

OPERATOR'S MANUAL

FOR

HAGIE MODEL 280 HI-TRACTOR

HAGIE MANUFACTURING COMPANY

BOX 273 CLARION, IOWA 50525

(515) 532-2861

COVERS MACHINE SERIAL NUMBERS:

018929001 Thru 018929200

1-92 493130

A WORD FROM HAGIE MANUFACTURING COMPANY

Congratulations on your selection of a Hagie Model 280 sprayer. We recommend that you study this Operator's Manual and become acquainted with the adjustments and operating procedures before attempting to operate your new sprayer. As with any piece of equipment, certain operating procedures, service, and maintenance are required to keep it in top running condition. We have attempted herein to cover all of the adjustments required to fit varying conditions. However, there must be times when special care must be considered.

Hagie Manufacturing company reserves the right to make changes in the design and material of any subsequent sprayer without obligation to existing units.

We thank you for choosing a Hagie sprayer and assure you of our continued interest in its satisfactory operation for you. If we might be of assistance to you, please call on us.

We are proud to have you as a customer.

TO THE OPERATOR

The following pages and illustrations will help you operate and service your new sprayer.

It is the responsibility of the user to read the Operator's Manual and comply with the safe and correct operating procedures and lubricate and maintain the product according to the maintenance schedule.

The user is responsible for inspecting the machine and having parts repaired or replaced when continued use of the product causes damage or excessive wear to other parts.

Keep this manual in a convenient place for easy reference when problems arise. If you require additional information or service, contact the Service Department at:

Hagie Manufacturing Company
P.O. Box 773
Clarion, Iowa 50526
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TABLE OF CONTENTS

I. Safety Precautions.....	4 - 7
II. Sprayer Identification.....	8 - 9
III. Specifications.....	10 - 12
IV. Preparing to Operate	
A. Wheel Tread Row Spacing.....	13 - 15
B. Attaching Booms.....	16 - 18
V. Operating Information	
A. Starting the Engine.....	19 - 20
B. Hydrostatic Drive.....	21
C. Hydraulics.....	22
D. Air Conditioning.....	23
E. Solution Tanks.....	24
F. Spray System.....	25 - 26
VI. Calibration.....	27 - 29
VII. Transporting	
A. Driving.....	30
B. Trailer.....	31 - 32
C. Towing.....	33
VIII. Service and Maintenance.....	34 - 40
IX. Storage.....	41 - 42
X. Trouble Shooting	
A. Engine.....	43 - 44
B. Spray System.....	45 - 46
C. Hydrostatic System.....	47 - 49
D. Hydraulic System.....	50
E. Electrical System.....	51
XI. Limited Warranty.....	52 - 53

SAFETY PRECAUTIONS

Most accidents, whether they occur in industry, on the farm, at home, or on the highway, are caused by the failure of some individual to follow simple and fundamental safety rules. For this reason, most accidents can be prevented by recognizing the real cause and doing something about it before the accident occurs.

Regardless of the care used in the design and construction of any type of equipment, there are many conditions that cannot be completely safeguarded against without interfering with reasonable accessibility and efficient operation.

STUDY this Operator's Manual. Learn how to use the sprayer controls for safe operation.

DO NOT make modifications such as weldments, add ons (adaptations or changes from the original design of sprayer). Such changes and/or modifications may become safety hazards to you and to others and will void all warranties.

ALWAYS select the widest tread setting to fit between the crop rows.

NEVER adjust the tread center on the sprayer until the wheels have been properly blocked and loosen the leg clamp bolts only enough for the leg to slide on the frame.

NEVER leave the sprayer in a raised position unattended.

NEVER adjust tire air pressure without knowing the proper recommendation. Do not attempt to dismount or mount a tire unless you have the proper equipment and experience to perform the job.

BE SURE the ladder and operator's station are clean and dry to help prevent personal injuries.

CAUTION

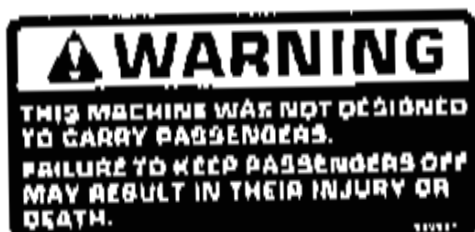
Read Operator's Manual for details on correct operation. This may help prevent injury. All safety practices and items listed in this manual are for information only. Do not attempt to modify or alter any equipment or parts without the approval of the manufacturer. Always use proper safety practices. Always wear your seat belt. Do not drink and drive. Do not drink alcohol or use drugs or operate machinery. Do not drink and drive. Do not drink and operate machinery.

CAUTION

**DON'T RISK INJURY BY
SLIPPING OR FALLING**

BE CAREFUL

WATCH YOUR STEP



NEVER bypass the safety start switch. Start engine from the operator's seat only.

NEVER run the sprayer engine in a closed building.

NEVER leave the sprayer unattended without applying the parking brakes.

BEFORE starting sprayer in motion, look carefully around to make sure no persons or obstructions are in the path of travel.

DO NOT permit passengers on the sprayer when it is moving.

NEVER operate the sprayer other than at recommended engine RPM settings to assure proper charge pressure for the hydrostatic drive system.

NEVER change factory engine RPM settings.

ALWAYS drive at a reasonable field speed.

NEVER drive near ditches, embankments, holes, mounds or other obstacles. Never drive on hills and slopes too steep for safe operation.

ALWAYS reduce the sprayer's speed before turning.

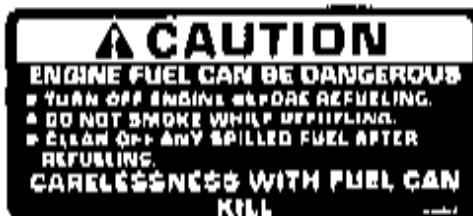
ALWAYS come to a complete stop before reversing direction.

ALWAYS stop sprayer and turn off engine before inspecting for damage after striking a foreign object. Damage should be repaired before restarting or operating the sprayer.

ALWAYS keep sprayer and attachments clean and in good operating condition.

ALWAYS inspect and keep all wheel lug nuts tightened to 85 foot pounds of torque.

NEVER operate the sprayer with loose lug nuts.



ALWAYS turn the engine off and allow it to cool before refueling. Do not smoke while refueling.



DO NOT fill fuel tank completely to the top; fuel will expand and run over. Wipe up spilled fuel; clean up spills with detergent and water before starting the engine.

ALWAYS keep a fire extinguisher handy.

DO NOT allow trash to build up on the sprayer.

NEVER remove radiator cap until engine has cooled.

ALWAYS keep all shields in place.

KEEP CLEAR of all moving parts and keep others away when operating.



DO NOT wear loose fitting clothing that may be blown or drawn into moving parts.

ALWAYS turn off engine and apply brakes before checking, adjusting, repairing, lubricating, or cleaning any part of the sprayer.



NEVER allow chemicals to come in contact with the skin or eyes. Always wear protective clothing recommended by the chemical manufacturer. Never pour chemicals into an empty tank; fill tank 1/2 full of water first.

ALWAYS dispose of empty chemical containers properly. Be sure to follow the chemical manufacturer's instructions for mixing chemicals. Always wash spilled chemicals or spray residue from sprayer to prevent corrosion and deterioration.

ALWAYS select a safe area to fill, flush, calibrate and clean sprayer where the chemicals will not drift or run off to contaminate people, animals, vegetation, or water supply.

NEVER place nozzle tips or other parts to one's lips in an attempt to unclog the spray tip.

DO NOT spray when wind is in excess of chemical manufacturer's recommendation.

FOLLOW the instructions given by the manufacturer when using or working with agricultural chemicals. The air filter in the cab will not filter out harmful chemicals.

ALWAYS store pesticides in their original containers with label intact. Store pesticides in a separate, locked building.

USE the flashing warning lights when traveling on public roads, day or night, unless prohibited by local law.

MAKE SURE the SMV emblem is in place and visible from the rear when traveling on public roads.

PLEASE refer to Page 33 for towing instructions if it ever becomes necessary to tow the sprayer.

SPRAYER IDENTIFICATION

Each Hagie sprayer is identified by means of a frame serial number. This serial number denotes the model, year in which it was built and the number of the sprayer. As for further identification, the engine has a serial number, the hydrostatic pump has a serial number, the wheel motors have identification tags, and the planetary hubs have identification plates that describe the type of mount and gear ratio. To insure prompt, efficient service when ordering parts or requesting service repairs from Hagie Manufacturing Company, record the serial and identification numbers in the space provided below.

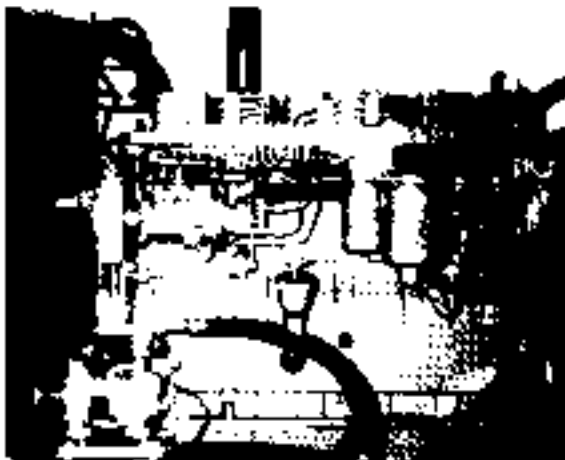
Note Reference to left hand and right hand used throughout this manual refers to the position when seated in the operator's seat facing forward.

SERIAL NUMBERS

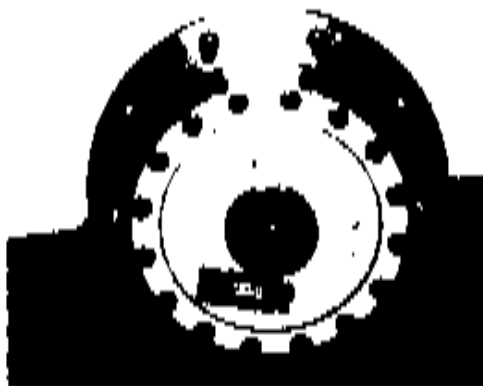


SPRAYER

NOTE: Serial number stamped in the frame on right rear corner



ENGINE (DIESEL)



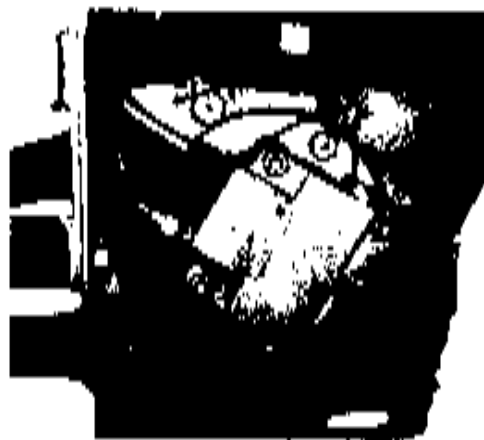
PLANETARY HUB IDENTIFICATION NUMBERS

Front, _____

Rear, _____



HYDROSTATIC PUMP SERIAL NUMBER



FRONT WHEEL MOTOR MODEL NUMBERS



REAR WHEEL MOTOR MODEL NUMBERS

ITEM

SPECIFICATIONS

Engine

Manufacturer and model.....Cummins Model 685.9
 Type.....Naturally aspirated
 Number of cylinders.....Six (6)
 Horsepower.....120, intermittent
 Type of fuel.....Number 1 or Number 2 diesel
 Fuel system.....Filtered, direct-injected
 Slow idle.....800 RPM
 Fast idle.....2,950 RPM

