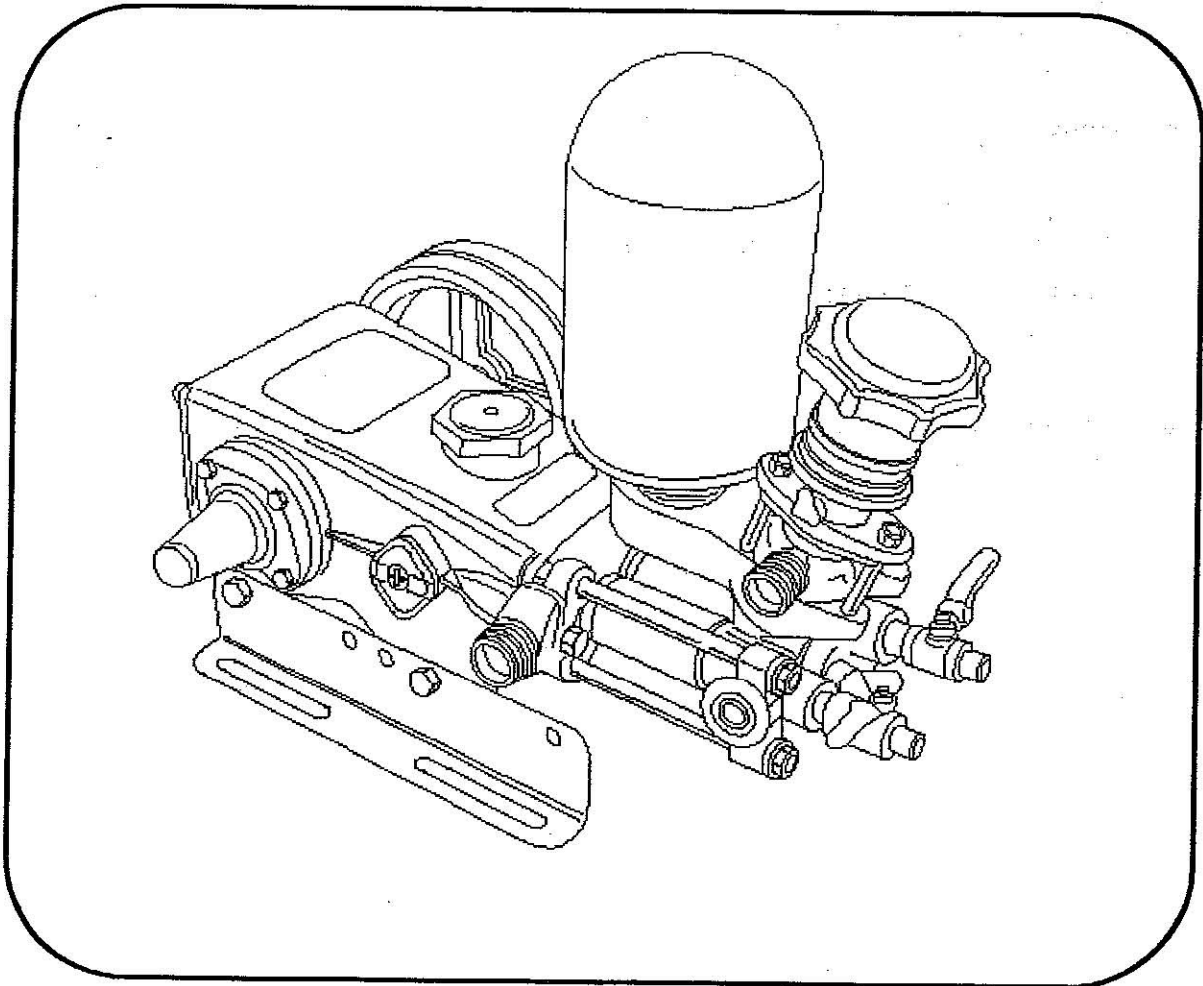





**Power Sprayer
Instruction Manual
MS313, 413, 513, 613, 653, 753, 903**



Please be sure to read this instruction manual before using the product.
Please keep this manual carefully as a permanent reference.

When Loaning the Equipment to Another Person or Having Someone Else Operate It

▪ When Loaning the Equipment to Another Person or Having Someone Else Operate It



Instruct them beforehand in proper operation of the equipment, and explain one by one all of the triangular warning labels  that are attached to it. Don't let your generosity cause problems: Hand over the Instruction Manual and Work Safety Manual together with the equipment. Instruct the operator to read and understand the instructions thoroughly and learn the operating procedure before using the equipment.

