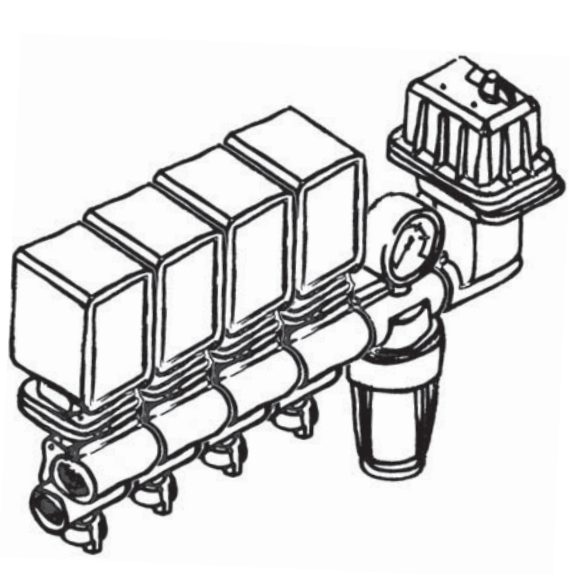
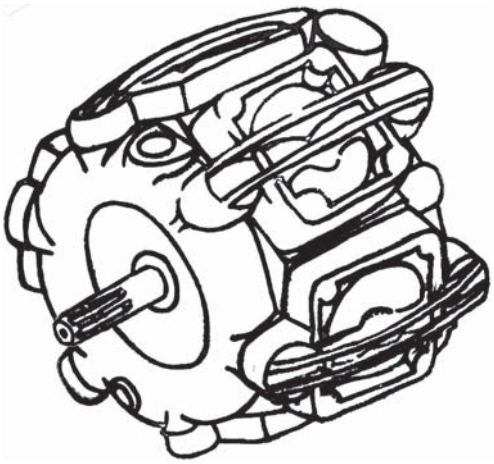
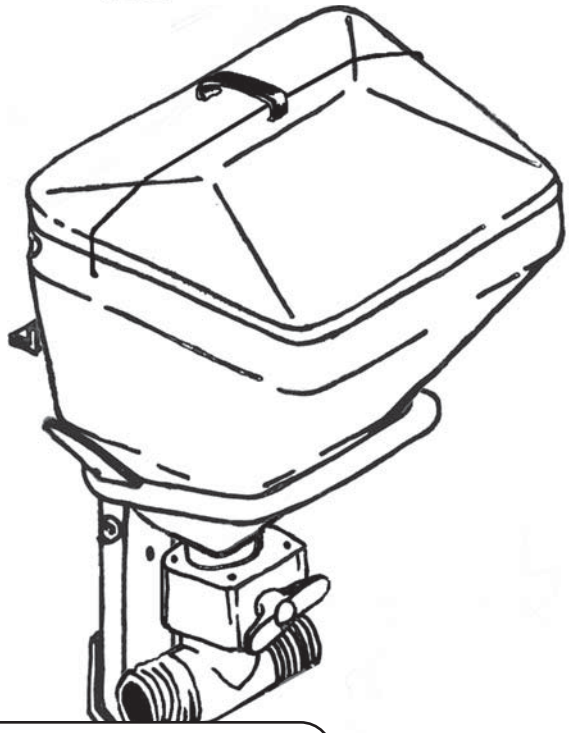
HARDI® SPRAYERS



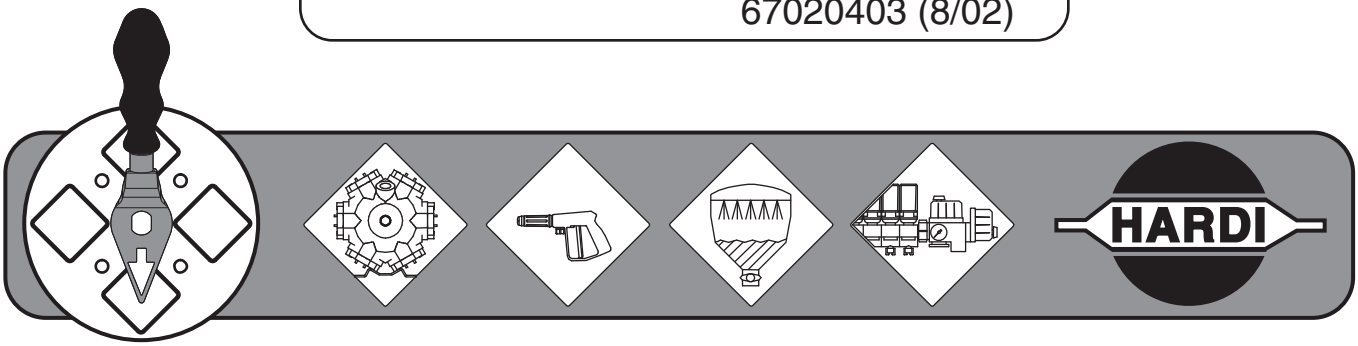




DELTA 3-PT.

