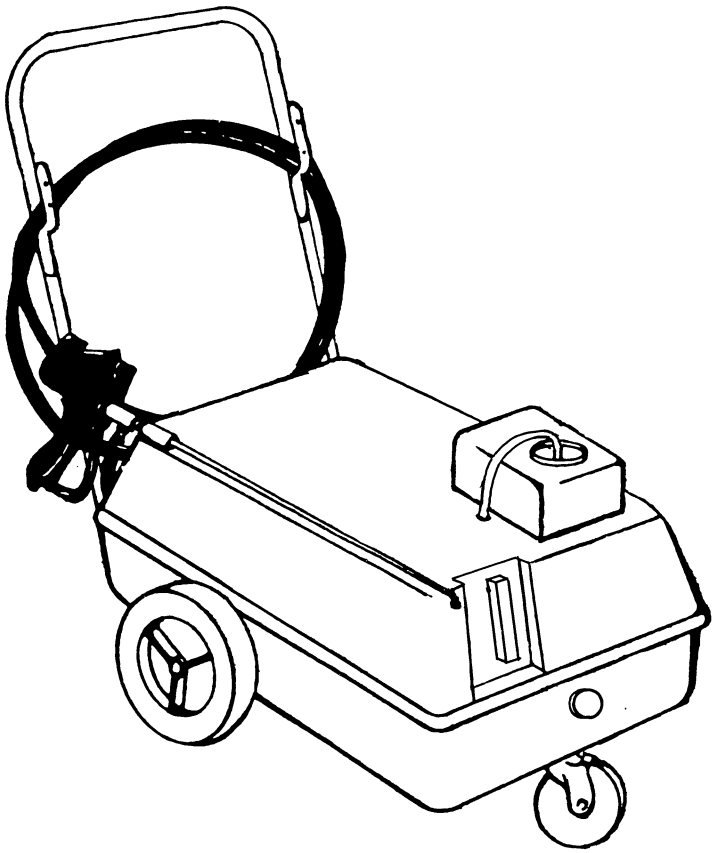
FORD

BTC SERIES HIGH PRESSURE WASHERS*



REPAIR MANUAL SUPPLEMENT

*S/N 225,000 & up

40998011

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FOREWORD

This manual contains service information for the Ford BTC High Pressure Washers, Serial #225,000 and up. Detailed information is provided on description and operation, trouble shooting, tests and adjustments, and specifications. The section detailing repair procedures for pumps also applies to Ford Pressure Washers prior to Serial #225,000.

Keep this manual, along with your other service literature, available for ready reference.

SAFETY PRECAUTIONS

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all tractors and equipment as well as the personal safety of the individual doing the work. This Shop Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the individual doing the work. This Manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in the Manual must first establish that he compromises neither his personal safety nor the equipment integrity by his choice of methods, tools or parts.

TABLE OF CONTENTS

SAFETY 4
SPECIFICATIONS 5
GENERAL 6
Serial and Model Numbers 6
Lubrication 6
Tune Up 6
PRINCIPLES OF OPERATION - BTC 60
..... See Pages 14-17, Form SE3921
PRINCIPLES OF OPERATION (Except BTC 60) 8
System Identification 8
Waterbreak Valve 9
Rinse Cycle 10
Soap Cycle 11
Relief Cycle 11
Off Cycle 13
Priming Procedure 13
Storage 13
DIAGNOSIS AND TESTING 14
Incoming Water Pressure Regulator 14
Diagnostic Procedure 14
Equipment For Testing 14
Testing For Air 15
Locating Air Leaks 15
Testing Nozzle Pressure 15
Pressure Test and Evaluation 15
TROUBLE SHOOTING GUIDE 17
CASE TOP REMOVAL AND INSTALLATION 22
WATERBREAK VALVE 23
Removal and Disassembly 23
Inspection Repair 23
Assembly 23
PROPORTIONING SYSTEM - BTC 60
..... See Pages 34 and 35 Of Form SE3921
PROPORTIONING SYSTEM - BTC65A, BTC 65AC .. 25
Removal and Disassembly Manual Soap Valve 25
Inspection and Repair 25
Assembly 26
Soap Proportioner Removal 26
Inspection and Repair 26
Assembly 26
FLOW METER 27
Removal and Replacement 27
ADJUSTABLE SOAP VALVE - BTC 100A, BTC 100AC, BTC 150A, BTC 150AC, BTC 300A, BTC 300AC 28
Removal 28
Inspection and Repair 28
Assembly 28
Disassembly of Solenoid Valve 28
Inspection and Repair 28
Assembly 28
PUMPS - ADJUSTMENT AND REPAIR 29
BTC 60, BTC 65, BTC 65A, BTC 65AC 29
BTC 100, BTC 100A, BTC 100AC 30
BTC 150, BTC 150A, BTC 150AC 33
BTC 300, BTC 300A, BTC 300AC 36
RELIEF VALVE 40
Operation 40
Testing 40
Adjustment 40
Disassembly 40
Inspection and Repair 41
Assembly 41
Installation 41
CHECK VALVE 42
Removal 42
Inspection and Repair 42
Assembly 42
FLUID CONTROL GUN WITH TRIGGER GUARD AND SAFETY LOCK 43
Disassembly 43
Inspection and Repair 43
Assembly and Installation 43
WANDS AND NOZZLES 45
Removal 45
Inspection and Repair 45
Nozzle Identification 45
Gun and Wand Assembly 45
Dial Kleen Nozzle 45
ELECTRICAL 46
Power Supply Requirements 46
Testing Voltage 46
Continuity Testing 46
Circuits 47
Testing Relay Points 47
Testing Solenoid Coil 47
Testing Transformer and Relay 47
Testing Switch 48
Switch Replacement 48
Replacing Soap Valve Coil 48
Wiring Diagrams 48
BTC 60 48
BTC 65A, BTC 65AC 48
BTC 100A, BTC 100AC 49
BTC 150A, BTC 150AC 50
BTC 300A, BTC 300AC 50
SPECIAL TOOLS 51

SAFETY SUGGESTIONS

Before operating or repairing any Ford High Pressure Washer, you should be completely familiar with the following safety precautions:

Read the operator's manual in its entirety before attempting the operation of Ford High Pressure Washer.

The service cord is equipped with a grounding prong. DO NOT REMOVE OR BYPASS THIS PRONG. BE SURE TO PLUG UNIT INTO AN OUTLET THAT IS PROPERLY GROUNDED AND WILL ACCOMMODATE A 3 PRONG MALE PLUG.

Do not use an extension cord with this machine.

Disconnect the service cord from the electrical outlet before removing the case top.

Do not direct the spray toward any part of the body or clothing.

Do not allow water to enter the machine case.

Do not run acids or aeromatic solvents through the machine.

Do not attempt to service the machine wile the pump and motor are running.

When the washer is fully primed and running, activating the trigger will create a kickback on the gun. This kickback should be anticipated.

Do not operate this machine with the case top removed.

If it is essential that an extension cord be used, be certain that is is grounded. Do not allow the connection between the extension cord and the power supply cord to lie in or come in contact with water.

FAILURE TO FOLLOW THE ABOVE INSTRUCTIONS COULD RESULT IN A SEVERE ELECTRICAL SHOCK.

PRESSURE WASHERS

Feature	BTC 60	BTC 65A BTC 65AC	MODEL NO. BTC 100A BTC 100AC	BTC 150A BTC 150AC	BTC 300A BTC 300AC
Nozzle	Single Jet 40°	Dual Jet 0° & 40°	Dual Jet 0° & 40°	Dual Jet 0° & 40°	Dual Jet 0° & 40°
Internal Waterbreak	No	Yes	Yes	Yes	Yes
Wheels	5"	6"	8"	10"	10"
50 Ft. Electric Cord	Yes - 16 Ga.	Yes - 16 Ga.	Yes	Yes	Yes
Detergent Container	1-1 Gal.	1-2½ Gal.	1-2½ Gal.	1-2¼ Gal.	2-2½ Gal.
Plastic Dipped Handle	Yes - Aluminum	Yes - Aluminum	Yes - Steel	Yes - Steel	Yes - Steel
Hose Length	10'	20'	30'	30'	50'
Spring Guard On Hose	No	No	Yes	Yes	Yes
Gun Type	Flow Thru	Safe-T-King Man.	Safe-T-King Elec.	Safe-T-King Elec.	Safe-T-King
Pumps P.S.I. (Minimum)	500	500	650	750	1000
Pump Operating Hours (Avg.)	500	500	2000	2000	2000
Front Support	2 legs	2 legs	1 caster	1 caster	2 casters
Motor HP	¾	¾	1 HP Special	1.5	3
Flow Meter	No	Yes	Yes	Yes	Yes
Relief Valve Pop Off Setting	No R.V.	800-900	950-1050	1000-1100	1300-1450
Variable Soap Adjustment	Yes	Yes	Yes	Yes	Yes
Minimum Incoming Water Pressure	15 psi	15 psi	15 psi	15 psi	25 psi

GENERAL
SERIAL AND MODEL NUMBERS

The serial and model numbers are located on the bottom case at the rear of the machine. All models, except BTC 60, serial number 225,000 and up are equipped with internal waterbreaks.

LUBRICATION

Component	Capacity	Type of Lubricant
Pump -	Once every 500 hours use needle gun. NOTE: Do not overgrease. This will allow dirt and dust to accumulate in grease and shorten life of bearings.	Use and SAE multi-purpose type grease.
Pump Crankcase -	6 oz. (0.18 l) to center of window 12 oz. (0.35 L) to center of window 22 oz. (0.65 L) to center of window	Use SAE 30 non-detergent engine oil.
Pump Grease Cup and Cap -	Keep filled (turn down ½ turn every 50 running hours).	Use an SAE multi-purpose type grease.

TUNE-UP

Perform all the tune-up steps to put the high pressure washer to top operating condition if major disassembly and repair is not required.

Check Water Inlet Screen ..... See Operator's Manual

Check Reservoir Pickup Hose Screen ..... See Operator's Manual

Inspect Check Valve ..... Page 42

Check Reservoir Pickup Hose for Kinks ..... Page 22

Check Reservoir Pickup Hose for Excessive Wear and Cracks .....