Please take particular care to explain the warnings about improper use.

This also applies to your family members.



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Important Points for Set-Up

WARNING

- When you need to attach an engine to this product, please ask your nearest dealer to handle it.
- When operating with a V-pulley and V-belt or similar set-up, make sure to cover the rotating parts and arrange the equipment so those parts are difficult to come into contact with even when checking their operation.
(Leave the cover on both during operation and while checking operation. If a belt cover cannot be attached, then make sure to take other measures, such as putting up a fence around the machine.)
- Make sure to turn the machine OFF before inspecting or adjusting it.

CAUTION

- **Set-up the power sprayer for use within the specifications for crankshaft speed, pressure, and liquid volume.**
Using the equipment outside the specified ranges may damage the power sprayer or result in accidents.
- Use an engine with a rated power output that is equal to or higher than the power required by the sprayer. When the engine power is equal to or lower than the power required by the sprayer, the sprayer may not achieve full performance.
- Set up the power sprayer so that the oil gauge is easy to check.

CAUTION

- **For fixed installation of the power sprayer, use bolts of the proper size and quality, and tighten them firmly.**
Unstable installation of the power sprayer and engine will result in vibration that can have a bad effect on the power sprayer.
- Select a proper size V-pulley and V-belt suitable for the power required.
- Use a V-pulley with shaft bore and keyslot dimensions suited to the shaft.
A loose V-pulley bore or keyslot can result in harmful vibration and cause accidents, so be sure to use the proper size.
- Attach the V-pulley so the end of the shaft does not quite reach the face of the pulley, and tighten the bolt securely, using a washer. When necessary, use a setscrew on the V-pulley.
- Align the engine and the power sprayer so their V-pulleys are in a straight line.
The V-belt will come under excessive strain if it is not in a straight line when viewed from above, causing possible dislocation or damage to the belt.
- Make sure the V-belt is neither too loose nor too tight.
If the belt is too tight, it may damage the bearing.
If it is too loose, it may cause slipping, belt damage, or dislocation.
- When using two or more V-belts, make sure they are the same type and circumference.
- When replacing a V-belt, replace all of them at the same time.

Important Points for Set-Up

DANGER

- Use screws of the same type and size to attach hoses and nozzles, and attach them securely, always using gaskets.
- The use of screws of an improper size or type, lost or damaged gaskets, and loose screws can result in exposure to chemicals. Over-tightening screws can cause gaskets to protrude or be damaged, also resulting in exposure to chemicals. Therefore, be sure to tighten screws properly.
- Be sure to check operation with plain water before mixing in chemicals.

SUCTION

- The suction hose diameter should be determined by the suction port diameter. When the pipe diameter is narrowed by valves or other devices, use a suction hose that is one size larger.

CAUTION

Narrowing down the suction hose diameter unnecessarily can cause deterioration of performance and accidents.

- Keep the suction intake lifting height within 3 m.

SPRAYING

- Select sprayer hose that can handle the operating pressure.

HOSES

- Make sure that the suction hose and overflow hose are inserted well into the tank and fix them in place securely with a strap.
- When connecting a hose, always make sure there is a gasket in place.

WARNING

Attach only an overflow hose to the overflow port. Be absolutely sure not to attach any stopcock or valve and block the overflow completely, in particular, because this can wreck the machine and possibly cause injury.

NOZZLES

- Select nozzles with a delivery rate that assures an overflow volume of about 30%.

DANGER

- Using nozzles not suited to the pump specifications, removing standard equipment from the sprayer, or forcing the operation or handling of the sprayer, can not only keep the sprayer from putting out full performance but may cause malfunctions or in some cases even damage and injury. Therefore, be absolutely sure to avoid this kind of use.

CAUTION

- Never point the nozzle toward a person, since it may expose the person to chemicals.

Important Points for Handling the Engine & Important Points for after Use

When the Power Sprayer is Installed with an Engine

DANGER

- The fuel is flammable. Do not allow any open flame near the operating location.
- Always be sure to stop the engine and let it cool down before refueling. Thoroughly wipe up any spilled fuel.
- Do not allow lit cigarettes or any other flame nearby when refueling or maintaining the engine.
- After refueling, move the fuel container at least 3 m away before starting and operating the equipment.
- Do not add fuel beyond the standard capacity, or shake up the equipment, or tilt it.