Drive

Hydrostatic pump.....Sauer/Sundstrand series 90 heavy duty
 pump
 Range.....Variable displacement
 Speed two-wheel drive.....0-15 MPH
 four wheel drive.....0-11 MPH
 Hydrostatic wheel motor rear.....Sauer/Sundstrand 18 series
 front.....Sauer/Sundstrand M23 series
 Final drives - rear.....torque-hubs (24.85:1)
 front.....torque-hubs (18.25:1)

Basic Sprayer

Frame.....Hydra Hug with adjustable tread
 Clearance.....72 inches (66" center)
 Tread.....Adjustable 72" to 125"
 Wheel base.....106"
 Weight.....8300 pounds
 Length w/o outer booms.....216"
 Width w/booms folded w/122" tread setting.....152"
 Width w/o booms, transom.....102"
 Height.....133 1/2"

Brakes

Type.....Mechanically actuated rear wheel
 caliper disc

SPECIFICATIONS

ITEM

Steering System

TypeHydraulic
ControlFull time power

Electrical System

Battery.....1 12V
Alternator.....105 AMP
Battery terminal ground.....Negative

Hydraulic System

Type.....Open
Pump.....Gear type
Maximum working pressure.....1850 PSI

Tires

Front & rear tires.....17.4 x 28

Spraying System

Solution tanks: two 400 gallon.....polyethylene w/sump
Optional: two 400 gallonStainless steel w/sump
Application (both poly. and s.s.).....Mechanical, hydraulically driven,
variable speed
Pump - Hydro self priming.....Centrifugal, hydraulically driven,
variable speed

Boom Spray Control

Type.....Three 1 inch electronic solenoid valves
operation.....Right, left and center
Pressure gauge.....Glycerin filled
Motor.....Raven 440

Boom

Operation.....Hydraulic: fold, lift, level
Width60 foot: dry type
Row spacingVariable
Hose (pumper).....1/2 inch EPDM
Hose (handler)3/4 inch EPDM

<u>ITEM</u>	<u>SPECIFICATIONS</u>
<u>Cab</u>	
Air conditioning.....	Standard
Filter.....	Paper & Charcoal
Glass.....	Safety, tinted
Windshield wiper.....	Standard
Radio (AM/FM).....	Stereo cassette w/clock
Lights and flashers.....	Standard
Mirrors (2).....	Rear view
<u>Operator's Station and Controls</u>	
Seat.....	Bucket, adjustable
Speedometer.....	Solid state electronic
Indicator lights.....	Oil pressure; alternator
Gauges.....	Temperature, engine coolant, fuel, hour
Ladders (2 rear).....	Mounted w/service platforms
<u>Capacities</u>	
Fuel tanks (2).....	40 gallons each
Cooling system.....	Seven (7) gallons
Hydraulic reservoir.....	20 gallons
Tires (front and rear).....	18-22 PSI maximum

PREPARING TO OPERATE

THE HYDRA-HUG FRAME

The HYDRA-HUG frame, an exclusive Hagie design, uses hydraulically suspended and interconnected telescoping legs to help keep the booms level when one wheel of the machine passes over a bump or drops into a hole.

WHEEL TREAD AND ROW SPACING

Knowing the row spacing of the field one intends to spray, follow the steps below to properly obtain the desired tread setting.



FIGURE 1

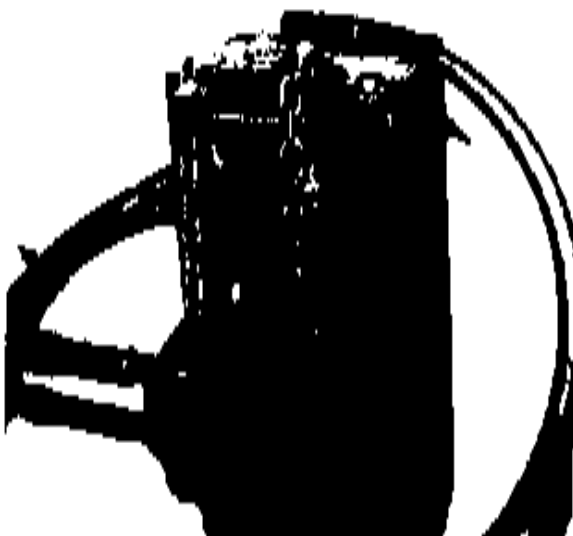
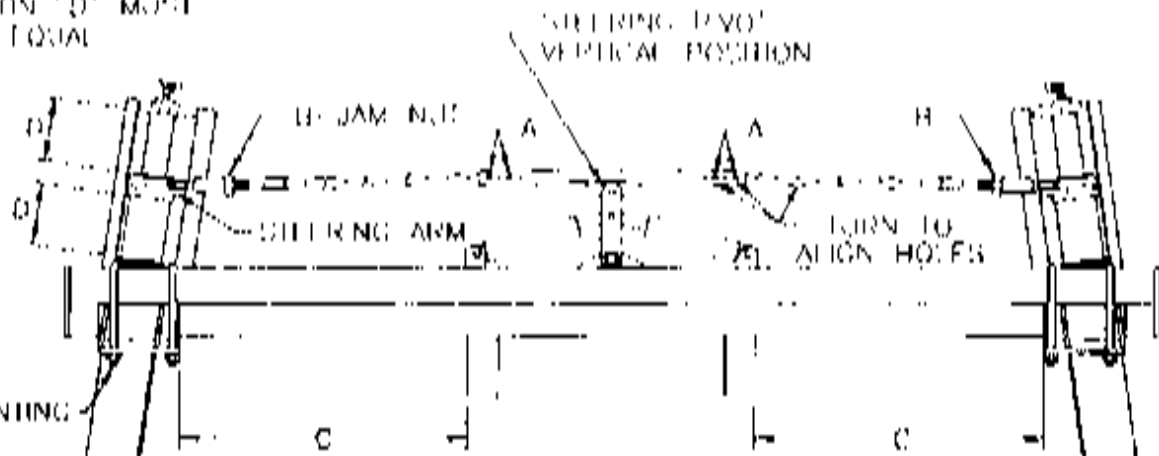


FIGURE 2

1. To adjust the legs, park the sprayer on level ground and shut off the engine. CAUTION: Firmly set the parking brake and to assure no possible movement, block the wheels on the opposite side, both front and rear.
2. Loosen bolts and jam nuts (Items A and B); (figure 1; Page 14). Remove the bolts and nuts from the tie rod.
3. Loosen the two leg mounting bolts on both the front and rear legs on one side only, as both legs must be moved at the same time. Refer to figure 1; page 14. CAUTION: Loosen only enough to allow for free movement of the leg on the main frame. Do not remove the bolts under any condition.
4. Loosen the lock nuts (Figure 1) on the leg brace. This will allow one or the other leg to move further than the other leg when adjusting to the desired tread setting.
5. Place a suitable block under the steering arm or use a chain (outlined in Figure 2) before raising the sprayer.

VIEW FROM OPERATOR STATION

DIMENSION "D" MUST
BE EQUAL



SUGGESTED TREAD SETTING

NUMBER OF TIRE "C"	DIMENSION "C"	ROWS
120 1/2"	28 1/2"	4-30"
119 1/2"	25 1/2"	3-30"
113 1/2"	22 1/2"	1-30"

MEASURE TREAD WIDTH AT
1/2 TIRE HEIGHT

FIGURE 1

FRONT VIEW OF MACHINE

LEG MOUNTING BOLTS MUST BE IN
THE SAME LINE AS THE TRACK
(MEASURE FROM CENTER OF TRACK)

FIGURE 2

FIGURE 3

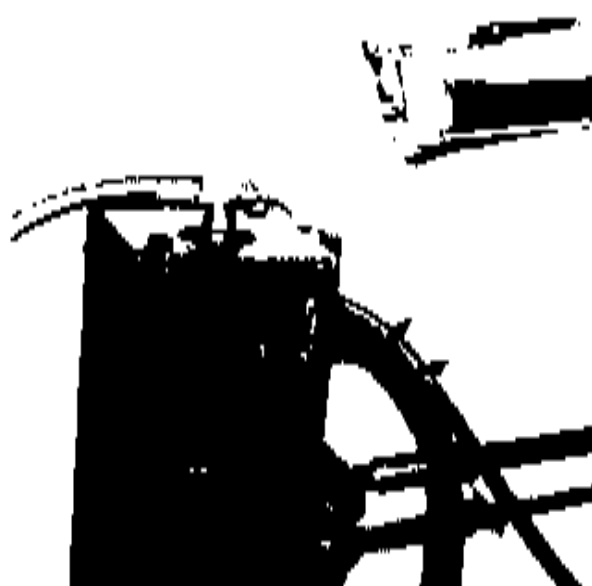


Figure 1

6. Raise the sprayer until the tires on the side being adjusted are just touching the ground.
CAUTION: When raising the sprayer, be sure the solution tanks are empty.
7. To adjust the tread out, place a suitable prying tool under the center of the tire and pry out at the same time that you push out at the top of the leg. Carefully lower the sprayer to the ground which, in turn, will allow the leg to slide outward. Repeat the procedure until the desired tread is obtained.

8. To adjust the tread in, raise the sprayer until the tires on the side being adjusted are just off the ground. Carefully lower the sprayer which, in turn, will allow the top of the leg to slide in on the main frame.

NOTE: When adjusting the tread the dimension from the main frame to the leg must be equal. (See Dimension "C"; Figure 1; Page 14.)

9. Carefully tighten all leg mounting bolts to 120 foot pounds of torque, following tightening procedures that ensure equal torque on all mount leg bolts.
10. Repeat above procedures to adjust and set the opposite side legs.
11. Before toe-in can be adjusted properly, the Hydro-Hug system must have the proper amount of oil so that each front leg is adjusted to the correct height. Check the sprayer's front legs to see if they are equal (Dimension "D"; Figure 1; Page 14).

To adjust Hydro Hug system, fill a grease gun with EP 90 weight oil and attach gun tip to grease fitting. See Figure 1.

The steering pivot must be in the vertical position before any toe-in adjustments are made. See Figure 1; Page 14.

To adjust the steering pivot, apply the parking brake, start the engine, and turn the steering wheel to center the pivot on the machine. Shut off engine.

The right and left front wheels must line up with the rear wheels in order to set the proper toe in. Failure to do so may allow one or the other front wheel to turn sharper.

With a suitable prying tool placed between the tire and steering tube, move each front tire to a position where the total toe in will be 1/2" to 3/4". See Figure 1, Page 14

12. Re-install the tie rod locking bolts and nuts; tighten all nuts firmly.

ATTACHING BOOMS AND SETTING NOZZLE SPACING

In shipment some of the sprayer components may have been sent loose and need to be installed before operating. In order to ensure proper installation of the components, please read and comply with the following instructions carefully. Always make sure you have proper equipment and/or help installing the components.