Check Drive Belt for Wear, Fraying, or Cracks .....

Check Belt Adjustment ..... Page 30-39

Check Solenoid and Coil ..... Page 47

Check Nozzle Pressure ..... Page 14-15

Check All Wiring for Loose Connections and Cracked Insulation .....

Check Hoses For Cracks and Excessive Wear .....

Change Oil in Crankcase ..... See Operator's Manual

Lubricate Pump ..... See Operator's Manual

Check Case for Cracks .....

Check Grease Cup and Cap for Adequate Grease ..... See Operator's Manual

TORQUE VALUES

MODEL NO.	BTC 60 BTC 65A BTC 65AC	BTC 100A BTC 100AC	BTC 150A BTC 150AC	BTC 300A BTC 300AC
Cylinder head bolts	80 inch-lbs.	125 inch-lbs.	125 inch-lbs.	125 inch-lbs.
Pump and/or discharge manifold nuts	DNA	125 inch-lbs.	125 inch-lbs.	150 inch-lbs.
Pump connecting rod screws	DNA	50 inch-lbs.	50 inch-lbs.	50 inch-lbs.

MODEL DESIGNATION

MODEL NO.	GPM	PSI (Operating)
BTC 60, BTC 65A, BTC 65AC	1.8	500 min.
BTC 100A, BTC 100AC	2.2	650 min.
BTC 150A, BTC 150AC	2.5	700 min.
BTC 300A, BTC 300AC	4.0	1000 min.

DESIGN USE

MODEL NO.	OPERATION	USE
BTC 60, BTC 65A, BTC 65AC	Intermittent	Farm and home
BTC 100A, BTC 100AC	Continuous	Light industrial
BTC 150A, BTC 150AC	Continuous	Industrial
BTC 300A, BTC 300AC	Continuous	Heavy industrial

⚠ FORD PRESSURE WASHERS MUST NOT BE OPERATED MORE THAN FIVE (5) MINUTES WITH FLOW SHUT OFF AT GUN OR PUMP DAMAGE MAY RESULT.

CHEMICALS

USE ONLY FORD OR FORD AUTHORIZED CHEMICALS TO INSURE PROPER OPERATION OF PROPORTIONER ASSEMBLY.

DO NOT RUN DEGREASER THROUGH MACHINE OR SEAL DAMAGE MAY RESULT.

CHEMICAL MIXTURE

WATER TYPE	HARDNESS	DETERGENT/WATER
Soft	0-5 grains of hardness	1 pound/2.5 gallons
Normal	5-10 grains of hardness	1-1.5 pounds/2.5 gallons
Hard	10 grains of hardness	1.5-2 pounds/2.5 gallons

NOTE: ADD DETERGENT TO WATER, NOT REVERSE.

USE CORRECT AMOUNT OF DETERGENT. INSUFFICIENT OR EXCESSIVE AMOUNTS OF DETERGENT WILL AFFECT OPERATION OF PRESSURE WASHER AND CLEANING EFFICIENCY.

PRINCIPLES OF OPERATION
FORD HIGH PRESSURE WASHERS
SERIAL NUMBER 225,000 AND UP (EXCEPT BTC 60)

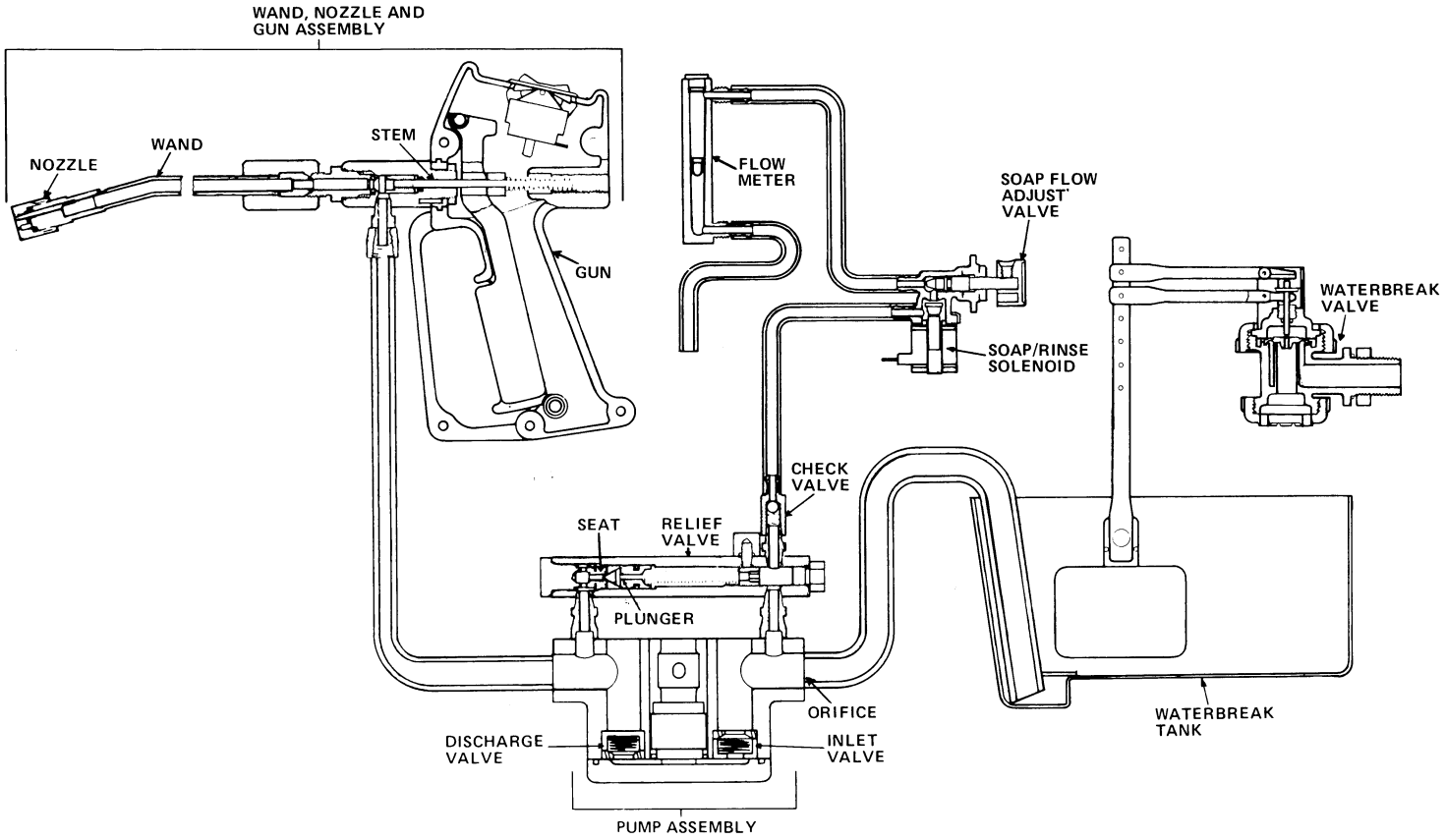

Figure 2 System Identification

All Ford Pressure Washers, Serial No. 225,000 and up are equipped with an internally mounted waterbreak. The purpose of the waterbreak is to prevent the possibility of cleaning chemicals or unclean water being drawn from the high pressure washer into the water supply system and contaminating it.

Ford High Pressure Washers, Serial No. 225,000 and up, are similar to previous models in that they are made up of six basic sub-assemblies: the electrical system, proportioning system, the pumping system, the relief system, the gun and w and assembly, and the nozzle. Only the proportioning system is radically different from the system used on high pressure washers prior to Serial No. 225,000.

The electrical system consists of the motor, switches, and the wiring.

The proportioning system on machines with the internal waterbreak is composed of five different subassemblies: the waterbreak valve, the waterbreak tank and orifice, soap valve, the flow meter, and the soap flow adjust valve. (On the electrically controlled machines, the soap valve and soap flow adjust valve are combined in one assembly.) The purpose of the proportioning system is to meter chemical into the incoming water at a rate controlled by the operator or to stop the flow of chemcals completely when rinse water is desired.

The purpose of the pump is to take incoming water and boost the pressure to a specific pressure at the nozzle. Nozzle pressure ranges from 500 psi to 1,300 psi, depending on the model of the machine and the model of pump used.

The relief valve is used on all Ford High Pressure Washers except the BTC 60. The purpose of the relief valve is to relieve the excess pressure that builds up when the water flow is stopped at the nozzle, due to the nozzle becoming plugged or the control gun being closed. The relief valve is mounted on the pump. Attached to the relief valve on all models with relief valve is the check valve. The purpose of the check valve is to prevent the back flow of water to the detergent container when the relief valve is open.

The wand and control gun provide a means of starting and stopping the flow of water at the nozzle (except on the BTC 60 which has a flow through gun). The wand also provides a means of directing the spray from the nozzle. This assembly is located at the discharge end of the hose.

The purpose of the nozzle is to provide a specific size orifice for the pump to force the liquid through. The nozzle is always located at the end of the wand. Each machine has its own specific nozzle orifice size.

Machine Cycles

Ford High Pressure Washers with internal waterbreaks, operate on 4 cycles:

1. The rinse cycle.
2. The soap cycle.
3. The relief cycle.
4. Off cycle.

To operate properly, these machines must be connected to an adequate water supply which provides more water than the machine volume rating at an incoming pressure of at least 15 psi (25 psi for BTC 300A & BTC 300AC). This will insure that the pump does not draw water from the waterbreak tank faster than water can enter through the waterbreak valve. As with previous Ford High Pressure Washers, a vacuum condition is created by restricting the amount of water available to the pump. It is this vacuum that pulls liquid from the detergent container and through the proportioner. This vacuum is created by a restricting orifice in the inlet hose that runs from the waterbreak tank to the pump.