WARNING

- The engine exhaust is harmful. Do not operate the engine indoors, as there is a danger of carbon monoxide poisoning. Be careful not to inhale the engine exhaust.

CAUTION

- The engine is very hot while running and immediately after stopping. Touching the muffler or cylinder fins could cause burns.
- High voltage electricity passes through the spark plugs while the engine is running. This is very dangerous, so be absolutely sure not to touch the spark plugs or plug cables.

CAUTION

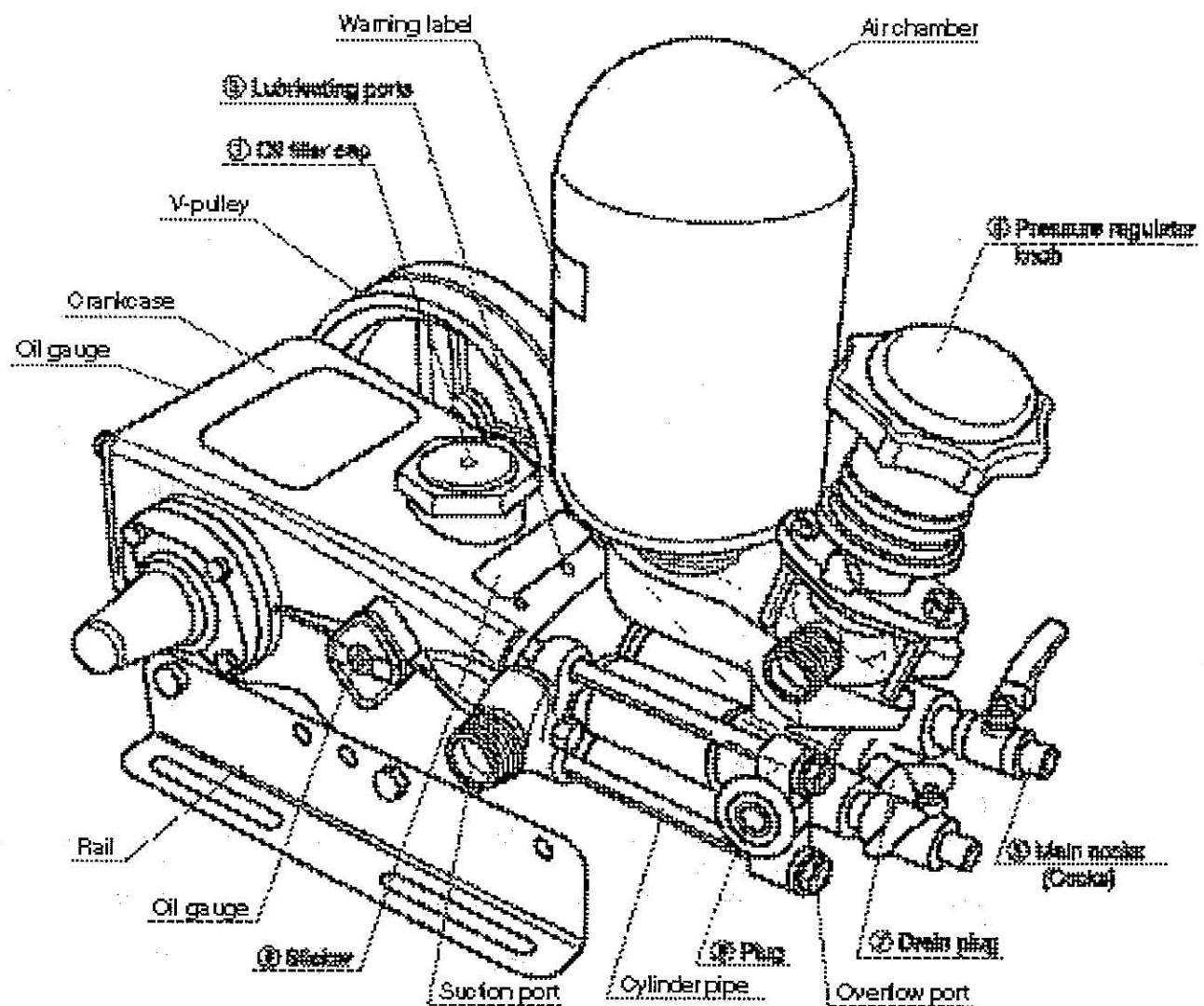
Please follow all the above cautions strictly, and also carefully read the instruction manual for the engine itself for further information.