Operator's Manual

67020403 (8/02)



DELTA 3-PT.
Operator's Manual

67020403 (8/02)

Table of Contents

Dear Owner,

Thank you for purchasing a HARDI® product and welcome to the ever-increasing family of HARDI® sprayer owners.

Our sprayers and accessories are rapidly becoming a familiar sight on North American farms. We believe that this results from growers becoming increasingly conscious of crop protection input costs and the vital need for cost effective spray application equipment.

Please take the time to thoroughly read the Operator's Manual before using your equipment. You will find many helpful hints as well as important safety and operation information.

Some of the features on your HARDI® sprayer were suggested by growers. There is no substitute for "on farm" experience and we invite your comments and suggestions. If any portion of this instruction book remains unclear after reading it, contact your HARDI® dealer or service personnel for further explanation before using the equipment.

For Product, Service or Warranty Information:

- Please contact your local HARDI® dealer.

To contact HARDI® directly:

- Please use the HARDI® Customer Service number: 1-866-770-7063
- Or send your email to CUSTSERV@hardi-us.com

HARDI® NORTH AMERICA INC. **Visit us online at: www.hardi-us.com**

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Phone: (563) 386-1730
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Sincerely,

Dale M. Szuminski

President

Introduction

We congratulate you for choosing a HARDI® plant protection product. The reliability and efficiency of this product depends upon your care. The first step is to carefully read and pay attention to this instruction book. It contains essential information for the efficient use and long life of this quality product.

The DELTA 3 PT. sprayer consists of a powder coated frame with a diaphragm or centrifugal pump, ECP control (Electric Control Plus) or ECPC control (Electric Control Plus Centrifugal), HARDI® Manifold system, Self-Cleaning Filter (diaphragm systems only), Paralift™ Boom Lift System, and 80', 88', or 90' EAGLE™ SPC series spray boom.

DELTA 3-PT. Sprayer with 90' Eagle™ SPC boom in transport position

DELTA 3-PT. Sprayer with 90' Eagle™ SPC boom in spraying position

Description

Frame
Strong and compact frame which has a strong chemical and weather resistant powder coat. Screws, nuts, etc. have been electrochemically treated to be resistant to corrosion.

Pumps
The HARDI® diaphragm pumps have low maintenance requirements and guaranteed pump life. The bearings and crankshaft are grease lubricated and are therefore protected from spray solution if any diaphragm fails in service. A drain hole is in the base of the crank case to facilitate the draining of any foreign matter. The diaphragm pumps are self priming and can be run dry without damage. Hydraulically driven centrifugal pumps and plumbing systems are also available.

MANIFOLD SYSTEM
All functions of the spray circuits are operated via the centrally situated MANIFOLD valves with color coded plates and pictorial symbols for easy operation.

ECP operating unit
The ECP operating unit consists of: control box, adjustable pressure agitation, pressure filter, HARDIMATIC mechanical rate controller (within same gear), 2-1/2" pressure gauge and individual boom feed valves featuring a constant pressure device for unchanged application rates even if one or more boom sections are shut off. The master on/off switch on the control box operates by shutting off all boom sections regardless of whether individual boom switches are on or off.

ECPC operating unit
The ECPC operating unit consists of: control box, adjustable pressure agitation, 2-1/2" pressure gauge and individual boom feed valves featuring a constant pressure device for unchanged application rates even if one or more boom sections are shut off. The master on/off switch on the control box operates by shutting off all boom sections regardless of whether individual boom switches are on or off.

Filters
With the self-cleaning filter (diaphragm pump only), the impurities that exist in the spray liquid will bypass the filter and be recirculated back to the tank via the return flow.

Suction filter and in-line pressure filters are standard with all booms.

Paralift™
The Paralift™ boom lift system consists of parallel lift arms that hydraulically lift and lower the boom assembly, ensuring that the boom remains parallel to the ground. A locking cylinder and arms are fitted to ensure that the paralift cylinders are relieved of any hydraulic pressure when the boom is in the transport position.

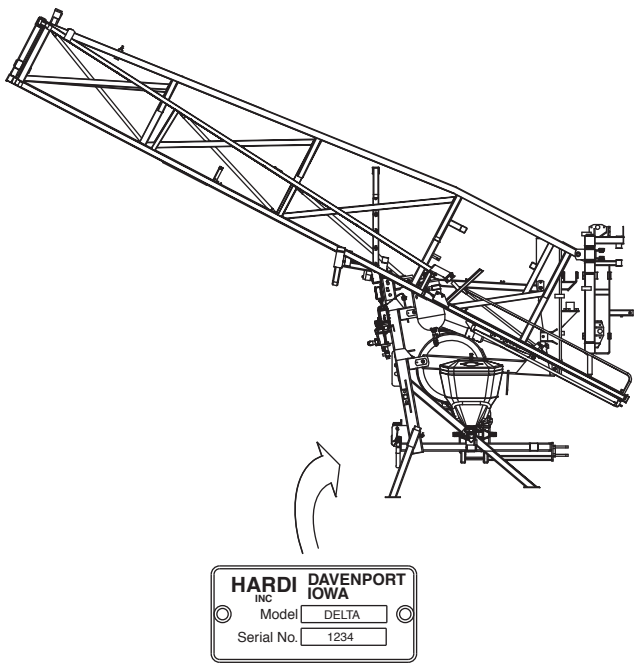
Booms
The EAGLE™ SPC boom is available for the DELTA in 80', 88' and 90' working width. Outer sections incorporate spring loaded breakaways.