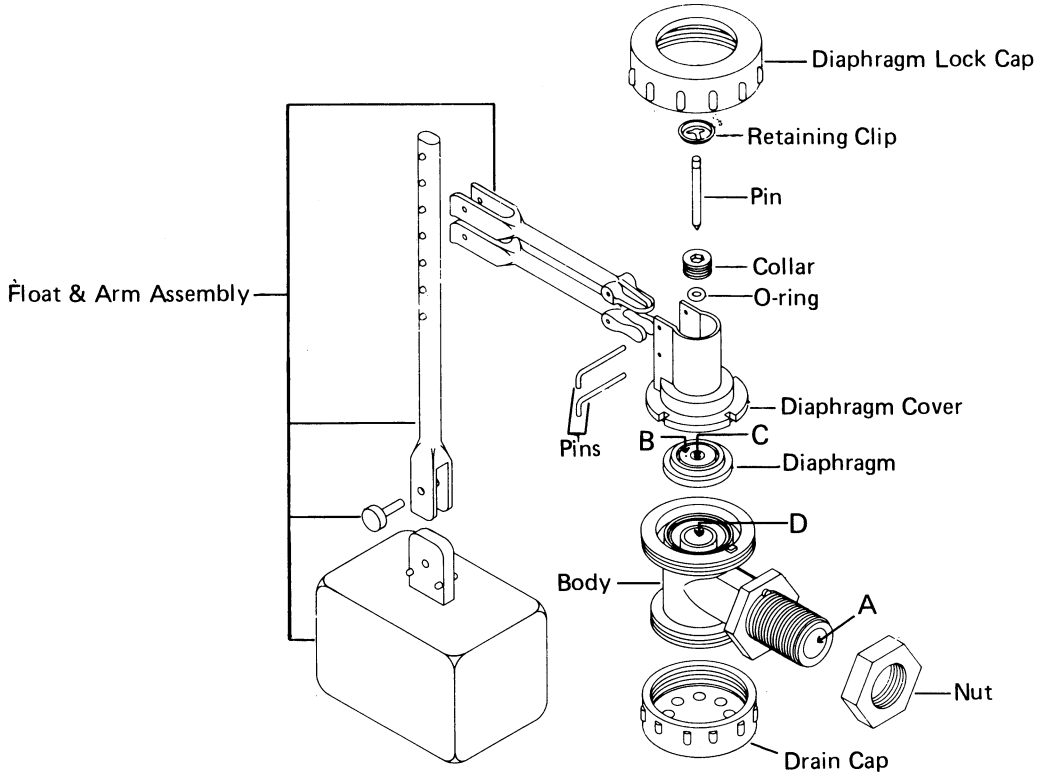

Figure 3 Waterbreak Valve

Waterbreak Valve

The waterbreak valve serves two purposes:

1. To maintain a constant supply of water in the waterbreak tank.
2. To prevent the back flow of liquid from the pressure washer into the water supply system.

These functions take place regardless of the machine cycle. The back flow of liquid from the pressure washer into the water supply line is prevented by the open air separation which exists between the surface of the water in the reservoir and the drain cap on the waterbreak valve.

The pump draws its water requirements from the waterbreak reservoir. As the water level in the reservoir drops, the float moves downward, opening the valve, and allowing more water to enter the reservoir through the waterbreak valve from the garden hose which is attached to a pressurized water source. When the gun is closed, with the pump and motor shut off, the water level in the reservoir rises to a pre-determined level. At that level, the float has risen to a point where it closes the valve and stops the flow of incoming water.

PRINCIPLE OF OPERATION - HYDRAULIC FLOW OF THE INTERNALLY MOUNTED WATERBREAK VALVE USED ON FORD HIGH PRESSURE WASHERS, S/N 225,000 AND UP

When the float and arm assembly are in the down position, water enters the valve at Point A. The lever action of the float and arm assembly against the retaining clip and pin lifts the pin away from the diaphragm and opens port C in the diaphragm. The incoming water pressure against the bottom face of the diaphragm lifts the diaphragm off of its seat in the body of the waterbreak valve. Some water does bleed through the small port B in the diaphragm into the area of the diaphragm cover. Because the larger port C is open, water can drain through the diaphragm and

back into the main body. There is equal pressure on both sides of the diaphragm. Water flows through port D in the body down through the drain cap. The drain cap is designed so that it breaks up the flow of the water entering the waterbreak tank and prevents excessive turbulance in the tank. As the water level in the tank rises, the lever action of the float arm assembly pushes the pin down into the larger port C in the diaphragm and seals it. Incoming water, which is bleeding through port B, pushes the diaphragm down and seals it over port D.

As the water level in the tank drops, the lever action of the float arm assembly lifts the pin away from port C in the diaphragm. This allows the water on the top side of the diaphragm to drain through port C and port D and the incoming water pressure through port A pushes the diaphragm off seat, which opens the valve and allows water to flow through port D down through the drain cap and into the waterbreak tank.

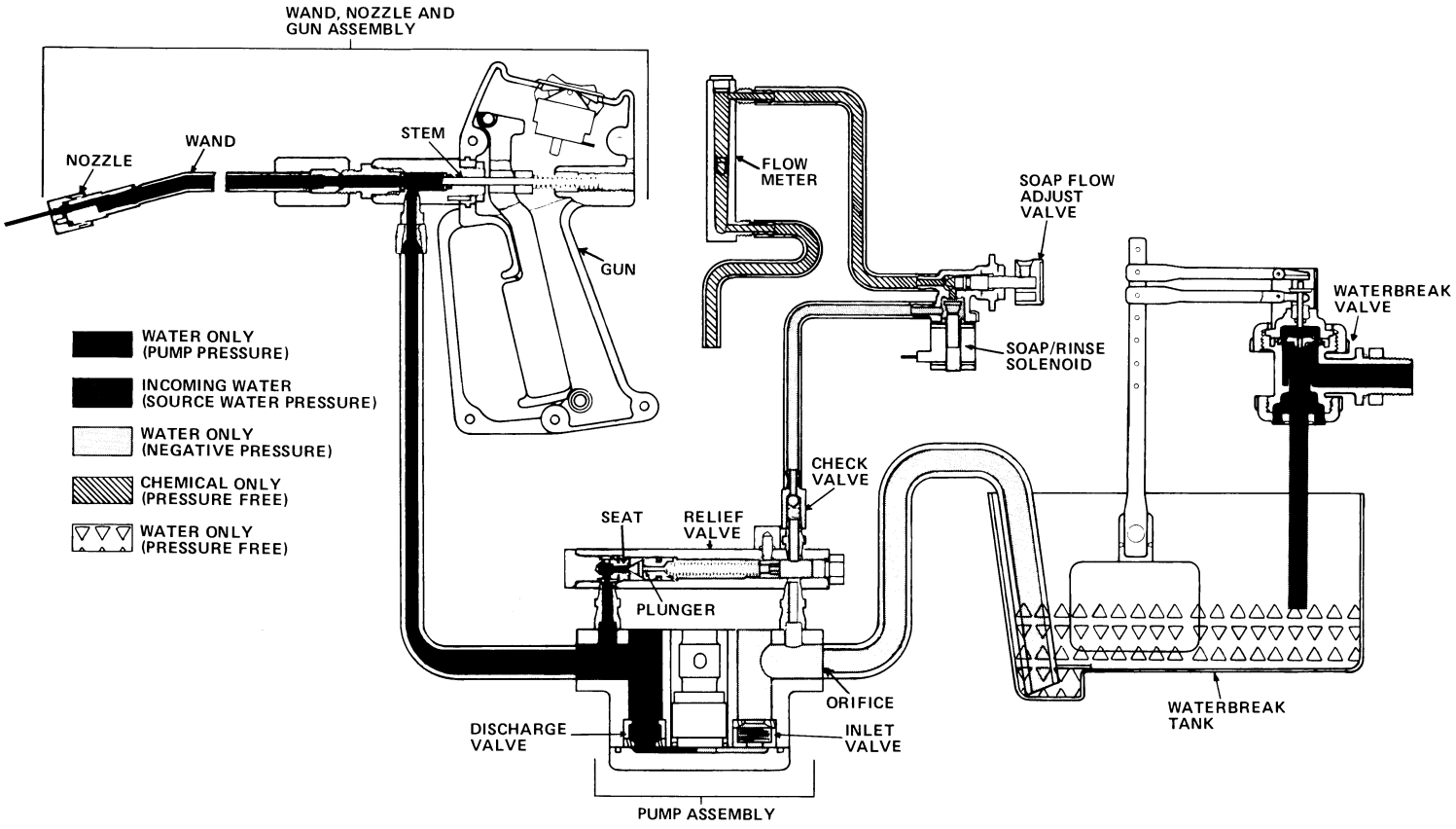

Figure 4 Rinse Cycle

The Rinse Cycle

Pumps used on Ford High Pressure Washers are positive displacement pumps. In a positive displacement pump a constant amount of water fills the cylinder each time the piston or plunger moves back. Likewise, a constant amount of water is displaced from the cylinder each time the piston moves in. Thus, given a constant incoming water supply available to the pump and the pump turning at a constant speed, the amount of water displaced by the pump will be equal over equal lengths of time. If the amount of incoming water to the pump is restricted so that is is less than the amount that the pump displaces, a negative pressure or vacuum condition will be created on the inlet side of the pump. It is this negative pressure that draws detergent into the high pressure washer when the soap valve is open.

On Ford High Pressure Washers, Serial No. 225,000 and up, when the pump starts, a vacuum is created. This vacuum is a result of a specially sized restricting orifice which is part of the inlet water hose. The size of this orifice varies from machine to machine.

In the rinse cycle, the soap valve is closed which prevents any soap from being drawn into the pump. The water is being drawn into the piston chamber of the pump through the inlet valve and is pushed out through the discharge valve. Pump pressure forces water through the high pressure hose to the open gun and out the nozzle at high pressure.

The amount of pressure the high pressure washer creates is determined by the volume of water which flows through the nozzle orifice. Because each model high pressure washer has a different water volume output, the nozzle orifice size must be matched to each machine's volume output.

In the rinse cycle, the relief valve is in the closed position. If the nozzle is plugged or the gun is shut off, the relief valve will open. If the relief valve is forced open, water from the pump passes through the relief valve plunger back to the inlet side of the pump and recirculates through the pump and relief valve assembly.