Important Points for after Use

- Any chemicals remaining after work should be placed in a tightly sealed container and stored carefully in a secure location that cannot be accessed by other people.
- After finishing work, operate the sprayer with plain water and then drain the pump, hoses, and so on. (Don't forget to clean and maintain protective masks, glasses, gloves, and other gear after finishing work.)
- When washing the equipment and other items, take the same careful precautions to avoid damage and exposure that you would when working with the chemicals themselves.
- When the equipment is used with an engine, drain out all fuel left in the engine after use.
- If any part of the equipment has been damaged, have it repaired at a dealer or through this company's sales office before storing it.
- Store the equipment in a low humidity location and protect the equipment from dust and debris.

2. Nomenclature and Functions of Working Parts

Parts Nomenclature



Making Sure All Standard Accessories are Present / List of Standard Accessories / Functions of Working Parts /

⚠ Warning Labels

Making Sure All Standard Accessories are Present

After opening the carton, first make sure that all standard accessory items are present. If anything is missing or damaged, please immediately inform the dealer you purchased the product from.

The sizes and quantities of the accessory items are listed in the tables of specifications on page 15.

List of Standard Accessories



Product Features

- The chemicals always flow in a single direction, so the suction mechanism will not be overburdened.
- The cylinder is MAC-processed (ceramic) for durability.
- The piston packing is made from a special rubber with chemically resistant properties.

Functions of Working Parts / ⚠ Warning Labels

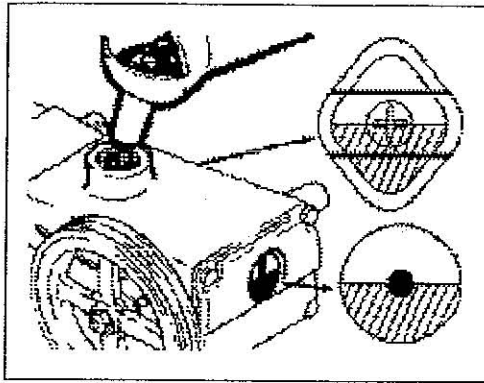
- 1) Oil filler cap
Before using the sprayer, be sure to open the filler cap and add oil (SAE 10W-30 equivalent, SC classification or better). See specifications on page 15 for the amount of oil.
- 2) Warning labels
 - Keep labels clean so the contents are always visible.
 - If a warning label gets damaged, please exchange it for a new label.
 - When replacing a part that has a warning label on it, make sure to place the label in the same location on the replacement part.
- 3) Lubricating ports
Before using the equipment, put 3-5 drops of oil (SAE 10W-30 equivalent) into each lubricating port.
- 4) Pressure regulator knob
This is the knob for adjusting sprayer pressure.
 - Turning the knob clockwise increases the pressure.
 - Turning the knob counterclockwise reduces the pressure.
- 5) Main cocks
The sprayer hoses attach to these cocks. Turning the lever above a cock 90° will open the cock.
- 6) Plug
When using the sprayer for watering, remove this plug first.
- 7) Drain plug
Loosen this plug in order to drain the sprayer. This allows the liquid inside to drain out.
- 8) Sticker
This sticker shows the product serial number.

⚠ CAUTION

- Before using the sprayer, be sure to read and understand the instructions first.
- When using the sprayer with an engine attached, be sure to attach a belt cover.

