EXCHANGER
18	11-800427.....BUSHING, 1"P x 1/2FP
19	12-800171.....ELL, 1/2P X 1/2T
20	10-805274.....HOSE, HP 3/8 x 26"
21	00-000055.....SCREW, 1/4-20 x 3/4" HXHD
22	00-000216.....SCREW, 1/4-20 x 1/2" FLTSOCHD
23	00-000142.....SCREW, 1/4-20 x 2-1/2" HXHD
24	01-000037.....NUT, 1/4-20
25	02-000143.....FLATWASHER, 5/16
26	02-000066.....FLATWASHER, 1/4
27	02-000038.....LOCKWASHER, 1/4

ENGINE ASSEMBLY
Front–Left Veiw



COIL DETAIL

1	66-902018.....ENGINE	31	11-800168.....PLUG, 1/2P
2	42-902325.....FAN	32	09-805403.....HOSE, RADIATOR
3	52-501677.....MANIFOLD, COOLANT "Y"	33	03-000248.....CLAMP, HOSE #16
4	42-902332.....BELT (Kubota)	34	42-902334.....COIL PLUG WIRE ASSEMBLY
5	49-802518.....CHOKE CABLE	35	42-902323.....COIL
6	49-802505.....THROTTLE CABLE	36	56-502030.....BRACKET, COIL MOUNT
7	35-900186.....HIGH TEMPERATURE SENSOR 220°	37	00-000328.....SCREW, THROTTLE LIMIT
8	42-902312.....SPARK PLUG	38	00-000071.....SCREW, 10-24 x 1/2" SOCHD
9	42-902335.....#1 PLUG WIRE ASSEMBLY	39	00-000055.....SCREW, 1/4-20 x 3/4" HXHD
10	42-902336.....#2 PLUG WIRE ASSEMBLY	40	00-000327.....SCREW, 10mm-1.25 x 21mm HXHD
11	42-902337.....#3 PLUG WIRE ASSEMBLY	41	00-000072.....SCREW, 3/8-16 x 2" HXHD
12	42-902329.....ROD, GOVERNING JOINT	42	00-000142.....SCREW, 1/4-20 x 2-1/2" HXHD
13	42-902330.....SPRING, GOVERNING JOINT	43	00-000344.....SCREW, 4mm x 10mm HXHD
14	50-501742.....BRACKET, THROTTLE LIMIT	44	01-000073.....NUT, 3/8-16 HXHD
15	42-902327.....CARBURETOR	45	01-000037.....NUT, 1/4-20 HXHD
16	42-902326.....SOLENOID, CARBURETOR	46	02-000032.....LOCKWASHER, #10
17	09-805366.....HOSE, FUEL 1/4 x 3-1/2"	47	02-000225.....LOCKWASHER, 7/16
18	42-902311.....FUEL FILTER	48	02-000074.....FLATWASHER, 3/8
19	03-000133.....CLAMP, CABLE	49	02-000075.....LOCKWASHER, 3/8
20	42-902362.....DISTRIBUTOR	50	02-000066.....FLATWASHER, 1/4
20A	42-902322.....CAP, DISTRIBUTOR	51	02-000038.....LOCKWASHER, 1/4
20B	42-902321.....ROTOR, DISTRIBUTOR		
21	12-800261.....ELL, 1/8P x 1/4T (45°)		
22	56-501857.....BRACKET, FUEL INLET		
23	12-800041.....FITTING, BARB 1/8P x 1/4H		
24	03-000065.....CLAMP, HOSE #4		
25	09-805351.....HOSE, FUEL 1/4 x 7-1/4"		
26	56-501873.....BRACKET, ENGINE MOUNT		
27	52-501674.....FITTING, OIL DRAIN		
28	11-800045.....ELL, STREET 1/4		
29	10-805367.....HOSE, HP 3/8 x 14"		
30	12-800141.....CONNECTOR, 1/2P x 1/2T		

NOT SHOWN	42-902345.....WATER PUMP
	42-902346.....GASKET, WATER PUMP
	42-902347.....SPARK PLUG WRENCH

ENGINE ASSEMBLY
Rear–Right Veiw

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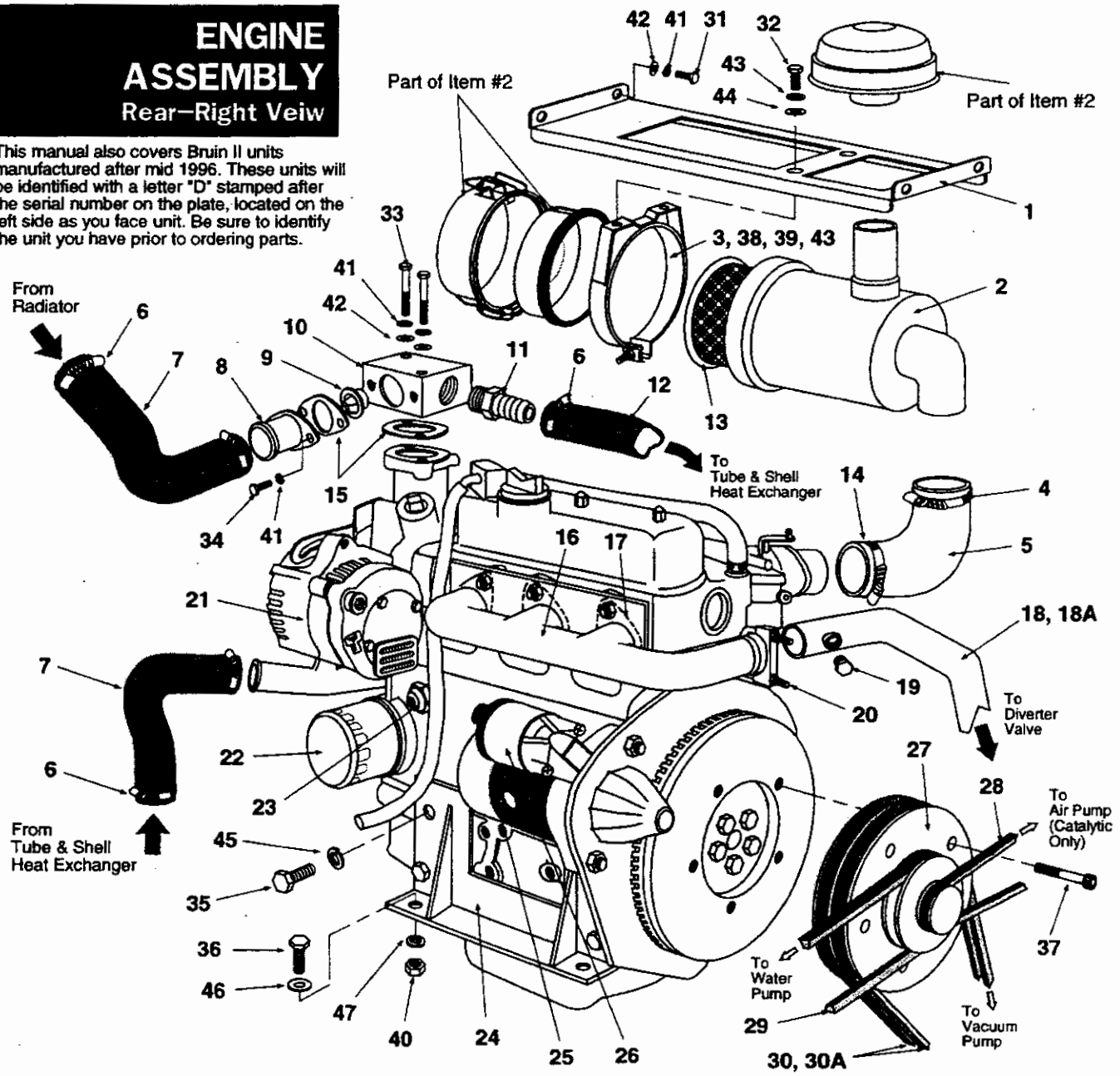

1	56-501850.....BRACKET, AIR CLEANER	25	42-902319.....STARTER
2	56-501971.....HOUSING, AIR CLEANER	26	42-902320.....SOLENOID, STARTER
3	42-902338.....BAND, AIR CLEANER	27	52-501709.....PULLY, ENGINE
4	03-000054.....CLAMP, HOSE #32	28	44-802240.....BELT, 3VX265 (Catalytic Only)
5	42-902344.....HOSE, AIR CLEANER	29	44-802103.....BELT, AP31
6	03-000248.....CLAMP, HOSE #16	30	44-802246.....BELT, BP41
7	09-805405.....HOSE, RADIATOR	30A	44-802243.....BELT, BP44 (Version "D")
8	42-902284.....HOUSING, THERMOSTAT	31	00-000055.....SCREW, 1/4-20 x 3/4 HXHD
9	42-902313.....THERMOSTAT	32	00-000226.....SCREW, 8mm-1.25 x 20mm HXHD
10	52-501668.....MANIFOLD, INLET	33	00-000078.....SCREW, 6mm-8.8 x 70mm HXHD
11	12-800361.....FITTING, BARB 3/4P x 1"H	34	00-000078.....SCREW, 1/4-20 x 1" HXHD
12	09-805407.....HOSE, 1" x 18"	35	00-000327.....SCREW, 10mm-1.25 x 21mm HXHD
13	42-902339.....CARTRIDGE, AIR FILTER	36	00-000072.....SCREW, 3/8-16 x 2" HXHD
14	03-000176.....CLAMP, HOSE #20	37	00-000320.....SCREW, 8mm-1.25 x 54mm SOCHD
15	42-902285.....GASKET, THERMOSTAT	38	00-000039.....SCREW, 5/16-18 x 1" HXHD
16	56-501821.....MANIFOLD, ENGINE EXHAUST	39	01-000041.....NUT, 5/16-18 HXHD
17	42-902317.....GASKET, EXHAUST MANIFOLD	40	01-000073.....NUT, 3/8-16 HXHD
18	56-501970.....TUBE, EXHAUST	41	02-000038.....LOCKWASHER, 1/4
18A	56-502116.....TUBE, EXHAUST (Version "D")	42	02-000066.....FLATWASHER, 1/4
19	11-800169.....PLUG, 1/4 (Non-Catalytic, See Page A-19 for Catalytic)	43	02-000040.....LOCKWASHER, 5/16
20	03-000086.....CLAMP, MUFFLER 1-1/4"	44	02-000143.....FLATWASHER, 5/16
21	42-902300.....ALTERATOR	45	02-000225.....LOCKWASHER, 7/16
22	42-902309.....OIL FILTER	46	02-000074.....FLATWASHER, 3/8
23	42-902324.....SWITCH, OIL PRESSURE	47	02-000075.....LOCKWASHER, 3/8
24	56-501873.....BRACKET, ENGINE MOUNT		

NOT SHOWN 42-902331.....GASKET, VALVE COVER

VACUUM PUMP ASSEMBLY

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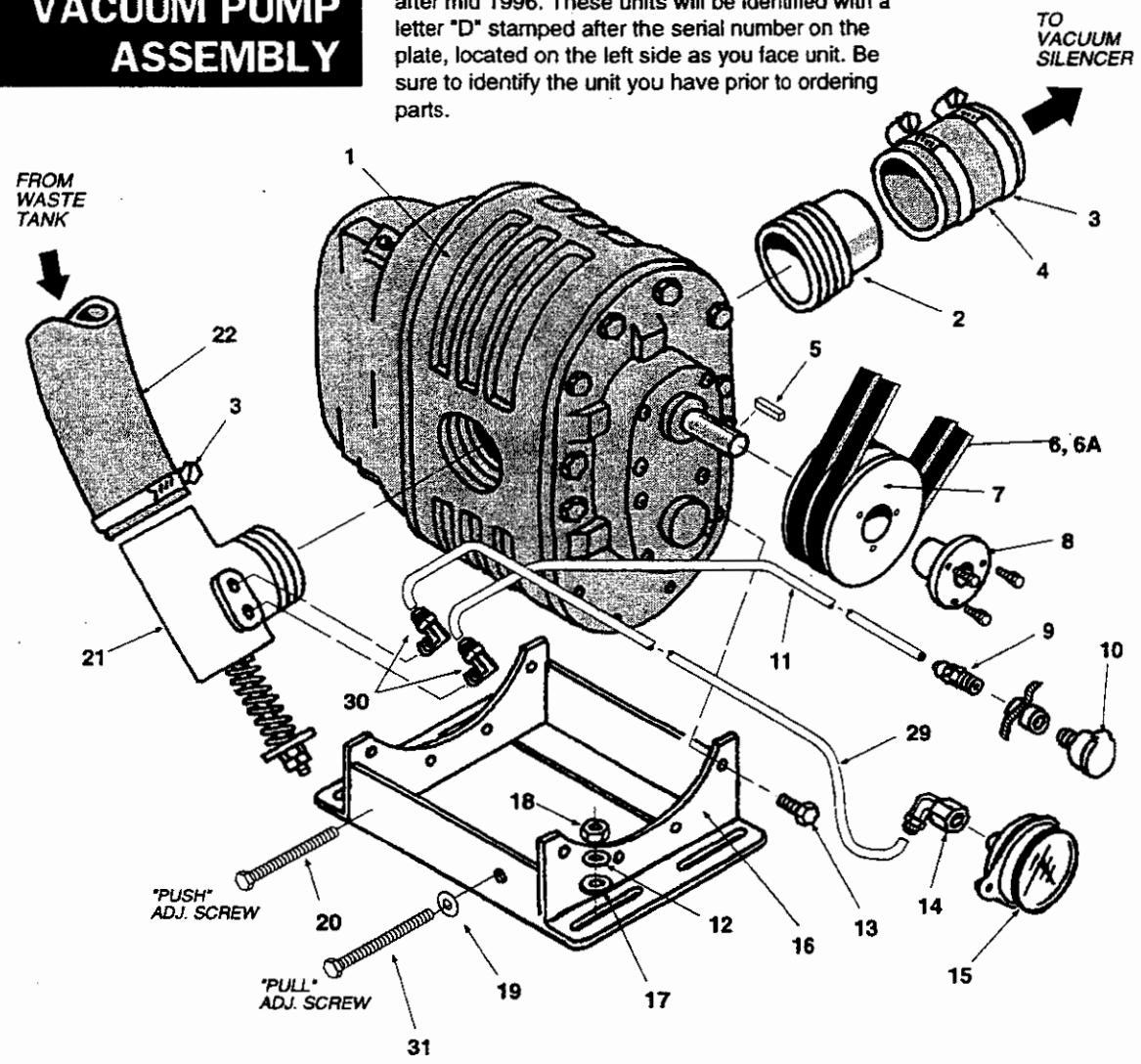
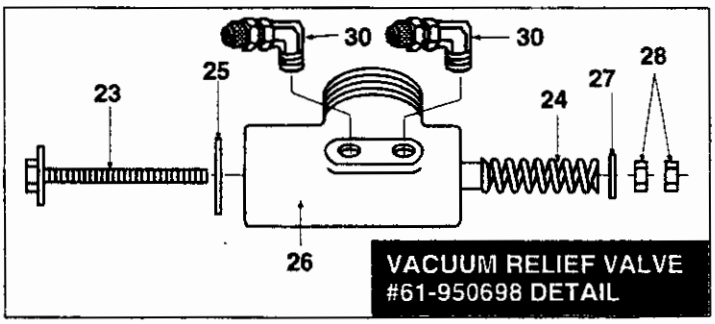


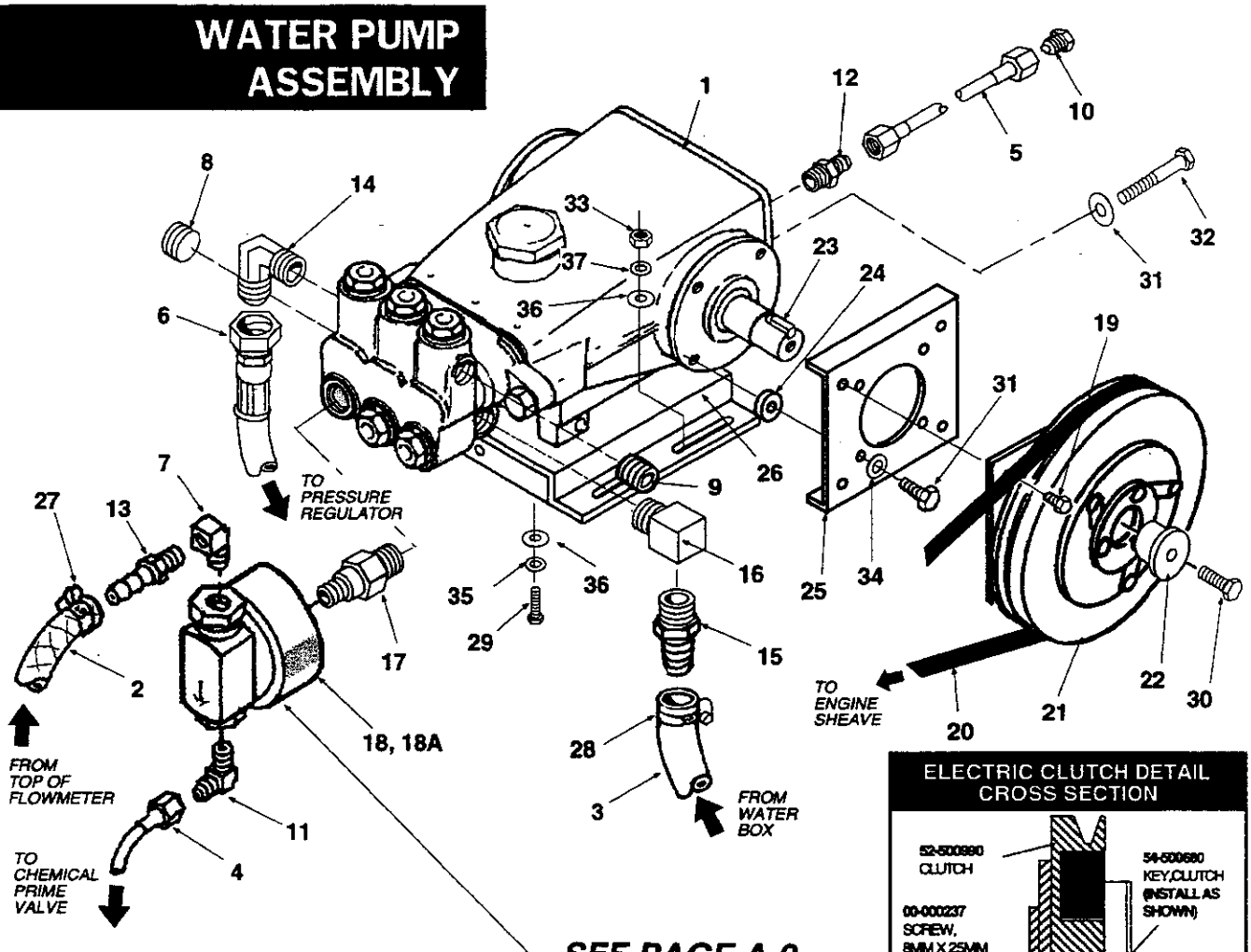
1	41-905021	VACUUM PUMP
2	54-501593	OUTLET NIPPLE
3	03-000112	CLAMP, HOSE #48
4	09-805401	HOSE, 2-7/8 x 4"
5	54-500680	KEY, SHAFT
6	44-802246	BELT, BP41
6A	44-802243	BELT, BP44 (Version "D")
7	44-802245	PULLEY, VACUUM PUMP-2TB58
8	44-802196	HUB, VACUUM PUMP
9	12-800059	CONNECTOR, 1/8P x 1/4POLYFLO
10	19-800075	LUBRICATION CUP
11	09-805442	TUBING, 1/4 x 62-1/2"
12	02-000075	LOCKWASHER, 3/8
13	00-000095	SCREW, 3/8-16 x 1" HXHD
14	12-800101	ELBOW, 1/4FP x 1/4POLYFLO
15	18-808525	VACUUM GAUGE
16	56-501866	MOUNT, VACUUM ADJUSTING
17	02-000074	FLATWASHER, 3/8
18	01-000073	NUT, 3/8-16
19	02-000057	FLATWASHER, 1/2 HEAVY
20	00-000324	SCREW, 1/2-13 x 3" HXHD
21	61-950698	RELIEF VALVE ASSEMBLY
22	09-805341	HOSE, 2-7/8 x 25"
23	56-501615	STEM, RELIEF VALVE
24	04-000091	SPRING, RELIEF VALVE
25	43-807074	DIAPHRAGM, RELIEF VALVE
26	52-501573	BODY, RELIEF VALVE
27	02-000269	FLATWASHER, 7/16
28	01-000224	NUT, 7/16-14
29	09-805411	TUBING, 1/4 x 84-1/2"
30	12-800099	ELBOW, 1/8P x 1/4POLY
31	00-000323	SCREW, 1/2-13 x 3-1/2" HXHD

NOT SHOWN 05-008039.....OIL, AEON PD (28G24 SUTORBILT)