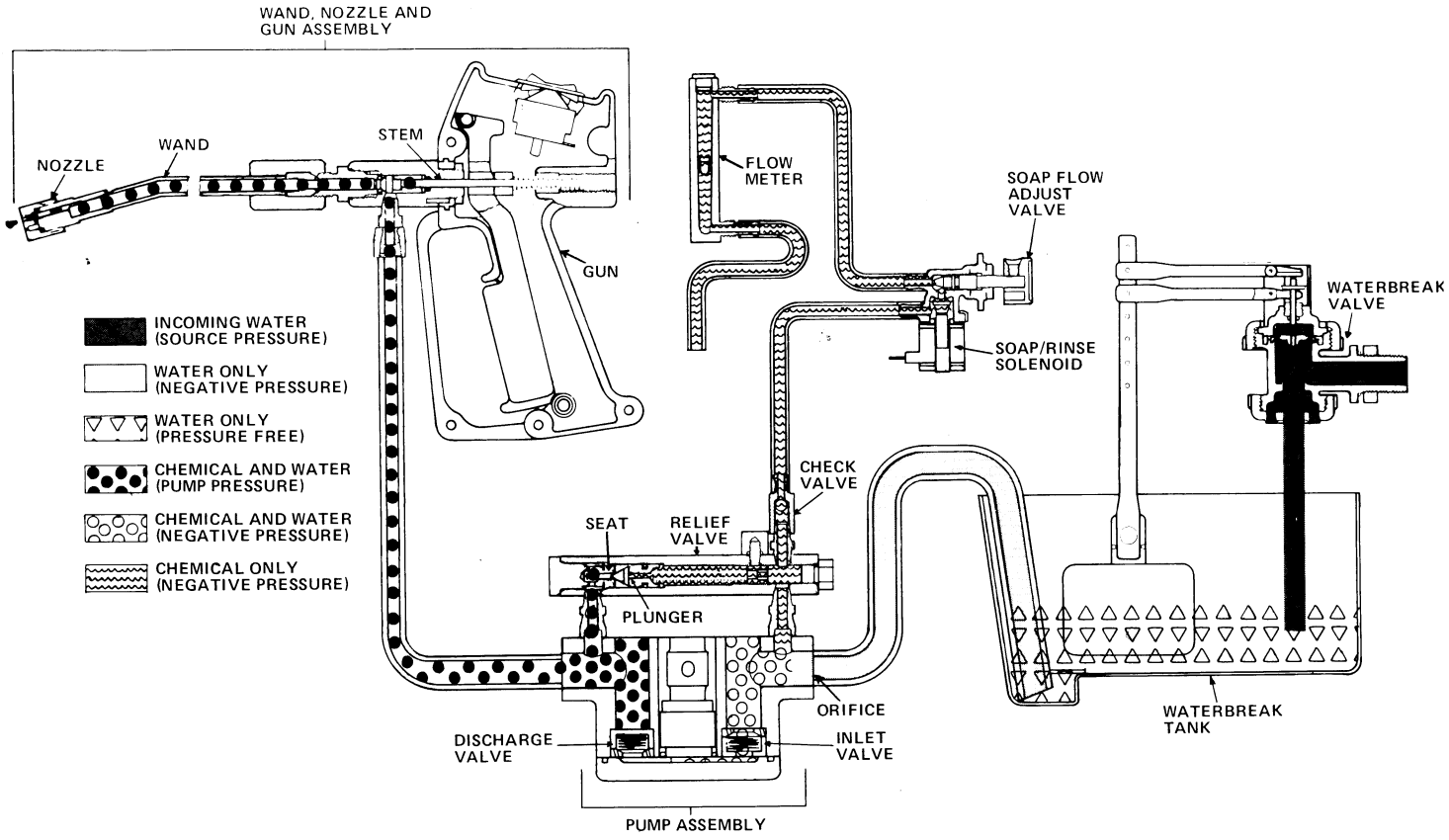

Figure 5 Soap Cycle

Soap Cycle

When the pump starts, it creates a vacuum. This vacuum draws water from the waterbreak tank through the specially sized orifice in the inlet hose and chemical through the soap valve simultaneously. The desired ratio of water to chemical is controlled by turning the soap adjust knob and observing the position of the float in the flow meter. Soap and water mixture is forced through the pump, out the high pressure hose, through the open gun and out the nozzle at high pressure.

The relief valve is in the closed position. If the nozzle should plug or the gun is shut off, the relief valve would open allowing all liquid to recirculate through the pump.

Relief Cycle

In the relief cycle, the pump is running but no liquid is passing through the nozzle. This happens whenever the nozzle is plugged or the flow is shut off at the gun. The excess pressure built up by the pump forces the relief valve open allowing the liquid to recirculate through the pump and open relief valve. This prevents the motor from stalling or from damage occurring to the pump.

Normally, the relief valve is in the closed position. It is held closed by spring tension on the back side of the plunger. This tension is set at the factory so that is takes 300 to 350 psi above the nozzle pressure to open the relief valve. In the closed position, only the very tip of the relief valve protrudes through the valve seat exposing only a small portion of the total surface area of the plunger to this high pressure. The moment high pressure overcomes the spring tension and the relief valve begins to open, the entire surface of the plunger is exposed to pressure. Because pressure is pushing against a larger surface area, smaller amount of pressure is needed to hold the relief valve open than it took to open it initially. This means that the water recirculating through the pump in the relief position is doing so at low pressure. This unique design feature is patented.

The check valve assembly, which is attached to the relief valve, prevents the pump from pushing liquid back into the chemical reservoir during relief cycle.

The instant the flow of liquid through the nozzle resumes there is a drop in the pressure against the face of the relief valve plunger which allows the spring to push the plunger back into the relief valve seat. Because liquid can no longer recirculate through the relief valve, the pump forces all liquid through the nozzle where it instantaneously developes normal nozzle pressure.