3. Handling and Operation

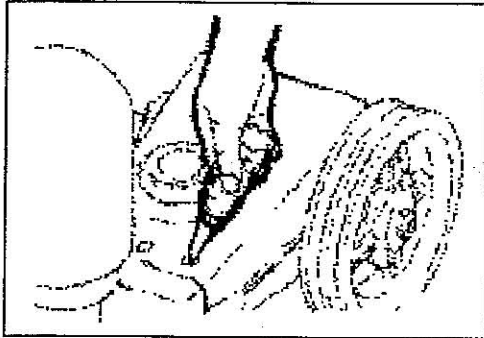
Preparation & Inspection ~ Spraying



CAUTION

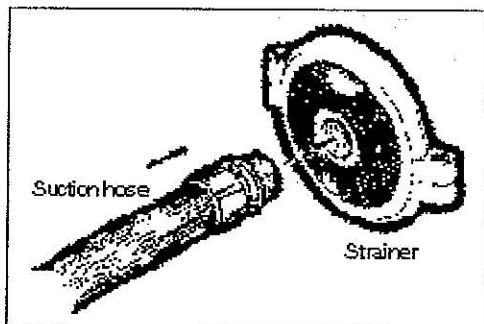
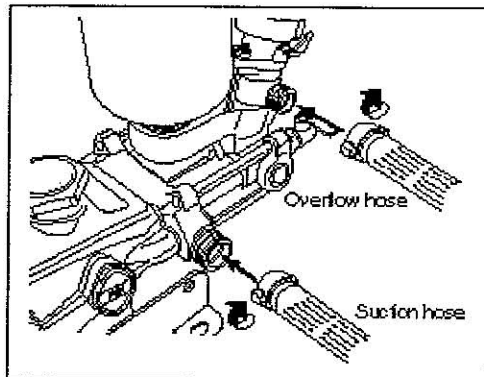
This power sprayer does not come with oil in it. Be sure to fill with oil before using it.

- Fill with oil (SAE 10W-30 equivalent, SC classification or better) until the level comes up inside the red circle on the oil gauge at the rear of the pump or until the level comes up into the area between the line marks on the oil gauge on the side of the pump.
- Put 3-5 drops of oil (SAE 10W-30 equivalent) into each of the three holes (lubricating ports) at the top front of the crankcase.



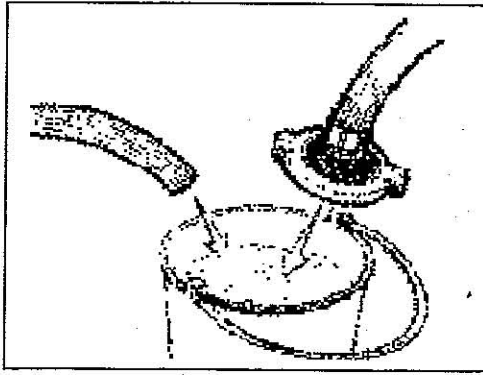
CAUTION

Check to be sure gaskets are used when attaching the suction hose and overflow hose. Lack of a gasket on the suction hose, in particular, can cause equipment vibration and suction problems that may shorten pump life.



- When a strainer is required, use the one that comes with the sprayer as a standard accessory. (Please check with the nearest dealer or with this company's sales office before using any other strainer.)

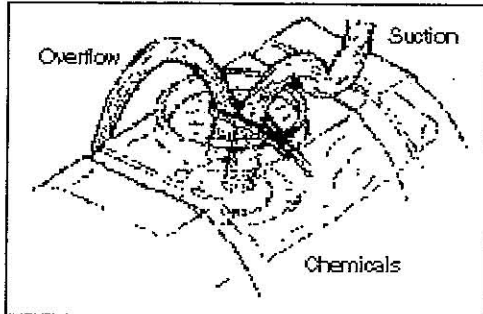
Preparation & Inspection ~ Spraying



- When starting to use the sprayer, test it first with plain water to make sure the sprayer is operating normally.

CAUTION

If the power sprayer operates abnormally in any way, turn it off immediately and refer to the troubleshooting section on pages 13-14 to diagnose and resolve the problem.

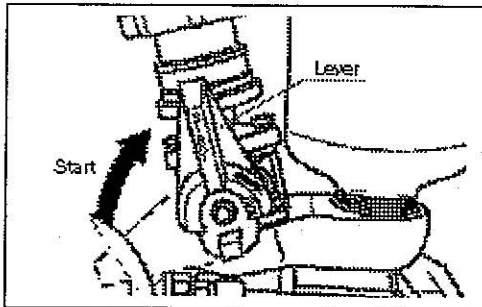


- When inserting the suction hose in the chemical tank, set it so that the lifting height is within 3 m.

CAUTION

It can be dangerous if the suction hose or overflow hose thrash around out of control, so use the provided strap

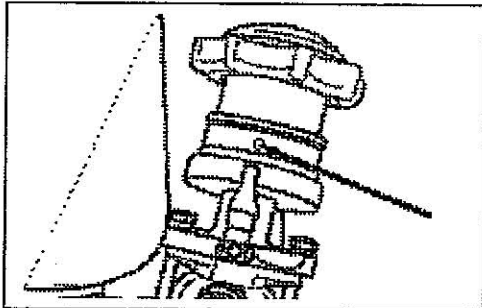
- Check to be sure that the strainer is inserted completely into the liquid in the tank.
- Lift up the lever on the pressure regulator valve to the Start position as shown in the illustration.



- Turn the knob to align the "0" point with the indicator.