Boom hydraulics
The EAGLE™ SPC booms are equipped with I.A.H. (Indirect Acting Hydraulics). Optional D.H. (Direct Acting Hydraulics) is available.

The boom is operated via the tractor hydraulics. It features hydraulic lift cylinders for boom height adjustment, boom wing fold and tilt cylinders that give the ability to obtain individual boom wing tilt as well as individual boom wing fold.

The hydraulics are controlled via a joystick or via a hydraulic control box.

Identification plates
An identification plate fitted on the frame indicates model and serial number. Frame, boom center frame, and inner/outer sections also have identification plates indicating boom type and part number of spare parts. If ordering spare parts, inform your dealer of these, so the right model and version are described.



Description

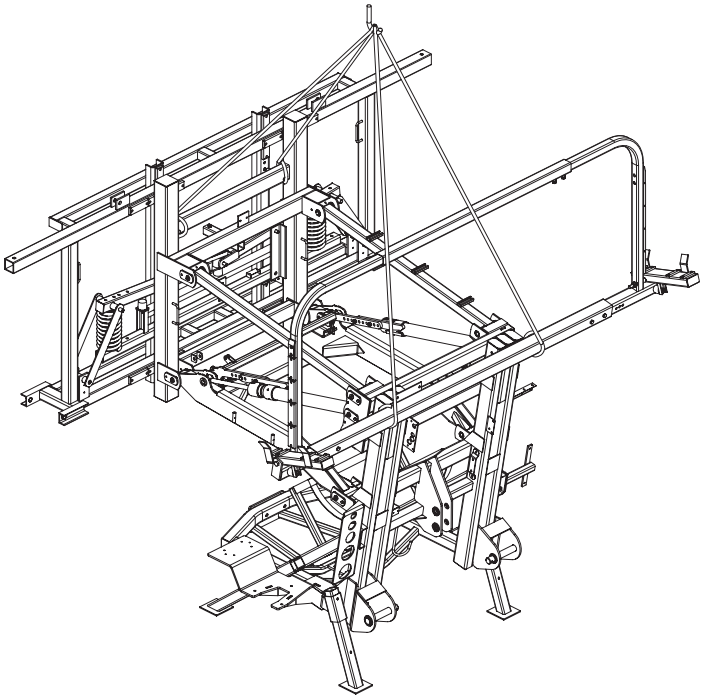
Sprayer use

The HARDI® DELTA 3-PT. sprayer is for the application of crop protection chemicals and liquid fertilizers.

If no local law demands that the operator must be certified to use the spray equipment, it is strongly recommended to be trained in correct plant protection and in safe handling of plant protection chemicals to avoid unnecessary risk for persons and the environment when doing the spray job.

Unloading the sprayer from the truck

When unloading the sprayer, a crane or a fork lift is needed. When loading with a crane, please observe the lifting points as shown on the illustration and make sure that the straps or belts used for lifting are suitable for the application.



Before putting the sprayer into operation

Although the sprayer has been applied with a strong and protective surface treatment on steel parts, bolts etc. in the factories, it is recommended to apply a film of anticorrosion oil (e.g. CASTROL RUSTILLO or SHELL ENSIS FLUID) on all metal parts in order to avoid chemicals and fertilizers discoloring the enamel. Avoid oil on rubber parts, hoses and tires.

If this is done before the sprayer is put into operation for the first time, it will always be easy to clean the sprayer and keep the enamel shiny for many years.

This treatment should be carried out every time the protection film is washed off.

Safety instructions

SAFETY INFORMATION

WARNING

ALWAYS READ OPERATOR'S MANUAL BEFORE USING EQUIPMENT

DO NOT REMOVE ANY SAFETY DEVICES OR SHIELDS. NEVER SERVICE, CLEAN OR REPAIR A MACHINE WHILE IT IS OPERATING

WARNING

ALWAYS WATCH FOR THIS SYMBOL TO POINT OUT IMPORTANT SAFETY PRECAUTIONS

IT MEANS ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

RECOGNIZE SAFETY INFORMATION

This is the Safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

Follow Safety Instructions

- Carefully read all the safety messages in this manual and the safety labels fitted to the machine. Keep safety labels in good condition. Replace missing or damaged safety labels. Be sure that new equipment components include any current safety labels. Replacement safety labels are available from your authorized HARDI® dealer.

- Learn how to operate the sprayer and how to use the controls properly. Do not let anyone operate the machine without proper instructions.

- Keep your sprayer in proper working condition. Unauthorized modifications or use may impair the function and/or safety and affect the machine's life.

- If you do not understand any part of this manual and need assistance, please contact your authorized HARDI® dealer.