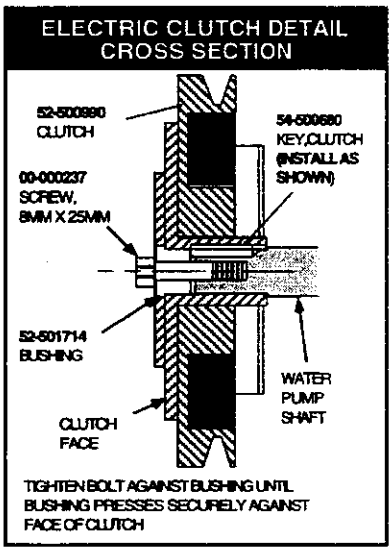


VACUUM RELIEF VALVE #61-950698 DETAIL

WATER PUMP ASSEMBLY

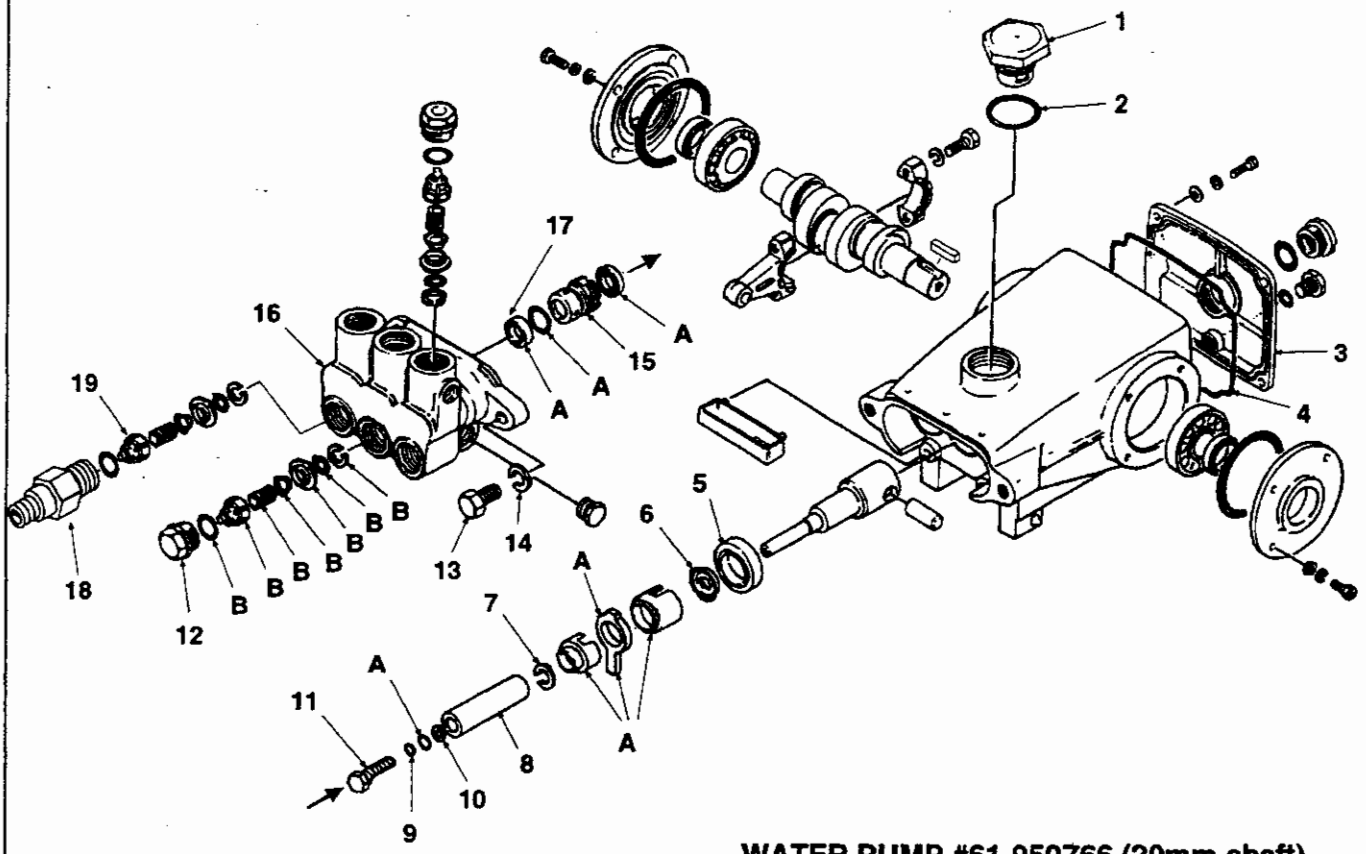


SEE PAGE A-9 FOR CHEMICAL PUMP BREAKDOWN



1	61-950776.....WATER PUMP	23	54-500680.....KEY
2	09-805242.....BRAIDED HOSE, 5/16 x 60"	24	54-501640.....SPACER, CLUTCH
3	09-805435.....HOSE, 3/4 x 33"	25	56-500753.....MOUNTING BRACKET, CLUTCH
4	10-805312.....HOSE, 3/16SST x 49"	26	56-501995.....ADJUSTING BRACKET, PUMP
5	10-805316.....HOSE, 3/16SST x 5"	27	03-000065.....HOSE CLAMP
6	10-805317.....H. P. HOSE, 3/8 x 37""	28	03-000113.....HOSE CLAMP
7	11-800014.....STREET ELBOW, 1/8	29	00-000226.....SCREW, 8mm-1.25mm x 20mm
8	11-800069.....PLUG, 1/2	30	00-000237.....SCREW, 8mm-1.25mm x 25mm
9	11-800224.....PLUG, 3/8	31	00-000277.....SCREW, 6mm x 20mm
10	12-800029.....PLUG, 1/4T	32	00-000336.....SCREW, 3/8-16 x 3"
11	12-800040.....ELBOW, 1/8P x 1/4T	33	01-000073.....NUT, 3/8-16
12	12-800060.....CONNECTOR, 1/4P x 1/4T	34	02-000038.....LOCKWASHER, 1/4
13	12-800093.....BARB FITTING, 1/8P x 5/16H	35	02-000040.....LOCKWASHER, 5/16
14	12-800225.....ELBOW,3/8P x 1/2T	36	02-000074.....FLATWASHER, 3/8
15	12-800278.....BARB FITTING, 1/2P x 3/4H	37	02-000075.....LOCKWASHER, 3/8
16	52-800315.....STREET ELBOW, 1/2 (SPECIAL)		
17	52-809125.....ADAPTOR FITTING		
18	41-809131.....CHEMICAL PUMP (Replaced by # 18A)		
18A	41-809144.....CHEMICAL PUMP (New Style)		
19	42-809353.....HARDWARE, CLUTCH MOUNTING		
20	44-802103.....BELT, WATER PUMP (AP-31)		
21	52-500990.....ELECTRIC CLUTCH		
22	52-501714.....BUSHING, CLUTCH	**NOT SHOWN**	05-008016.....OIL, CAT WATER PUMP-21oz.

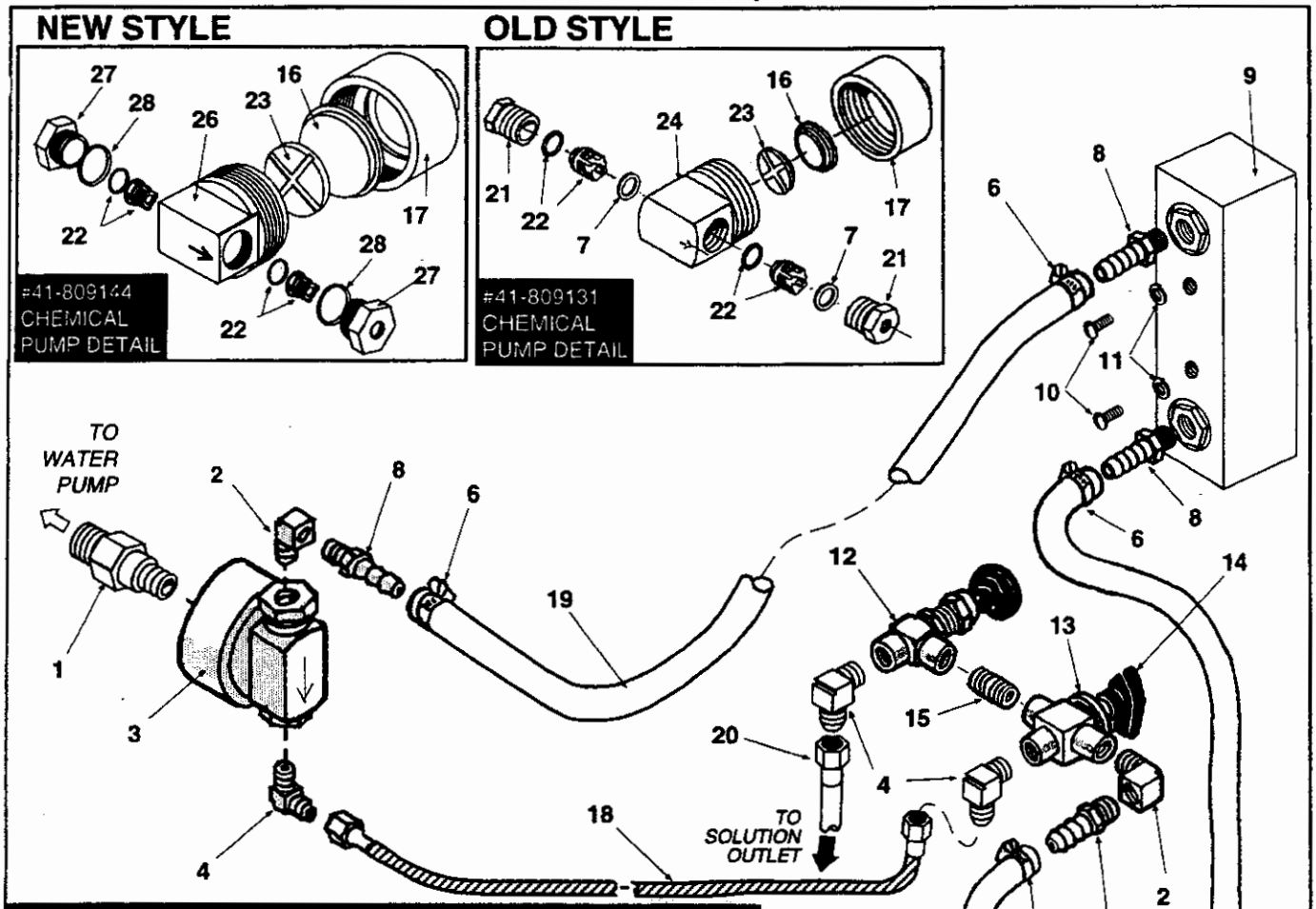
WATER PUMP DETAIL



WATER PUMP #61-950766 (20mm shaft)
WATER PUMP #61-950776 (3/4" shaft)

1	42-809242....DOMED FILLER CAP
2	42-809241....O-RING, FILLER CAP
3	42-809244....CRANKCASE COVER
4	42-809243....COVER SEAT
5	42-809245....OIL SEAL
6	42-809246....BARRIER SLINGER
7	42-809249....KEYHOLE WASHER M18
8	42-809247....CERAMIC PLUNGER
9	42-809248....COPPER GASKET
10	42-809250....BACK UP RING, PLUNGER
11	42-809251....PLUNGER RETAINER W/ STUD
12	42-809253....VALVE PLUG
13	42-809255....HEX SOCKET BOLT M18X35
14	42-809254....SPLIT LOCKWASHER M10
15	42-809252....SEAL CASE
16	42-809259....MANIFOLD HEAD
17	42-809316....SEAL, HIGH PRESSURE (HI. TEMP.)
18	52-809125....ADAPTOR, CHEMICAL PUMP
19	52-809123....CHECK VALVE, CHEMICAL PUMP PORT
A	42-809256....SEAL KIT (must order 3 each of ref. nos. 9 & 10 when replacing all seals)
B	42-809257....VALVE KIT (must order 2 valve kits per pump and 1 of ref. no. 19 to replace all check valves)
C	05-008016....CAT WATER PUMP OIL

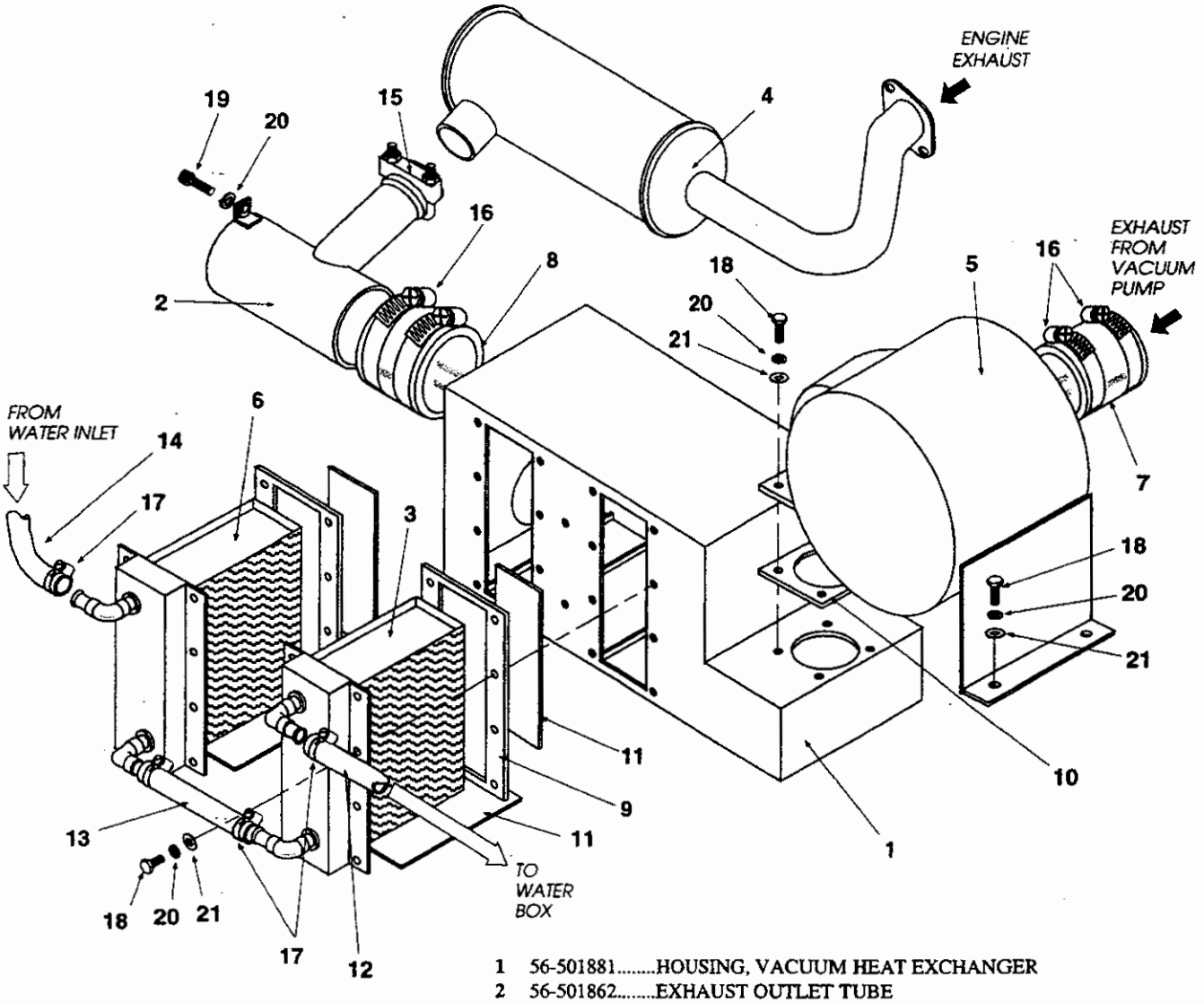
**(For additional parts, consult your CAT PUMP manual)*



CHEMICAL SYSTEM

1	52-809125	ADAPTER FITTING
2	11-800014	STREET ELBOW, 1/8
3	41-809131	CHEMICAL PUMP (Replaced by # 3A)
3A	41-809144	CHEMICAL PUMP
4	12-800040	ELBOW, 1/8P x 1/4T
5	14-806506	END STRAINER, 1/8P
6	03-000065	HOSE CLAMP
7	16-808213	TEFLON WASHER,CHEMICAL PUMP
8	12-800093	BARB FITTING, 1/8P x 5/16H
9	18-808513	FLOW METER
10	00-000065	SCREW, 10-32 x 3/8"
11	02-000032	LOCKWASHER, #10
12	15-808106	VALVE, CHEMICAL METERING
13	50-501663	SPACER
14	15-808022	VALVE, CHEMICALPRIMING
15	11-800105	NIPPLE, 1/8
16	42-809047	DIAPHRAGM, CHEMICAL PUMP
17	42-809045	COVER, CHEMICAL PUMP
18	10-805312	HOSE, 3/16SST x 49"
19	09-805242	BRAIDED HOSE, 5/16 x 60"
20	10-805288	HOSE, 3/16SST x 17"
21	16-808212	CHK VALVE CAP, CHEM. PUMP
22	42-809265	CHECK VALVE, CHEM. PUMP
23	42-809264	DISK, CHEMICAL PUMP
24	**Not Availible**	...Replace by Kit# 66-945433 (Includes #26,27&28)
25	09-805363	BRAIDED HOSE, 5/16 x 52"
26	42-809358	BODY,CHEMICAL PUMP (New Style)
27	16-808237	CHK VALVE CAP, CHEM. PUMP (New Style)
28	43-810079	O-RING, 7/8ID - 1-1/16OD

VACUUM EXHAUST HEAT EXCHANGER & SILENCER DETAIL

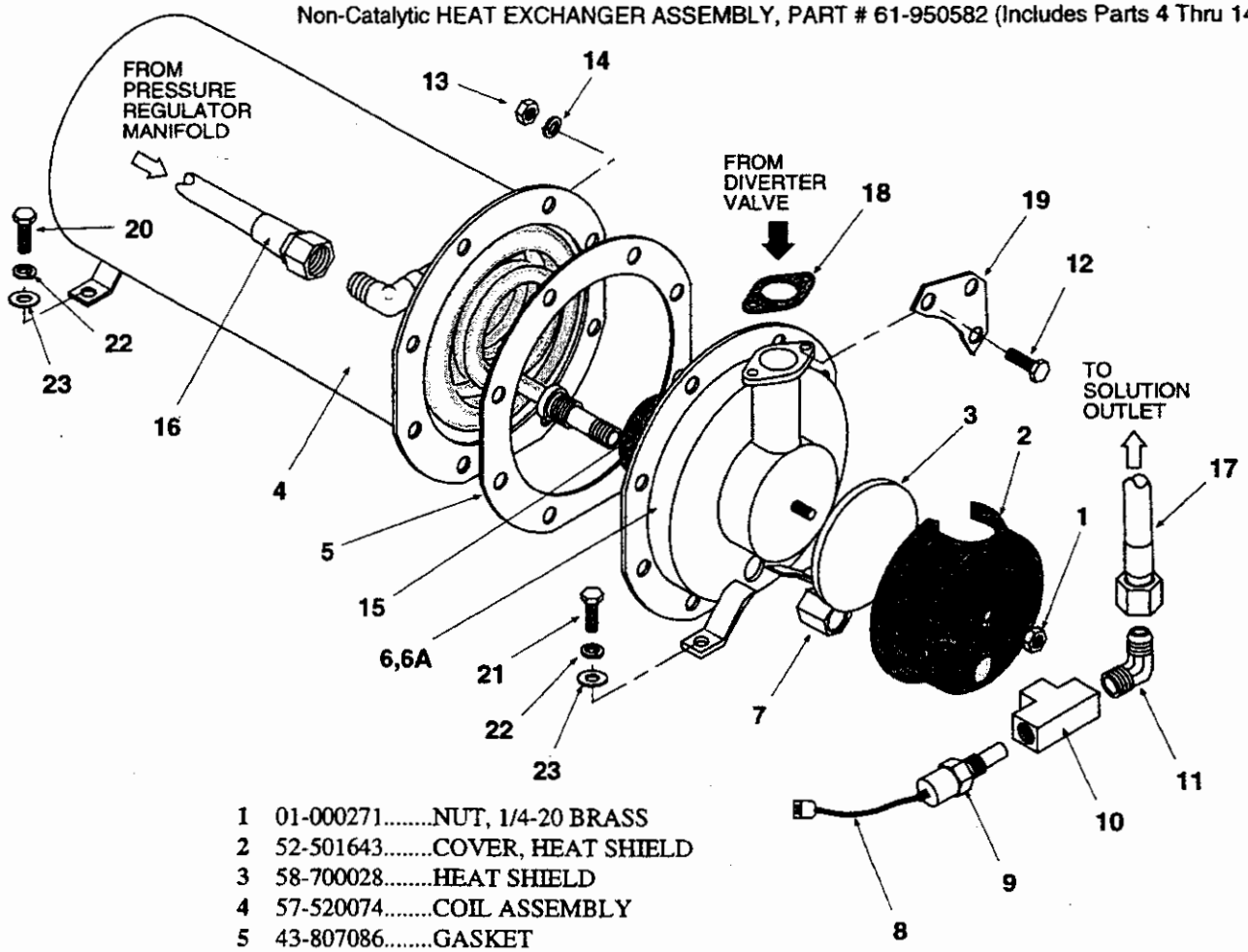


1	56-501881	HOUSING, VACUUM HEAT EXCHANGER
2	56-501862	EXHAUST OUTLET TUBE
3	61-950695	ASSEMBLY, VACUUM PREHEATER CORE (Rear)
4	57-520096	EXHAUST MUFFLER
5	57-520082	VACUUM SILENCER
6	61-950696	ASSEMBLY, VACUUM PREHEATER CORE (Front)
7	09-805401	HOSE, 2-7/8 x 4"
8	09-805478	HOSE, 2-7/8 x 2-1/2"
9	43-807080	GASKET, VACUUM PREHEATER CORE
10	43-807081	GASKET, VACUUM SILENCER
11	58-700027	GASKET, REAR & BOTTOM
12	09-805288	HOSE, 5/8 x 27"
13	09-805372	HOSE, 5/8 x 6-1/2"
14	09-805369	HOSE, 5/8 x 9-1/2"
15	03-000081	CLAMP, MUFFLER 1-1/2"
16	03-000112	CLAMP, HOSE #48
17	03-000246	CLAMP, HOSE #8
18	00-000055	SCREW, 1/4-20 x 3/4" HXHD
19	00-000210	SCREW, 1/4-20 x 3/4" SOCHD
20	02-000038	LOCKWASHER, 1/4
21	02-000066	FLATWASHER, 1/4

This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located on the left side as you face unit. Be sure to identify the unit you have prior to ordering parts.

EXHAUST HEAT EXCHANGER ASSEMBLY

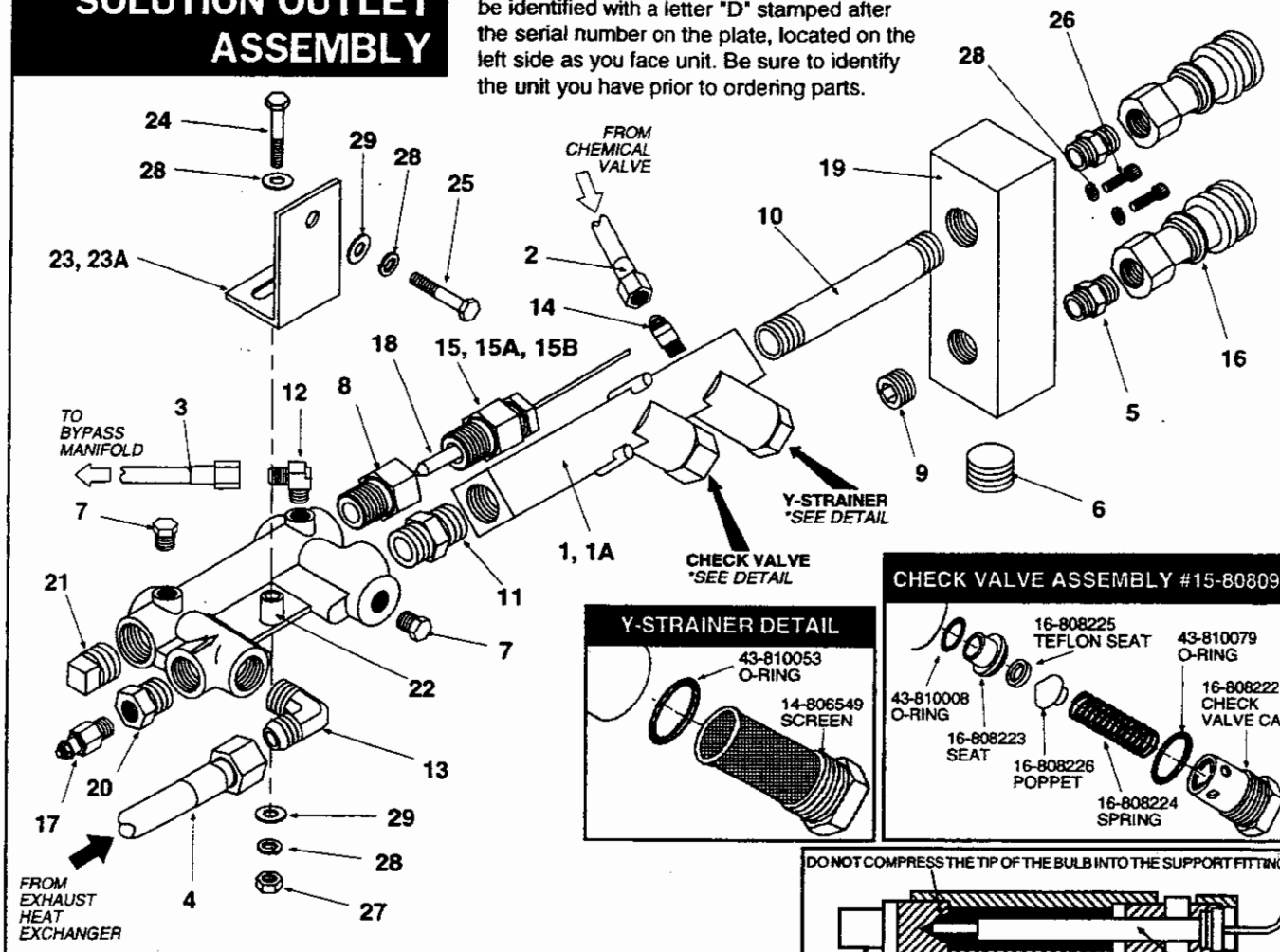
CATALYTIC HEAT EXCHANGER ASSEMBLY, PART # 61-950628 (Includes Parts 1 Thru 14)
Non-Catalytic HEAT EXCHANGER ASSEMBLY, PART # 61-950582 (Includes Parts 4 Thru 14)

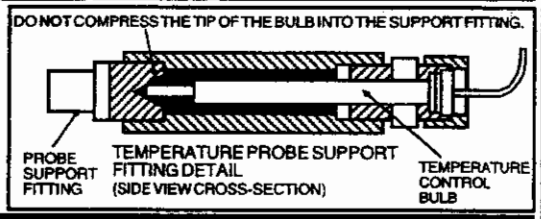


1	01-000271	NUT, 1/4-20 BRASS
2	52-501643	COVER, HEAT SHIELD
3	58-700028	HEAT SHIELD
4	57-520074	COIL ASSEMBLY
5	43-807086	GASKET
6	56-501759	COVER, CATALYTIC (Includes Part# 15)
6A	56-501758	COVER, NON-CATALYTIC
7	52-501654	NUT, ADAPTOR
8	64-950546	WIRE, TEMPERATURE SENSOR
9	35-900184	TEMPERATURE SENSOR, 285°
10	52-501671	TEE, ADAPTOR
11	12-800171	ELBOW, 1/2P x 1/2T
12	00-000019	SCREW, 1/4-20 x 3/4" HXHD SST
13	01-000045	NUT, 1/4-20 SST
14	02-000044	LOCKWASHER, 1/4 SST
15	57-520071	CATALYTIC CONVERTER (Welded in place)
16	10-805275	HP HOSE, 1/2 x 19"
17	10-805376	HP HOSE, 1/2 x 14-1/2"
18	42-902212	GASKET
19	50-501741	GUIDE, DIVERTER ROD (Prior to Version "D")
20	00-000055	SCREW, 1/4-20 x 3/4" HXHD
21	00-000078	SCREW, 1/4-20 x 1" HXHD
22	02-000038	LOCKWASHER, 1/4
23	02-000066	FLATWASHER, 1/4

SOLUTION OUTLET ASSEMBLY

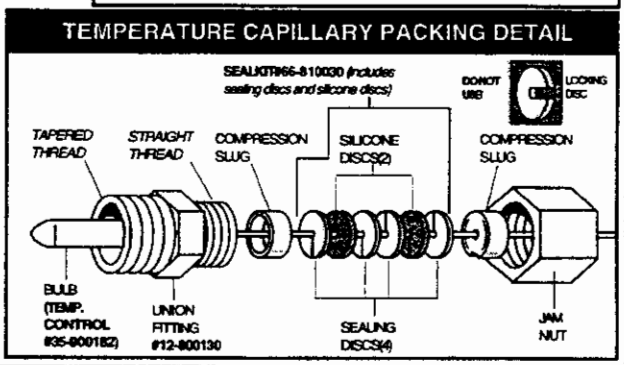
This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located on the left side as you face unit. Be sure to identify the unit you have prior to ordering parts.