CAUTION

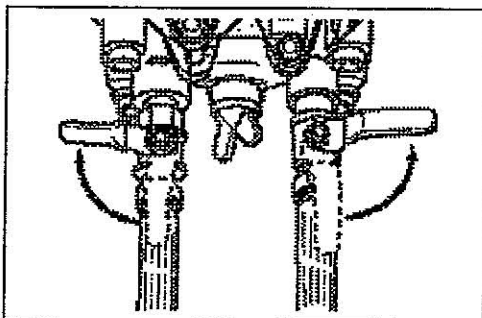
Be careful not to start running the sprayer with positive pressure, since running it when there is nothing to pump can damage the piston packing.



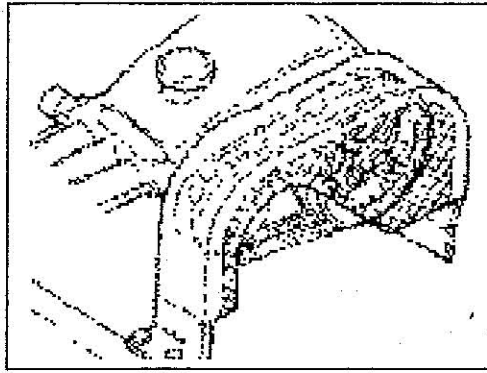
- Close the main cocks.

CAUTION

If the pump starts running with the main cocks open, chemicals may suddenly spurt out of the cock area or the nozzle may start thrashing out of control. This is dangerous, so always be sure to close the main cocks.



Preparation & Inspection ~ Spraying ~ Stopping

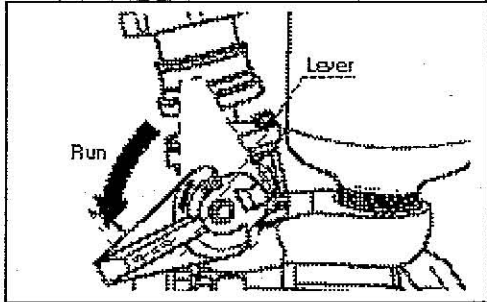


- Be sure to attach the belt cover when starting and operating the equipment.

⚠ WARNING

Rotating parts can cause accidents when objects are caught up in them, so always make sure that the belt cover is attached. If a cover cannot be attached, then be sure to take other measures, such as putting up a fence around the machine.

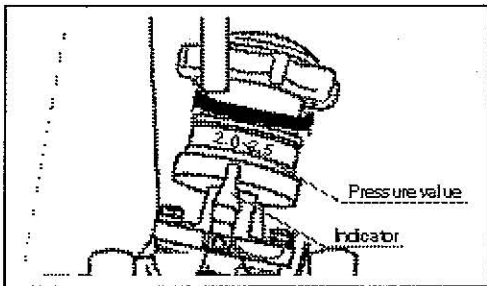
- Turn the lever on the pressure regulator valve down to the Run position.



CAUTION

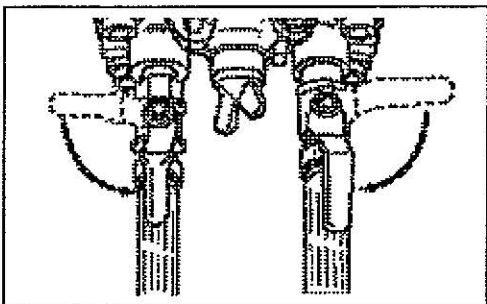
Make absolutely sure that there is suction at this point. If the sprayer runs for one minute or more without anything to pump (running empty) after starting, it will damage the piston packing. In this case, stop the sprayer and refer to the troubleshooting section on pages 13-14 to diagnose and resolve the problem, then try again.

- Turn the knob to align the desired pressure value with the indicator.



⚠ CAUTION

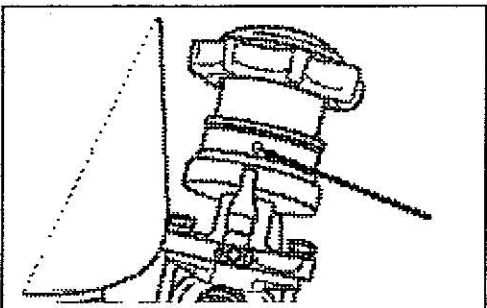
When more than one person is working, they should signal each other in advance whenever opening the main cocks. This is because the sudden rise in pressure can backlash on anybody holding a nozzle, and this is dangerous.