Operating The Sprayer Safely

1. Read the complete manual carefully and become familiar with the operation of the equipment before initial operation in each spraying season. Failure to do so may result in possible over or under application of spray solution which may drastically affect crop production and lead to personal injury.

2. Before starting the engine on the tractor unit, be sure all operating controls are in the off or neutral position, including (but not limited to) the P.T.O. shaft and/or spray controls. Be sure the tractor power train is disengaged.

3. Operate spray and boom functions only when seated in the operator's seat.

4. One of the most frequent causes of personal injury or death results from persons falling off or being run over. Do not permit others to ride on or in. Only one person should be working the machine when in operation.

5. Before leaving the tractor seat, stop the engine, put all controls in neutral, and put the transmission control lever in the park position or neutral with the brakes locked. Read the tractor operation manual for added safety precautions.

6. P.T.O. driven equipment can cause serious injury. Before working on or near the P.T.O. shaft, servicing or cleaning the equipment, put P.T.O. lever in the DISENGAGE position and stop the engine.

7. Do not fold or unfold boom near overhead wires. Serious injury or death could result if contact is made with electric wires.

8. Keep hands, feet & clothing away from moving parts.

9. Wear relatively tight and belted clothing to prevent from being caught on some part of the machine.

10. Slow down when turning, especially with boom unfolded.

11. Always keep children away from your sprayer and/or tractor unit.

12. Before transporting the sprayer, ensure that the boom is fully folded and fully locked into transport position. Ensure all locking devices are fully engaged, whether hydraulic or mechanical.

13. Slow moving tractors and spray equipment can create a hazard when on public roads. Avoid personal injury or death resulting from any accidents by using flashing lights. Local regulations may require installation of flashing warning lights.

14. Avoid injuries from high pressure fluids penetrating the skin by relieving system pressure before disconnecting hydraulics or other lines. Ensure all fittings are tight before applying pressure to the system.

15. Understand service procedures before undertaking any maintenance. Never lubricate, service, or adjust the machine while it's moving. Securely support any components before working on them.

16. Keep all parts in good condition and properly installed. Fix damaged parts immediately. Replace worn or broken parts. Remove excessive buildup of grease, oil or debris.

Handling Chemical Products Safely

1. Direct exposure to hazardous chemicals can cause serious injury. These chemicals can include lubricants, coolants, paints, adhesives and agricultural chemicals. Material Safety Data Sheets (M.S.D.S.) are available for all hazardous chemicals which inform the user of specific details including: physical and health hazards, safety procedures, and emergency response techniques.

2. Protective clothing such as rubber gloves, goggles, coveralls and respirator must be worn while handling chemicals. All protective clothing should be kept in excellent condition and cleaned regularly or discarded.

3. If chemicals come in contact with any exposed skin areas, wash immediately with clean water and detergent. Never place nozzle tips or any other components that have been exposed to chemicals to lips to blow out obstructions. Use a soft brush to clean spray nozzles.

4. Dedicate an area to fill, flush, calibrate and decontaminate sprayer where chemicals will not drift or run off to contaminate people, animals, vegetation, water supply, etc. Locate this area where there is no chance of children coming in contact with this residue.

5. Decontaminate equipment used in mixing, transferring and applying chemicals after use. Follow the instructions on the chemical label for the correct procedure required. Wash spray residue from outside of the sprayer to prevent corrosion.

6. Extreme care should be taken in measuring spray products. Powders should be used in suitable sized packages or weighed accurately. Liquids should be poured into a suitable graduated container. Keep chemical containers low when pouring. Wear a filtered respirator and let the wind blow away from you to avoid dust and/or splashes contacting the skin or hair.

7. Store chemicals in a separate, plainly marked locked building. Keep the chemical in its original container with the label intact.

8. Dispose all empty containers after rinsing in accordance with local regulations & by-laws. Dispose of all unused chemicals and left over fertilizer in an approved manner.

9. Keep a first aid kit and fire extinguisher available at all times when handling chemicals.

Local Poison Information Center

If you live anywhere in the United States, the following toll free number will connect you to your Local Poison Information Center.

PHONE NO. 1 - 8 0 0 - 2 2 2 - 1 2 2 2

If you live outside the United States, find the number for the poison control center in your phone book and write it in the space below:

PHONE NO. _____-_____-_____

Keep a list, in the space provided below, of all the chemicals that you have in use.

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8._____
9._____
10._____

Sprayer setup

DELTA 3-PT. set-up

WARNING: **Note these recommendations:**

1. Add front tank (or front ballast weights) to the tractor before mounting the DELTA 3-PT. sprayer.
2. Adjust tire pressure (see tractor's instruction book).
3. Be careful when filling/lifting the sprayer for the first time.
4. Ensure that the operating unit and the tractor do not touch.

Connecting the front tank

Refer to your Front Tank Operator's manual for attaching the front tank. If equipped with a HARDI® Front tank, refer to manual no. #10564503.