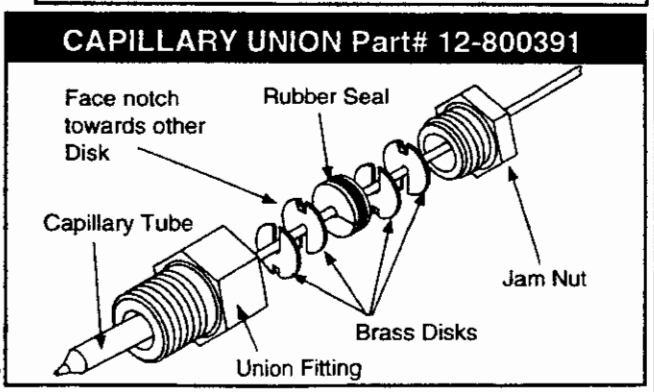


1	15-808095	CHECK VALVE MANIFOLD ASSY (Includes Y-Strainer & Check Valve)
1A	52-501621	CHECK VALVE MANIFOLD
2	10-805288	HOSE, 3/16SST x 17"
3	10-805204	HOSE, 3/16SST x 23"
4	10-805376	HOSE, 1/2 x 14-1/2"
5	11-800029	NIPPLE, HEX 1/4
6	11-800069	PLUG, 1/2 SOCHD
7	11-800101	PLUG, 1/8
8	11-800342	CONNECTOR, 1/2P x 1/2FP
9	11-800345	PLUG, 1/4 SOCHD
10	11-800426	NIPPLE, 3/8 x 5" sst
11	11-800429	NIPPLE, HEX 3/8 sst
12	12-800040	ELBOW, 1/8P x 1/4T
13	12-800225	ELBOW, 3/8P x 1/2T
14	12-800261	ELBOW, 1/8P x 1/4T (45°)
15	12-800130	UNION, TEMP. SENSOR (Old Style)
15A	66-810030	SEAL KIT, TEMPERATURE PROBE (for Old Style ONLY)
15B	12-800391	CAPILLARY UNION, TEMPERATURE PROBE (New Style)
16	13-806001	DISCONNECT, 1/4F x 1/4FP
17	34-903019	SENSOR, TEMPERATURE GAUGE
18	35-900182	TEMPERATURE CONTROL
19	52-501653	MANIFOLD, SOLUTION OUTLET
20	52-501669	BUSHING, TEMPERATURE SENSOR
21	52-501680	SUPPORT FITTING
22	52-501700	THERMOSTAT MANIFOLD
23	56-501884	MOUNTING BRACKET
23A	56-502118	MOUNTING BRACKET (Version "D")
24	00-000132	SCREW, 1/4-20 x 1-1/2" HXHD
25	00-000142	SCREW, 1/4-20 x 2-1/2" HXHD
26	00-000210	SCREW, 1/4-20 x 3/4" SOCHD
27	01-000037	NUT, 1/4-20
28	02-000038	LOCKWASHER, 1/4
29	02-000066	FLATWASHER, 1/4

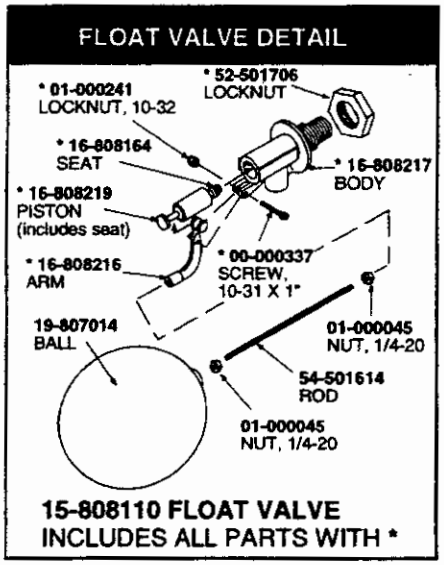
OLD STYLE

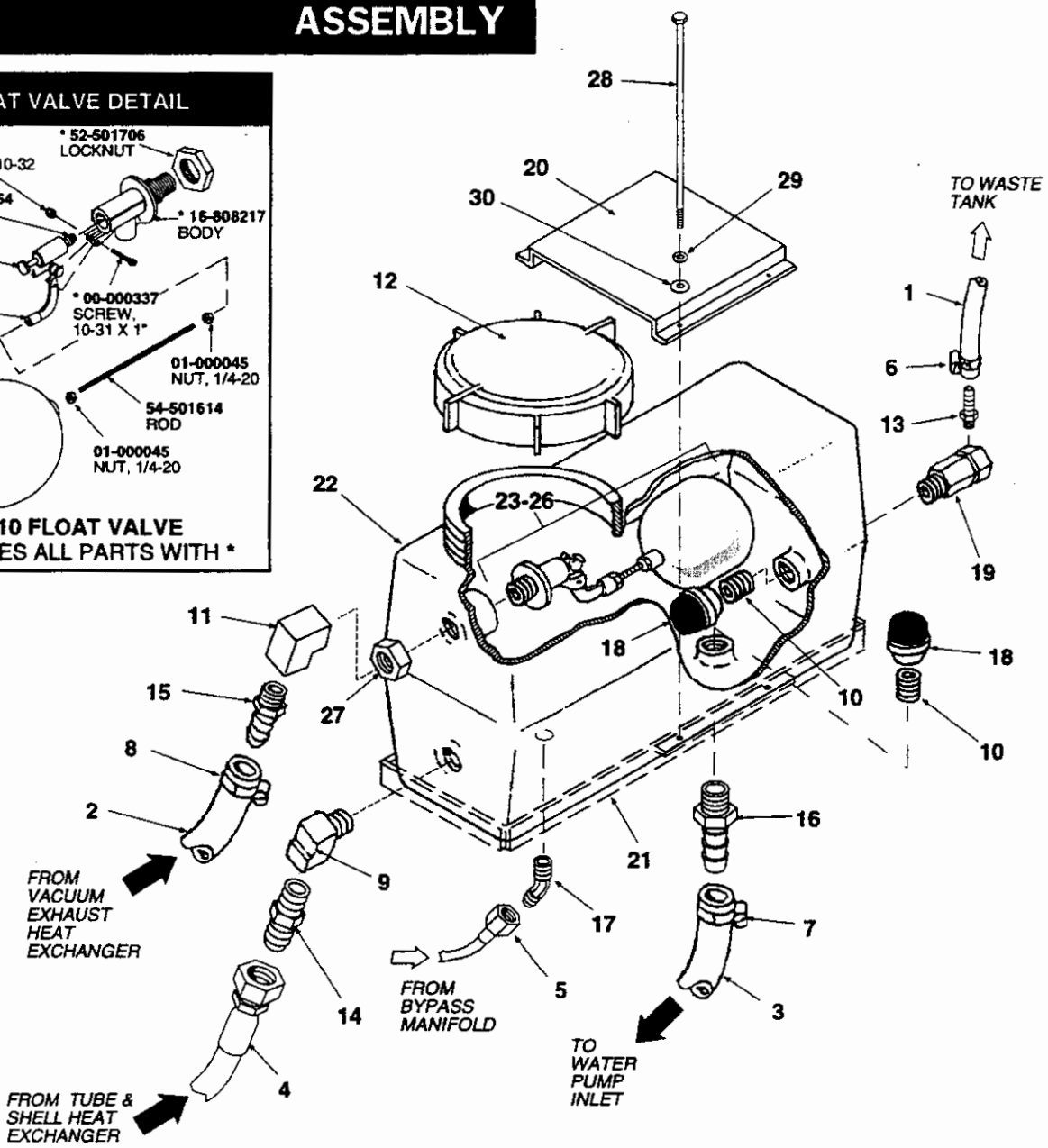


NEW STYLE



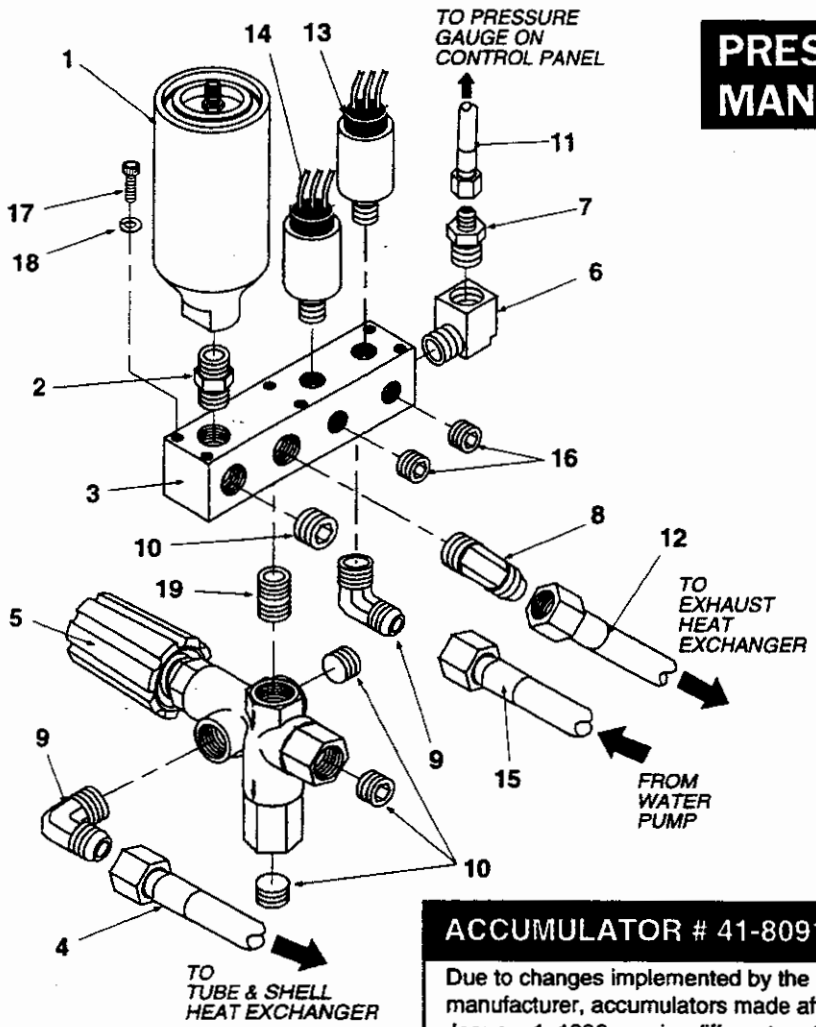
WATER BOX ASSEMBLY





1	09-805099.....HOSE, 5/16 x 40"	18	14-806540.....STRAINER, SUC END 1/2FP
2	09-805288.....HOSE, 5/8 x 27"	19	15-808083.....VALVE, TEMP REL 180°
3	09-805435.....HOSE, 3/4 x 33"	20	50-501746.....HOLD DOWN
4	10-805274.....HOSE, HP 3/8 x 26"	21	56-501902.....TRAY, WATER BOX
5	10-805294.....HOSE, 3/16SST x 11-1/2"	22	58-500655.....WATER BOX
6	03-000065.....CLAMP, HOSE #4	23	15-808110.....VALVE, FLOAT
7	03-000113.....CLAMP, HOSE #12	23A	16-808217.....BODY, FLOAT VALVE
8	03-000246.....CLAMP, HOSE #8	23B	16-808219.....PISTON, FLOAT VALVE
9	11-800041.....STREET ELBOW,1/2	23C	16-808216.....ARM, FLOAT VALVE
10	11-800300.....NIPPLE, 1/2 x CLOSE	24	01-000045.....NUT, 1/4-20 SST
11	11-800361.....ELBOW, 1/2	25	54-501614.....ROD, FLOAT
12	11-800432.....COVER, WATER BOX	26	19-807014.....BALL, FLOAT
13	12-800093.....FITTING, BARB 1/8P x 5/16H	27	01-000119.....LOCKNUT, 3/4NPT
14	12-800141.....CONNECTOR, 1/2P x 1/2T	28	00-000335.....SCREW, 1/4-20 x 8" HXHD
15	12-800269.....BARB FITTING, 1/2P x 5/8H	29	02-000038.....LOCKWASHER, 1/4
16	12-800278.....FITTING, BARB 1/2P x 3/4H	30	02-000066.....FLATWASHER, 1/4
17	12-800356.....ELL, 1/4P x 1/4T (45°)		

PRESSURE REGULATOR MANIFOLD ASSEMBLY

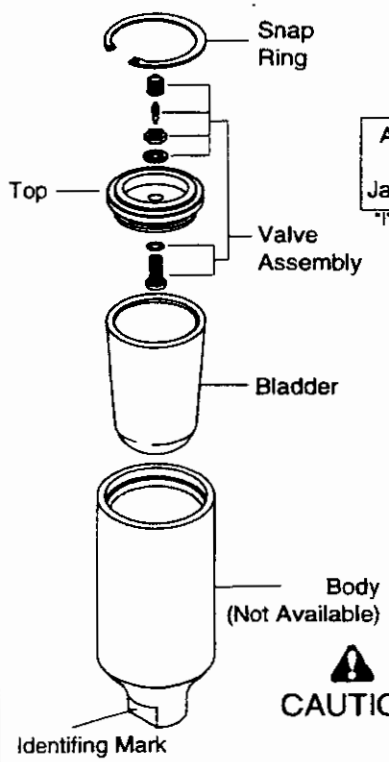


1	41-809119	ACCUMULATOR
2	11-800429	HEX NIPPLE, 3/8 sst
3	52-501682	MANIFOLD
4	10-805274	HOSE, HP 3/8 x 26"
5	15-808068	PRESSURE REGULATOR
6	11-800275	STREET ELBOW, 3/8
7	12-800346	CONNECTOR, 3/8P x 1/4T
8	12-800347	ELL, 3/8 x 1/2T (45°)
9	12-800225	ELL, 3/8P x 1/2T
10	11-800224	PLUG, 3/8
11	10-805205	HOSE, 3/16SST x 15-1/8"
12	10-805275	HOSE, 1/2 x 19"
13	32-900186	HIGH PRESSURE SWITCH
14	32-900184	LOW PRESSURE SWITCH
15	10-805317	HOSE, HP 3/8 x 37"
16	11-800345	PLUG, 1/4
17	00-000210	SCREW, 1/4-20 x 3/4"
18	02-000038	LOCKWASHER, 1/4
19	11-800368	NIPPLE, 3/8 x CLOSE sst
20	16-808201	KIT, O-RING
21	43-810078	O-RING, VITON
22	16-808200	KIT, VALVE

ACCUMULATOR # 41-809119

Due to changes implemented by the manufacturer, accumulators made after January 1, 1996 require different parts. All units are date coded and can be identified by a two letter marking as noted in the detail. Identify the unit prior to ordering parts. The first letter identifies the month and the second the year it was manufactured.

A thru M = Jan. - Dec.	Month	DS	Year	N thru T = 1991 - 1996
"I" not used	April		1995	"Q" not used



PART NUMBERS

Units Manufactured Before Jan. 1 1996

Snap Ring	42-809273
Top	42-809272
Valve Assembly	42-809274
Bladder	42-809275
Body	Not Available

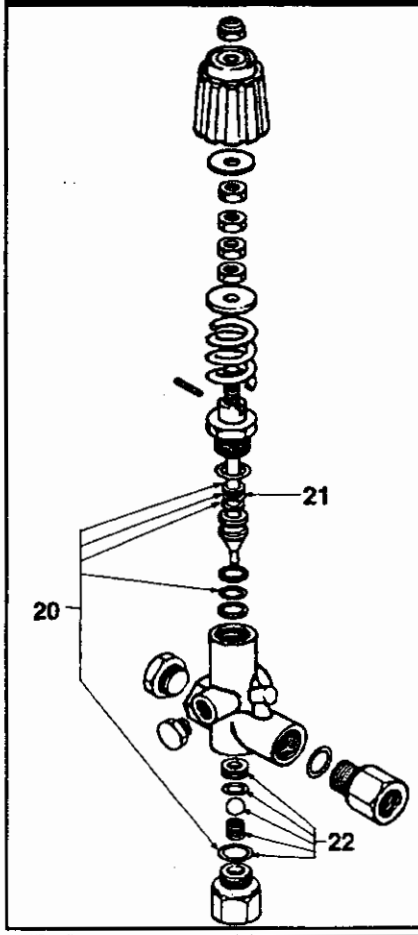
Units Manufactured After Jan. 1 1996

Snap Ring	42-809362
Top	42-809363
Valve Assembly	42-809274
Bladder	42-809275
Body	Not Availible

CAUTION: Rebuilding and repressurising should only be done at a facility with the proper equipment and qualified personnel to do so. Pre-charge with nitrogen to 250 PSI. The pre-charge should be checked at least once a year.

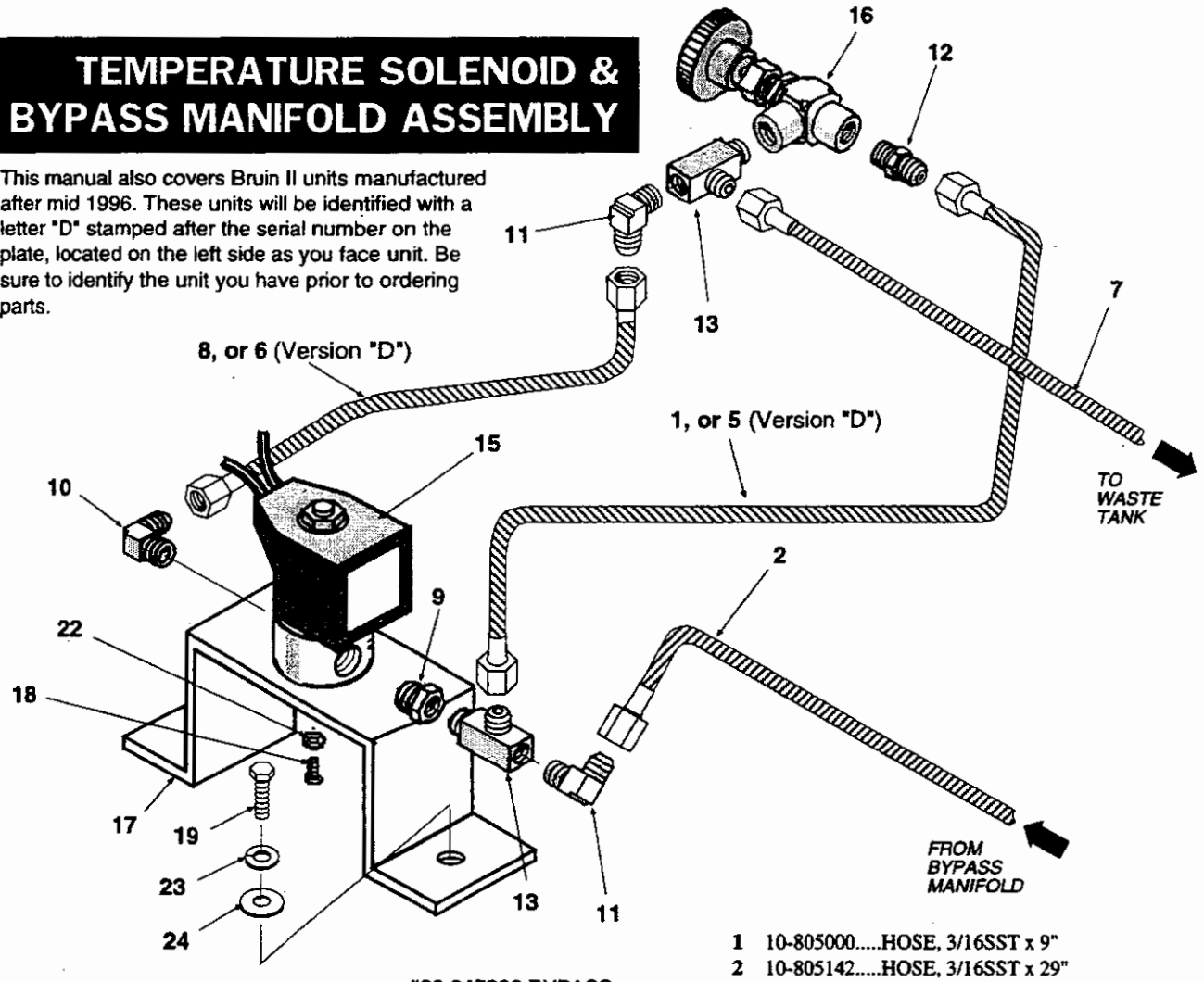
Do Not pre-charge accumulator above 250 PSI.