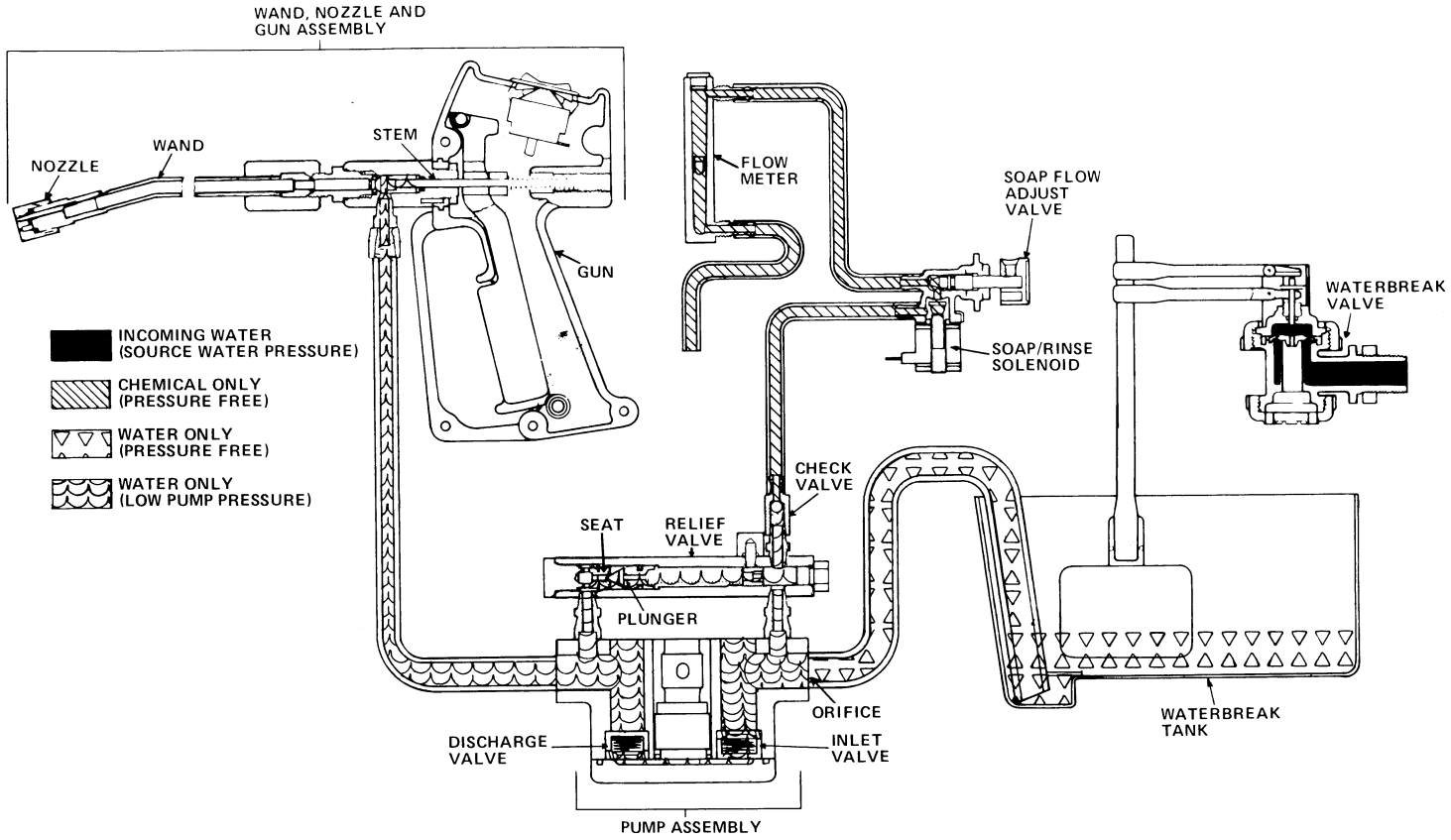

Figure 6 Relief Cycle

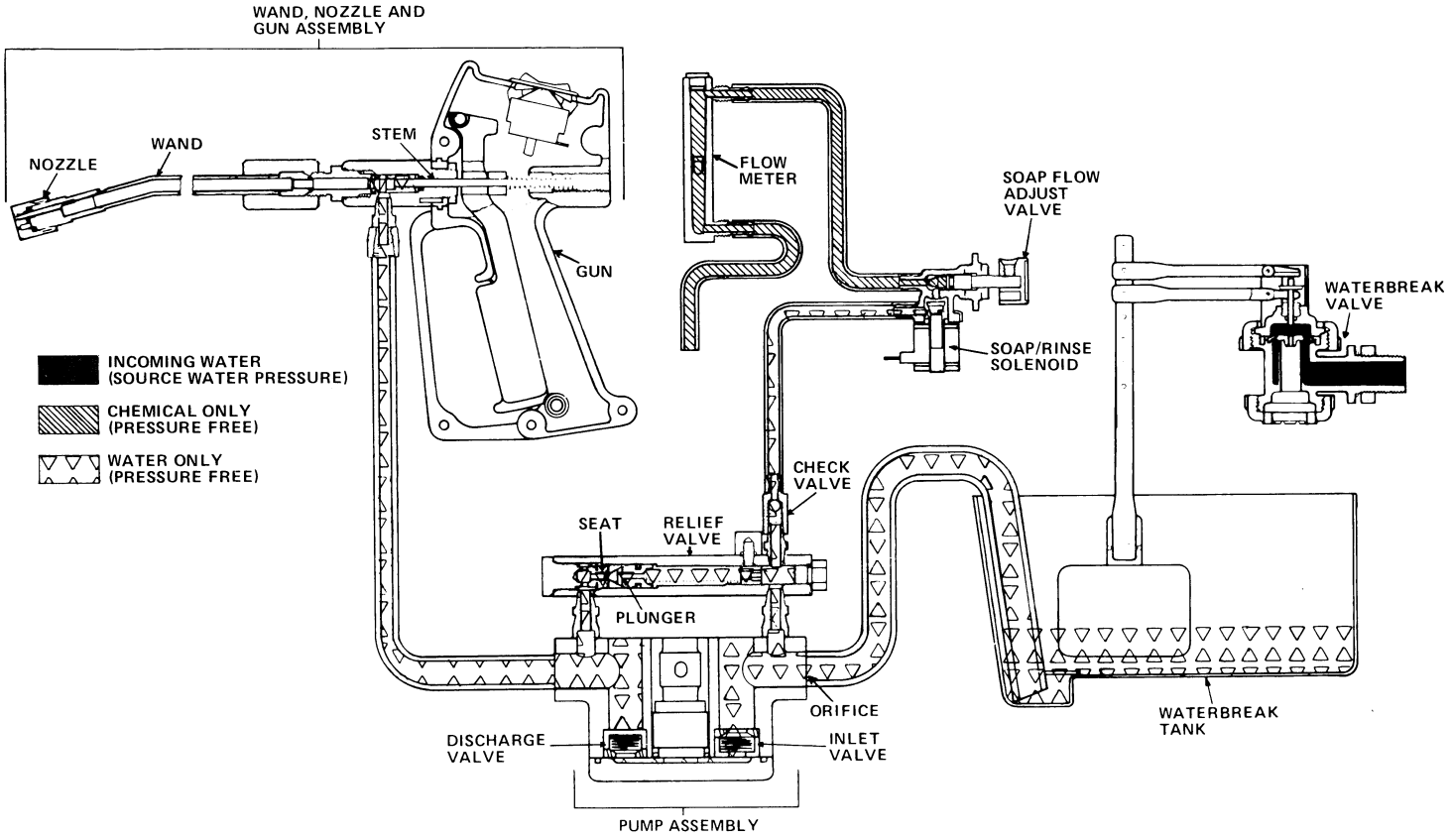

Figure 7 Off Cycle

Off Position

In the off position, the mxotor and pump are not operating. Water pressure from the water supply source extends only to the waterbreak valve. There is no water pressure present in the other parts of the machine.

Priming

Because a vacuum condition is necessary in Ford High Pressure Washers in order to have proper pressure and detergent flow, it is absolutely necessary that all air be removed from the system. Because if there is a free air space between the drain cap of the waterbreak valve and the water surface in the waterbreak tank, any air in the water supply system will escape at that point. However, any air that enters the system in the end of the inlet hose in the waterbreak tank to the inlet valve of the pump will prevent proper operation of the machine.

Removing air from the system is commonly referred to as priming.

Priming Procedure

The priming procedure is the same for all Ford High Pressure Washers, Serial No. 225,000 and up, except the BTC 60. Because the BTC 60 does not have a trigger operated control gun or removable wand and nozzle assembly, priming may be expected to take longer than on other machines due to the presence of back pressure created by the nozzle.

1. Check the condition of the inlet water screen. If the screen is clogged or corroded, clean and replace as necessary.
2. Connect good grade garden hose (5/8 I.D. minimum) to the water supply faucet. Connect the other end of the hose to the inlet fitting on the machine.
3. Turn on the water faucet all the way.
4. Remove the wand. This will reduce back pressure on the pump and make it easier for the air inside the machine to move out with the water.
5. Plug power supply cord into a properly grounded outlet.

WARNING: DO NOT REMOVE OR BYPASS THE GROUND PIN ON THE POWER SUPPLY CORD.

WARNING: DO NOT USE AN EXTENSION CORD WITH FORD HIGH PRESSURE WASHERS. If it is essential that an extension cord be used, be certain that the connection between the power supply cord and the extension cord does not lie in water.

6. Grip the gun and depress the trigger. Push the switch to start the motor and move the control lever to the rinse position on manual machines.
7. Allow water to flow through the gun for approximately 30 seconds.
8. Release the trigger for 2-3 seconds and repeat step 7. Repeat this procedure 4 to 5 times until all air is expelled from the system and the pump is running smoothly.

NOTE: On the Model BTC 60 step 8 does not apply and you should continue with step 7 until all air is expelled from the system and the pump is running smoothly.

9. Switch the machine to the soap cycle and again start and stop the flow of water from the gun as in step 8 until all air is expelled from the soap tube and soap proportioner and the pump is running smoothly.

NOTE: In order for the machine to operate properly, it must be connected to an adequate water supply. If the machine fails to prime, Make sure that the water supply provides the proper pressure and volume as shown in the specifications on page five.

Storage

If the washer is to be stored in areas where freezing is possible, the following procedure should be followed:

1. Mix a solution of ½ permanent anti-freeze and ½ water (approximately 1 qt. or 1 L total solution).

WARNING: If the washer is to be used in areas where food is prepared, consumed or stored or where sanitation is required, use a non-toxic anti-freeze, labeled U.S.P. Food Grade AntiFreeze.

2. Leave the garden hose attached to both the water faucet and the inlet fitting on the machine. Be sure the water is turned on.
3. Place the detergent tube in the anti-freeze solution.
4. Grip the gun, depress the trigger, and operate the machine in the soap cycle until the anti-freeze solution is gone.
5. Turn the water faucet off and remove the hose from the inlet fitting.
6. Grip the gun, depress the trigger, and operate the machine on the rinse cycle unti it loses pressure.
7. Release the trigger and turn the machine off.
8. Disconnect the electrical cord.
9. Loosen the screws that attach the case top to the case bottom.
10. Remove the detergent container from the cavity in the case top and remove the case top. (Be careful to prevent damage to the detergent pickup tube.)
11. Mix another 1 qt. (1 liter) solution of ½ permanent anti-freeze and ½ water.
12. Pour this mixture into the waterbreak tank.
13. Replace the case top and tighten screws.
14. Plug the electrical cord into an outlet.
15. Grip the gun, depress the trigger, and operate the machine in the rinse cycle. The machine will gradually build up pressure and then again lose pressure. when the pressure decreases, turn the machine off.

DIAGNOSIS AND TESTING

Two test tools are needed for diagnosing service problems with Ford High Pressure Washers, Serial No. 225,000 and up. Nozzle tip and relief valve tester.

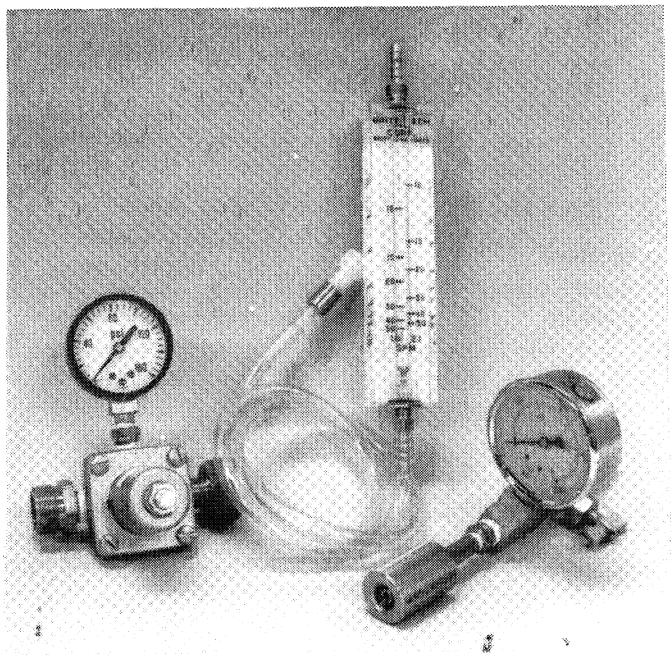

Figure 8 Test Tools

This two-in-one tester tells you exactly how much pressure is at the nozzle and what pressure the relief valve is popping off at. Just loosen the knurled nut on the wand, remove the wand, connect the tester to the gun assembly and replace the wand on the tester.
Using nozzle tip and relief valve tester to check nozzle pressure.

IMPORTANT: Machine must be primed to obtain accurate reading. The air in the system will give inaccurate or misleading readings.

1. Connect the nozzle tip and relief valve tester to the gun as described above.
2. Open the line valve completely and read the pressure gauge while the machine is operating on the rinse or soap cycle. Reading obtained is the pressure at the nozzle tip. **NOTE:** Pressure testers that do not have liquid filled gauges have an adjustable damper valve to steady the needle.

Using the nozzle tip and relief valve tester to test relief valve pop off pressure.

IMPORTANT: Machine must be primed to obtain an accurate reading. Air in the system will give inaccurate or misleading reading.

1. Remove wand.
2. Install tester on gun.
3. With machine operating, slowly close line valve which restricts the flow of water through the tester.
4. Observe the highest pressure reading before sudden pressure drop. The highest reading will be pop-off pressure where the relief valve opens.

IMPORTANT: Turning the restricting valve too slowly may affect the motor torque and give an inaccurate reading. Turning the restricting valve too fast may make it difficult to read the pop off pressure on the gauge.

Incoming Water Pressure Regulator

Incoming water pressure regulator is necessary to check the adequacy of the incoming water pressure necessary for the waterbreak valve to operate properly.