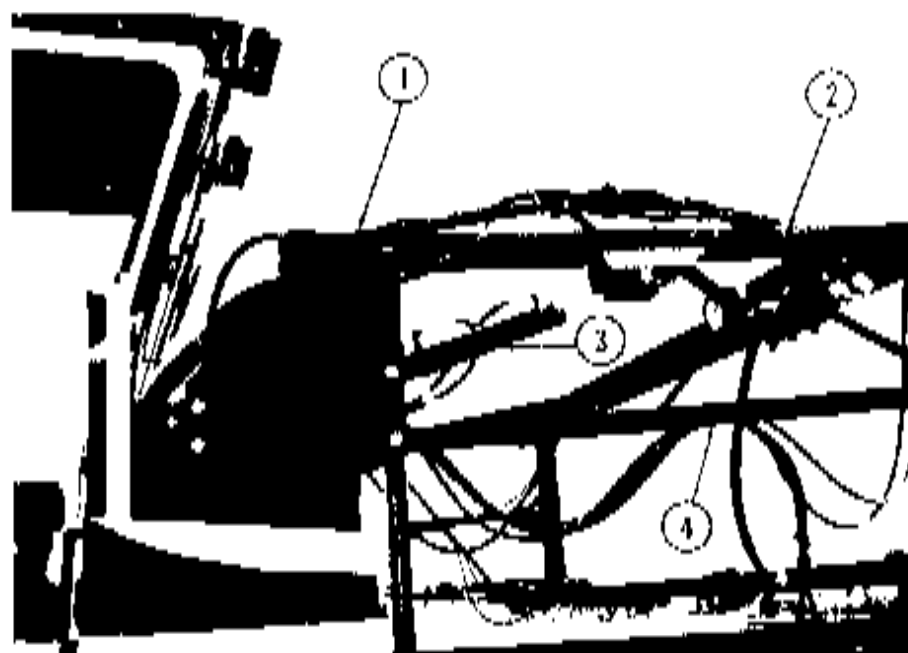


Figure 1

1. First, attach right hand (Item 1) and left hand (not shown) lift arm mounts; tighten all bolts. See Figure 1.
2. Install upper lift arm weldment (Item 2) to lift arm mounts (Item 1), using proper bushings and bolts provided. See Figure 1.
3. Install lift cylinders (Item 3), using correct bushings and bolts. See Figure 1.
4. After installing the lift cylinders, install two lower lift arm weldments (Item 4), using correct bushings and bolts. See Figure 1.

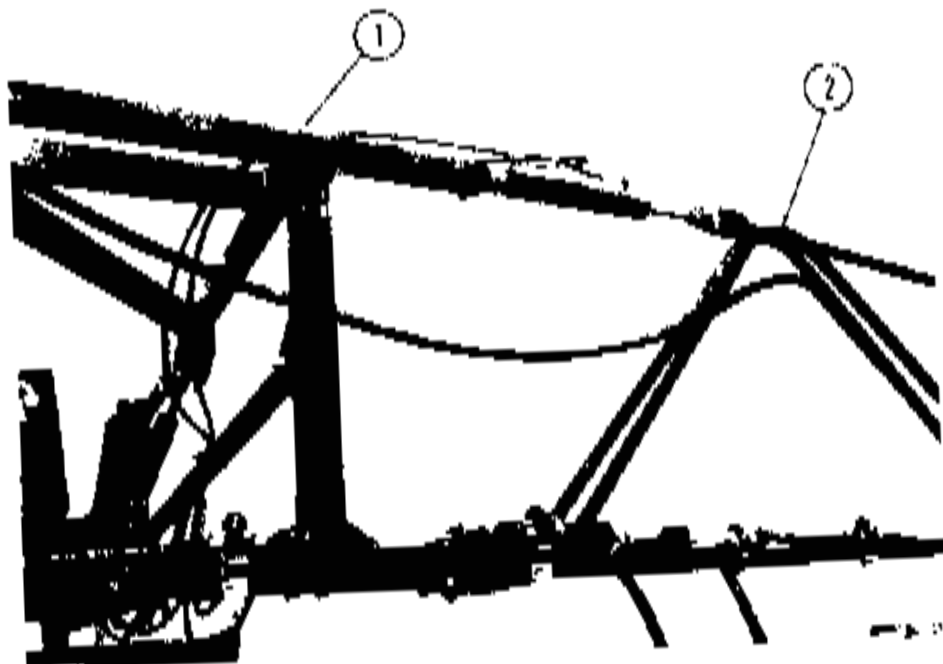


FIG. 2

5. The transom weldment is the next item to be installed (Item 1; Figure 2).
NOTE: An overhead hoist or fork lift is very useful when installing the transom.
6. After the transom is securely fastened, the next items to be installed are the outer boom weldments (Item 2; Figure 2).
NOTE: Care should be taken not to overtighten the boom springs. A good rule of thumb when first starting out is to use half the adjustment thread on the eye bolt when tightening the boom springs.
7. After Steps 1 through 6 have been completed, mount the nozzle spacings to the outer booms and transom.
NOTE: For further information as to what bushings and bolts are used where, please refer to Page 18; Figure 1 and Figure 2.



FIGURE 1
 Exploded view of the assembly showing the motor, gear train, and housing components.

FIGURE 1

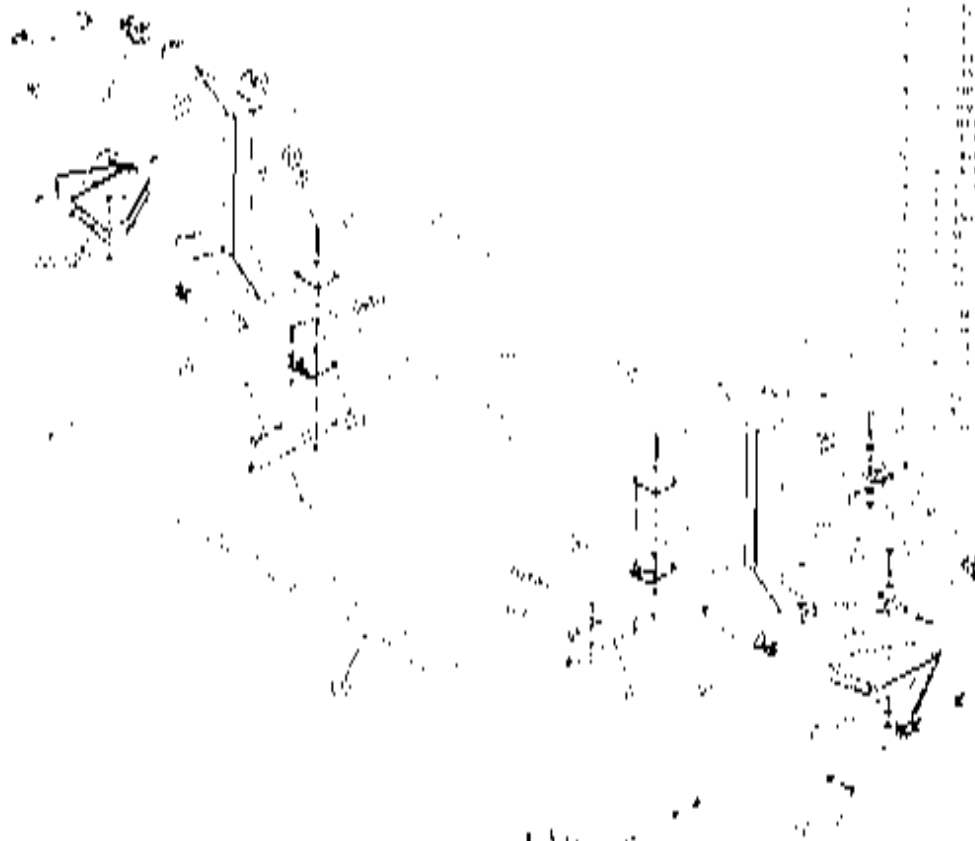


FIGURE 2
 Exploded view of the assembly showing the motor, gear train, and housing components.

FIGURE 2

OPERATING INFORMATION

STARTING THE ENGINE

CAUTION: Start the engine from the operator's seat only. When starting the engine in a building, be sure there is plenty of ventilation.

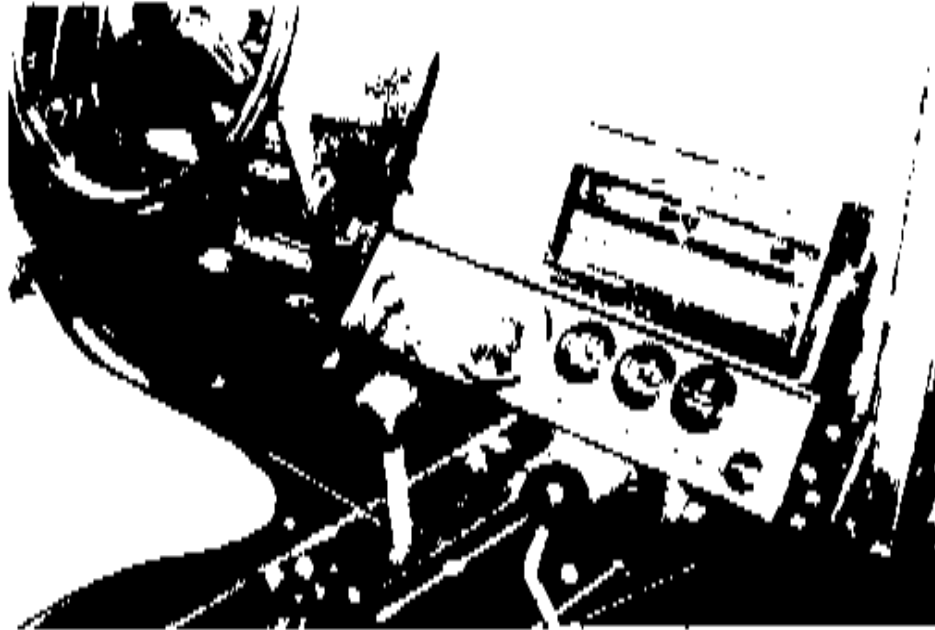


Figure 1

1. Perform these maintenance checks before starting the engine.
 - a. Engine oil level.
 - b. Radiator coolant level.
 - c. Hydraulic oil level.
 - d. Air filter condition.
 - e. Clean air intake screens and inspect outside of radiator core.
 - f. Correct all oil or fuel leaks.
2. Position hydrostatic control lever in N (neutral) position. See Figure 1.
3. Make sure all control levers are in the neutral setting or in the off position.
4. Set parking brake.
5. Start the engine with the throttle at one half speed.
6. Turn key to the on position to check instruments and indicator lights.



CAUTION

Electrical system is 12 volt negative ground. When using booster with jumper cables, precautions must be taken to prevent personal injury or damage to electrical parts.

1. Attach one end of jumper cable to positive terminal of booster battery and other end to positive terminal of vehicle battery connected to starter motor.
2. Attach one end of second cable to negative terminal of booster battery and other end to vehicle frame away from battery. Do not attach to cab or cab support.
3. To remove cables, reverse above sequence exactly to avoid sparks. See operator's manual for additional information.