PRESSURE REGULATOR DETAIL #15-808068

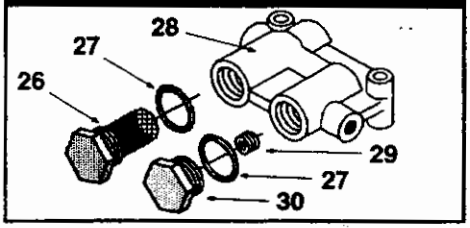


TEMPERATURE SOLENOID & BYPASS MANIFOLD ASSEMBLY

This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located on the left side as you face unit. Be sure to identify the unit you have prior to ordering parts.

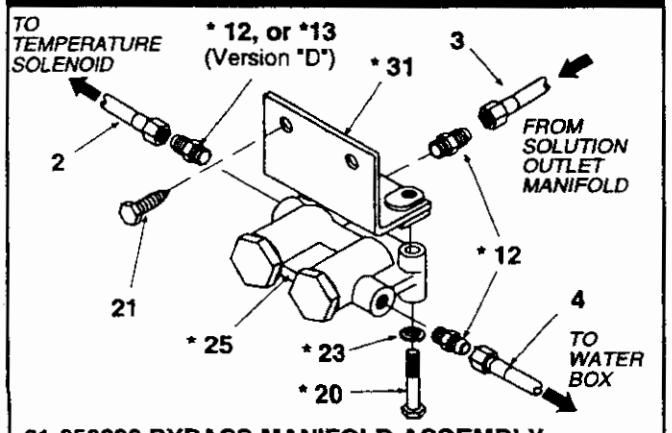


#15-808112 BYPASS MANIFOLD DETAIL



#66-945280 BYPASS MAINTENANCE KIT IS AVAILABLE. THIS CONTAINS THE TOOLS NECESSARY TO DISASSEMBLE AND REASSEMBLE THE INTERIOR PARTS OF THE BYPASS MANIFOLD AND TEMPERATURE SOLENOID.

BYPASS MANIFOLD ASSEMBLY

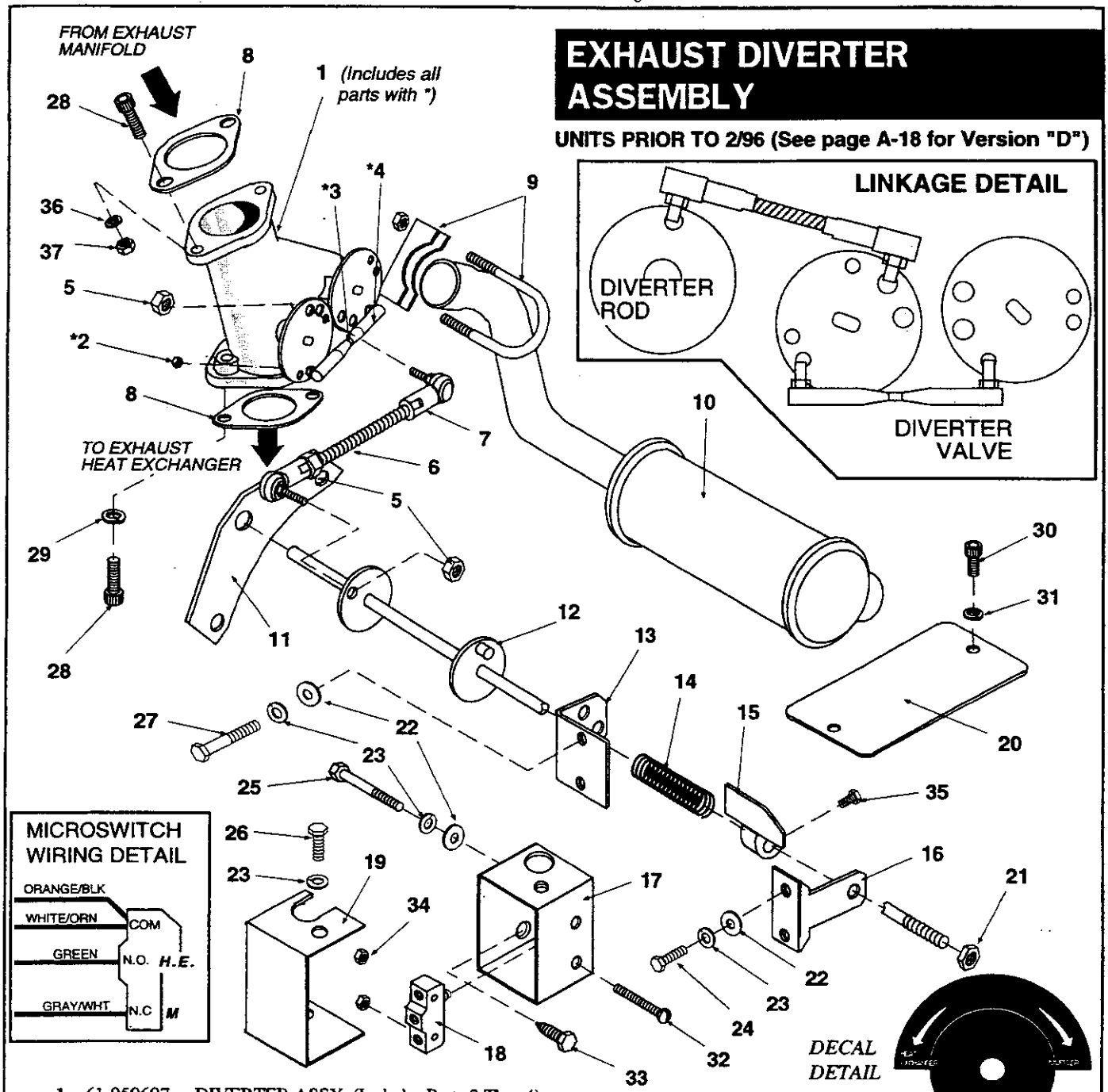


61-950692 BYPASS MANIFOLD ASSEMBLY
INCLUDES ALL PARTS WITH *

1	10-805000	HOSE, 3/16SST x 9"
2	10-805142	HOSE, 3/16SST x 29"
3	10-805204	HOSE, 3/16SST x 23"
4	10-805294	HOSE, 3/16SST x 11-1/2"
5	10-805311	HOSE, 3/16SST x 10-1/2"
6	10-805355	HOSE, 3/16SST x 8"
7	10-805363	HOSE, 3/16SST x 63-1/2"
8	10-805366	HOSE, 3/16SST x 6"
9	11-800039	BUSHING, 1/4P x 1/8FP
10	12-800031	ELBOW, 1/4P x 1/4T
11	12-800040	ELBOW, 1/8P x 1/4T
12	12-800065	CONNECTOR, 1/8P x 1/4T
13	12-800088	TEE, 1/8P x 1/4T x 1/8FP
14	12-800261	ELBOW, 1/8P x 1/4T (45°)
15	15-808105	TEMPERATURE SOLENOID
16	15-808107	VALVE, TEMPERATURE BYPASS
17	50-501744	BRACKET, SOLENOID MOUNTING
18	00-000065	SCREW, 10-32 x 3/8" PANHD
19	00-000055	SCREW, 1/4-20 x 3/4" HXHD
20	00-000132	SCREW, 1/4-20 x 1-1/2" HXHD
21	00-000255	SCREW, SELFDRIVE #14 x 1" HXHD
22	02-000032	LOCKWASHER, #10
23	02-000038	LOCKWASHER, 1/4
24	02-000066	FLATWASHER, 1/4
25	15-808112	BYPASS MANIFOLD ASSEMBLY
26	14-806552	SCREEN, BYPASS MANIFOLD
27	43-810053	O-RING, BYPASS MANIFOLD
28	52-501659	BLOCK, BYPASS MANIFOLD
29	52-501701	BYPASS ORIFICE
30	53-501523	CAP, BYPASS MANIFOLD
31	56-501906	BRACKET, BYPASS MANIFOLD

EXHAUST DIVERTER ASSEMBLY

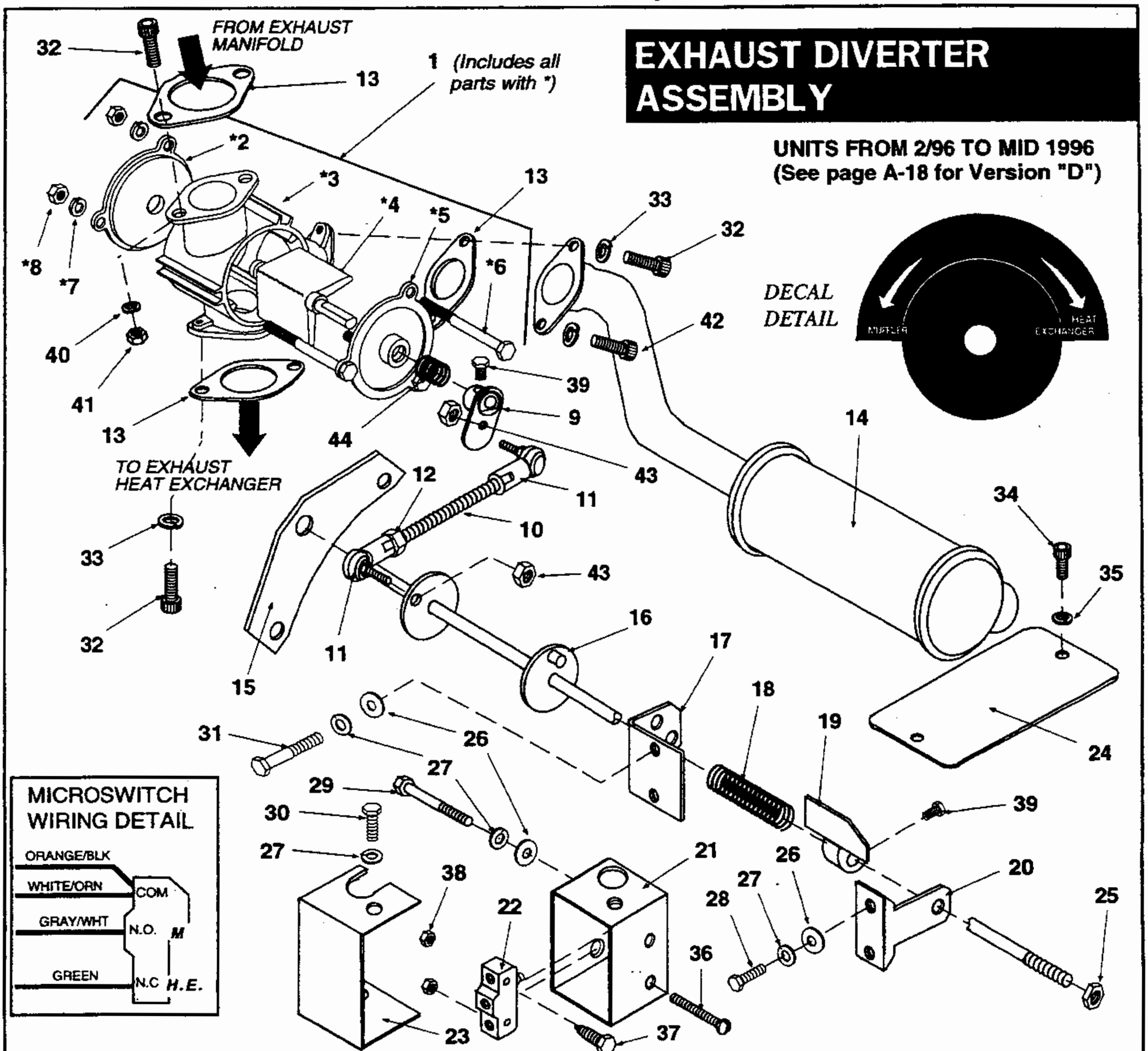
UNITS PRIOR TO 2/96 (See page A-18 for Version "D")



1	61-950697.....DIVERTER ASSY. (Includes Parts 2 Thru 4)		
2	01-000019.....LOCKNUT, 10-32	20	50-501728.....COVER, THERMOSTAT
3	54-501625.....ROD, 10-32 x 3/4"	21	01-000272.....JAMNUT, 3/8-16
4	04-000292.....SWIVEL LINKAGE	22	02-000066.....FLATWASHER, 1/4
5	01-000230.....LOCKNUT, 1/4-28	23	02-000038.....LOCKWASHER, 1/4
6	52-501631.....CONNECTOR ROD	24	00-000055.....SCREW, 1/4-20 x 3/4"
7	04-000284.....ROD END (SPHER)	25	00-000142.....SCREW, 1/4-20 x 2-1/2"
8	42-902212.....GASKET, EXHAUST	26	00-000070.....SCREW, 1/4-20 x 1/2"
9	03-000082.....MUFFLER CLAMP, 1-1/2"	27	00-000122.....SCREW, 1/4-20 x 1-3/4"
10	57-520086.....EXHAUST MUFFLER	28	00-000315.....SCREW, 5/16-18 x 7/8" SOCHD
11	50-501741.....GUIDE, DIVERTER ROD	29	02-000274.....LOCKWASHER, 5/16 (SOCKET HD)
12	56-502071.....DIVERTER ROD	30	00-000071.....SCREW, 10-24 x 1/2"
13	56-501882.....DIVERTER ROD GUIDE (Rear)	31	02-000032.....LOCKWASHER, #10
14	04-000286.....SPRING, DIVERTER ROD	32	00-000014.....SCREW, 6-32 x 1"
15	56-501761.....ACTIVATING LEVER	33	00-000255.....SCREW, SELFDRIVE #14 x 1"
16	56-501772.....DIVERTER ROD GUIDE (Front)	34	01-000059.....LOCKNUT, 6-32
17	56-501770.....SWITCH MOUNTING BRACKET	35	00-000342.....SCREW, 5/16-24 x 3/8"
18	35-900180.....MICROSWITCH	36	02-000040.....LOCKWASHER, 5/16
19	50-501689.....COVER, SWITCH BRACKET	37	01-000041.....NUT, 5/16-18

EXHAUST DIVERTER ASSEMBLY

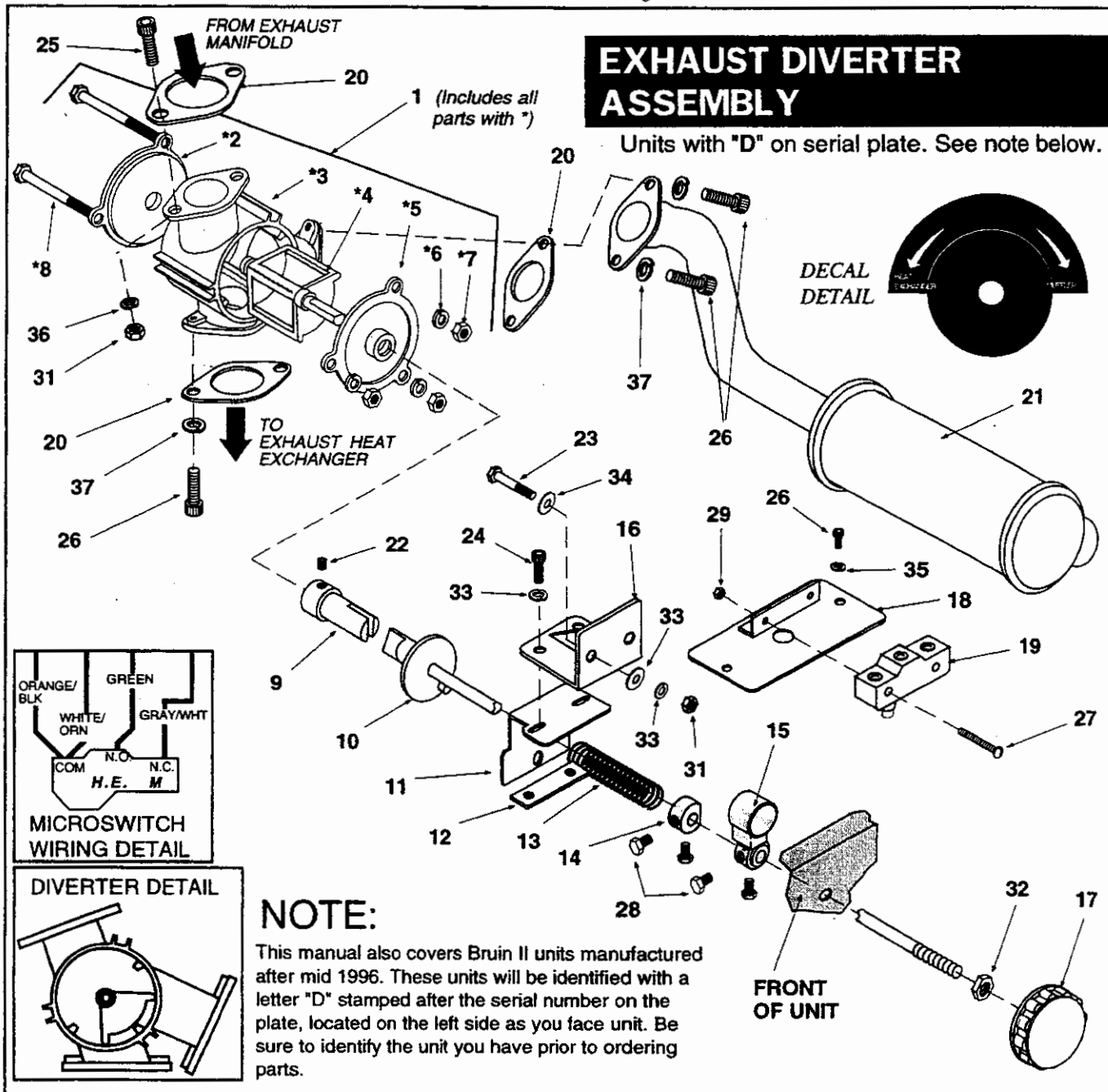
UNITS FROM 2/96 TO MID 1996
(See page A-18 for Version "D")



1	61-950885	DIVERTER ASSY. (Includes Parts 2 Thru 8)
2	52-501743	CAP, DIVERTER VALVE
3	52-501741	BODY, DIVERTER VALVE
4	58-500706	DIVERTER
5	52-501763	CAP, FRONT-DIVERTER VALVE
6	00-000383	SCREW, 1/4-20 x 2-1/4" sst
7	02-000044	LOCKWASHER, 1/4 sst
8	01-000045	NUT, 1/4-20 sst
9	56-502085	DIVERTER ARM
10	54-501631	CONNECTOR ROD
11	04-000284	ROD END (SPHER)
12	01-000290	JAMNUT, 1/4-28
13	42-902212	GASKET, EXHAUST
14	57-520096	EXHAUST MUFFLER
15	50-501741	GUIDE, DIVERTER ROD
16	56-502071	DIVERTER ROD
17	56-501882	DIVERTER ROD GUIDE (Rear)
18	04-000286	SPRING, DIVERTER ROD
19	56-501761	ACTIVATING LEVER
20	56-501772	DIVERTER ROD GUIDE (Front)
21	56-501770	SWITCH MOUNTING BRACKET
22	35-900180	MICROSWITCH
23	50-501689	COVER, SWITCH BRACKET
24	50-501728	COVER, THERMOSTAT
25	01-000272	JAMNUT, 3/8-16
26	02-000066	FLATWASHER, 1/4
27	02-000038	LOCKWASHER, 1/4
28	00-000055	SCREW, 1/4-20 x 3/4"
29	00-000142	SCREW, 1/4-20 x 2-1/2"
30	00-000070	SCREW, 1/4-20 x 1/2"
31	00-000122	SCREW, 1/4-20 x 1-3/4"
32	00-000315	SCREW, 5/16-18 x 7/8" SOCHD
33	02-000274	LOCKWASHER, 5/16 (SOCKET HD)
34	00-000071	SCREW, 10-24 x 1/2"
35	02-000032	LOCKWASHER, #10
36	00-000014	SCREW, 6-32 x 1"
37	00-000255	SCREW, SELFDRIVE #14 x 1"
38	01-000059	LOCKNUT, 6-32
39	00-000342	SCREW, 5/16-24 x 3/8"
40	02-000040	LOCKWASHER, 5/16
41	01-000041	NUT, 5/16-18
42	00-000326	SCREW, 5/16-18 x 5/8" SOCHD
43	01-000059	LOCKNUT, 1/4-28
44	04-000308	SPRING, DIVERTER VALVE

EXHAUST DIVERTER ASSEMBLY

Units with "D" on serial plate. See note below.



MICROSWITCH WIRING DETAIL

DIVERTER DETAIL

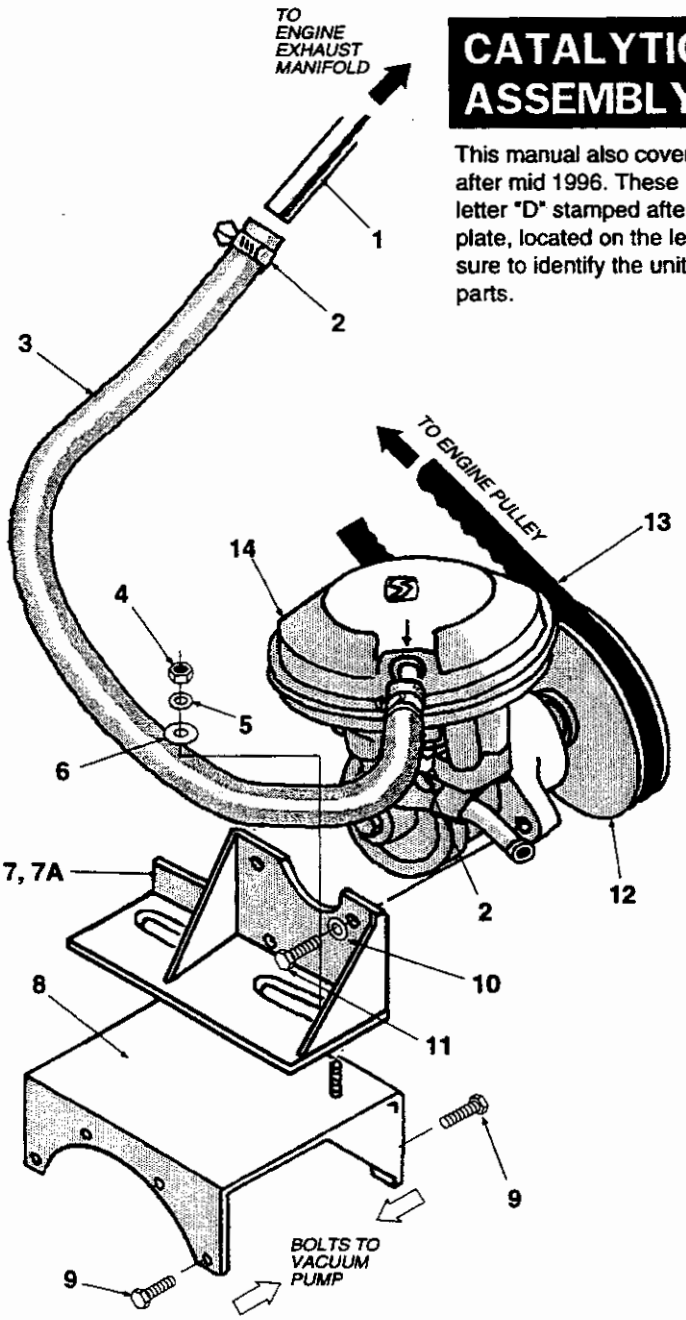
NOTE:

This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located on the left side as you face unit. Be sure to identify the unit you have prior to ordering parts.