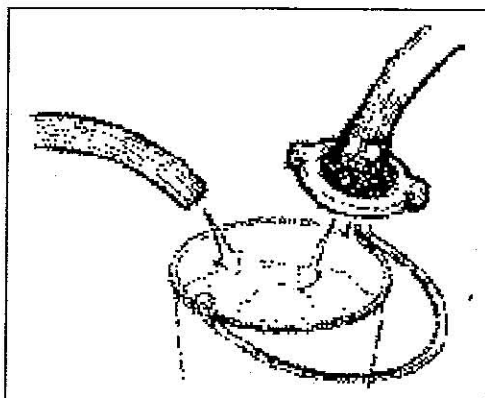
Stopping

- In order to stop the pump, turn the pressure regulator knob to "0" and return the lever on the pressure regulator valve to the Start position.

The pressure regulator operates using a compression spring. If there is still pressure inside any hose, the remaining liquid may spurt out when disconnecting the hose.



4. Cleaning, Maintenance, and Storage



- When finished working, let the pump take in plain water to flush out any chemicals remaining inside and clean it. This helps prevent problems when starting the pump up for the next work season.

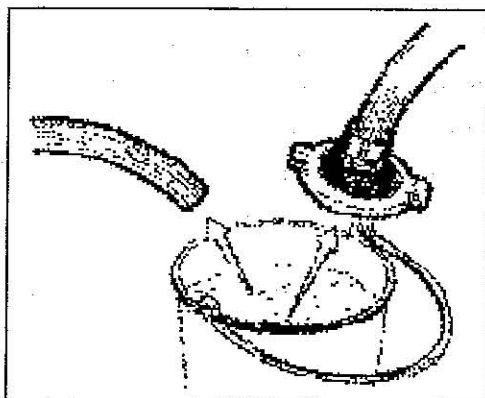
CAUTION

When handling the water used to flush out the equipment, take the same careful precautions to avoid damage and exposure that you would when working with the chemicals themselves.

Carefully read the handling and safety instructions for the chemicals to learn how to handle them properly.

- Remove the nozzles from the hoses and lift the suction strainer out of the water, then run the sprayer at low speed with the main cocks open to drain it.

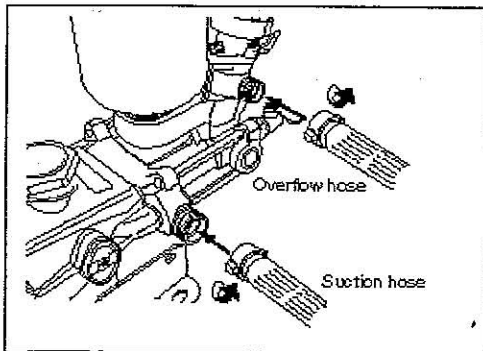
(Set the pressure regulator knob to "0" and turn the lever to Start.)



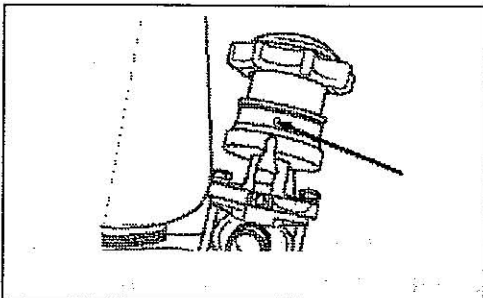
CAUTION

To protect the equipment, do not run it empty for any longer than a minute at most.

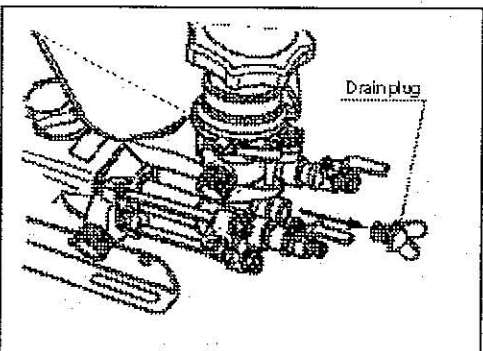
Cleaning, Maintenance, and Storage



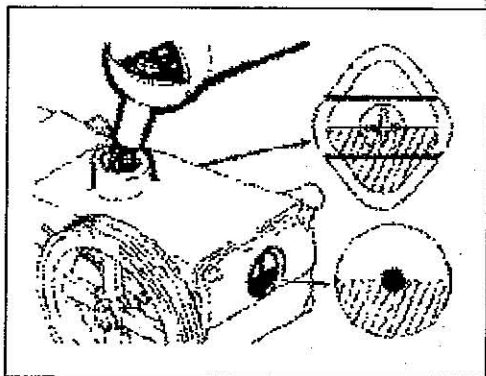
- Be sure to disconnect the suction hose and overflow hose, because leaving them attached will damage the gaskets, which can cause problems. The disconnected suction and overflow hoses should be stored properly.