12297

7. Turn the ignition key switch to the start position to engage the starter. If the engine fails to start after 15 seconds, turn key to off, wait one minute and repeat the procedure. If the engine does not start after three attempts, check fuel supply system. Absence of blue or white exhaust smoke during cranking indicates no fuel is being delivered.

When engine starts, immediately reduce throttle lever setting to 1/3.

8. Inspect indicator lights and gauges for correct operation. If any lights or gauges do not operate, shut off engine and determine cause.
9. Always allow at least a five-minute warm-up period before operating the engine at high RPM. This means the engine must reach operating temperature and oil pressure must stabilize in the normal operating range before it is run faster than an idle (1000 RPM or less).
NOTE: Cold oil may not flow in quantities adequate to prevent pump cavitation, thus causing damage to the pump which will lead to pump failure.

COLD WEATHER STARTING (DIESEL)

Using starting fluid without metering equipment:

WARNING: Never use starting fluid near an open flame, or with a pre heater or flame thrower equipment. This combination can cause an explosion.

WARNING: Do not breathe starting fluid fumes. Starting fluid fumes can be harmful to your health.

CAUTION: Do not use excessive amounts of starting fluid when starting an engine. The use of too much starting fluid will cause engine damage.

Spray starting fluid into the air cleaner intake while another person cranks the engine.

When starting the sprayer using jumper cables, follow these steps:

Caution: When using jumper cables to start the engine, make sure to connect the cables in parallel: positive (+) to positive (+) and negative (-) to negative (-). When using an external electrical source to start the engine, turn the disconnect switch to the "off" position. Remove the key before attaching the jumper cables to prevent unintentional starter engagement.

HYDROSTATIC DRIVE

The Hagie 280 Sprayer is derived from a Cummins diesel engine. The hydrostatic power system consists of a Sauer/Sundsstrand heavy duty variable displacement pump and fixed displacement motors. A manual control lever connected to the pump swash plate controls the amount and direction of oil flow to the motors, determining the speed and direction of the machine.



1. Open the throttle slowly to the maximum recommended engine speed setting. **CAUTION:** Never operate the sprayer at anything less than full recommended throttle.
2. To move forward, slowly push the hydrostatic control lever forward. The farther the control lever is moved, the faster the sprayer will travel.
3. To stop, slowly pull the hydrostatic control lever to the N (neutral) position.
4. To move backwards, slowly pull the hydrostatic control lever backwards. The farther the control lever is moved, the faster the sprayer will travel.
5. To stop, slowly push the hydrostatic control lever to the N (neutral) position.
6. Before turning off the engine, close the throttle to reduce engine speed and allow the engine to idle at least 3 minutes.
7. To shut off the Cummins engine, turn off the ignition switch.
8. Set the brakes when parking the sprayer on a hill or slope.
9. To engage your hydrostatic system in four wheel drive, pull up on the control knob.

HYDRAULICS

The auxiliary hydraulic system is an open type directly connected to the heavy duty variable displacement pump (Item 1; Figure 2). This system consists of a gear-type pump that supplies the required hydraulics to operate the full time power steering unit. The boom controls the solution pump and mechanical agitation.

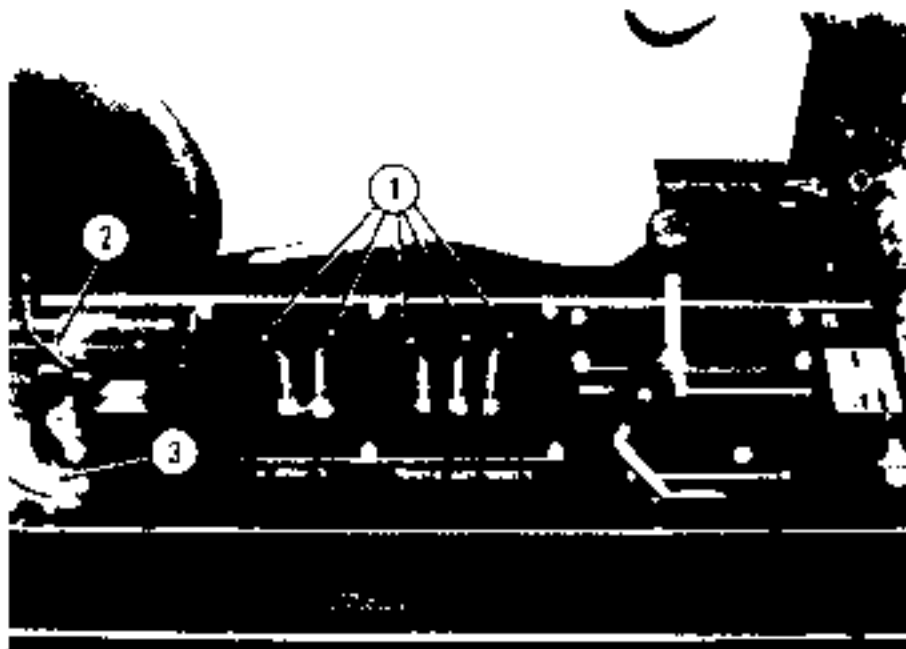


Fig. 1



Fig. 2

1. Boom control levers operate the lift, leveling, and fold cylinders. Item 1; Figure 1.
CAUTION: Be sure everyone is a safe distance away from the sprayer before operating levers.
2. The solution variable flow control lever operates the solution pump hydraulic motor for spray pressure. The more solution pressure desired, the further the lever needs to be moved forward. Item 2; Figure 1.
3. The agitation variable flow control lever operates the hydraulic motor for the required speed. The more speed required, the farther the lever needs to be moved forward. Item 3; Figure 1.

AIR CONDITIONER

The cab is equipped with an air conditioner. The controls for the air conditioner are located overhead and toward the front of the cab.

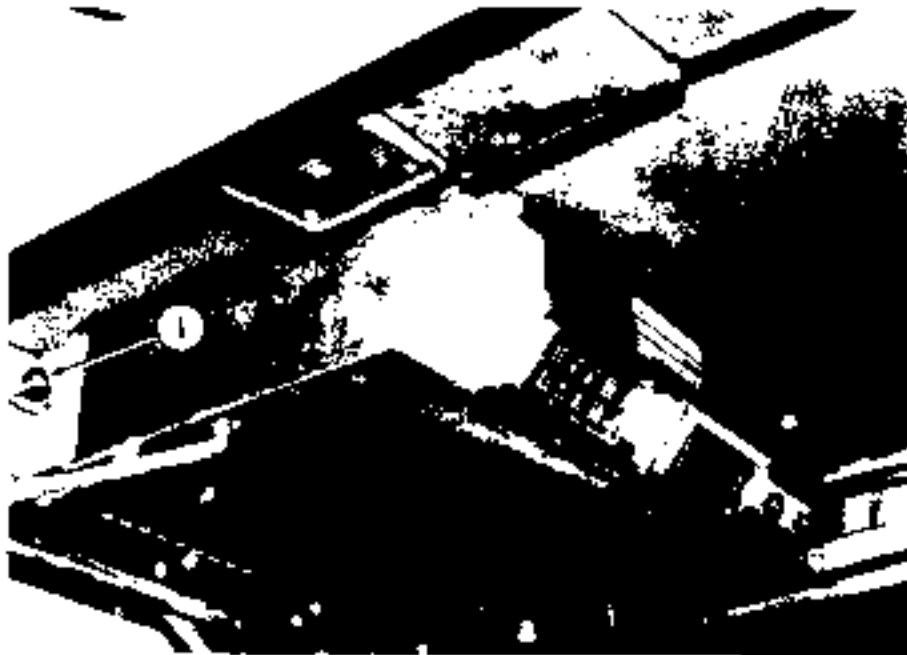


Fig. 1

1. The fan speed control switch regulates the amount of air flow out of the blower system. When this switch is off, the air conditioner will not run.
2. The temperature switch is a thermostat switch that controls the temperature within the cab. Turning the switch to the right will increase the coolness of the air to be circulated.
3. Vent knob (labeled 1; Figure 1) - this knob can be adjusted to control the amount of outside air needed for proper ventilation.
4. CAUTION: To prevent air conditioner compressor damage and condenser freezing, inside and/or outside, air intake vents must be open.
5. Filter cleaning: remove the two upper thumb screws, drop the door down and remove the paper filter. Clean by using air pressure or replace as needed. For charcoal filters, remove and replace when chemical odor comes into the cab through the filter.

SOLUTION TANKS

The Model 280 can come equipped with either two 400-gallon polyethylene or stainless steel tanks with mechanical agitation. The stainless steel tanks are held in place with mounting bolts and springs. Tighten only enough to start to compress the springs.

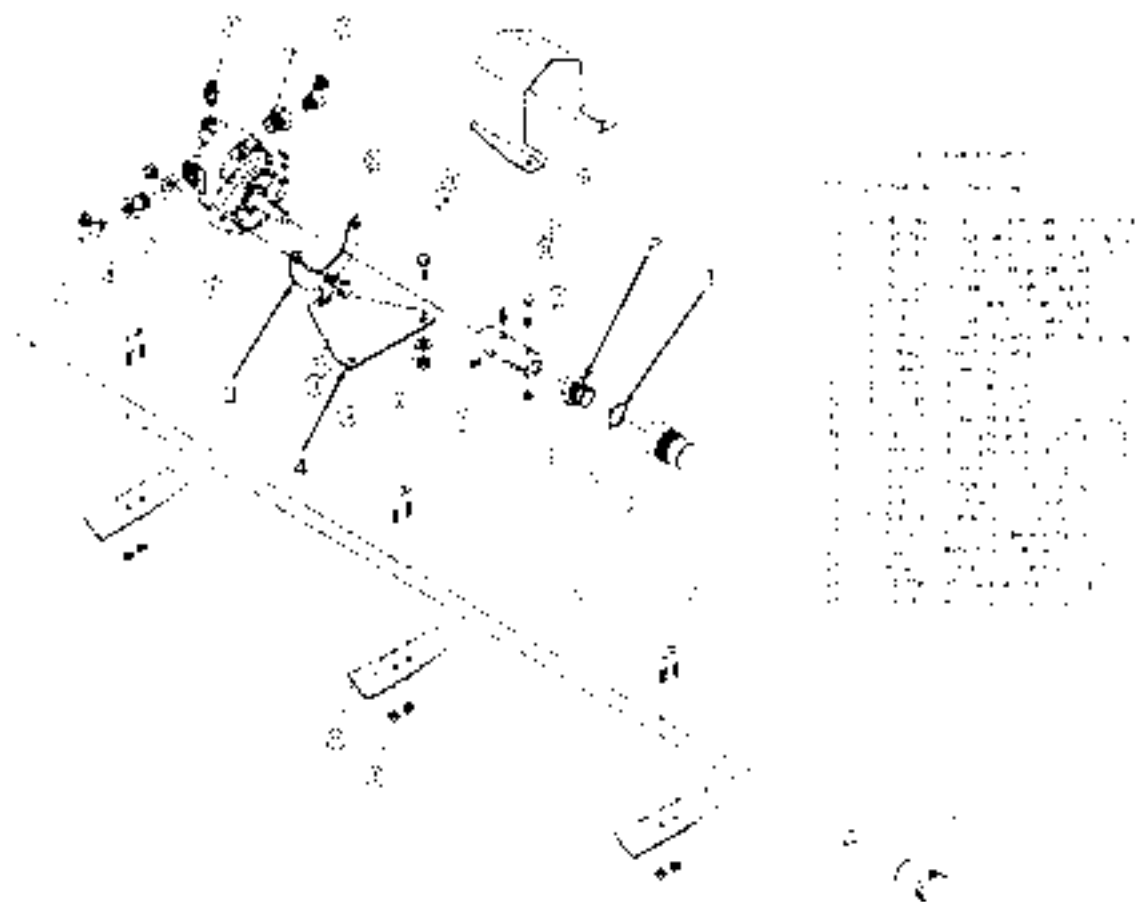


Fig. 1

AGITATOR MOTORS

The agitator motors for both the polyethylene and stainless steel tanks are held in place with a motor mount yoke (see Item 3; Figure 1). The yoke lap must extend through the motor mounting plate (Item 4) to allow the motor to float with the agitator shaft.