1	61-950885.....DIVERTER ASSY. (Inlcudes Parts 2 Thru 8)	20	42-902212.....GASKET, EXHAUST
2	52-501743.....CAP, DIVERTER VALVE	21	57-520096.....EXHAUST MUFFLER
3	52-501741.....BODY, DIVERTER VALVE	22	00-000265.....SET SCREW, 1/4-20 x 1/2"
4	58-500752.....DIVERTER	23	00-000132.....SCREW, 1/4-20 x 1-1/2"
5	52-501763.....CAP, FRONT-DIVERTER VALVE	24	00-000210.....SCREW, 1/4-20 x 3/4" SOCHD
6	02-000044.....LOCKWASHER, 1/4 sst	25	00-000315.....SCREW, 5/16-18 x 7/8" SOCHD
7	01-000045.....NUT, 1/4-20 sst	26	00-000071.....SCREW, 10-24 x 1/2"
8	00-000383.....SCREW, 1/4-20 x 2-1/4" sst	27	00-000014.....SCREW, 6-32 x 1"
9	52-501788.....DIVERTER CONNECTOR LINKAGE-F	28	00-000342.....SCREW, 5/16-24 x 3/8"
10	56-502137.....DIVERTER ROD LINKAGE-M	29	01-000059.....LOCKNUT, 6-32
11	50-501880.....DIVERTER ROD GUIDE (Rear)	30	01-000037.....NUT, 1/4-20
12	56-502136.....HOLD DOWN, DIVERTER ROD GUIDE	31	01-000041.....NUT, 5/16-18
13	04-000286.....SPRING, DIVERTER ROD	32	01-000272.....JAMNUT, 3/8-16
14	53-501525.....STOP, CRANK ARM	33	02-000038.....LOCKWASHER, 1/4
15	56-502114.....ACTIVATING LEVER	34	02-000066.....FLATWASHER, 1/4
16	56-502115.....BRACKET, SUPPORT-ROD GUIDE (Rear)	35	02-000032.....LOCKWASHER, #10
17	04-000285.....HANDLE, EXHAUST DIVERTER VALVE	36	02-000040.....LOCKWASHER, 5/16
18	56-502108.....BRACKET, MICROSWITCH MOUNT	37	02-000274.....LOCKWASHER, 5/16 (SOCKET HD)
19	35-900180.....MICROSWITCH		

CATALYTIC AIR PUMP ASSEMBLY

This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located on the left side as you face unit. Be sure to identify the unit you have prior to ordering parts.

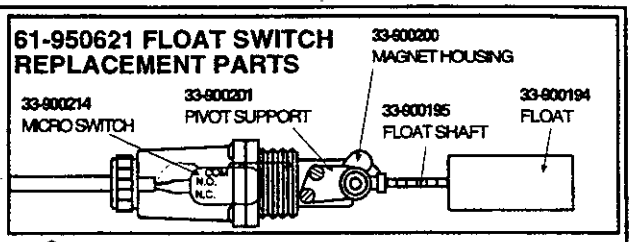


1	55-501800	TUBE, AIR PUMP
2	03-000246	CLAMP, HOSE #8
3	09-805397	HOSE, 1/2 x 24"
4	01-000073	NUT, 3/8-16
5	02-000075	LOCKWASHER, 3/8
6	02-000074	FLATWASHER, 3/8
7	56-501871	BRACKET, UPPER AIR PUMP
7A	56-502112	BRACKET, AIR PUMP MOUNT (Version "D")
8	56-501849	BRACKET, LOWER AIR PUMP
9	00-000266	SCREW, 3/8-16 x 1-1/4"
10	02-000040	LOCKWASHER, 5/16
11	00-000226	SCREW, 8mm-1.25mm x 20mm
12	52-501647	PULLEY, AIR PUMP
13	44-802240	BELT, 3VX265
14	41-809122	AIR PUMP

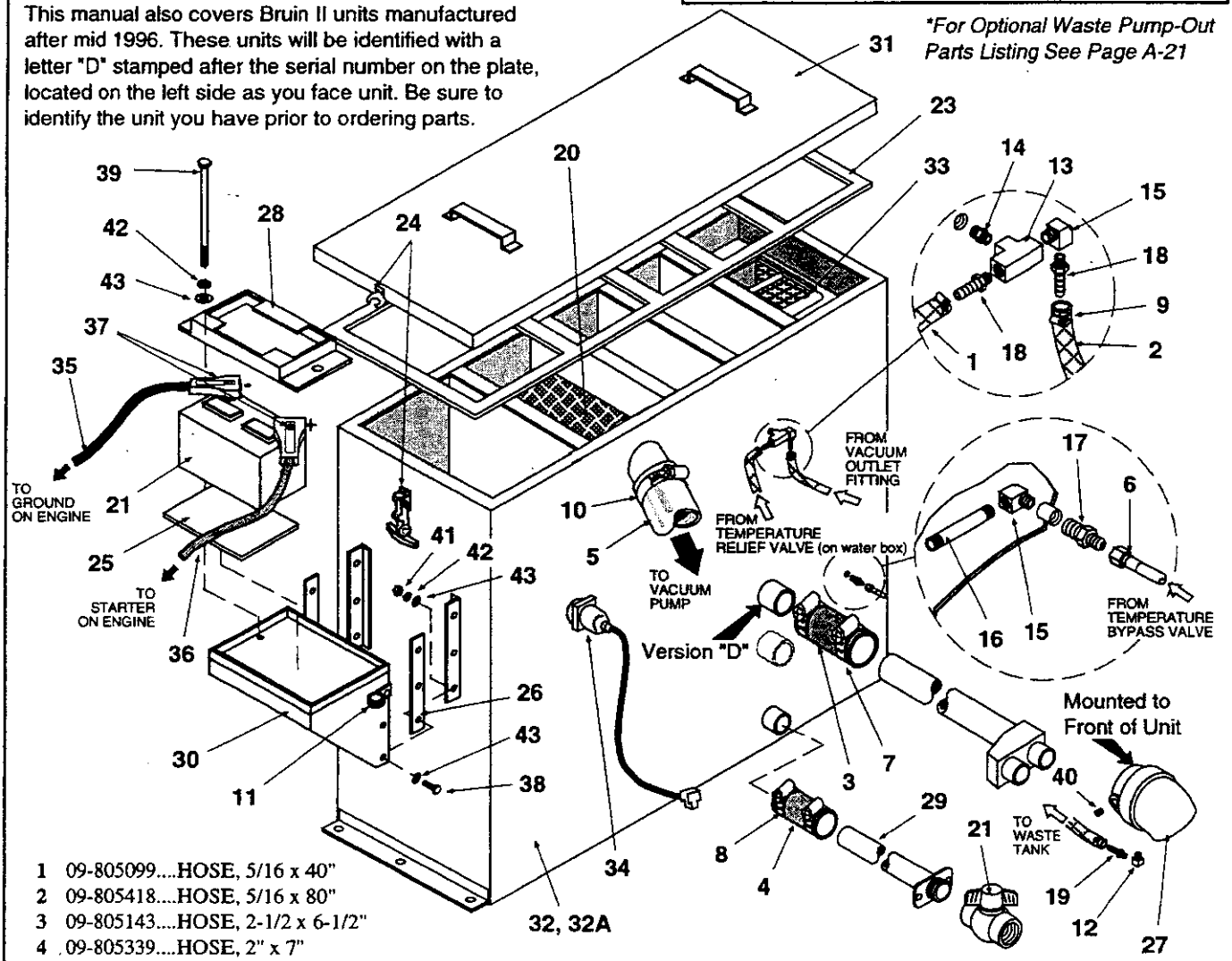
WASTE TANK ASSEMBLY

WASTE TANK ASSEMBLY Part #63-950384
WASTE TANK ASSEMBLY Part #63-950401 (Version "D")

This manual also covers Bruin II units manufactured after mid 1996. These units will be identified with a letter "D" stamped after the serial number on the plate, located on the left side as you face unit. Be sure to identify the unit you have prior to ordering parts.

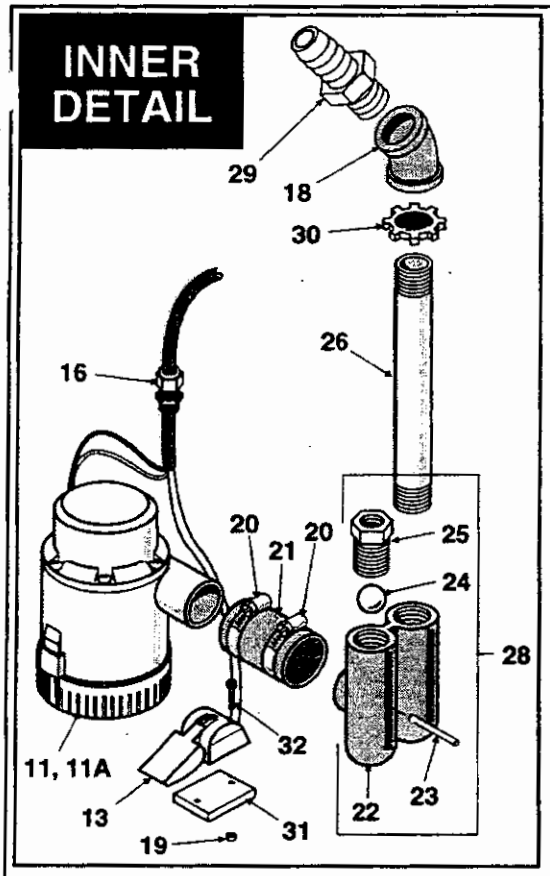


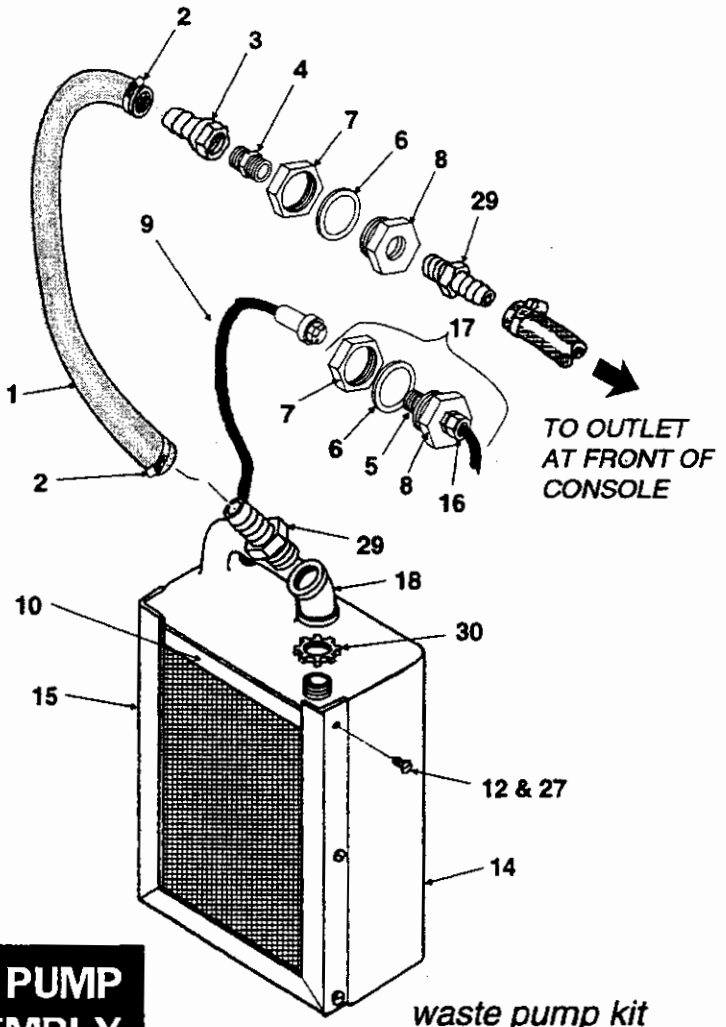
For Optional Waste Pump-Out Parts Listing See Page A-21

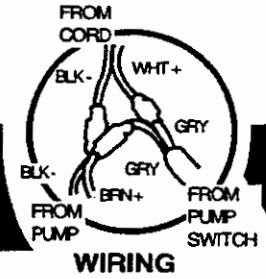


1	09-805099....HOSE, 5/16 x 40"	26	50-501697....SPACER, BATTERY MOUNT
2	09-805418....HOSE, 5/16 x 80"	27	52-501681....DIVERTER, VACUUM EXHAUST
3	09-805143....HOSE, 2-1/2 x 6-1/2"	28	56-500188....HOLD-DOWN, BATTERY
4	09-805339....HOSE, 2" x 7"	29	56-501686....WASTE OUTLET TUBE
5	09-805341....HOSE, 2-7/8 x 25"	30	56-501779....MOUNT, BATTERY
6	10-805363....HOSE, 3/16SST x 63-1/2"	31	56-501788....LID, WASTE TANK
7	03-000000....CLAMP, HOSE #40	32	56-501792....WASTE TANK (tank only)
8	03-000054....CLAMP, HOSE #32	32A	56-501947....WASTE TANK (tank only-Version "D")
9	03-000065....CLAMP, HOSE #4	33	56-501793....STRAINER BASKET
10	03-000112....CLAMP, HOSE #48	34	61-950621....ENGINE SHUTOFF SWITCH
11	03-000242....CABLE CLAMP	35	64-950515....BATTERY CABLE x 111" (Black)
12	11-800014....ELBOW, STREET 1/8	36	64-950521....BATTERY CABLE x 108" (Red)
13	11-800028....TEE, 1/4	37	31-900179....BATTERY TERMINAL COVERS
14	11-800029....HEX NIPPLE, 1/4	38	00-000078....SCREW, 1/4-20 x 1" HXHD
15	11-800045....ELBOW, STREET 1/4	39	00-000167....SCREW, 1/4-20 x 6" HXHD
16	11-800404....NIPPLE, 1/4 x 5" sst	40	00-000265....SCREW, SET 1/4-20 x 1/2" SOCHD
17	12-800060....CONNECTOR, 1/4P x 1/4T	41	01-000037....NUT, 1/4-20
18	12-800092....FITTING, BARB 1/4P x 5/16H	42	02-000038....LOCKWASHER, 1/4
19	12-800093....FITTING, BARB 1/8P x 5/16H	43	02-000066....FLATWASHER, 1/4
20	14-806518....STRAINER		
21	15-808080....VALVE, WASTE OUTLET		
22	36-900056....BATTERY		
23	43-807094....GASKET, WASTE TANK LID		
24	46-802510....DRAW LATCH		
25	47-700007....HEAT SHIELD	NOT SHOWN	05-008002....GASKET ADHESIVE (10.3oz. Tube)

INNER DETAIL





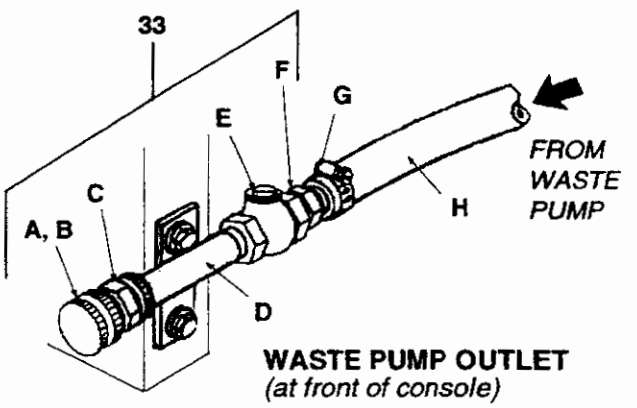


WIRING

WASTE PUMP ASSEMBLY

waste pump kit #66-945193

1	09-805436	HOSE 3/4 x 21"
2	03-000111	CLAMP, HOSE #10
3	12-800370	FITTING, BARB 3/4 HOS SWIV x 3/4H
4	12-800051	HOSE CONNECTOR, 3/4
5	31-900198	CORD CONNECTOR
6	43-807092	SEAL
7	52-501651	NUT
8	52-501649	CORD FITTING
9	31-900197	CORD
10	14-806550	SCREEN
11	41-809128	WASTE PUMP
11A	42-809267	SCREEN, WASTE PUMP (Plastic)
12	00-000210	SCREW, 1/4-20 x 3/4" sst
13	32-900183	FLOAT SWITCH
14	58-500643	ENCLOSURE
15	50-501706	STRAINER GUIDE
16	31-900194	STRAIN RELIEF
17	64-950541	CORD ASSEMBLY (Includes Parts 5,6,7,8,& 16)
18	11-800434	ELBOW, 3/4 (45°)
19	01-000241	LOCKNUT, 10-32 sst
20	03-000110	HOSE CLAMP #24
21	08-805048	CUFF (Cut in Half)
22	52-501662	BODY, VALVE
23	04-000290	PIN
24	04-000291	BALL,NYLON
25	52-501666	SEAT, VALVE
26	11-800419	NIPPLE, 3/4 x 6-5/8"
27	01-000023	NUT, 1/4-20
28	15-808101	ASSY, CHECK VALVE (Includes Parts 22 thru 25)
29	12-800095	FITTING, BARB, 3/4P x 3/4H
30	01-000119	LOCKNUT, 3/4NPT
31	50-501730	SPACER
32	00-000317	SCREW, 10-32 x 1-1/4"
33	66-950412	WASTE OUTLET ASSEMBLY



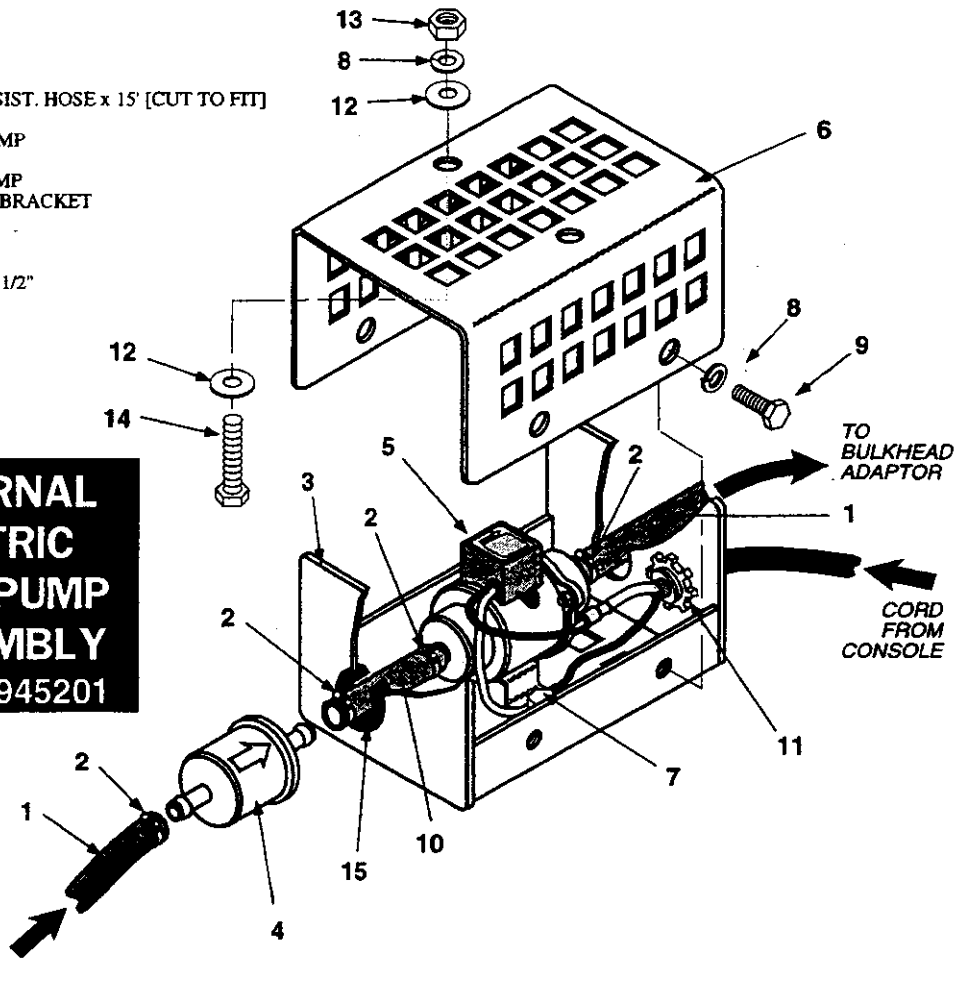
WASTE PUMP OUTLET
(at front of console)

A	12-800052	END CAP
B	43-807008	END CAP WASHER
C	12-800360	HOSE CONNECTOR FITTING
D	56-501794	OUTLET NIPPLE & BRACKET
E	15-808065	SWING CHECK VALVE
F	12-800095	FITTING, BARB 3/4P x 3/4H
G	03-000111	HOSE CLAMP #10
H	09-805320	HOSE, 3/4" x 85"

1 09-805345.....5/16" ABRASION RESIST. HOSE x 15' [CUT TO FIT]
2 03-000065.....HOSE CLAMP
3 56-501880.....BRACKET, FUEL PUMP
4 42-902311.....FUEL FILTER
5 41-809132.....ELECTRIC FUEL PUMP
6 50-501739.....COVER,FUEL PUMP BRACKET
7 00-000055.....SCREW, 1/4-20 x 3/4"
8 02-000038.....LOCKWASHER, 1/4
9 00-000070.....SCREW, 1/4-20 x 1/2"
10 09-805417.....FUEL HOSE, 5/16 x 3-1/2"
11 31-900017.....CORD CONNECTOR
12 02-000066.....FLATWASHER, 1/4
13 01-000037.....NUT, 1/4-20
14 00-000078.....SCREW, 1/4-20 x 1"
15 43-807506.....GROMMET