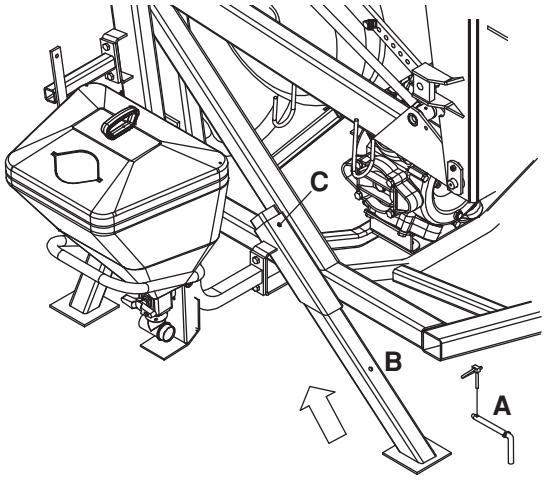
Connecting the DELTA 3-PT. lift

The DELTA is designed for three point mounting on a tractor and will fit both CAT. III wide and narrow hitch. The frame has 4 support legs (for use when the sprayer is free standing) that are retractable to minimize crop damage.

1. Connect lift arms or quick hitch to sprayer.
2. Lift the sprayer, checking that no part of the sprayer contacts the tractor.
3. Adjust the top link bar so that the sprayer frame is perpendicular to the ground.
4. Do not connect P.T.O. shaft until operating shaft clearance has been determined (see Installation of P.T.O. shaft - p.11).
5. Retract each of the four support legs.

Retraction of support legs

1. Remove the lock pin **A**.
2. Push up the support leg until the lower hole **B** in the inner profile matches the hole **C** in the outer profile.
3. Fasten this position by the pin **A**.
4. Position the tractor lift so the boom can be lowered to 18-20" (45-50 cm) in the lowest position, and adjust top bar until the sprayer frame is perpendicular to the ground.