CAUTION: Damage will occur to the agitator system if the motor mounting yoke is not properly installed in the motor mounting plate.

SPRAY SYSTEM

IMPORTANT: The solution pump is a centrifugal hydraulically driven pump with variable speed control. The solution pump assembly consists of a make-up tank and check valve to aid in a self priming system. In aid in priming, always fill the tanks through the bottom fill plumbing (Figure 1). To operate the spray system in an efficient way and prolong its life, follow these steps closely:

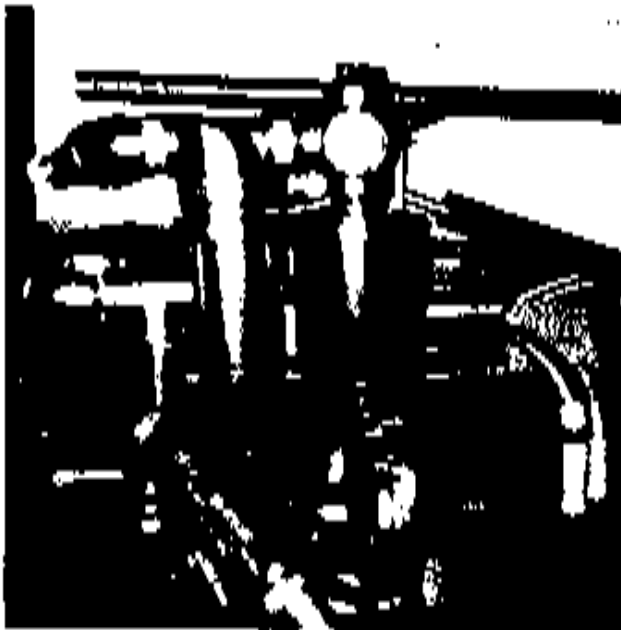


Figure 1

1. Check contents and quantity in spray tanks.
CAUTION: Never attempt to operate the spray system with no solution in the spray tanks.
2. Completely open the tank valves.
3. Start engine and maintain a relatively slow engine RPM setting (1,000).
4. Turn the solution pump on by slowly moving the solution pump variable flow control lever. (Item 2; Figure 2)
WARNING: Operating the solution pump dry will void all warranties on the solution pump.

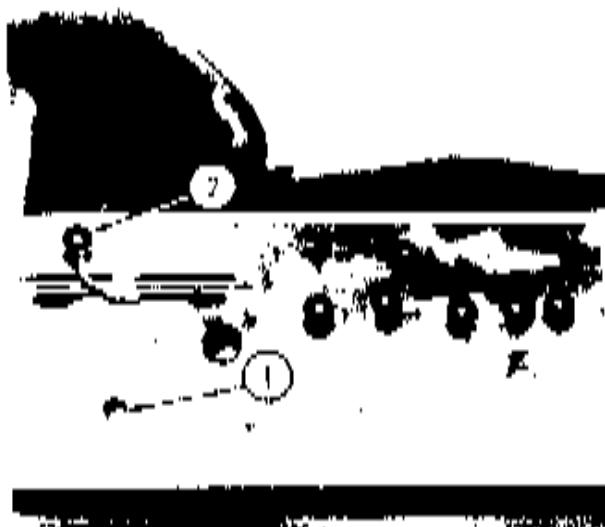


Figure 2

Mechanical Agitation:

5. Turn the agitation system on slowly by moving the agitator variable flow control lever. (Item 1; Figure 2)
WARNING: Operation of the agitation system with no solution in the spray tanks will void all warranties on the agitation system.
6. The gland packing (Item 1; Page 24; Figure 1) may require adjustment during start up. If adjustment is required, shut off the agitation system and adjust the gland nut (Item 2).
CAUTION: Do not adjust with the agitation system running.



Figure 1

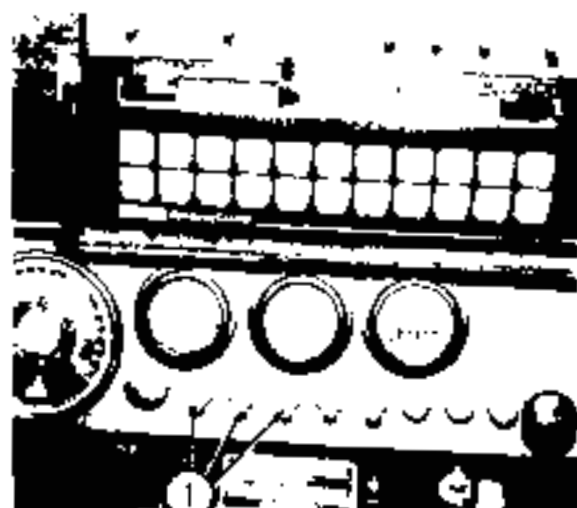


Figure 2



Figure 3

7. Observe solution pressure gauge and adjust solution pump variable flow control lever if necessary.
8. Adjust booms if necessary.
9. Place individual solution valve switches to the "on" position. (Item 1; Figure 2)
10. Turn on main solution valve switch. (Item 1; Figure 3)
11. Slowly move the hydrostatic control lever forward to obtain the desired ground speed.
12. Adjust spray pressure to the desired setting by using solution pump variable flow control lever.
13. Frequently observe the pressure gauge and speedometer in order to apply the desired amount of chemical determined when calibrating the sprayer.
14. When pressure gauge drops to zero, or spray pattern quits, shut off main solution valve switch, solution pump, and agitation system until refilling solution tanks.
WARNING: Operating the spray system with no solution in the tanks will cause severe damage and void all warranties.
15. If equipped with a Raven SCS 440 monitor, refer to Raven's Installation and Service manual to calibrate your monitor.

CALIBRATION

It is important to apply chemicals as recommended by the manufacturers of the chemical products. In order to do so, one must calibrate the sprayer using the steps outlined below.

Determine the speed at which the sprayer will be driven while applying chemicals. To select the best speed, consider the lay of the land, the condition of the soil, the type of crops, the height of the crops, etc.

Calibrate (measure the actual speed) the speedometer to the desired speed. Test the speedometer by driving along a pre-measured distance. For example, if one wishes to spray at a speed of five miles per hour (MPH), one should drive one mile in 12 minutes, and then note the actual location of the speedometer needle in relation to five MPH on the dial.

Select the nozzle spacing (distance between each nozzle on the spray boom) best suited for the intended spraying job.

NOTE: For help in determining the nozzle spacing and height of boom, refer to the spray product catalog that accompanies this manual.

There are several types and sizes of nozzles. Select and install the type and size of nozzles that are best for the intended spraying job and for the speed that one intends to travel while spraying. The type and size of nozzles selected will depend upon the speed the sprayer will travel, the nozzle spacing, and the number of gallons that one intends to apply per acre.

NOTE: When selecting the type and size of nozzles, refer to the spray product catalog.

EXAMPLE: Assume that one intends to spray at five MPH with 30-inch nozzle spacing, using flat spray nozzles for broadcasting a herbicide, at the rate of 10 gallons per acre. In order to select the best nozzles, use the Hagie calibration tube. Select a chart near the bottom of the tube by using "top

(nozzle) spacing" and "miles per hour". Using 30-inch spacing at five MPH, the corresponding number (.251) on that chart is the "flow rate". The flow rate is the amount of liquid that is applied from one nozzle in one minute, measured in thousandths of a gallon (based on a rate of 10 gallons per acre).

Use a chart in a spray products catalog that covers flat spraying nozzles (tips). Read down the column in the catalog marked capacity 1 - nozzle (GPM) until the number .25 is found or the number closest to it. Then read left to the column marked tip number; this will give you the nozzle (tip) number having a delivery rate within the desired spraying pressure.

NOTE: Check with the chemical manufacturer on recommended spray pressure.

Test and calibrate (measure the actual flow rate) the spray system.

Fill the solution tank with clean water. DO NOT ADD CHEMICALS UNTIL CALIBRATION IS COMPLETED.

Apply the brakes, start the engine of the sprayer, and remain parked. Turn on the main, right, center, and left solution switches. Move the solution pump's variable flow control lever until the pressure gauge reads the desired pressure for the above example.

Make sure that there are no leaks and that all nozzles are spraying a desirable pattern. Continue spraying in the stationary position for at least 10 minutes for proper warm up of the sprayer and its system.



Use the calibration tube to catch one nozzle's spray for one minute. (If the flow rate is more than the tube will hold, catch the spray in a larger container and then pour it into the tube. For the example given above, a larger container will have to be used.)

The numbered marks on the side of the calibration tube show the flow rate. The measured flow rate should be the same as the flow rate shown on the chart near the bottom of the calibration tube .251.

If the measure flow rate is not the same as that on the calibration tube's chart, move the solution pump's variable flow control lever to increase or decrease (as required) the pump's pressure. Use the calibration tube and again measure the flow rate. Continue adjusting the variable flow control lever and continue measuring the flow rate until the proper flow rate is reached. At this time note the exact pressure gauge reading and maintain this pressure setting while spraying in the field.

All nozzles should be spraying at about the same flow rate.

If one drives the sprayer at the proper speed and maintains the right pressure setting while spraying, the desired gallons per acre will be applied.

TRANSPORTING

A. Driving

When driving the sprayer on a public road or highway, drive carefully and follow these steps:



1. Fold the booms in and lower them on the boom cradles.
2. CAUTION: Flashing hazard warning lights have been placed on the sprayer to warn other drivers.
3. A SMV (Slow Moving Vehicle) emblem has been mounted on the sprayer to warn other drivers that one is moving slowly. Keep it properly displayed!
4. Know and obey all state laws for driving farm equipment on a public road or highway.
5. Adjust the sprayer's speed to suit the conditions.
6. Slow down and use turn signals before turning.
7. Keep a proper lookout, and maintain control of the sprayer.
8. Do not drive under trees, bridges, wires, or other obstructions unless there is clearance.
9. Use extra care before entering or leaving a public road or highway.

B. Trailer

When moving the sprayer onto a trailer, follow these steps completely:

WARNING: Never load or unload a sprayer with solution in the tanks.