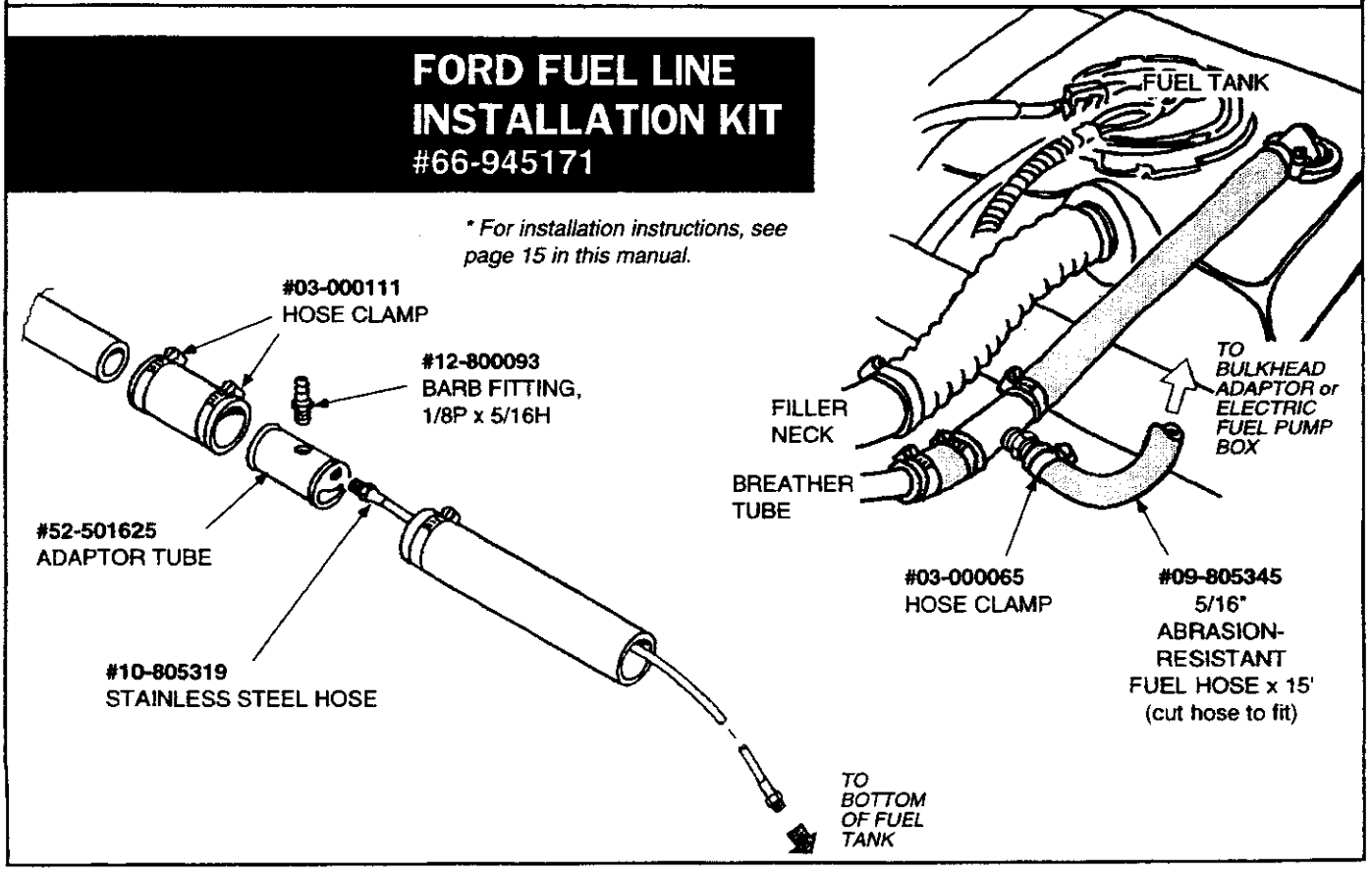
EXTERNAL ELECTRIC FUEL PUMP ASSEMBLY
KIT #66-945201

** For installation instructions, see page 17 in this manual.*

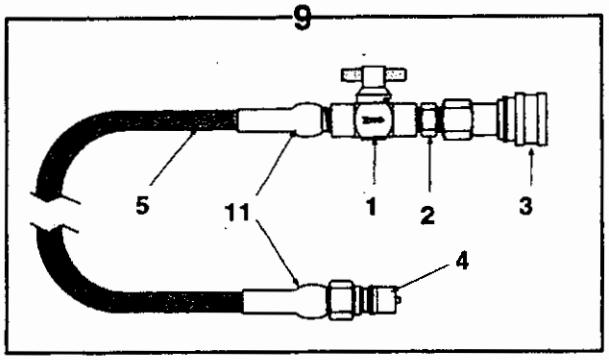


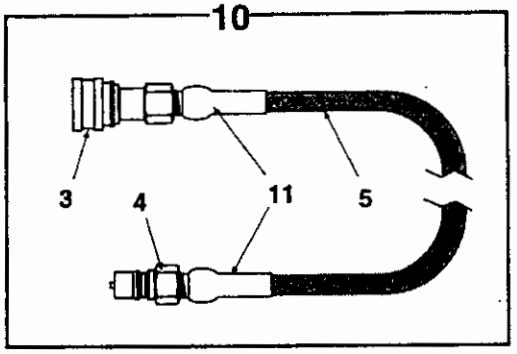
FORD FUEL LINE INSTALLATION KIT
#66-945171

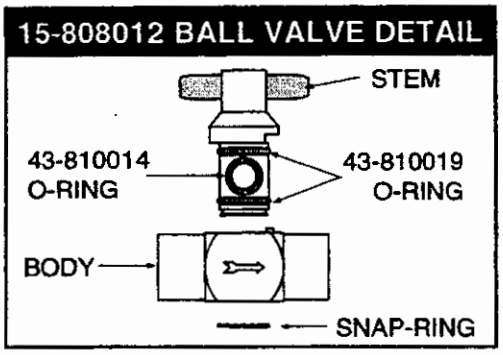
** For installation instructions, see page 15 in this manual.*

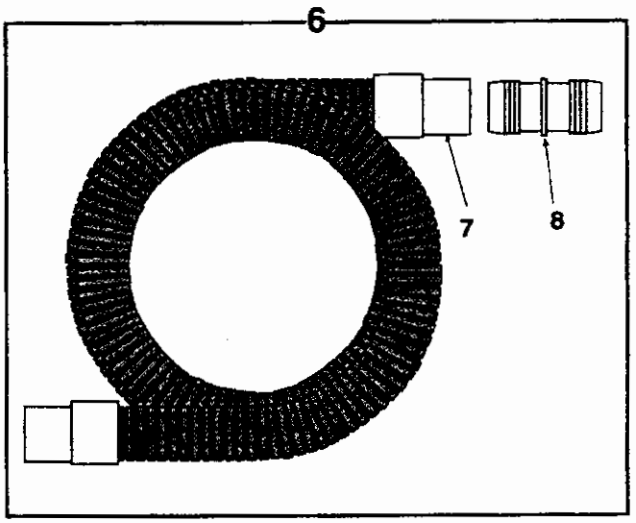


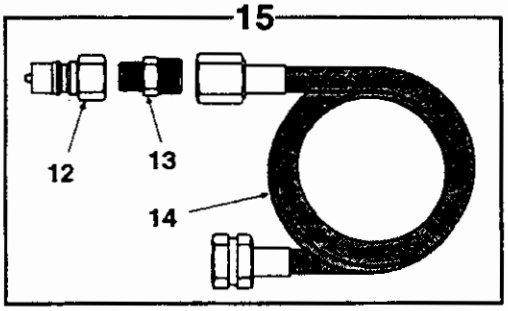
HOSE ACCESSORIES





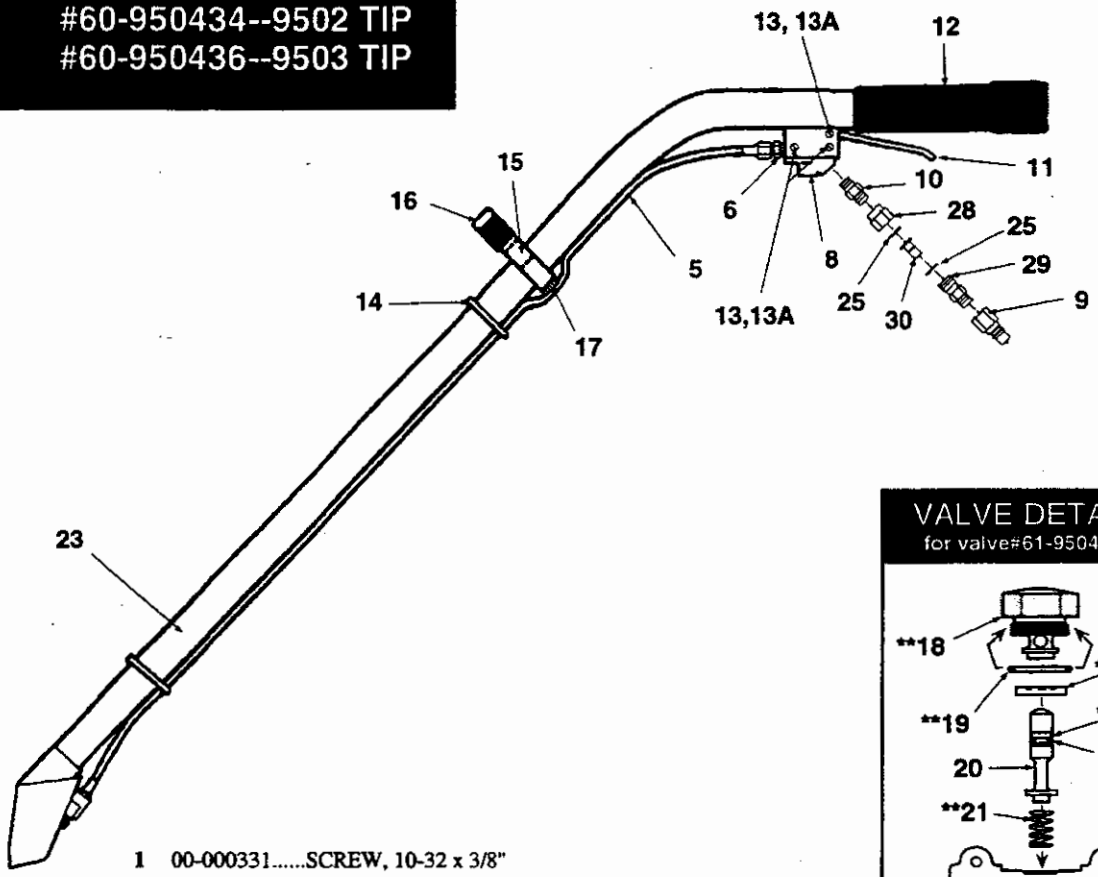






1 15-808012.....BALL VALVE, 1/4
2 11-800029.....HEX NIPPLE, 1/4
3 13-806001.....DISCONNECT, 1/4F
4 13-806000.....DISCONNECT, 1/4M
5 10-805077.....HOSE ASSEMBLY x 50' W/O DISCONNECTS OR VALVE
6 10-805060.....VACUUM HOSE x 50' W/ CUFFS
7 08-805147.....CUFF, VACUUM HOSE
8 12-800078.....CONNECTOR
9 10-805108.....HOSE ASSEMBLY, 50' W/ VALVE & DISCONNECTS
10 10-805122.....HOSE ASSEMBLY, 50' W/ DISCONNECTS
11 08-805155.....VINYL BEND GUARD
12 13-806009.....DISCONNECT, 3/8M
13 11-800354.....HEX NIPPLE, 1/2 x 3/8
14 10-805157.....WATER HOSE ASSEMBLY x 50'
15 10-805295.....WATER HOSE ASSEMBLY x 50' W/ DISCONNECT

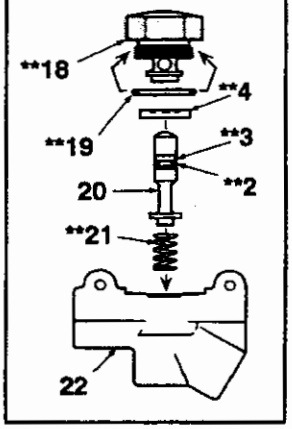
WAND ASSEMBLY
#60-950434--9502 TIP
#60-950436--9503 TIP



1	00-000331	SCREW, 10-32 x 3/8"
2	43-810062	O-RING, VALVE
3	43-810064	BACK-UP RING, VALVE
4	16-808228	SEAT, VALVE
5	10-805253	HOSE, 3/16SST x 49"
6	12-800060	CONNECTOR, 1/4P x 1/4T
7	11-800206	PLUG, 1/8
8	61-950496	VALVE
9	13-806000	DISCONNECT, 1/4M
10	11-800029	HEX NIPPLE, 1/4
11	52-501619	LEVER
12	09-805359	SLEEVE
13	00-000317	SCREW, 10-32 x 1-1/4"
13A	01-000241	LOCKNUT, 10-32
14	04-000053	NYLON TIE
15	52-501577	HOLD-DOWN, HANDLE
16	52-501576	BODY, HANDLE
17	00-000282	SCREW, HANDLE
18	16-808229	CAP, VALVE
19	43-810063	O-RING, VALVE
20	16-808189	STEM, VALVE
21	16-808190	SPRING, VALVE
22	52-501590	BODY, VALVE
23	56-501900	WAND BODY
24	50-501743	BRACKET, MANIFOLD
25	17-803006	NYLON WASHER
26A	17-803002	SPRAY TIP, 9502 SST (60-950434)
26B	17-803046	SPRAY TIP, 9503 SST (60-950436)
27	52-501702	MANIFOLD
28	17-803036	CONNECTOR, F
29	17-803010	CONNECTOR, M
30	14-806512	STRAINER, JET 50 MESH

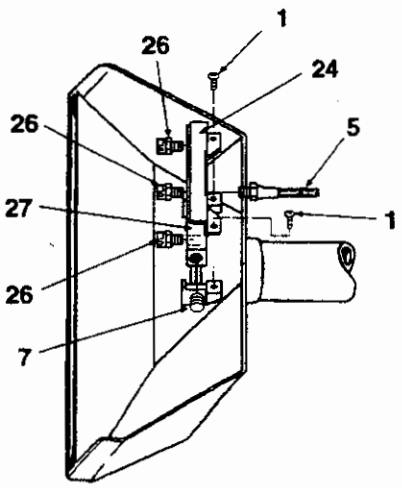
NOT SHOWN 48-941186.....WAND DECAL

VALVE DETAIL
for valve#61-950496

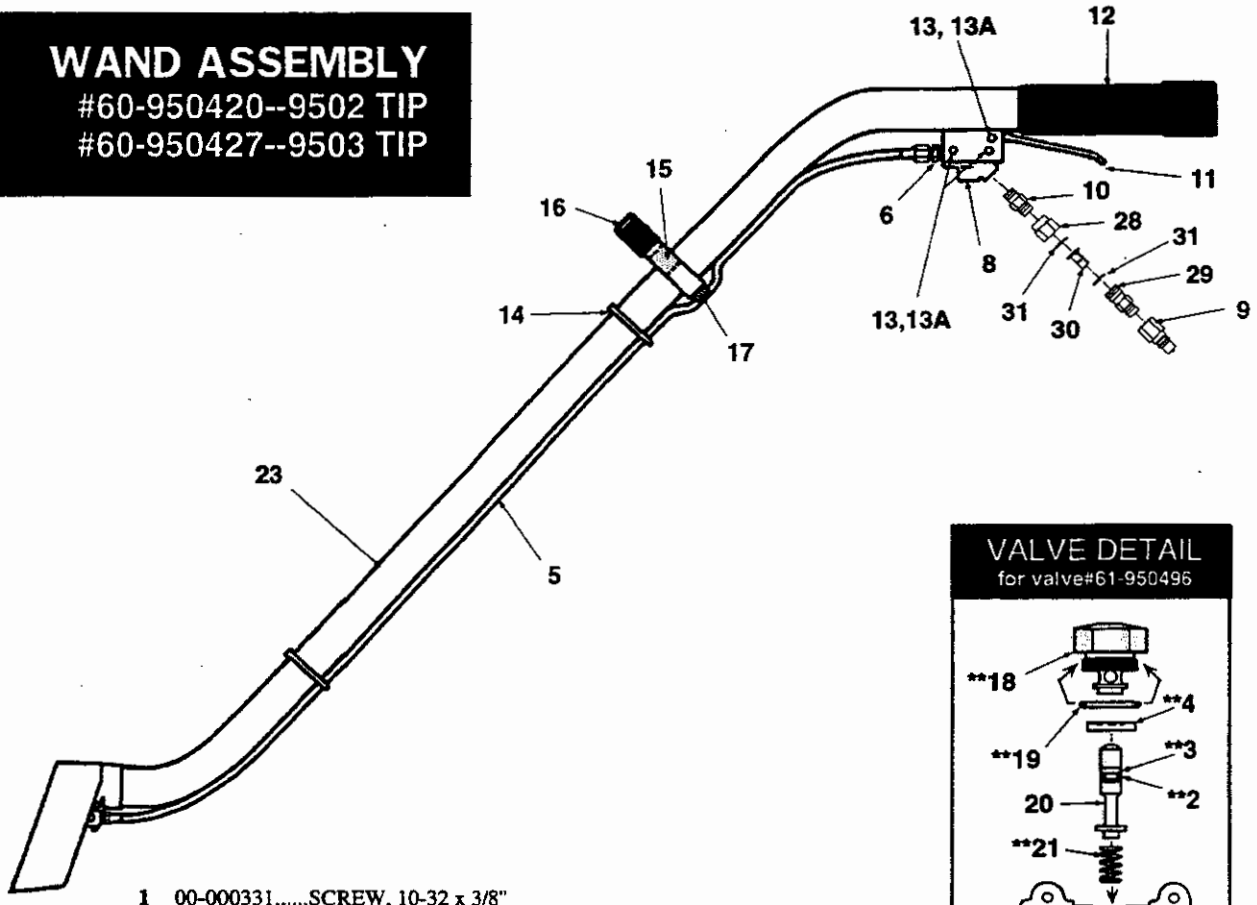


****66-808169**
VALVE REPAIR KIT

HEAD MANIFOLD ASSEMBLY



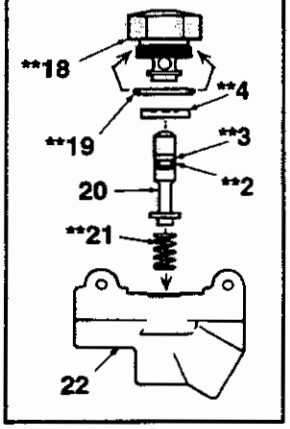
WAND ASSEMBLY
#60-950420--9502 TIP
#60-950427--9503 TIP



1	00-000331	SCREW, 10-32 x 3/8"
2	43-810062	O-RING, VALVE
3	43-810064	BACK-UP RING, VALVE
4	16-808228	SEAT, VALVE
5	10-805063	HOSE, 3/16 SST x 48"
6	12-800060	CONNECTOR, 1/4P x 1/4T
7	11-800206	PLUG, 1/8
8	61-950496	VALVE
9	13-806000	DISCONNECT, 1/4M
10	11-800029	HEX NIPPLE, 1/4
11	52-501619	LEVER
12	09-805359	SLEEVE
13	00-000317	SCREW, 10-32 x 1-1/4"
13A	01-000241	LOCKNUT, 10-32
14	04-000053	NYLON TIE
15	52-501569	HOLD-DOWN, HANDLE
16	52-501568	BODY, HANDLE
17	00-000282	SCREW, HANDLE
18	16-808229	CAP, VALVE
19	43-810063	O-RING, VALVE
20	16-808189	STEM, VALVE
21	16-808190	SPRING, VALVE
22	52-501590	BODY, VALVE
23	56-501712	WAND BODY
24	01-000018	NUT, 10-32
25	02-000241	LOCKWASHER, #10
26A	17-803002	SPRAY TIP, 9502 SST (60-950420)
26B	17-803046	SPRAY TIP, 9503 SST (60-950427)
27	56-501739	MANIFOLD
28	17-803036	CONNECTOR, F
29	17-803010	CONNECTOR, M
30	14-806512	STRAINER, JET 50 MESH
31	17-803006	NYLON WASHER

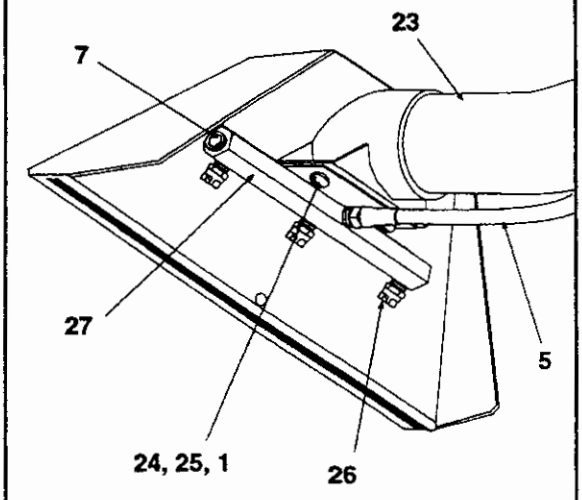
NOT SHOWN 48-941166.....WAND DECAL

VALVE DETAIL
for valve#61-950496



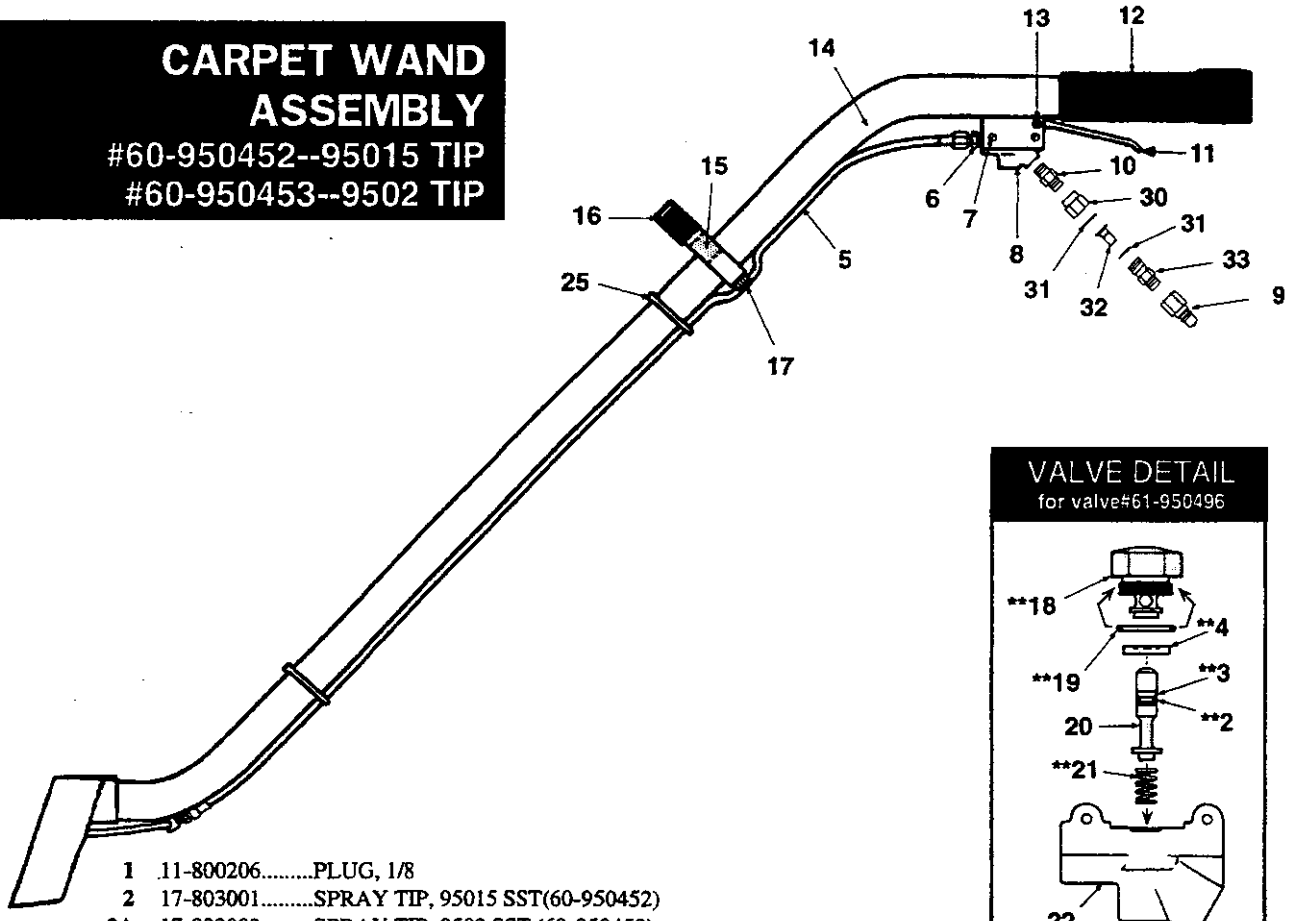
****66-808169**
VALVE REPAIR KIT

MANIFOLD DETAIL



CARPET WAND ASSEMBLY

#60-950452--95015 TIP
#60-950453--9502 TIP



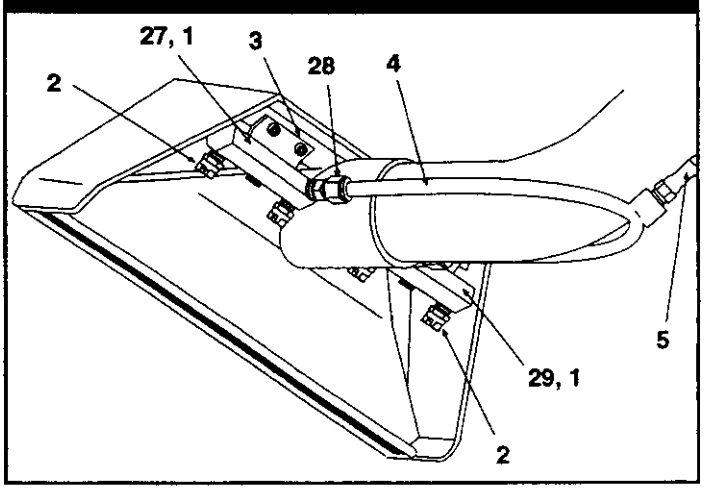
VALVE DETAIL

for valve#61-950496

****66-808169**
VALVE REPAIR KIT

1	11-800206	PLUG, 1/8
2	17-803001	SPRAY TIP, 95015 SST(60-950452)
2A	17-803002	SPRAY TIP, 9502 SST (60-950453)
3	00-000071	SCREW, 10-24 x 1/2"
4	56-501967	MANIFOLD, TUBE ASSEMBLY
5	10-805387	HOSE, 3/16 SST x 44"
6	12-800060	CONNECTOR, 1/4P x 1/4T
7	00-000317	SCREW,10-32 x 1-1/4
8	61-950496	VALVE
9	13-806000	DISCONNECT, 1/4M
10	11-800029	HEX NIPPLE, 1/4
11	52-501619	LEVER
12	09-805359	SLEEVE
13	00-000068	SCREW, 10-32 x 1-1/4"
13A	01-000019	LOCKNUT, 10-32
14	56-501940	WAND
15	52-501569	HOLD-DOWN, HANDLE
16	52-501568	HANDLE
17	00-000282	SCREW, HANDLE
18	16-808229	STEM HOLDER, VALVE
19	43-810063	O-RING, VALVE
20	16-808189	STEM, VALVE
21	16-808190	SPRING, VALVE
22	52-501590	BODY, VALVE
23	43-810062	O-RING, VALVE
24	43-810064	BACK-UP RING, VALVE
25	04-000053	NYLON TIE
26	16-808228	SEAT, VALVE
27	56-501966	MANIFOLD, LEFT
28	12-800322	CONNECTOR, 1/8P x 1/4 COMPRESSION
29	56-501986	MANIFOLD, RIGHT
30	17-803036	CONNECTOR, F
31	17-803006	NYLON WASHER
32	14-806512	STRAINER, JET 50 MESH
33	17-803010	CONNECTOR, M