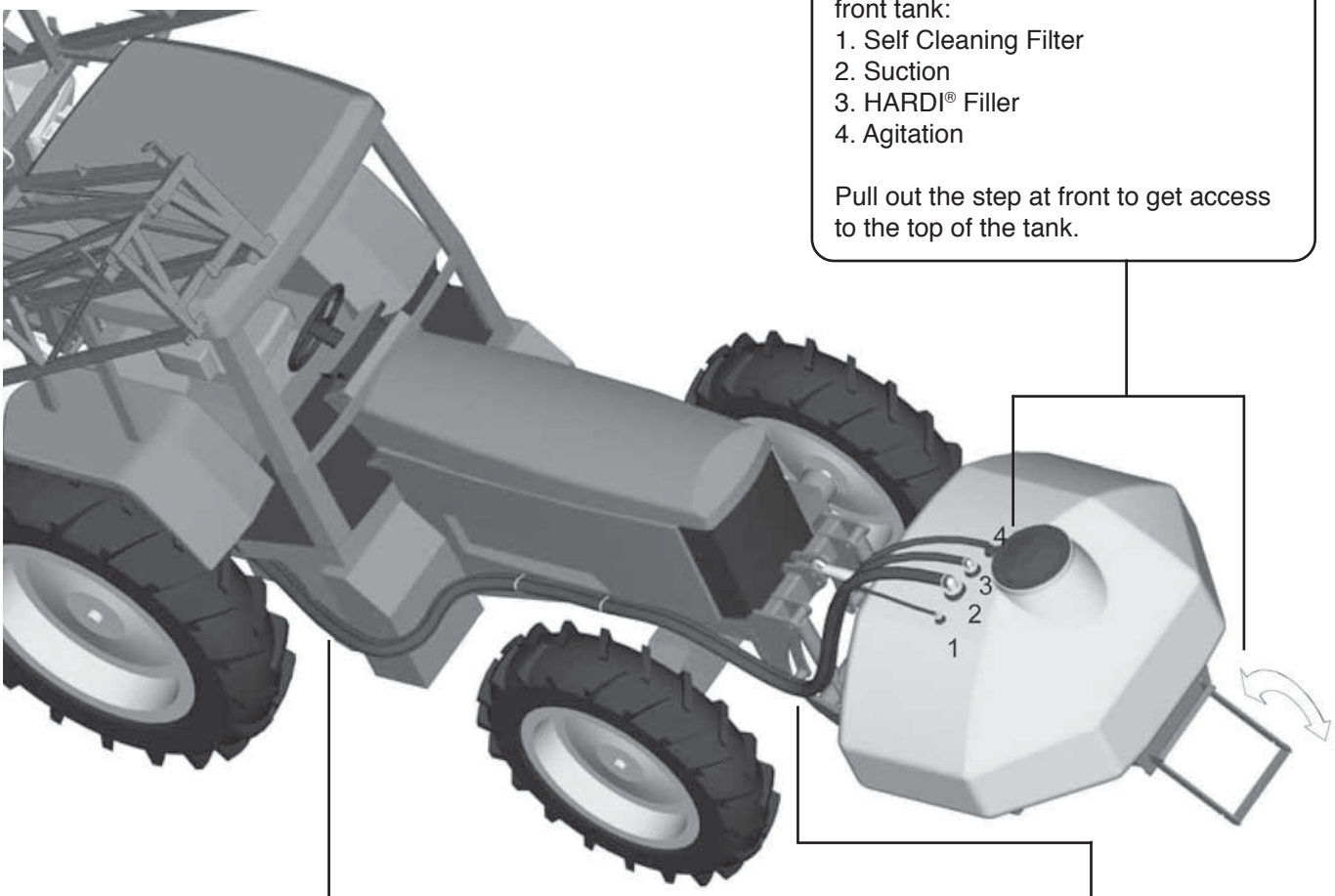


Sprayer setup

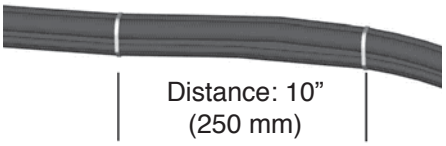
Set up - hoses

Attach the hoses with fittings to the front tank:
1. Self Cleaning Filter
2. Suction
3. HARDI® Filler
4. Agitation

Pull out the step at front to get access to the top of the tank.



The hoses are led from the MANIFOLD valves along the side of the tractor to the front tank as shown on the drawing. Routing of hoses will vary depending on tractor model.



The hoses must be secured with tie straps at 10” (250 mm) spacing between MANIFOLD valves and front tank.

Sprayer setup

P.T.O. Shaft Operator Safety

WARNING: **ALWAYS STOP ENGINE BEFORE ATTACHING THE TRANSMISSION SHAFT TO TRACTOR P.T.O. MOST TRACTOR P.T.O. SHAFTS CAN BE ROTATED BY HAND TO FACILITATE SPLINE ALIGNMENT WHEN ENGINE IS STOPPED.**

When attaching the shaft, make sure that the snap lock is FULLY ENGAGED - push and pull shaft until it locks.

WARNING: **ROTATING TRANSMISSION SHAFTS WITHOUT PROTECTION GUARDS ARE FATAL.**

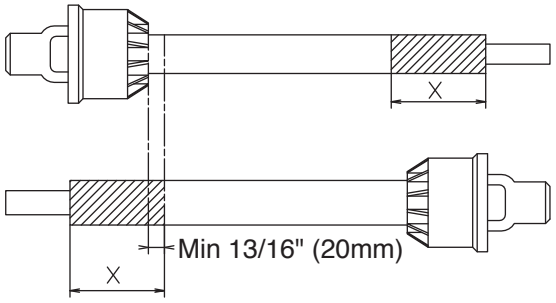
Always keep protection guards and chains intact and make sure that the guards cover all rotating parts, including CV-joints at each end of the shaft.
Do not use without protection guard.
Do not touch or stand on the transmission shaft when it is rotating - safety distance: min 5' (1.5 meters).
Prevent protection guards from rotating by attaching the chains, allowing sufficient slack for turns.

Make sure that protection guards around the tractor P.T.O. and implement shaft are intact. Always STOP ENGINE and remove the ignition key before carrying out maintenance or repairs to the transmission shaft or implement.

INSTALLATION OF P.T.O. SHAFT

WARNING: **THE P.T.O. SHAFT ANGLE WILL CHANGE WHEN RAISING AND LOWERING THE CLEVIS. TO PREVENT EXCESSIVE LOADING AND BINDING ON THE P.T.O. SHAFT, IT MAY BE ADVISABLE TO LEAVE THE P.T.O. SHAFT DISCONNECTED UNTIL THE CLEVIS ADJUSTMENT IS COMPLETED. THEN THE P.T.O. SHAFT ADJUSTMENTS CAN BE MADE.**

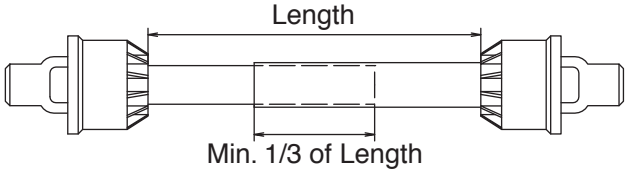
Initial installation of the shaft is done as follows:
1. Attach sprayer to tractor and set sprayer in the position with shortest distance between the tractor and sprayer pump P.T.O. shafts.
2. Stop engine and remove ignition key.
3. If P.T.O. shaft must be shortened, the shaft is pulled apart. Fit the two shaft parts at tractor and sprayer pump and measure how much it is necessary to shorten the shaft. Mark the protection guards.



Note: The minimum allowable overlap for the shaft depends on the pump model.

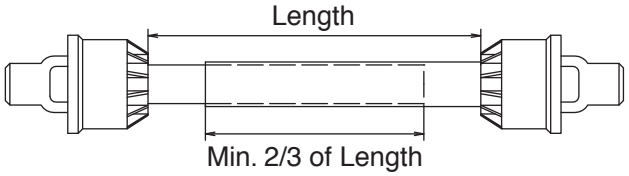
Pump with 6 splines (540 r.p.m.)

The shaft must always have a minimum overlap of 1/3 the length.