1. Be sure to read and understand the trailer's owner and operator manual.
2. Hitch the trailer to the pulling vehicle as shown in the trailer's owner and operator manual.

3. Loading:

NOTE: Extra care should be taken when loading the sprayer onto any trailer. Consider whether it is best to back the sprayer on or drive forward onto the trailer.

- a. Pull the trailer to flat ground. Apply the pulling vehicle parking brake and turn off the engine. Use tire blocks to keep trailer from moving.
- b. Fold in the sprayer's booms and lower them onto the boom cradles.
- c. The loaded height and width of the trailer must conform to the law of the state in which it is being used.
- d. Lower the trailer ramps and set the ramp spacing for the sprayer's tread setting.
- e. Get someone to help guide onto the trailer. Keep this individual at a safe distance from the sprayer.
- f. **WARNING:** Stopping the sprayer on the trailer loading ramps may result in sprayer tip over.

- g. Allow enough room between the sprayer and the pulling vehicle for turning.
 - h. Secure the sprayer to the trailer. See the trailer's owner and operator manual for instructions.
 - i. Cover or remove the SMV (Slow Moving Vehicle) emblem when traveling over 25 miles per hour.
4. When unloading the sprayer from the trailer, follow these steps:
- a. Park the trailer on level ground for unloading.
 - b. Place in gear or park and turn off engine in pulling vehicle. Apply parking brake and use tire blocks to keep the trailer from moving.
 - c. Lower the trailer ramps and set ramp spacing for the sprayer's tread setting.
 - d. Release securing chains carefully.
 - e. Get help to guide off the trailer. Keep everyone at a safe distance from the sprayer.
 - f. Uncover or replace the SMV (Slow Moving Vehicle) emblem.



C. Towing

It is not recommended that the sprayer be towed, but if it should ever be necessary, follow these steps carefully.



Figure 1



Figure 2

1. Fold the booms in and lower them onto the boom cradles.
2. Disengage the torque hubs by removing two outer cap bolts, turning the outer cap with the extended center in toward the hub and re-installing the two outer cap bolts. This process pushes on a spring-loaded splined shaft, disengaging the torque hubs (Figure 1).
WARNING: Wheel motors will be ruined if these steps are not taken.
CAUTION: When re-engaging the torque hubs, make sure the spring loaded spline shaft has returned to its extended position.
3. Turn on the flashing hazard warning lights.
4. Check to be sure the SMV emblem is in place and visible from the rear (Figure 2).
5. When towing, it is necessary that two vehicles of sufficient size and weight for adequate pulling and braking ability are used. One of these vehicles is used for pulling the sprayer; the second vehicle for braking if the sprayer starts to overtake the towing vehicle, such as going downhill. The reason for this is the sprayer, once the torque hubs have been disengaged, has no braking power of its own. Use extreme caution.
WARNING: Take steps to ensure that the items used between the towing vehicle and braking vehicle (chains, etc.) are safely secured to prevent them from disconnecting.
6. **CAUTION:** Excessive speed may cause damage to the torque hubs as well as the hydrostatic system.
7. Always reduce towing speed well in advance of any anticipated turns.
8. Know and obey the state laws for towing farm equipment on public roads and highways.

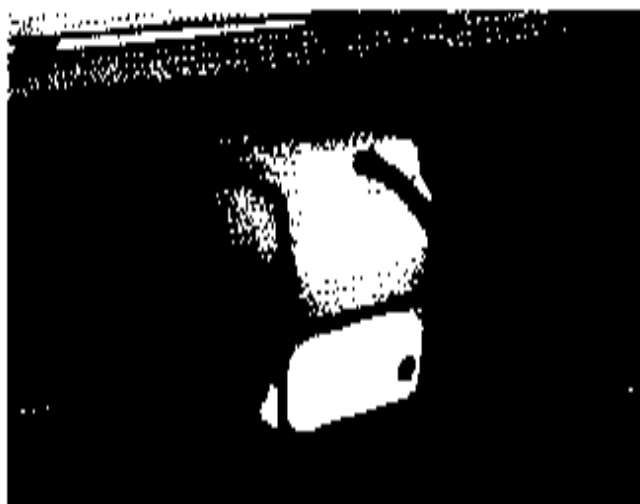
SERVICE AND MAINTENANCE

Perform these services every 10 hours or as required whenever unusually severe or dusty operating conditions prevail.



OIL LEVEL

1. Check:
Never operate the engine with the oil level below the "L" (low) mark or above the "H" (high) mark. Wait at least 5 minutes after shutting off the engine to check the oil. This allows time for the oil to drain to the oil pan.
NOTE: The engine must be level when checking the oil level to make sure the measurement is correct.
Low Mark to High Mark Capacity:
6 cylinder - 1.89 liter (2.0 U.S. quarts)
Refer to Engine Operation and Maintenance manual for maintenance schedule.
Oil capacity of pan - 15 quarts.



2. Check radiator coolant level and add if necessary. A mixture of 50-50 water and permanent type anti-freeze is recommended.



3. Inspect and clean air intake screens, radiator core, oil cooler and air conditioner condenser.
CAUTION: Failure to keep the air intake system clean can cause overheating and damage to the hydrostatic system and the engine.

4. Inspect and tighten all belts.



FIG. 1

DRIVE BELT

Inspection

Visually inspect the belt. Check the belt for intersecting cracks. Transverse (across the belt width) cracks are acceptable. Longitudinal (direction of belt length) cracks that intersect with transverse cracks are not acceptable. Replace the belt if it is frayed or has pieces of material missing. Refer to Adjustment and Replacement (Section 10) in Engine Operation and Maintenance manual.

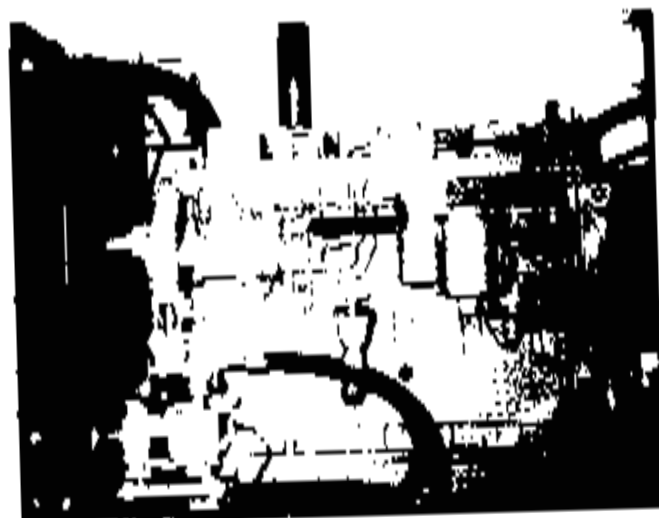
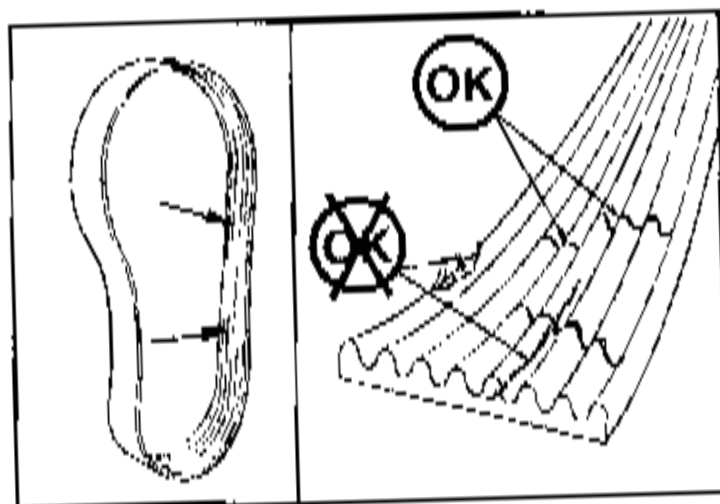


FIG. 2

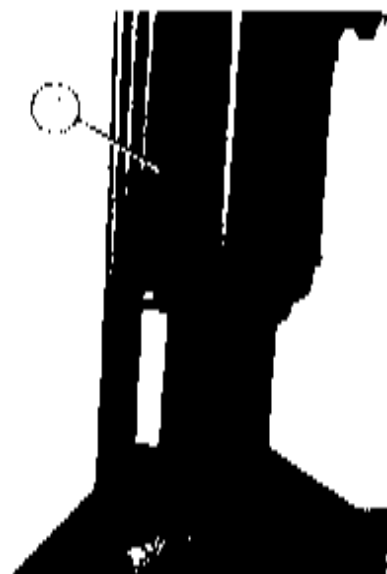
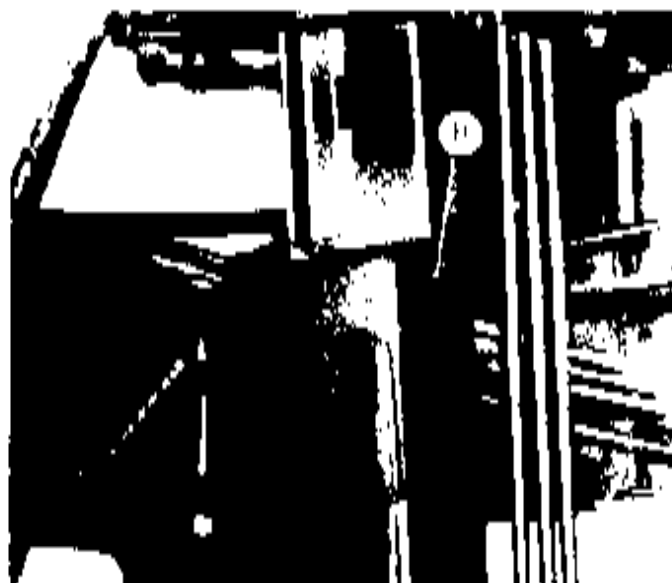
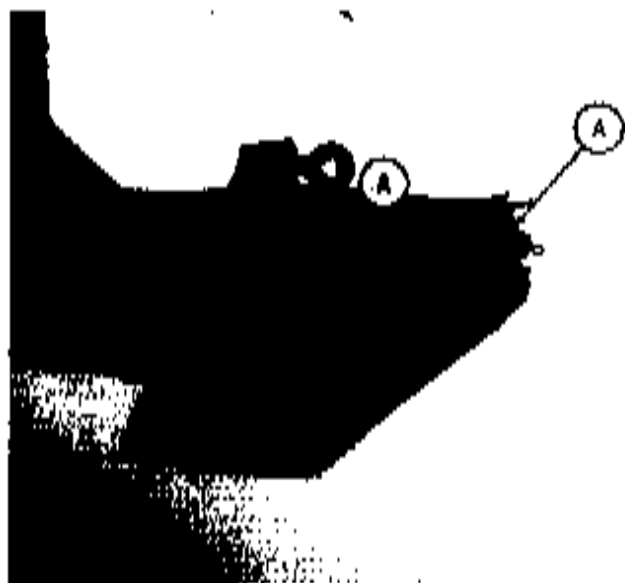
To tighten air conditioner compressor drive belt, loosen mounting bolts and pivot compressor outward. Tighten mounting bolts (Figure 2).

Lubricate and check all pivoting points.

a. Boom breakaway pivots (weekly).

c. Tie rod ends (weekly).

b. Upper and lower front leg bearings (Daily).