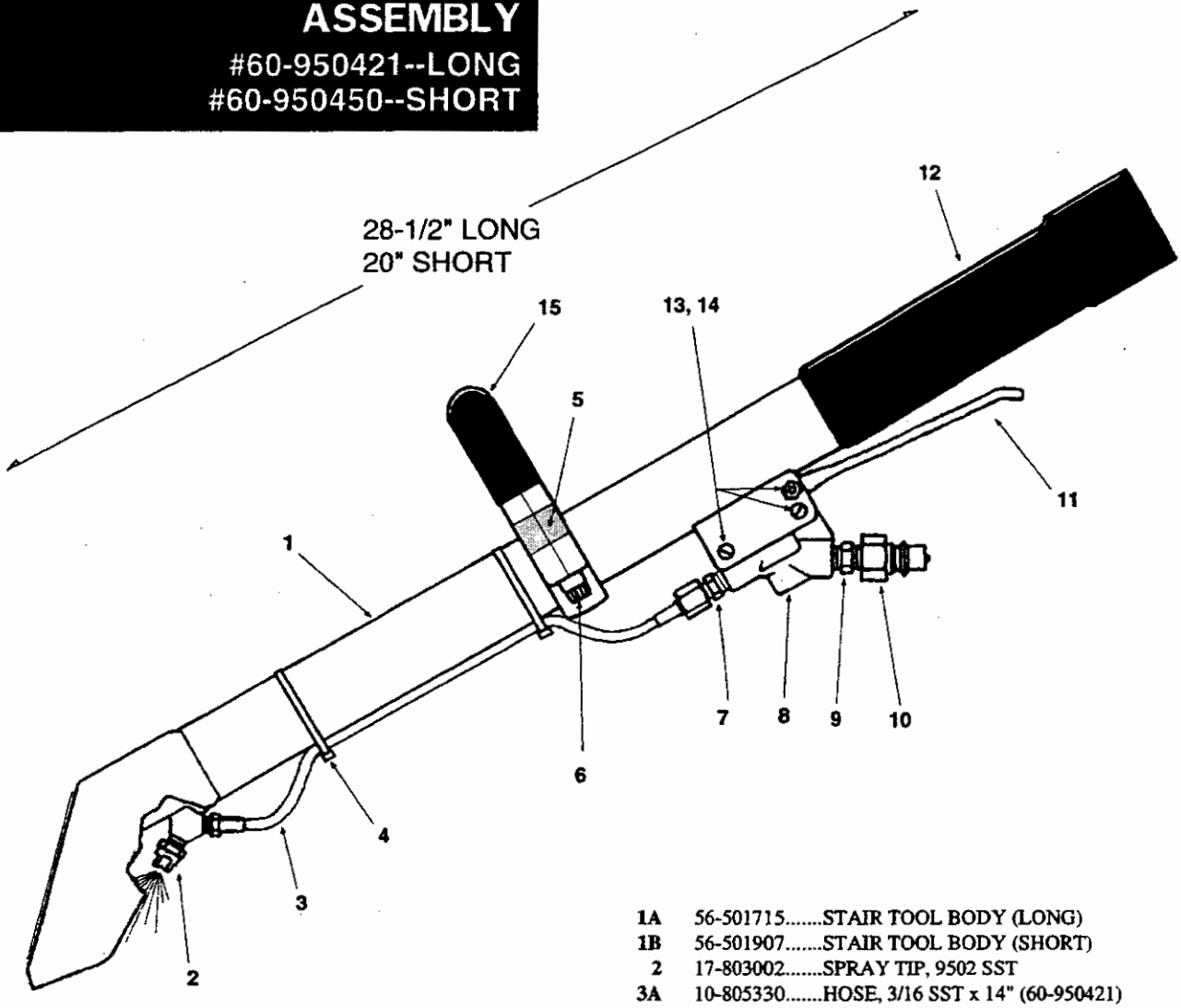
MANIFOLD DETAIL



NOT SHOWN 48-941186.....WAND DECAL

STAIR TOOL ASSEMBLY

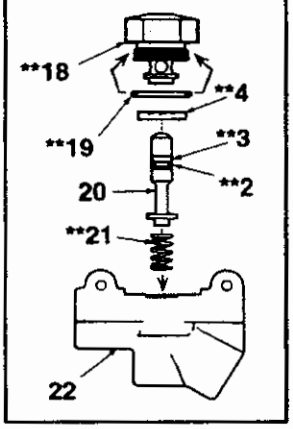
#60-950421--LONG
#60-950450--SHORT



1A	56-501715	STAIR TOOL BODY (LONG)
1B	56-501907	STAIR TOOL BODY (SHORT)
2	17-803002	SPRAY TIP, 9502 SST
3A	10-805330	HOSE, 3/16 SST x 14" (60-950421)
3B	10-805397	HOSE, 3/16 SST x 7-1/2"(60-950450)
4	04-000053	NYLON TIE
5	00-000282	SCREW, 1/4 x 1-1/4"
6	52-501577	HOLD-DOWN, HANDLE
7	12-800060	CONNECTOR, 1/4P x 1/4T
8	61-950496	VALVE
9	11-800029	HEX NIPPLE, 1/4
10	13-806000	DISCONNECT, 1/4M
11	52-501619	TRIGGER, VALVE
12	09-805359	GRIP SLEEVE
13	00-000317	SCREW, 10-32 x 1-1/4
14	01-000241	LOCKNUT, 10-32
15	52-501576	BODY, HANDLE
16	16-808229	CAP, VALVE
17	43-810063	O-RING, VALVE
18	43-810064	BACK-UP RING, VALVE
19	43-810062	O-RING, VALVE
20	16-808189	STEM, VALVE
21	16-808190	SPRING, VALVE
22	16-808228	SEAT, VALVE
23	52-501590	BODY, VALVE

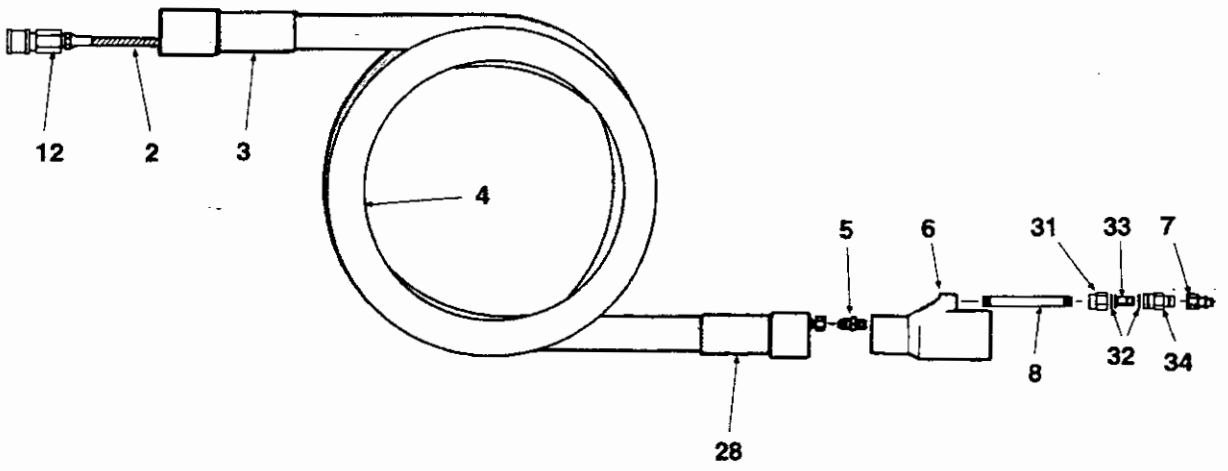
NOT SHOWN 48-941163.....STAIR TOOL DECAL

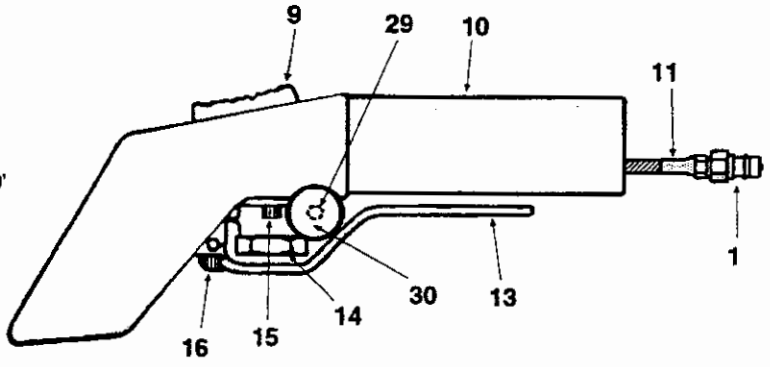
VALVE DETAIL
for valve#61-950496



****66-808169**
VALVE REPAIR KIT

UPHOLSTERY TOOL
#60-950422

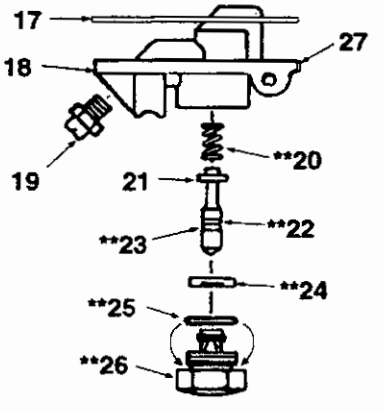




1	13-806030.....DISCONNECT, 1/8M
2	10-805347.....HOSE, 3/16 SST x 120-1/2"
3	08-805243.....CUFF, SWIVEL
4	09-805131.....VACUUM HOSE,1-1/4 x 10'
5	12-800065.....CONNECTOR, 1/8P x 1/4T
6	52-501585.....COUPLER
7	13-806000.....DISCONNECT, 1/4M
8	11-800404.....NIPPLE, 1/4 x 5" SST
9	52-501624.....VACUUM ADJUSTER
9A	04-000282.....SPRING, VACUUM ADJ
9B	00-000310.....SCREW, VACUUM ADJ
10	56-501735.....TOOL BODY
11	10-805348.....HOSE, 3/16 SST x 5-1/2"
12	13-806023.....DISCONNECT, 1/8F
13	58-500639.....TRIGGER
14	61-950570.....VALVE ASSEMBLY
15	00-000307.....SCREW, 6-32 x 3/8"
16	00-000306.....SCREW, 6-32 x 1"
17	43-807513.....GASKET
18	52-501623.....BODY, VALVE
19	17-803033.....SPRAY TIP, 80015 SST
20	16-808190.....SPRING, VALVE
21	16-808189.....STEM, VALVE
22	43-810062.....O-RING, VALVE
23	43-810064.....BACK UP RING, VALVE
24	16-808228.....SEAT, VALVE
25	43-810063.....O-RING, VALVE
26	16-808229.....HOLDER, VALVE
27	00-000076.....SET SCREW
28	08-805138.....CUFF, 1-1/4 x 1-1/2
29	43-810016.....O-RING, ADJ. KNOB
30	52-501626.....KNOB, ADJUSTING
31	17-803036.....COVER
32	17-803006.....WASHER
33	14-806512.....FILTER
34	17-803010.....BODY

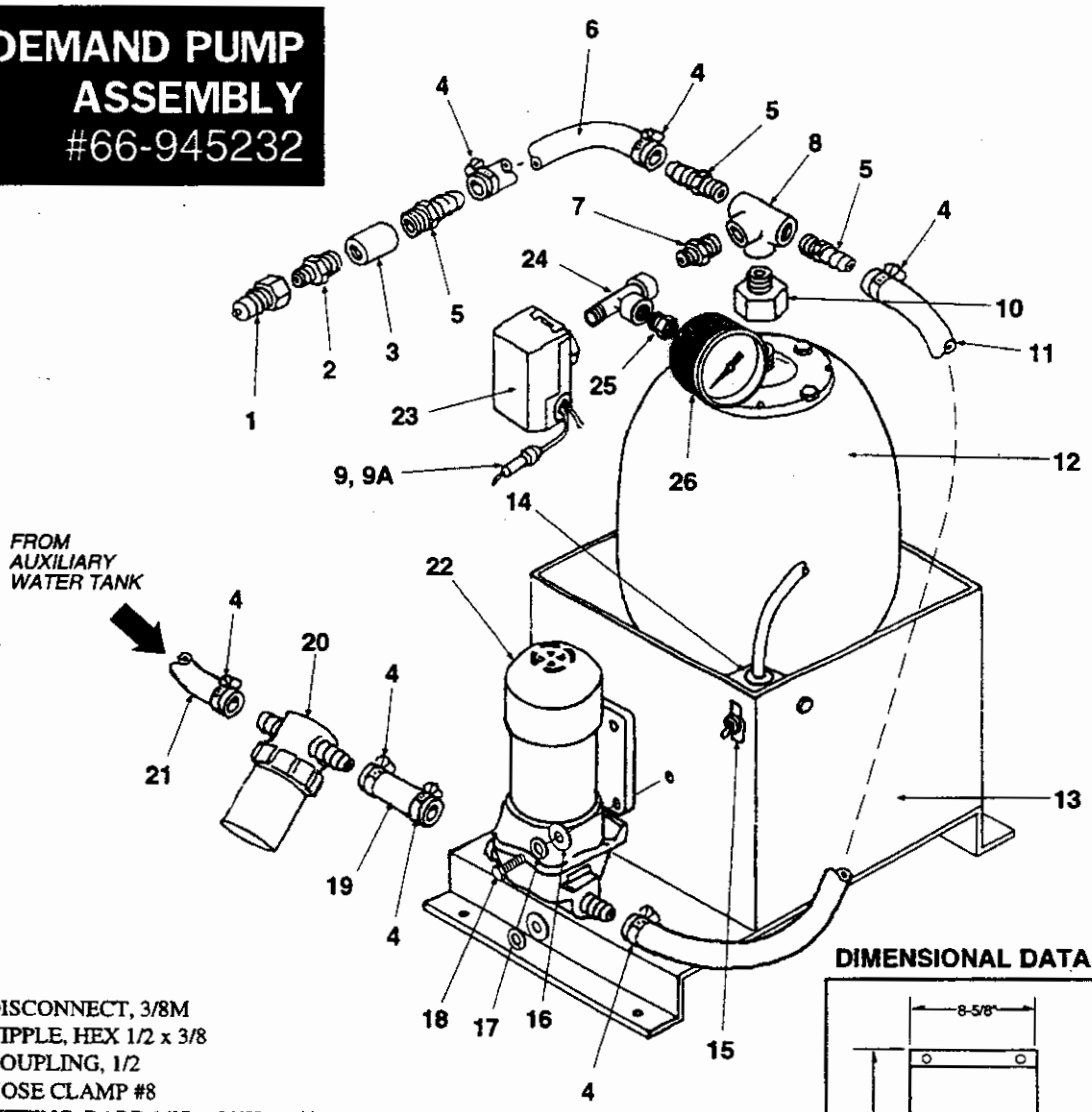
NOT SHOWN 48-941164.....UPHOLSTERY TOOL DECAL

VALVE DETAIL
PART #61-950570



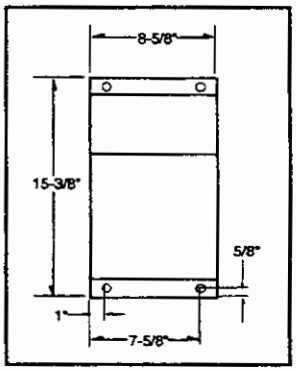
****66-808169**
VALVE REPAIR KIT

DEMAND PUMP ASSEMBLY #66-945232



1	13-806009	DISCONNECT, 3/8M
2	11-800354	NIPPLE, HEX 1/2 x 3/8
3	11-800006	COUPLING, 1/2
4	03-000113	HOSE CLAMP #8
5	12-800278	FITTING, BARB 1/2P x 3/4H
6	09-805315	HOSE, 3/4 x 120"
7	11-800284	NIPPLE, HEX 1/2 x1/4
8	11-800114	SIDE OUTLET TEE, 1/2
9	31-900171	FUSE HOLDER
9A	33-900167	FUSE, AGW 20amp
10	12-800369	CONNECTOR, 3/4FP x 1/2P
11	09-805172	HOSE, 3/4 x 24"
12	41-700001	PRESSURE VESSEL
13	56-501950	HOLDER
14	56-501954	SWITCH HOLDER
15	32-900087	SWITCH
16	02-000066	FLATWASHER, 1/4
17	02-000038	LOCKWASHER, 1/4
18	00-000055	SCREW, 1/4-20 x 3/4"
19	09-805278	HOSE, 3/4 x 3"
20	14-806553	FILTER
21	09-805061	HOSE, 3/4 x 63"
22	41-809134	DEMAND PUMP
23	35-900187	PRESSURE SWITCH
24	11-800472	TEE, 1/4F x 1/4F x 1/4M
25	11-800039	BUSH, 1/4 x 1/8
26	15-808536	PRESSURE GAUGE

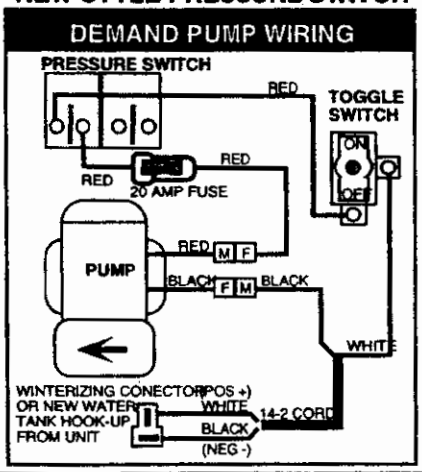
DIMENSIONAL DATA



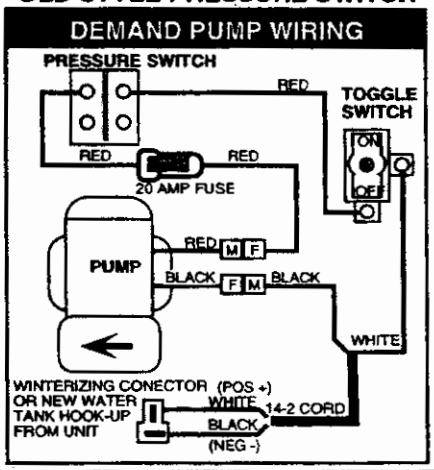
OVERALL DIMENSIONS

16-1/2" TALL
8-5/8" WIDE
15-3/8" DEEP

NEW STYLE PRESSURE SWITCH



OLD STYLE PRESSURE SWITCH

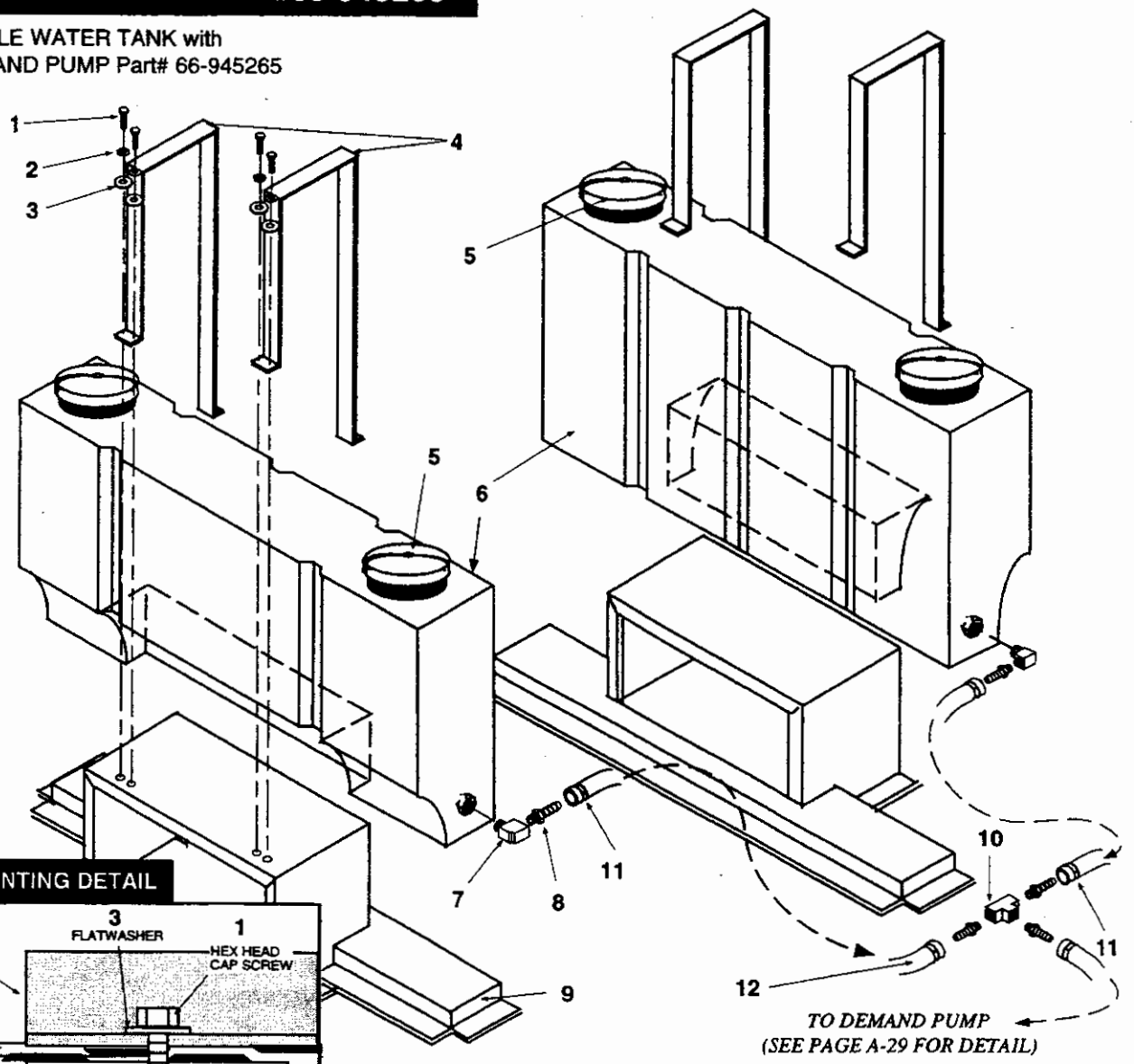


DUAL AUXILIARY WATER TANK with DEMAND PUMP #66-945260

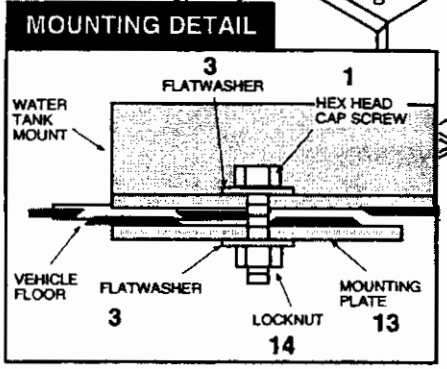
ACCESSORIES NOT SHOWN

FLOAT VALVE KIT Part# 66-945273
DRAIN VALVE KIT Part# 66-945274
4-1 Gallon JUG HOLDER for Top of Tank Part# 56-502027