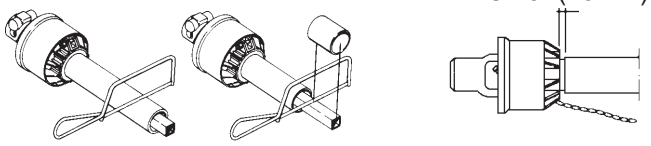


Pump with 21 splines (1000 r.p.m.)

The shaft must always have a minimum overlap of 2/3 the length.



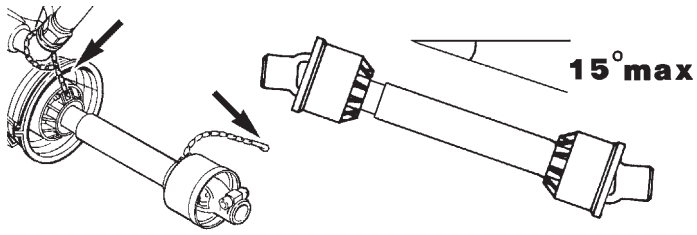
4. The two parts are shortened equally. Use a saw, and file the profiles afterwards to remove burrs.



5. Grease the profiles, and assemble male and female parts again.
6. Fit the shaft to tractor and sprayer pump.

Note: Female part towards tractor. Fit chains to prevent the protection guards from rotating with the shaft.

7. To ensure long life of the P.T.O. shaft, try to avoid working angles greater than 15°.



Hydraulic system

Connection requirements for HZ booms are:

- One single acting outlet for the lift function of the spray boom
- One double acting outlet for the folding function
- 12 Volt electric supply

Note: The hydraulic system requires an oil capacity of approximately 0.8 GPM (3 liters) and a minimum pressure of 1,950 PSI (130 bar).

BE SURE TO HOOK UP HYDRAULIC LINES PROPERLY!

ENSURE HYDRAULIC LINES HAVE NOT BEEN DAMAGED DURING SHIPPING.

ESCAPING HYDRAULIC FLUID UNDER PRESSURE CAN PENETRATE THE SKIN CAUSING SERIOUS INJURY. AVOID THIS HAZARD BY RELIEVING PRESSURE BEFORE DISCONNECTING HYDRAULIC LINES.

ENSURE ALL CONNECTIONS ARE TIGHT BEFORE APPLYING PRESSURE, SEARCH FOR LEAKS WITH A PIECE OF CARDBOARD NOT YOUR HANDS!

IMPROPER HOOK-UP CAN CAUSE DANGEROUS BOOM MOVEMENTS AND/OR DAMAGE TO THE SPRAYER HYDRAULICS.

DO NOT ALLOW ANYONE NEAR A HYDRAULIC BOOM IN OPERATION.

ALWAYS SHUT TRACTOR OFF WHEN CONNECTING, SERVICING OR ADJUSTING BOOM.

Make sure that the hydraulic couplers are clean before connecting to the tractor's remote outlets.

IMPORTANT! Due to the variation in tractor hydraulic systems and capacities, care should be exercised when initially operating the sprayer hydraulic cylinders. It is advisable to adjust the hydraulic flow control down to the minimum rate before operating the system. Adjust/increase the flow control after the system is bled of any air, if necessary.

Hydraulics - standard joystick handle

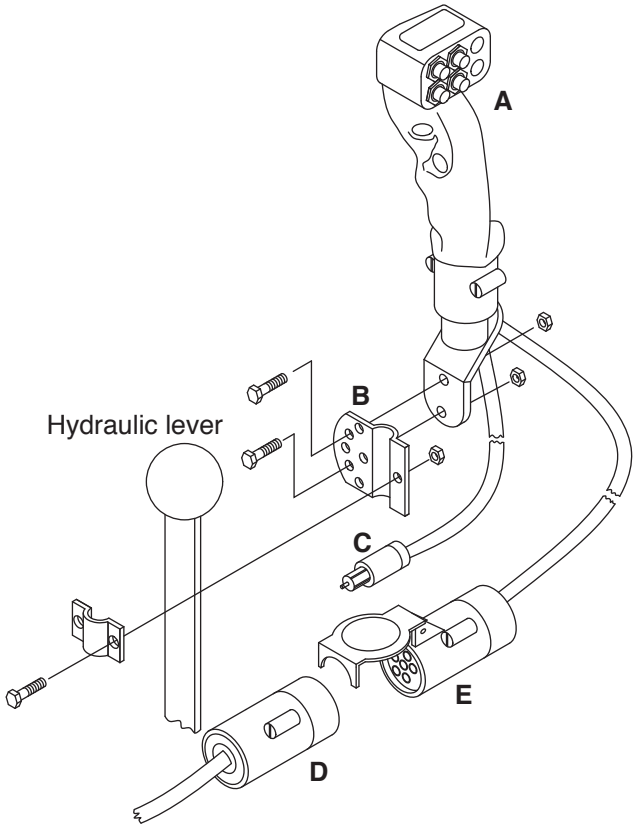
Installation of handle

1. Attach the control handle/joystick **A** to the hydraulic lever that operates the double acting outlet to be used. The universal mounting bracket **B** is very flexible and a number of different mounting positions can be used.
2. Connect the plug **C** to the tractor's 12V power system. Try to hook-up the handle as close as possible to the battery power supply. HARDI® recommends using an electric distribution box (ref. no. 817925) to ensure a good power supply to various 12V attachments.