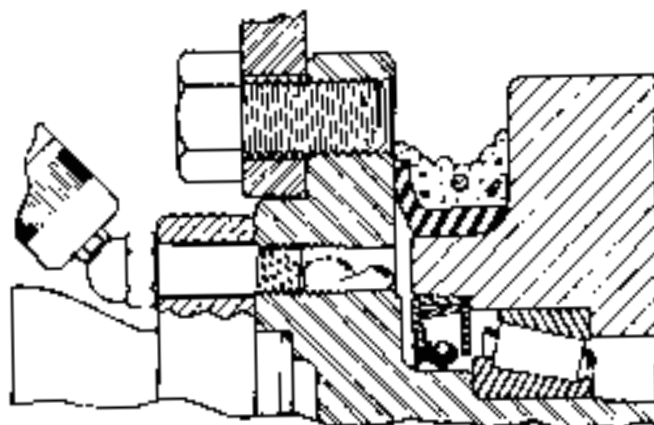


5. Check oil level in torque hubs. Position hubs with check level plug in the horizontal position. Remove plug; if EP-90 oil is needed, remove top plug and fill to proper level; reinstall plugs.

Oil change: Initial - after the first 50 hours of operation, preferably in a loaded condition.

Subsequently - 1000 hours or one year, whichever comes first.

Front and rear torque hubs have a supplementary seal that keeps dirt and other debris from main oil seal. The seal boot is lubricated by grease which is injected through a zerk fitting motor mounting bolt.



6. Check front and rear lug nuts; torque to 85-foot pounds.
CAUTION: Damage will occur to rim and torque hub if lug nuts are not checked often and kept tight.



7. Loosen air cleaner clamp. Remove and check air cleaner element and replace with new element if required.



8. Check hydraulic oil level in reservoir and add if necessary (Figure 1). Hydraulic oil must conform to one of the following types: anti-wear hydraulic oil, type F automatic transmission fluid, or agricultural hydraulic transmission fluid. Replace the oil in the hydraulic reservoir every 500 hours or at the beginning of each spraying season, whichever comes first.

FIGURE 1

10. Remove and clean line strainer screen (Figure 2).

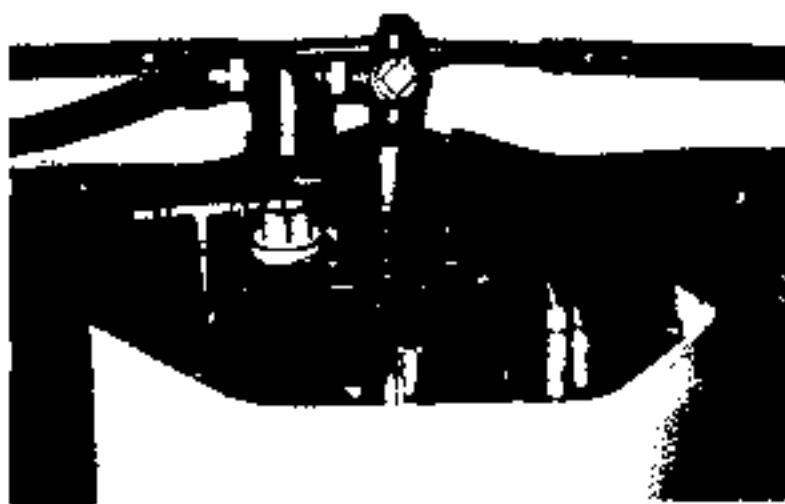


FIGURE 2

Perform these service and maintenance checks every fifty (50) hours of use.



Fig. 1

1. Remove and install a new hydrostatic pump suction filter at the end of the first 50 hours of use; subsequently, every 200 hours or once a year, whichever comes first. See Figure 1.

CAUTION: Never install anything other than a 10 Micron filter.



Fig. 2

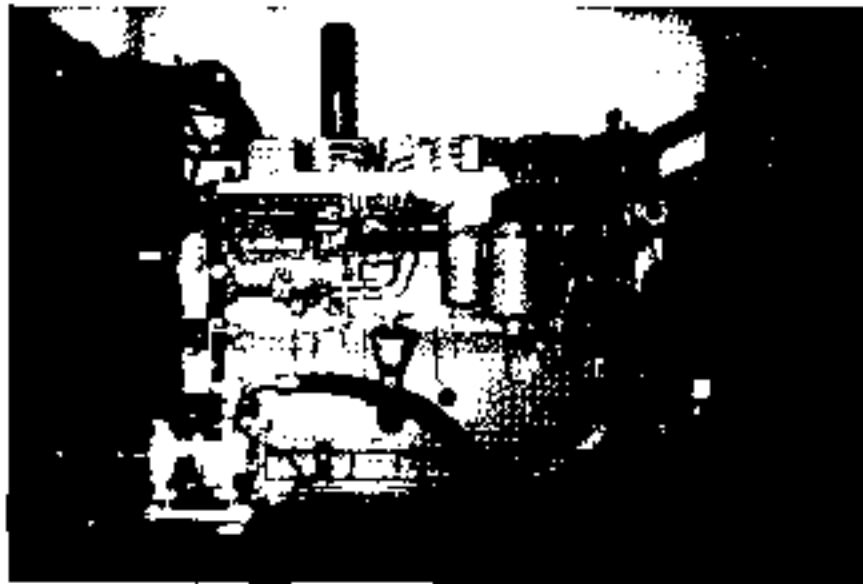
2. Inspect and clean, if necessary, all battery connections. If corrosion is present and check tension of battery hold down bracket. See Figure 2.
3. Check leg mounting bolts; be sure they are tight.
4. Check the steering tie rod linkage; be sure it is tight. See Figure 3.
5. Check parking brake tension and adjust if necessary.
6. Check to maintain an adequate neutral setting of the hydrostatic pump.



Fig. 3

MAINTENANCE GUIDELINES FOR YOUR DIESEL ENGINE

Every 100 hours of use, perform these service and maintenance checks.



3. Drain engine crank case oil and replace it with recommended oil.
NOTE : Use high quality multi grade lubricating oil in Cummins engines. Choose the correct oil for your operating climate as outlined in Specifications and Torque Values (Section 13) in Engine Operation and Maintenance manual.



2. Inspect oil (Figure 2) in hydraulic reservoir for any foreign material (contamination) and replace with approved oil if necessary (see Page 38). Replace the oil in the hydraulic reservoir every 500 hours or at the beginning of each spray season, whichever comes first.

STORAGE

A. Preparing the Z80 Sprayer for storage.

1. Drain the coolant from the engine and radiator. Probe the drain holes during draining to ensure they are not clogged by sludge, scale, or other deposits. Fill the cooling system to the top with a 50-50 water/anti-freeze mixture. Run engine to operating temperature and re-check level.

NOTE: If anti-freeze is added, make sure the engine is run to operating temperature to assure proper mixing of solution.

2. Add a fuel stabilizer to the fuel and fill fuel tank.
3. Run the engine until it is at operating temperature, then drain the engine oil. Refill with new engine oil and install a new lubricating oil filter element.
4. Run the engine until it reaches normal operating temperature. Cycle all hydraulic functions including the steering.
5. Release tension on all belts.

For more detailed information, see the engine manufacturer's manual.

6. Use plastic bags and water resistant adhesive tape to seal the air intake opening, the exhaust manifold orifice, and the air vent on the fuel tank.
7. Disconnect and remove battery or batteries. Completely clean and charge the battery. Coat the terminals with petroleum jelly and store battery in cool, dry place.
8. Thoroughly clean the sprayer. Touch up any painted surfaces that are scratched or chipped.
9. Replace worn decals. Contact Hagie Manufacturing Company, Box 273, Clarion, Iowa 50525, for replacement decals.

10. Use a multi-purpose grease to coat exposed hydraulic cylinder rods.
11. To winterize the spray system, use a pre-mixed solution of 50-50 permanent type anti-freeze and water. Run this mixture through the spray system until it comes out all boom openings.
12. Use a plastic bag and water resistant adhesive tape to seal the engine oil filler cap and the hydraulic oil tank breather cap.
13. If the sprayer must be stored outside, cover it with a waterproof cover.

B. Removing the 780 Sprayer from storage.

1. Check the condition and air pressure of all the tires. Check the section on specifications for proper pressure.
2. Unseal all openings that were sealed in the storage procedures.
3. Clean and install the battery. Be sure to attach the battery cables to proper terminals.
4. Tighten all belts. Replace any worn belts.
5. Check levels of engine oil, hydraulic oil and engine coolant. Add, if necessary. Remember, a mixture of 50-50 anti freeze and water will cool adequately in summer as well as protect in winter.
6. Completely clean the sprayer. (NOTE: Protective compounds such as grease can harden under exposure to weather conditions.)
7. Perform all needed services as instructed under Maintenance in the Operator's Manual.
8. For starting instructions, see section on Operating Information.

TROUBLE SHOOTING

A. ENGINE

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>SUGGESTED REMEDY</u>
Engine won't crank	Dead battery	Recharge or replace battery
	Poor connections	Clean, tighten battery connections
	Neutral safety switch (Located in the Sauer/ Sundstrand pump)	Replace
	Starter or starter relay	Test - rebuild or replace
Engine will not start	Out of fuel	Fill fuel tank
	Clogged fuel filters	Replace fuel filters
	Cold weather	Use cold weather starting aid
	Low starter speed	Check starter & battery
Engine misfires; runs uneven, low power	Water in fuel	Drain, flush, replace filter, fill system
	Dirty air cleaner element	Replace element
	Poor grade of fuel	Drain system; change to good grade
	Fuel tank vent clogged	Open fuel tank vent in cap
	Engine overloaded	Reduce load
Engine overheats	Dirty radiator core or grill screens	Remove all foreign material and clean all items
	Low coolant level	Refill to proper level with recommended coolant
	Faulty radiator cap	Replace cap
	Loose or faulty fan belt	Tighten or replace
	Faulty thermostat	Replace thermostat

(Engine - Continued)

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>SUGGESTED REMEDY</u>
Engine knocks	Low oil level in crankcase	Add oil to full mark
	Cold engine	Allow proper warm up period

For additional engine information, see the engine owner's handbook.

B. THE SPRAY SYSTEM

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>SUGGESTED REMEDY</u>
Solution pump will not prime	Low water level	Fill solution tanks through the bottom fill to aid in priming. Solution pumps are normally self-priming after once filled
	Air leak in suction line	Inspect; tighten all fittings on suction line
	Solution valves turned off	Turn solution valves to open position, allowing air to leave system
Solution pump not producing normal pressure	Clogged line strainer screen	Remove screen; clean thoroughly and replace screen; tighten strainer cap to avoid air leak
	Air leak in suction line	Inspect and tighten all connections
	Restricted solution flow to pump	Main solution tank shut-off valve or valves not completely open
	Suction hose collapsed	Obstruction at inlet end of hose, causing high vacuum on hose
	Faulty hydraulic pump	Replace hydraulic pump
	Faulty hydraulic motor on solution pump	Replace motor
	Malfunction of electric solution valve	Internal restriction of diaphragm
Electrical		Check fuse; check grounds; clean contact terminals; check continuity of wires; check switches; short in solenoid coil
		Replace valve

(Spray System - continued)

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>SUGGESTED REMEDY</u>
No reading on pressure gauge	Orifice in back of gauge clogged	Remove gauge; clean orifice; re-install
	Faulty gauge	Replace gauge
Erratic reading on pressure gauge	Air leak in suction line	Inspect; tighten all fittings in suction line
	Loss of glycerin from gauge	Glycerin acts as a damper to stabilize needle reading. If it leaks out, replace gauge

NOTE: If your unit is equipped with a mounter (see Figure 1), refer to the manufacturing service manual for probable problems and suggested remedies.