- Store the equipment without any tension on the compression spring. In order to maintain the accuracy of the pressure values on the knob, the knob should be turned to "0" and the lever on the pressure regulator valve should be put at the Start position.



- Drain all liquids from the equipment completely before storing to protect it from freezing damage during the winter. Specifically, loosen the drain plug as shown in the illustration and completely drain all liquid from inside the unit. Then clean, maintain, and store the equipment.



CAUTION

Make sure the oil has cooled down before draining it.

- Make absolutely sure that the equipment has stopped working before starting to change the oil.
- The first oil change should be made after 50 hours of operation. From the second time on, change the oil after every 100 operating hours.

Oil breaks down, so it should be changed (SAE 10W-30 equivalent, SC classification or better) at least once a year even if the equipment is operated for fewer hours than indicated above.

Power Sprayer Troubleshooting

- This power sprayer troubleshooting section shows how to diagnose and resolve problems that may occur in the course of normal operation. If you experience a problem, take the steps indicated for the applicable diagnosis.

When you can't determine the cause of a problem or if you have any difficulty, please feel free to contact your nearest dealer or this company's sales office. Please have the following information ready:

- Model designation
- Serial number
- Description of problem (What happened? What were you doing when it happened? What were the conditions when it happened?)

For items marked with *, please request adjustment or repair from your nearest dealer or from this company's sales office.

WARNING

Do not change the setting of the screw that is under the cap on the top of the pressure regulator knob. This screw absolutely must not be changed, since that will raise the pressure above rated specifications, damage the machine, and possibly cause injury.

Condition		Cause	Solution	
(1) Suction is low or absent	Power train	Belt is slipping	Adjust or replace	
	Up to suction port	Suction strainer is blocked with debris	Clear and clean	
		Suction hose is damaged or crooked	Repair or replace	
		Suction hose connector gasket is bad	Repair or replace	
		Connection is bad	Connect properly	
		Suction hose is too long	Replace	
		Suction side lifting height is too high	Lower the lifting height	
	Suction & pressure parts (Cylinder part)	Debris is stuck in inlet or discharge valve	Clean	*
		Inlet or discharge valve is assembled improperly	Assemble properly	*
		Inlet or discharge valve is damaged or worn	Repair or replace	*
		Discharge valve spring is damaged	Replace	*
		Piston packing is damaged	Replace	*
		O-ring is damaged	Replace	*
		Seal and packing are damaged	Replace	*
	Pressure regulator part	Pressure regulator valve lever is in Run position	Return lever to Start position	
		Pressure regulator is stuck	Disassemble and clean	*

Power Sprayer Troubleshooting

Condition		Cause	Solution
(2) Pressure will not increase	Suction & pressure part	Insufficient liquid supplied to intake	Diagnose under (1)
	Pressure regulator part	Pressure regulator valve ball or valve seat damaged	Replace
		Pressure regulator valve rod is bad	Adjust or replace
		Pressure regulator valve spring is bad	Repair or replace
		Pressure regulator valve spring is damaged or weak	Replace
(3) Pressure falls when an output cock is opened	Nozzle	Nozzle is worn	Replace
		Nozzle sprays too much liquid	Replace with suitable nozzle
	Power sprayer	Intake liquid amount is too small	Diagnose under (1)
	Hose	Sprayer hose is too long	Make it the proper length
		Sprayer hose is too narrow gauge	Make it the proper gauge
		Water is leaking at hose connecting parts	Repair or replace
(4) Sprayer hose vibrates	Air chamber is filled with water	Let air in (run without intake for no more than one minute)	
	Pressure regulator valve works poorly	Disassemble or adjust	
	Faults in intake or pressure assemblies (Stopped up, slack)	Disassemble or adjust	
	Nozzle stopped up	Clean	
(5) Noise	V-pulley installation bolt is loose	Tighten or replace	
	Conrod bolt or other bolt is loose	Tighten	
	Bearings are damaged	Replace	
	Pressure regulator valve is assembled wrong	Adjust	
	Air is being drawn in	Inspect	
(6) Liquid or oil leakage	O-rings are damaged	Replace	
	Seal and packing are damaged	Replace	
	Oil seal is damaged	Replace	
	Clamping or assembly are incorrect	Disassemble or adjust	