Using the incoming water pressure regulator

1. Connect the regulator between the inlet fitting on the machine and the pressurized water supply hose.
2. Start machine and prime it.
3. With the machine running and water flowing, loosen lock nut on regulator adjust screw and turn screw in (clockwise).
4. If gauge reads less than the minimum incoming water pressure for the machine shown in the specification section when the adjust screw is turned completely in, the incoming water pressure is inadequate for proper waterbreak valve operation.

⚠ CAUTION: Stop turning the adjust screw if gauge reading reaches maximum recommended incoming water pressure shown in the specification section. If this occurs incoming water pressure is too high for proper operation and a regulator must be installed on the incoming water line.

Diagnostic Procedure

Before any repairs or adjustment is attempted, basic diagnosis should be made to determine which section of the machine is not working properly.

There are four basic types of pressure involved in pressure washer operation:

Low Pressure - This is normally the incoming water pressure. It involves water faucets, faucet hardware, garden hose and garden hose fittings, inlet water fittings and all hoses and connections from the inlet fitting of the machine through the waterbreak valve.

Static Pressure - (0 Pressure) - There is no pressure present in the waterbreak tank or detergent container.

Negative Pressure - (Vacuum) - Vacuum is created in the area between the waterbreak tank outlet and the inlet valves of the pump. This includes the soap valve, detergent tubes, and check valves. The inside of the relief valve, between the relief valve plunger and pump inlet, is also subject to vacuum conditions.

High Pressure - Normally referred to as pump or nozzle pressure. All fittings, connections, hoses, etc. between the pump discharge valve and the nozzle tip are subject to high pressure. The area between the point of the relief valve plunger and pump discharge head is also subject to high pressure. If air is present in the static pressure, negative pressure, or high pressure areas of the machine, the whole operation of the high pressure washer can be affected.

Equipment Recommended For Diagnostic and Testing Procedures

1. Water regulator and gauge with garden hose fittings.
2. Nozzle tip and relief valve tester.

3. Garden hose. Good grade, heavy duty water tight 5/8" minimum I.D. long enough to reach from the faucet to the test area.
4. Scrap hose 12" long which will fit securely over the nozzle of the machine being tested.

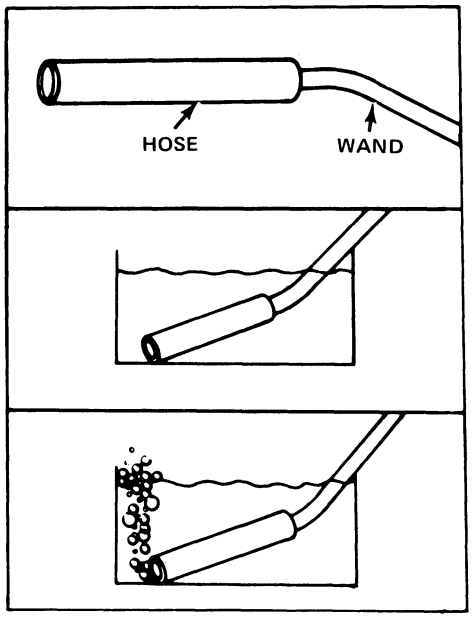

Figure 9 Testing For Air

Testing For Air

1. Prime the machine.
2. Slip the 12" piece of scrap hose over the end of the nozzle.
3. Emerse the nozzle and hose completely in a bucket of water.
4. Operate the washer on the rinse and soap cycle. Look for air bubbles coming from the hose on the end of the nozzle.
5. If air bubbles are present, it indicates air is entering the system somewhere between the outlet of the waterbreak tank and the inlet valves of the pump.

Locating Air Leaks

1. If no air bubbles were present on the rinse cycle but were present in the soap cycle, it would indicate air entering the system in the soap valve section. Remove the case top and check the soap valve for loose connections, cross threading, external cracks, and damaged o-rings, holes in the plastic soap tube or leaks around fittings.
2. If air bubbles were present in both the soap and the rinse cycles, this would indicate air entering the system somewhere between the outlet of the waterbreak tank and the inlet valve of the pump. Remove the case top. Inspect the inside of the case for evidence of water leaks. Pay special attention to water that may be leaking through worn or loose seals in the pump, or water leaking from cracked or cross threaded fittings.
3. If no leaks can be found by inspecting the inside of the machine, turn the machine on in the soap position. **WARNING: Use extreme caution when operating the machine with the cover off. DO NOT ALLOW WATER TO COME IN CONTACT WITH INTERNAL PARTS OF THE MACHINE. KEEP HANDS AND CLOTHING CLEAR OF MOVING PARTS.** Observe the action of the float valve in the waterbreak tank. Make sure that air is not entering the system as a result of insufficient water flow from the float valve into the waterbreak tank. Also, look for leaks that may occur when water is flowing through the system.

Testing Nozzle Pressure

Nozzle pressure is determined by the amount of water being forced through the nozzle orifice. Before testing nozzle pressure, be sure the following conditions are met:

1. An adequate supply of water for the washer.
2. Washer is properly primed.
3. Adequate electrical current available at the machine. Plus or minus 10% of 120 volts or plus or minus 10% of 230 volts depending on machine model.
4. No leakage between pump and nozzle.
5. No. belt slippage.

Pressure Test and Evaluation

Perform the nozzle pressure test as outlined previously in this section.

PRESSURE GAUGE READINGS FOR NORMAL SATISFACTORY OPERATION

BTC 60, BTC 65A BTC 65AC	BTC 100A BTC 100AC	BTC 150A BTC 150AC	BTC 300A BTC 300AC
500-550 PSI	650-700 PSI	700-750 PSI	1000-1100 PSI

If the pressure is between the following approximate range, it would indicate the nozzle is worn. Replace the nozzle and recheck the pressure.

# INDICATES WORN NOZZLE

BTC 60, BTC 65A BTC 65AC	BTC 100A BTC 100AC	BTC 150A BTC 150AC	BTC 300A BTC 300AC
400-450 PSI	550-600 PSI	600-650 PSI	850-950 PSI

Approximate pressure readings in the following range could indicate water passing through the relief valve or low pump displacement.

LOW WATER VOLUME

BTC 60, BTC 65A BTC 65AC	BTC 100A BTC 100AC	BTC 150A BTC 150AC	BTC 300A BTC 300AC
250-375 PSI	250-450 PSI	250-500 PSI	250-750 PSI

Pressure readings higher than normal but lower than relief valve pop off pressure would indicate:
Partially plugged nozzle.
'ncorrect sized nozzle.

TROUBLE SHOOTING GUIDE

TROUBLE	POSSIBLE CAUSE	REMEDY	MODELS
Motor will not run.	3 amp fuse blown.	Page 46	All ex. BTC 60, BTC 65A, BTC 65AC
	Washer not plugged in.		All
	Motor burned out.*		All
	Motor overheated (low voltage).	Page 46	All
	Transformer burned out (high voltage).	Page 47	All ex. BTC 60, BTC 65A, BTC 65AC
	Wire disconnected at electrical container.		All ex. BTC 60, BTC 65A, BTC 65AC
	Electrical power supply has been interrupted.	Check circuit breaker or fuse.	All
	Loose connection between switch and relay.	Page 46	All ex. BTC 60, BTC 65A, BTC 65AC
	Switch not working.	Page 46	All
	Relay not working (points burned).	Page 47	All ex. BTC 60, BTC 65A, BTC 65AC
	Defective 5-conductor wire.	Page 46	All ex. BTC 60, BTC 65A, BTC 65AC
Motor shuts off.	Overheated (low voltage).	Page 46	All
	Too light of extension cord.	Page 46	All
	Electrical supply shut off because of blown fuse or breaker switch.		All
	Service cord pulled out of plug.		All
	3 amp fuse burned out in electrical container.	Page 46	All ex. BTC 60, BTC 65A, BTC 65AC
	Transformer burned out.	Page 47	All ex. BTC 60, BTC 65A, BTC 65AC
	Lose wire.		All
Motor overheats and and cuts off.	Excessive discharge pressure caused by partially clogged or incorrect nozzle size.	(See operator's manual)	All
	Operating unit on too light of an extension cord.	Page 46	All
	Low voltage at electrical outlet.	Page 46	All
	Relief valve stuck closed when nozzle is shut off.	Page 40	All ex. BTC 60
Motor will not shut off	Faulty switch.	Page 46	All
	Relay contacts stuck closed.	Page 47	All ex. BTC 60, BTC 65A, BTC 65AC
No fluid at nozzle.	Plugged inlet screen.	(See operator's manual)	All
	Water tap not on.		All
	Plugged nozzle.	Page 45	All
	Waterbreak valve not operating.	Page 23	All except BTC 60
	Proportioner valve not open.	Turn knob.	BTC 60
Gun will not open when trigger is pulled or lever is pushed.	Safety lock on.	Release lock.	All except BTC 60
	Collar on stem assembly is loose or too far away from trigger.	Page 43	All except BTC 60

* Motor requiring service must be sent to manufacturer's nearest repair station.

TROUBLE	POSSIBLE CAUSE	REMEDY	MODELS
Trigger moves when safety lock is on.	Trigger worn.	Page 43	All except BTC 60
	Safety lock worn.	Page 43	All except BTC 60
Can not get machine primed.	Not removing wand during priming.		All except BTC 60.
	Loose or leaking connections at water faucet.		BTC 60
	Hole in garden hose.		BTC 60
	Air coming through water supply system.		BTC 60
	Loose, damaged or cross threaded connections in machine		All
	Hole in soap tube.		All
	Soap tube not submerged in liquid.		All
	Not activating the relief valve by stopping and starting the flow at the gun several times.		All except BTC 60
	Grease cup is empty.		All except BTC 60, BTC 65A, BTC 65AC
	Packing glands loose.		All except BTC 60, BTC 65A, BTC 65AC
	Inadequate water supply.	Page 5	All
	Waterbreak valve not allowing enough water to enter tank.	Page 23	Al except BTC 60
Low nozzle pressure	Water inlet screen clogged.	(See operator's manual)	All
	Nozzle orifice worn.	Test nozzle pressure. Page 45	All
	Incorrect nozzle.	See specs.	All
	Inadequate water supply	(See operator's manual)	All
	Low pump displacement. Worn seals or packing glands loose.	Pages 29-30-33-36	All
	Relief valve stuck open.	Page 40	All except BTC 60
	Faucet not fully open.		All
	Drive belt slipping.	Adjust tension Page 33-36-39	All except BTC 60, BTC 65A, BTC 65AC
	Unit not primed. (Air entering washer).	See priming Page 13	All
	Pump valves not seating properly	Page 32-33-35-38	All
Water flows from nozzle when shut off.	Fluid control gun valve not seating properly.	Page 43	All except BTC 60
Draws from reservoir on "rinse" cycle.	Proportioner solenoid valve not seating properly.	Page 28	All except BTC 60, BTC 65A, BTC 65AC.
	Shorted wire activating proportioner solenoid valve.	Page 28-47	All except BTC 60, BTC 65A, BTC 65AC.