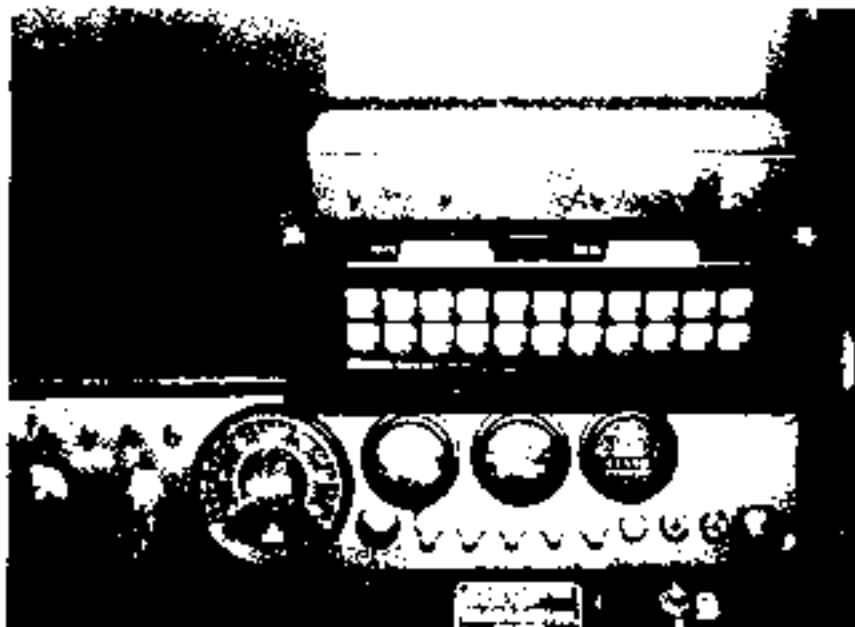
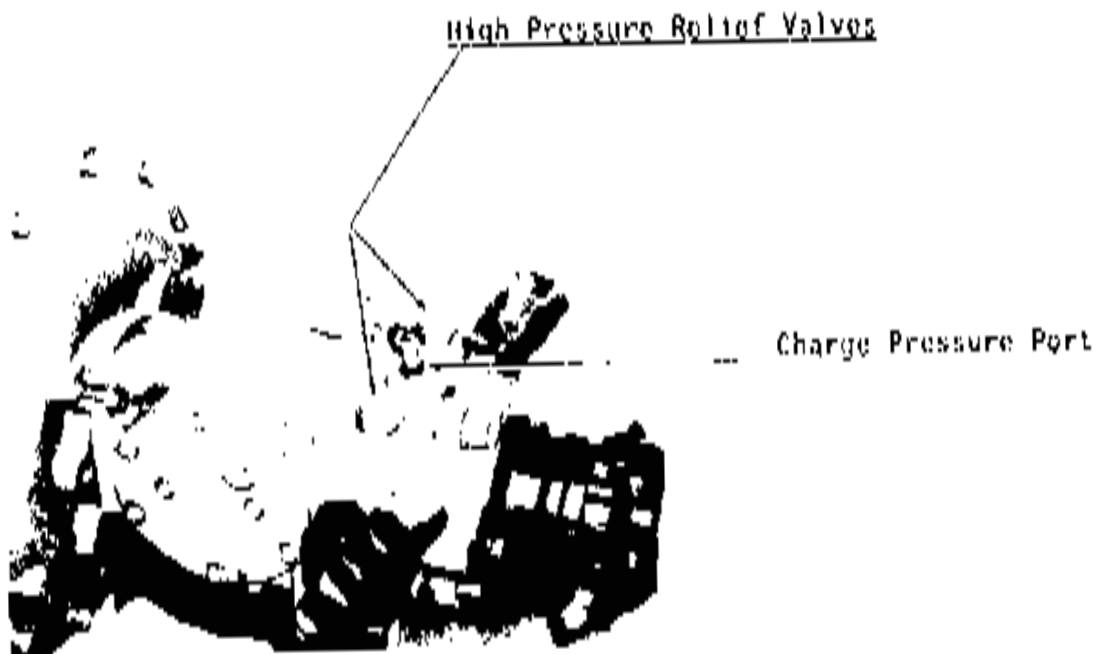


FIGURE 1

NOTE: If your unit is equipped with a high pressure system, call our Service Department for probable problems and suggested remedies.

HYDROSTATIC SYSTEM



The Series 90 pump is designed with a sequenced pressure limiting system and high pressure relief valves. When the pre-set pressure is reached, the pressure limiter system acts to rapidly de-stroke the pump in order to limit the system pressure.

Charge Pressure

To check out the closed loop system (the heavy duty variable displacement pump), install a 500 PSI pressure gauge at the charge pressure gauge port. See Figure 1. Start the engine and open the throttle to full RPM. The charge pressure should be 320 to 340 PSI; if it is below the required pressure, contact our Service Department.

C. HYDROSTATIC SYSTEM

PROBLEM	PROBABLE CAUSE	<u>SUGGESTED REMEDY</u>
Machine won't move in either direction	Engine speed too low	Set engine at operating RPM before trying to move machine
	Oil level in reservoir low	Fill reservoir to proper level w/approved oil; see chapter on Service and Maintenance
	Control linkage	Check - repair or replace
	Clogged filter	Replace filter
	Hydrostatic pump not turning	Check drive coupling
	Faulty hydrostatic pump	Replace pump
	Air in suction line	Inspect & tighten all connections
Machine will move in only one direction	Faulty high pressure relief valve	Switch relief valves from side to side. If problem reverses itself, replace faulty relief valve (Figure 1; Page 47)
Hydrostatic system responding slowly	Engine speed too low	Set engine at operating RPM before trying to move machine
	Low oil level in reservoir	Fill reservoir to proper level with approved oil
	Cold oil	Always allow system to warm up before operating
	Partially restricted suction line	Filter - replace; inspect for collapsed suction hose
	Internal damage - hydrostatic pump or motor	Replace

(Hydrostatic System - continued)

<u>PROBLEM</u>	<u>PROBABLE CAUSE</u>	<u>SUGGESTED REMEDY</u>
Noisy hydrostatic system	Cold oil	Allow for adequate warm-up period
	Low engine speed	Set engine at operating speed
	Low oil level in reservoir	Fill to proper level with approved oil
	Air in system	Inspect; tighten fittings on suction line
	Internal damage to pump	Replace pump
External oil leaks	Loose or faulty fittings	Tighten or replace
	Damage of O'Ring	Inspect; if damaged, replace
	Cracked hose	Replace hose

J. HYDRAULIC SYSTEM

PROBLEM

Entire hydraulic system fails to function

PROBABLE CAUSE

Low oil level in reservoir

Oil not reaching pump

Faulty hydraulic pump

Noisy hydraulic pump

Cold oil

Low oil level in reservoir

Air leak in suction line

Collapsed suction hose

SUGGESTED REMEDY

Fill reservoir to proper level w/approved oil

Remove suction hose from reservoir; hold the far end higher than pump; hand feed two quarts approved oil through suction hose by turning engine w/starter. Re-install hose; tighten all fittings; pull up on throttle control; start engine

Replace hydraulic pump

Allow for adequate warm up period

Fill to proper level with approved oil

inspect and tighten all fittings on suction hose

Cold oil: let system warm up before increasing engine speed

F. ELECTRICAL

PROBLEM	<u>PROBABLE CAUSE</u>	<u>SUGGESTED REMEDY</u>
Entire electrical system is dead	Battery or connections	Check battery - charge or replace
	Low charging rate	Tighten alternator belt
	No charging rate	Replace alternator
All gauges on instrument panel not working	Blown fuse	Replace fuse
	Dead battery	Charge or replace battery
	Battery connection	Clean; tighten battery connection
Speedometer not working	Blown fuse	Check & replace fuse
	Loose connections at sensor	Tighten connections at sensor
	Sensor clearance	Adjust sensor to clear speedometer disc about 1/8"
	Faulty sensor	Replace sensor
	Faulty speedometer head	Replace speedometer head
	Faulty toggle switch	Replace switch
Electric solution valve not working	Fuse	Check and replace fuse
	Faulty ground	Clean; tighten ground
	Separation in wire	Check continuity; repair or replace wire
	Short within solenoid coil	Replace coil
Light system does not function	Faulty fuse	Replace fuse
	Poor ground	Clean; tighten ground
	Burned out bulb	Replace bulb
	Separation or short in wire	Check continuity
	Faulty switch	Replace switch

LIMITED WARRANTY

HAGIE MANUFACTURING COMPANY NEW EQUIPMENT WARRANTY

1. The warranty.
 - a. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.
 - b. Hagie makes this warranty only to the original purchaser of its new equipment.
 - c. The warranty period ends 12 months from the date of delivery of the equipment to the original purchaser. When requesting warranty service, the original purchaser must present evidence of the date of delivery of the equipment.
 - d. Parts or rebuilt assemblies furnished under the terms of this warranty are not warranted beyond the original warranty period.
 - e. Exceptions to this warranty must be covered by separate warranty agreements.
2. ITEMS NOT COVERED BY HAGIE WARRANTY
 - a. Used equipment.
 - b. Tires, tubes, engines and batteries (under separate manufacturer's warranty).
 - c. Depreciation or damage caused by normal wear, accident, improper maintenance, improper storage, or improper use.
 - d. Service calls and the moving of the equipment to and from the place where the equipment is used.
3. USE OF THIS WARRANTY IS LIMITED TO THE ORIGINAL PURCHASER OF THE EQUIPMENT.

THIS WARRANTY IS LIMITED TO THE ORIGINAL PURCHASER OF THE EQUIPMENT. IT IS NOT TRANSFERABLE TO ANY OTHER PARTY.

(Limited Warranty continued)

- a. If service is performed by someone other than Hagie authorized personnel;
or
 - b. If the equipment is modified or altered without Hagie approval.
4. NO COMMERCIAL LOSS COVERAGE
- a. Hagie shall not be liable for incidental or consequential damages or injuries (damage and repairs of equipment itself, loss of profits, rental or substitute equipment, loss of good will, etc.)
 - b. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.
5. MERGER CLAUSE
- a. The entire warranty agreement is included in this writing.
 - b. Any oral statements that are made by the selling persons about the equipment are not warranties, and are not to be relied upon by the purchaser.
6. NO REPRESENTATIONS OR IMPLIED WARRANTY
- The parties agree that the implied warranties of merchantability and fitness for a particular purpose and all other warranties, express or implied, are excluded from this transaction and shall not apply to the equipment sold.

MEMORANDA

MEMORANDA