SINGLE WATER TANK with
DEMAND PUMP Part# 66-945265

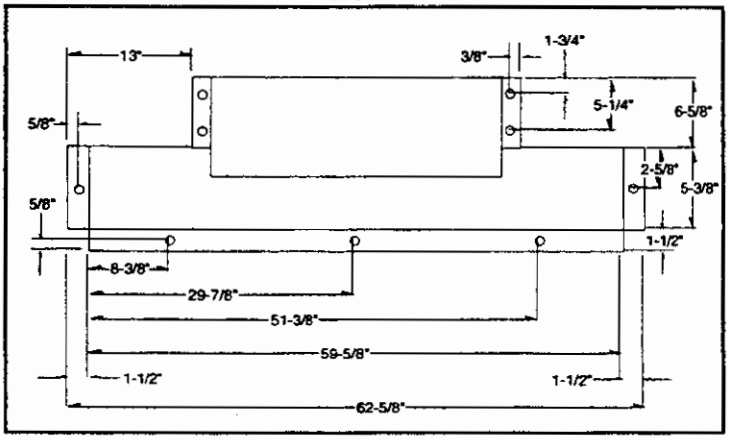


MOUNTING DETAIL



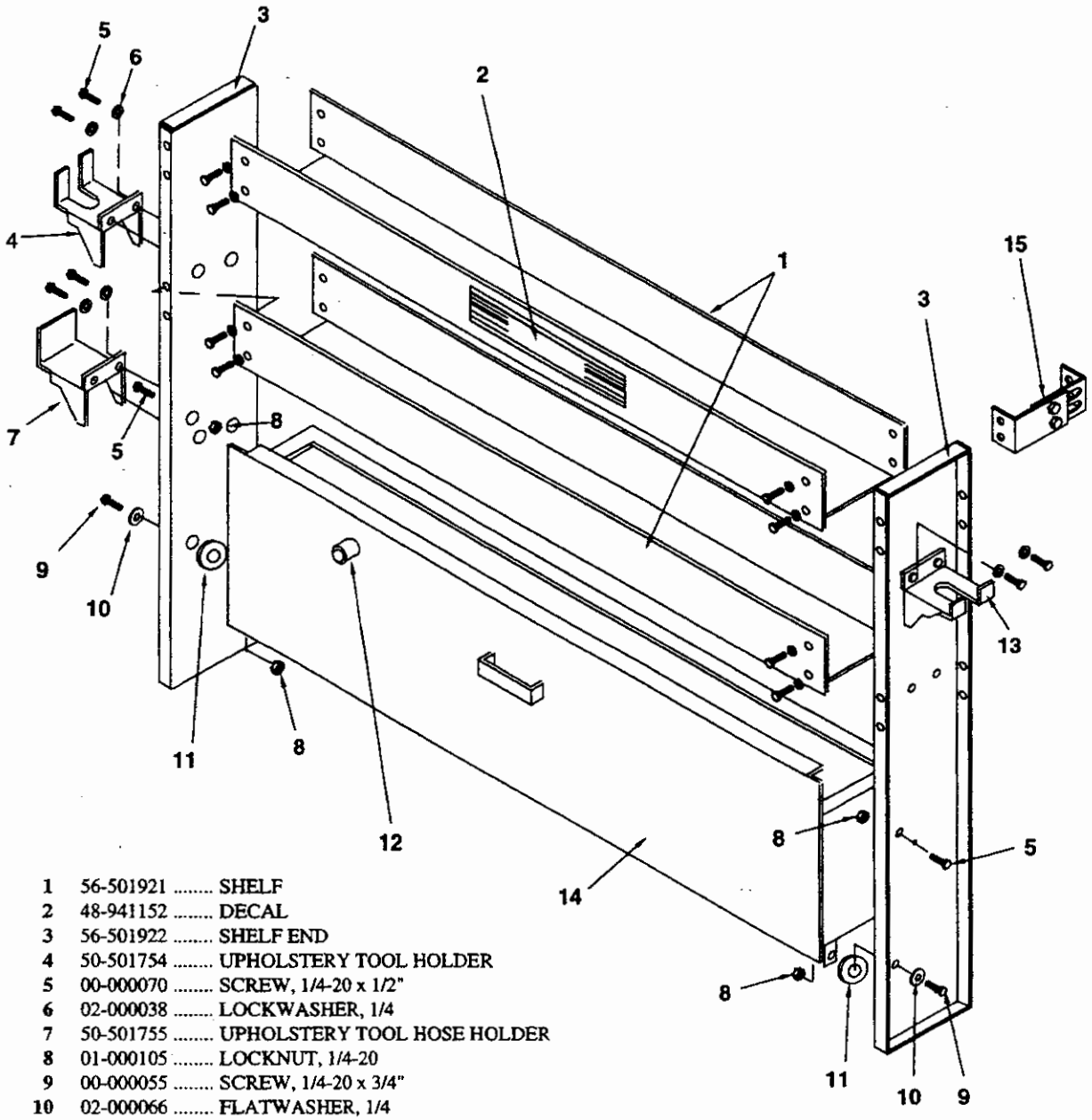
1	00-000072	SCREW, 3/8-16 x 2" HXHD
2	02-000075	LOCKWASHER, 3/8
3	02-000074	FLATWASHER, 3/8
4	50-501774	HOLD DOWN, TANK
5	11-800432	CAP, WATER TANK
6	58-500661	TANK, PLASTIC
7	11-800041	ELBOW, STREET 1/2
8	12-800278	FITTING, BARB 1/2P x 3/4H
9	56-502000	BASE
10	11-800085	TEE,1/2
11	03-000113	CLAMP, HOSE
12	07-805078	HOSE, WATER 3/4
13	50-500511	PLATE, INSTALLATION
14	01-000158	LOCKNUT, 3/8

DIMENSIONAL DATA



OVERALL DIMENSIONS 32-1/2" TALL
62-5/8" WIDE
15-1/2" DEEP

SHELF ASSEMBLY
#65-950392

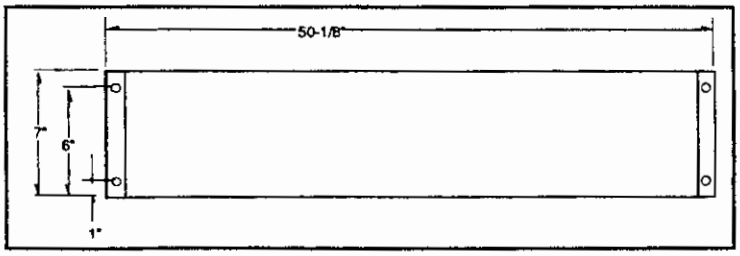


1	56-501921	SHELF
2	48-941152	DECAL
3	56-501922	SHELF END
4	50-501754	UPHOLSTERY TOOL HOLDER
5	00-000070	SCREW, 1/4-20 x 1/2"
6	02-000038	LOCKWASHER, 1/4
7	50-501755	UPHOLSTERY TOOL HOSE HOLDER
8	01-000105	LOCKNUT, 1/4-20
9	00-000055	SCREW, 1/4-20 x 3/4"
10	02-000066	FLATWASHER, 1/4
11	50-501749	WASHER, NYLON
12	46-802506	LATCH
13	50-501753	STAIR TOOL HOLDER
14	56-501920	DRAWER
15	66-945424	KIT, ADJUSTABLE MOUNTING BRACKET
NOT SHOWN	56-501942	MOUNTING BRACKET

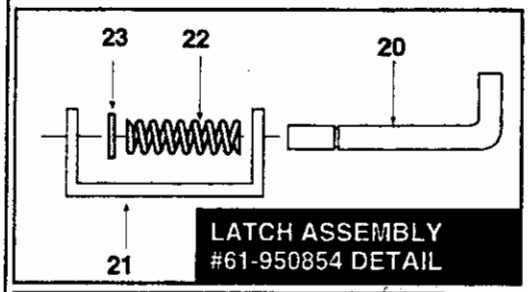
OVERALL DIMENSIONS

41-1/2" TALL
50-1/8" WIDE
With Tool Holders 57" WIDE
7-7/8" DEEP

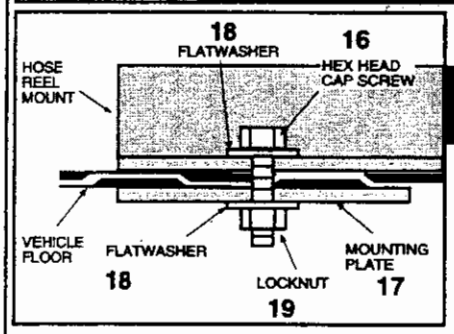
DIMENSIONAL DATA



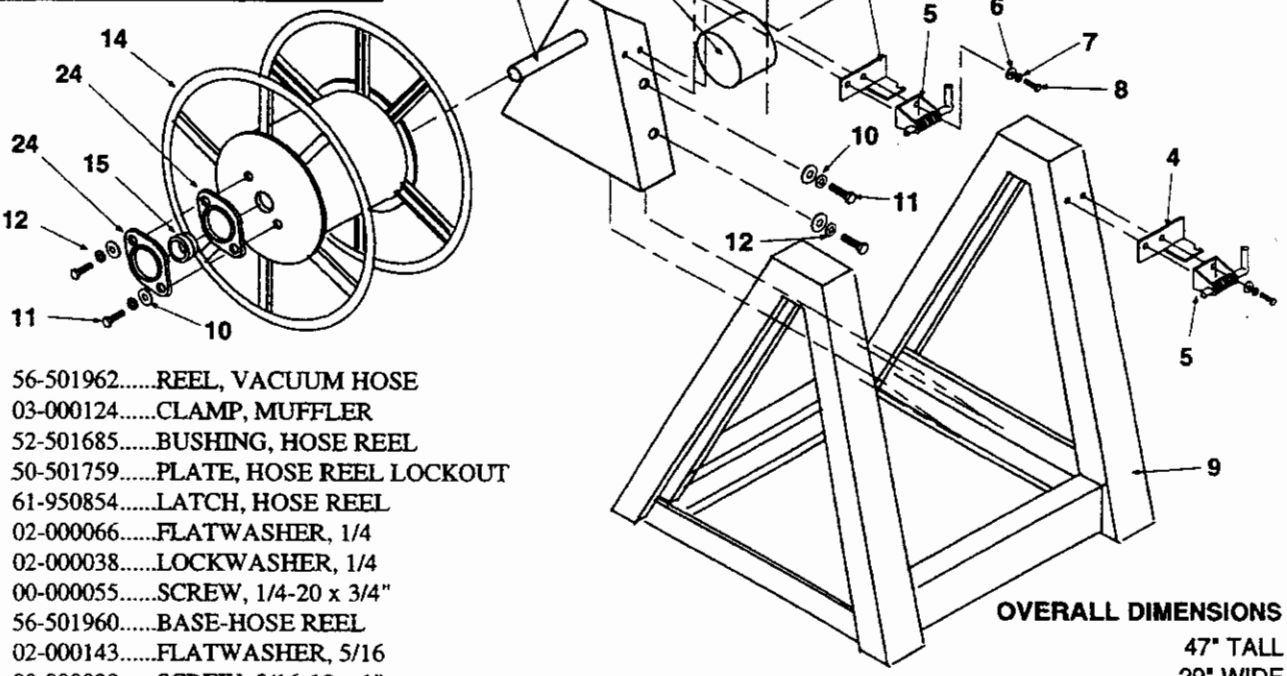
HOSE REEL ASSEMBLY
#65-950393



LATCH ASSEMBLY
#61-950854 DETAIL



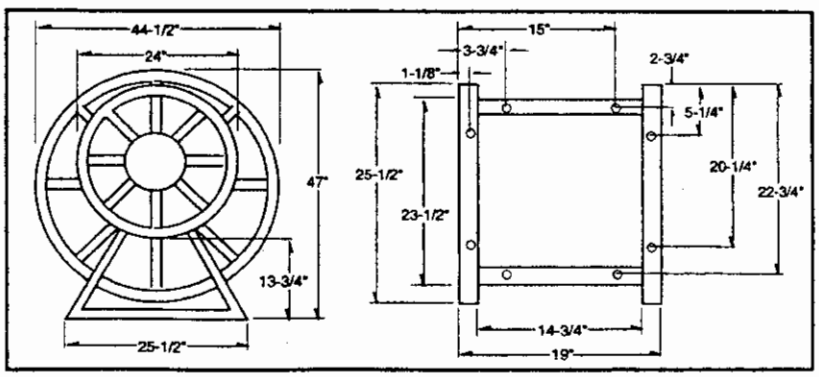
MOUNTING DETAIL



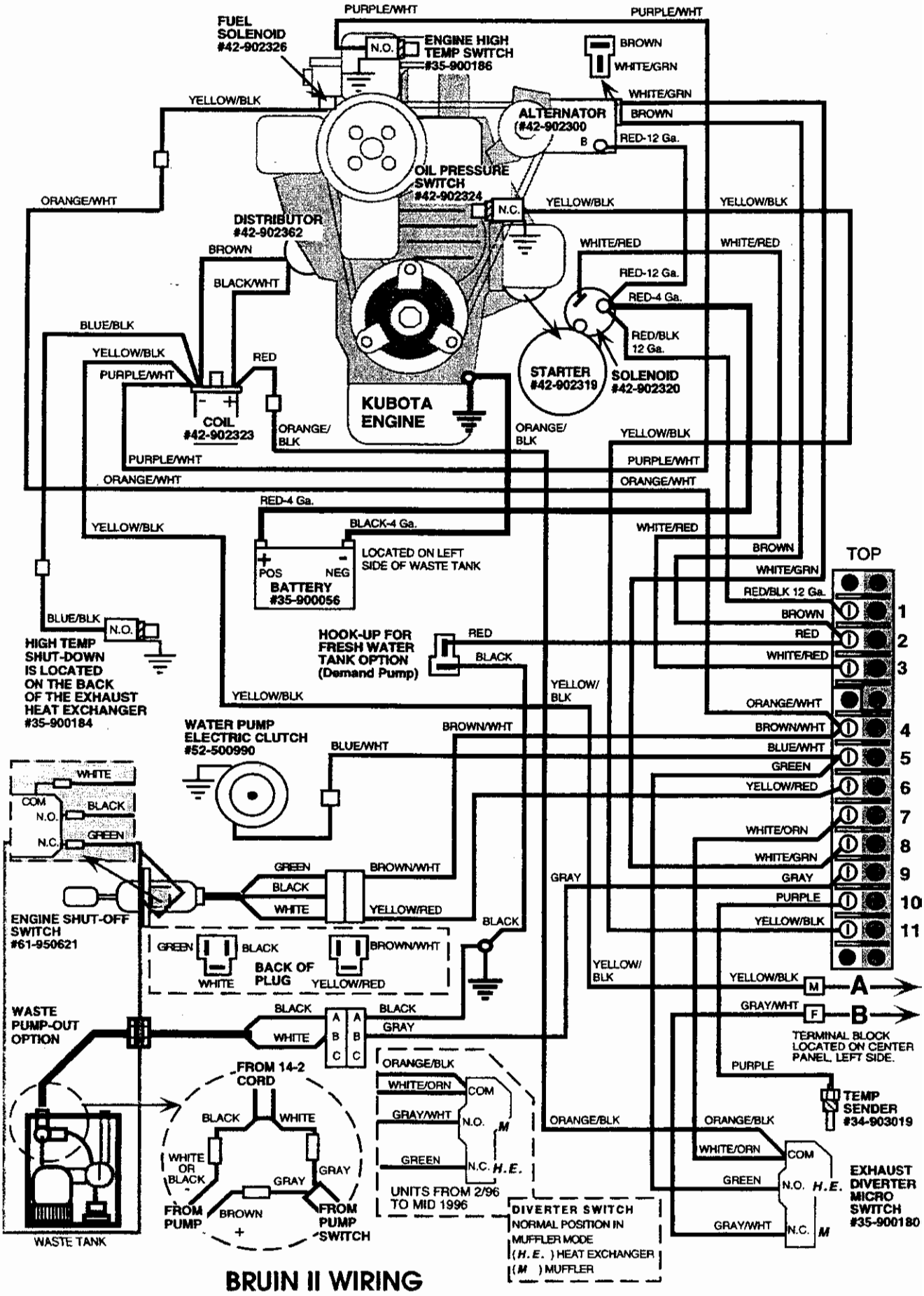
1	56-501962	REEL, VACUUM HOSE
2	03-000124	CLAMP, MUFFLER
3	52-501685	BUSHING, HOSE REEL
4	50-501759	PLATE, HOSE REEL LOCKOUT
5	61-950854	LATCH, HOSE REEL
6	02-000066	FLATWASHER, 1/4
7	02-000038	LOCKWASHER, 1/4
8	00-000055	SCREW, 1/4-20 x 3/4"
9	56-501960	BASE-HOSE REEL
10	02-000143	FLATWASHER, 5/16
11	00-000039	SCREW, 5/16-18 x 1"
12	02-000040	LOCKWASHER, 5/16
13	56-501961	BODY, HIGH PRESS REEL
14	56-501968	REEL, HIGH PRESSURE
15	45-802138	BEARING, HOSE REEL
16	00-000072	SCREW, 3/8-16 x 2"
17	50-500511	MOUNTING PLATE
18	02-000074	FLATWASHER, 3/8
19	01-000158	LOCKNUT, 3/8
20	55-501789	LATCHING PIN
21	50-501812	LATCH BRACKET
22	04-000302	LATCH SPRING
23	04-000303	C-CLIP
24	44-802122	FLANGE, BEARING

OVERALL DIMENSIONS
47" TALL
29" WIDE
44-1/2" DEEP

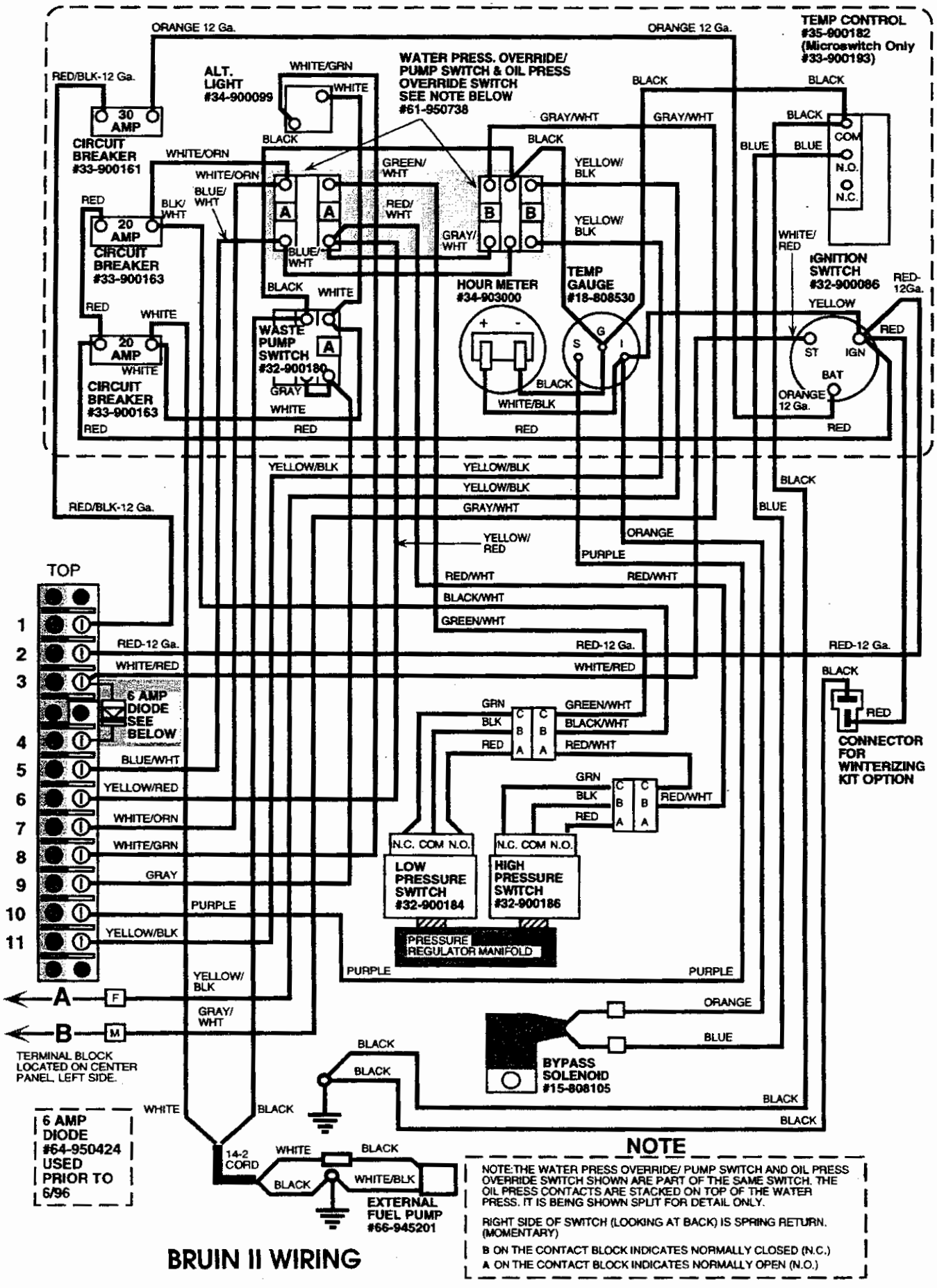
DIMENSIONAL DATA



NOTES



BRUIN II WIRING



BRUIN II WIRING