TROUBLE	POSSIBLE CAUSE	REMEDY	MODELS
	Internal crack in proportioner valve.	Page 25-28	All
	Proportioner valve not seating.		BTC 65A, BTC 65AC
Will not draw from reservoir on "soap" cycle.	Reservoir pickup hose out of reservoir.		All
	Reservoir pickup hose pinched.		
	Reservoir pickup hose screen clogged.		All
	Reservoir empty.		All
	Hole in reservoir pickup hose.		All
	Proportioner knob turned too far in.	See operator's manual	All except BTC 60
	Check valve stuck closed.	Page 42	All
	Pump worn (low displacement)	Pages 29-30-33-36	All
	Defective switch	Pages 46	All except BTC 60, BTC 65A, BTC 65AC.
	Washer not primed (air entering washer).	See priming Page 13	All
	Soap valve solenoid coil burned out.		All except BTC 60, BTC 65A, BTC 65AC
Draws too much from reservoir on "soap" cycle.	Proportioner valve adjust screw or knob too far open.	Page 26	All
	Internal crack in proportioner valve.	Page 25-28	All
Will NOT draw enough from reservoir on "soap" cycle.	Reservoir pickup hose screen clogged.		All
	Reservoir pickup hose pinched.		All
	Proportioner valve adjust screw or knob not open enough.		All
Waterbreak reservoir runs empty while machine in operating.	Insufficient flow from garden hose (not enough pressure or volume).		All except BTC 60
	Water faucet not completely open.		All except BTC 60
	Inlet water screen partially plugged.		All except BTC 60
	Garden hose ruptured.		All except BTC 60.
	Garden hose kinked.		All except BTC 60
	Bleed port in valve cap plugged.		All except BTC 60
Reservoir won't fill to desired level.	Float positioned too low on float arm.		All except BTC 60
Machine won't draw from reservoir.	Outlet of reservoir clogged.		All except BTC 60
Pump fluctuates or pulsates.	Air in system		All
	Pump valves not seating properly	Page 32-33-35-38	All
	Grease cup & cap empty.	(See operator's manual)	All except BTC 60, BTC 65A, BTC 65AC.

TROUBLE	POSSIBLE CAUSE	REMEDY	MODELS
	Pump seals loose or worn.	Page 39-30-33-36	All
	Drive belt slipping	Page 33-36-39	All except BTC 60, BTC 65A, BTC 65AC
	Waterbreak tank running empty.	Page 23	All except BTC 60
Pulls grease out of grease cup.	Packing gland loose or v-packing worn.		All except BTC 60, BTC 65A, BTC 65AC
Pushes water out through grease cups.	Use of water in excess of 170 degrees F.		All except BTC 60, BTC 65A, BTC 65AC.
Leaks water around plunger.	Scored plungers		All except BTC 60, BTC 65A, BTC 65AC.
	Loose packing glands.		All except BTC 60, BTC 65A, BTC 65AC.
	Worn V-packings.		All except BTC 60, BTC 65A, BTC 65AC.
Pump body cracked around inlet or discharge port.	Exposed to freezing temperatures.		All
	Overtightening of fittings.		All
Water leaking from center cavity of pump.	Cups worn.		BTC 60, BTC 65A, BTC 65AC.
	O-rings seals damaged.		BTC 60, BTC 65A, BTC 65AC.
	Pump body cracked due to freezing indicated by line cracks.		BTC 60, BTC 65A, BTC 65AC.
	Porous casting indicated by small hole or holes.		BTC 60, BTC 65A, BTC 65AC.
Premature wear on V-packing seals.	Packing gland too tight.		All except BTC 60, BTC 65A, BTC 65AC.
	Abrasives in water.		All except BTC 60, BTC 65A, BTC 65AC.
	Excessive greasing accumulates grit & grime.		All except BTC 60, BTC 65A, BTC 65AC.
	Abrasive material blowing into plunger area of pump.		All except BTC 60, BTC 65A, BTC 65AC.
	Running pump over 5 minutes in relief cycle.		All except BTC 60, BTC 65A, BTC 65AC.
	Running pump dry.		All except BTC 60, BTC 65A, BTC 65AC.
Packing glands back out.	Gland retainer not in place.		All except BTC 60, BTC 65A, BTC 65AC.
	Gland retainer not properly installed.		All except BTC 60, BTC 65A, BTC 65AC.
Gland retainer falls off.	Clip has lost tension.		All except BTC 60, BTC 65A, BTC 65AC.

TROUBLE	POSSIBLE CAUSE	REMEDY	MODELS
	Tension not put on retainer tips.		All except BTC 60, BTC 65A, BTC 65AC.
Oil leaks from crankcase.	Plunger oil seals worn or damaged.		All except BTC 60, BTC 65A, BTC 65AC.
	Drain plug oil seal worn or damaged.		All except BTC 60, BTC 65A, BTC 65AC.
	Crankshaft oil seals worn or damaged.		All except BTC 60, BTC 65A, BTC 65AC.
Pump runs too hot.	Normal during break-in period.		All except BTC 60, BTC 65A, BTC 65AC.
	Packing glands too tight.		All except BTC 60, BTC 65A, BTC 65AC.
	Low on oil.		All except BTC 60, BTC 65A, BTC 65AC.
	Connecting rod caps reinstalled too tight causing excessive drag on crankshaft.		All except BTC 60
Belt slips.	Worn belt		All except BTC 60
	Insufficient tension.		All except BTC 60
	Pump overloaded due to plugged nozzle.		All except BTC 60
	Relief valve set too high. Worn nozzle tip.		All except BTC 60
	Relief valve plunger stuck.		All except BTC 60
Wears belt.	Improper alignment		All except BTC 60
	Damaged pulley.		All except BTC 60

CASE TOP REMOVAL AND INSTALLATION

WARNING: Unplug the machine before starting disassembly.

1. Remove detergent containers.
2. Remove screws from each side of case.
3. Carefully raise top to gain access to connection between soap tube and proportioner or check valve (depending on model). Use pliers to spread hose clamp and pull hose off fitting.
4. Remove case top.

To install case top, reverse removal procedure.

WATERBREAK VALVE
ALL FORD PRESSURE WASHERS SERIAL NO. 225,000 AND UP

Removal and Disassembly

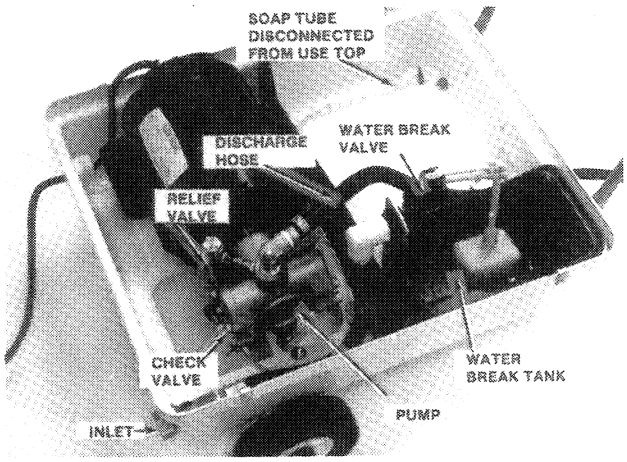

Figure 10 Waterbreak Location

1. Remove float assembly from float arms by spreading tabs on float arms off of pins on float stem.
2. Loosen lock nut.
3. Hold elbow and lock nut with one hand while turning valve assembly out of elbow with the other hand.
4. Turn discharge cap off of waterbreak body.
5. Loosen diaphragm lock cap and lift diaphragm cover off of body.

NOTE: Unless water has been observed leaking from diaphragm around the pin no further disassembly is necessary. You may proceed to inspect the diaphragm and body.

6. Remove control arm pins from diaphragm cover and slip float arms off of diaphragm control pin.
7. Pull control pin from diaphragm cover.
8. Use 3/16 allen wrench to remove control pin guide from diaphragm cap.
9. Remove o-ring from control pin guide.

Inspection and Repair

1. Inspect diaphragm for cracks and wear. Examine o-ring and pin for wear or damage. Replace as necessary.
2. Inspect remaining component parts for condition. Clean rust, sediment, or debris from all parts.

Assembly

1. Place o-ring in diaphragm cover and secure with control pin guide.

IMPORTANT: The control pin guide is the only part of the waterbreak valve that need be tightened with a wrench. All other parts should be HAND TIGHTENED ONLY when reassembling takes place.

2. Snap retaining clip onto pin. Push pin through guide.
3. Place diaphragm lock cap over diaphragm cover.
4. Attach upper and lower float arms to diaphragm cover with control arm pins.

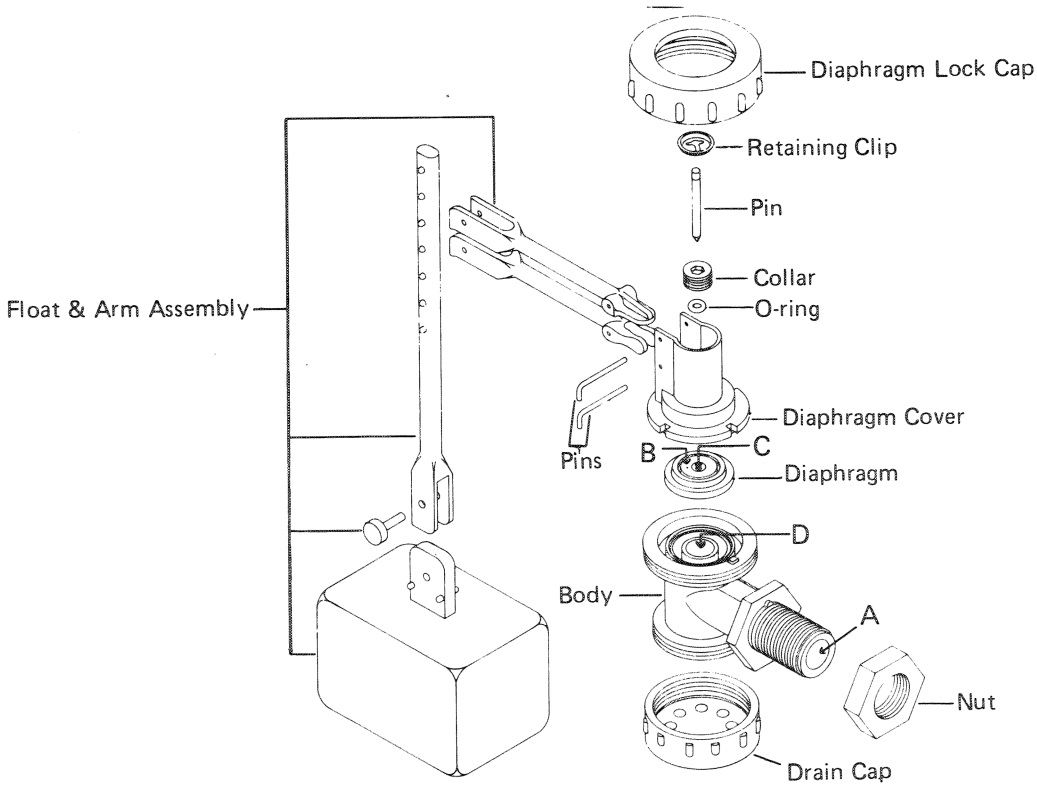

Figure 11 Exploded View, Waterbreak Valve

5. Place diaphragm in waterbreak valve body, making sure diaphragm lays flat in the proper grooves.
6. Position diaphragm cover on valve body and turn diaphragm lock cap onto body hand tight. Turn discharge cap onto body hand tight.
7. Insert threaded stem through waterbreak valve mounting bracket and turn valve into elbow fitting hand tight and secure with locking nut.

IMPORTANT: Make sure valve body and arms are positioned so that the float assembly will move straight up and down when attached to the float arms.

8. Position float on float arms and secure by pushing tabs over pins on float assembly.

IMPORTANT: In its lowest position, float must not rest on waterbreak tank bottom.

PROPORTIONING SYSTEM — BTC 65A, BTC 65AC

The proportioning system on the BTC 65A and BTC 65AC contain three basic components:

1. Soap on-off valve.
2. Soap proportioner valve.
3. Flow meter.

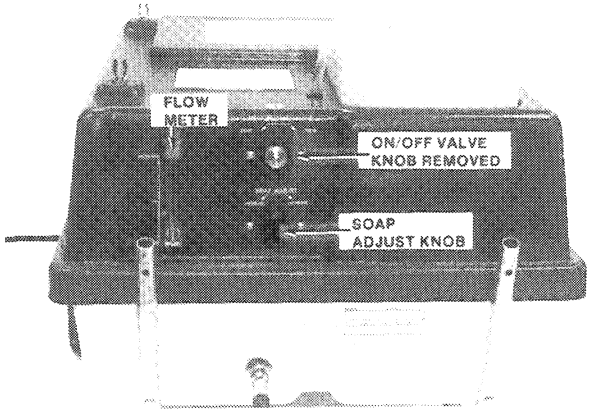

Figure 12
, Proportioner System Component Location

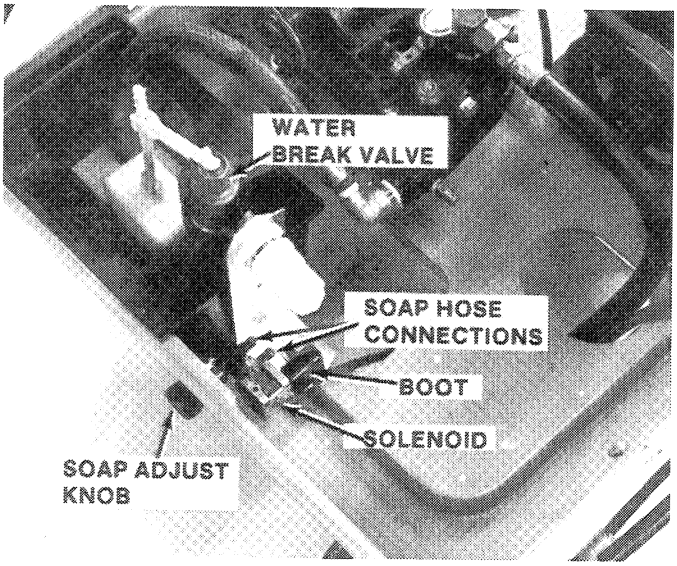

Figure 13
Installation Of Electric Proportioning System
(Inlet Hose Removed)
Flow Meter Is In Case Top & Not Shown

The purpose of the soap on-off valve is to provide a method of starting and stopping the flow of soap into the system. The soap proportioner valve controls the amount of soap entering the system while the flow meter gives the operator a method of determining the relative concentration of the soap and water mixture being discharged from the machine.

Removal and Disassembly Of The Manual Soap Valve

1. Remove the case top.
2. With a pliers, spread the hose clamps and remove the soap inlet and discharge hoses from the valve.
3. Loosen the 1/8" allen set screw in the control knob and pull the knob off the stem.
4. Loosen the screws that hold the valve in the case top and remove the valve.
5. Remove the set screw from the collar.
6. Unthread the collar from the valve body.
7. Pull the collar and stem apart.

NOTE: It is only necessary to remove the entire valve assembly from the case top when the valve body or the complete valve assembly are to be replaced. To remove the collar or stem, it is necessary to complete only steps 3, 5, 6, and 7 above.

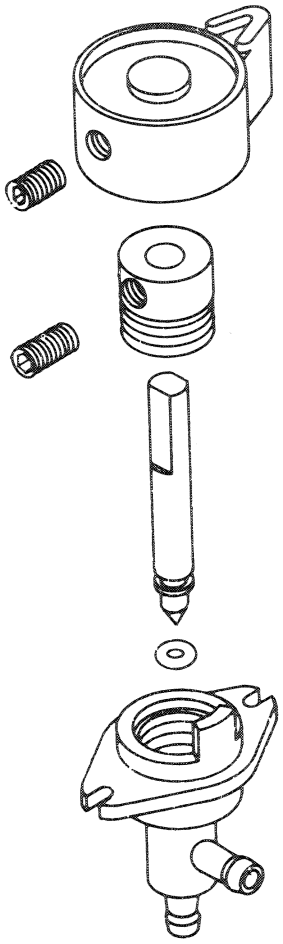

Figure 14 Exploded View, On-Off Soap Valve

Inspection and Repair

1. Inspect the valve body, especially the seat for cracks and wear. Replace as necessary.
2. Inspect the valve stem for wear. Observe the condition of the o-ring. Replace parts as necessary.
3. Observe the conditions of the thread in the collar.

Assembly

1. Position the valve body in the case top with the stop tab towards the bottom and secure with screws.
2. Insert stem through the collar and slide the collar down the steam until it rests against the o-ring.
3. Thread stem and collar assembly into soap valve body by hand.
4. When the collar has been turned clockwise as far as it will go into the soap valve body, turn collar counter-clockwise until the threaded port for the set screw passes the stop tab.
5. Thread the stop screw into the collar but do not tighten.
6. With the stop screw against the stop tab, turn the stem in the collar until the flat sides of the stem are at a 90 degree angle to a line drawn between the screws that hold the valve assembly in place in the case top. Holding the stem stationary, turn the collar counterclockwise until the stop screw is parallel to the line between the two screws. (See figure 15.)

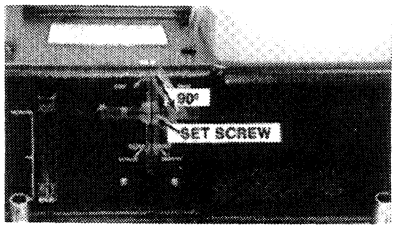

Figure 15 Adjusting On-Off Soap Valve

7. Push the stem down into the valve body until it seats firmly.
8. Turn the stop screw into the collar until it seats firmly against the stem.
9. Slip the control knob over the stem so that the indicator points in the same direction as the stop screw.

Soap Proportioner Removal

1. Remove case top.
2. Remove inlet and discharge hose from soap proportioner valve.

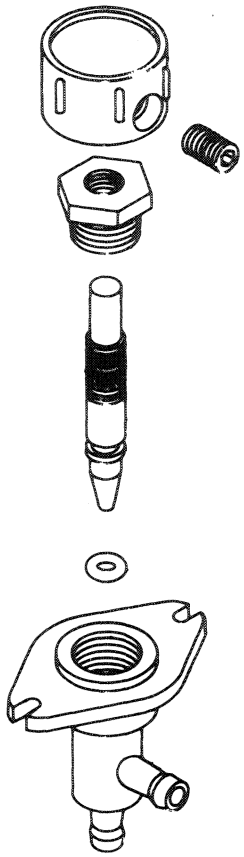

Figure 16 Exploded View, Soap Proportioner

3. Loosen set screw and slip knob of soap adjust screw.
4. Remove screws holding valve in case top.
5. Turn collar and adjust screw assembly counter-clockwise out of the valve body.
6. Turn collar counter-clockwise off of stem.

Inspection and Repair

1. Examine valve body for cracks. Replace as necessary.
2. Inspect condition of threads in valve body, collar and adjust screw. Replace if stripped or worn.
3. Inspect condition of o-ring on adjust screw. Replace as necessary.

Assembly

1. Thread collar all the way onto adjust screw.
2. Turn collar into valve body and tighten.
3. Attach valve assembly to case bottom with screws.
4. Slip knob onto stem and tighten set screws.