Note: Check with your dealer or tractor operator's manual for the best location to hook up the 12V system.

Note polarity: BROWN wire = Positive (+)
BLUE wire = Negative (-)

3. Connect electric plug **D** from sprayer's hydraulics to plug **E** on handle.



Direct Acting Hydraulic system (D.H.) (optional)

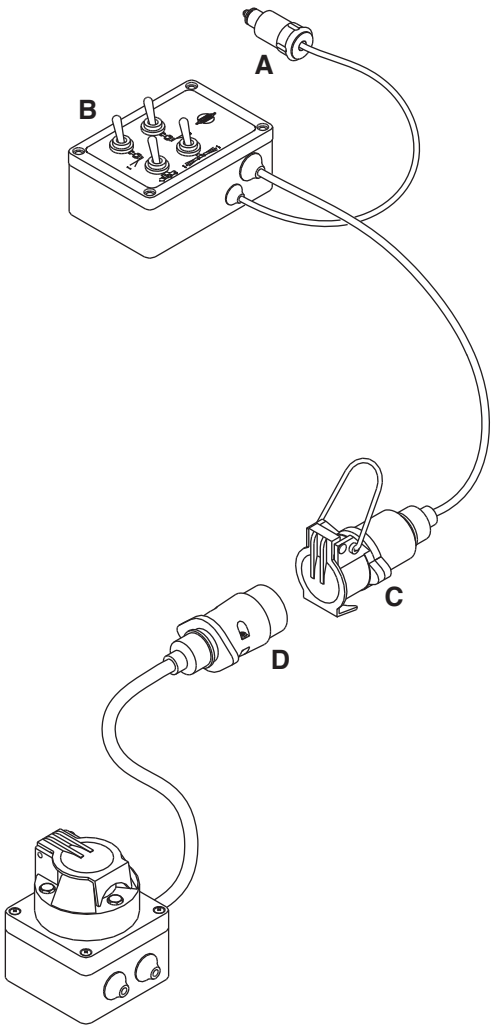
Installation of control box

1. Connect the plug **A** to the tractor's 12V power system. Try to hook up the handle as close as possible to the battery power supply. HARDI® recommends using an electric distribution box (ref. no. 817925) to ensure a good power supply to various 12V attachments.

Note: Check with your dealer or tractor operator's manual for the best location to hook up the 12V system.

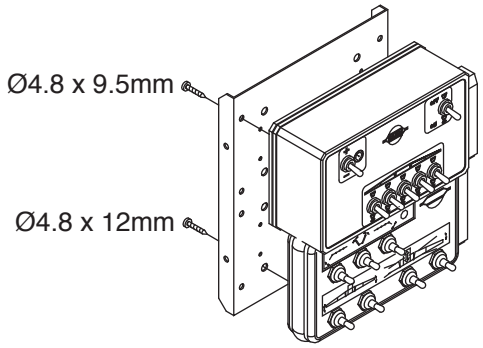
Note polarity: BROWN wire = Positive (+)
BLUE wire = Negative (-)

2. Route the cable with the 7 pins, from the sprayer's hydraulic mount plate to the tractor.
3. Mount the hydraulic control box **B** in a suitable location in the tractor cabin.
4. Connect the female 7 pin plug **C** from the switch box to the 7 pin male plug **D** from the sprayer.



Control boxes and power supply

The control boxes for the ECP operating unit are fitted in the tractor cabin in a convenient place. Self-tapping screws can be used for mounting.



Power requirement is 12V DC.

Note polarity: BROWN wire = Positive (+)
BLUE wire = Negative (-)

The wires must have a cross sectional area of at least 12wg (4 mm^2) to ensure sufficient power supply. For the ECP operating unit the tractor circuit should have an 8 Amp fuse (5 Amp fuse for hydraulic system).

The 12V power sockets on the control boxes can be plugged directly into either a HARDI® 4 outlet connection box (#817925) or a single female bayonet style plug (#260827). Both of these are available from your HARDI® Dealer.

12-volt junction box (#817925) for 12-volt hook-up.

Sprayer setup

Transport position

The height and width of the transport brackets can be set in different positions. Choose a setting which gives sufficient clearance from the tractor cabin.

IMPORTANT! Make sure that max. transport height and width are not exceeded.

Height setting

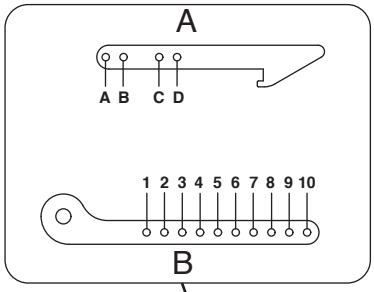
NOTE! The rear settings must correspond to the front settings so the boom is resting on the front as well as rear brackets.

WARNING! The max. transport height must never exceed 13.1 ft. (4.0 m). Always measure the actual total height, and choose settings not exceeding 13.1 ft (4.0 m).

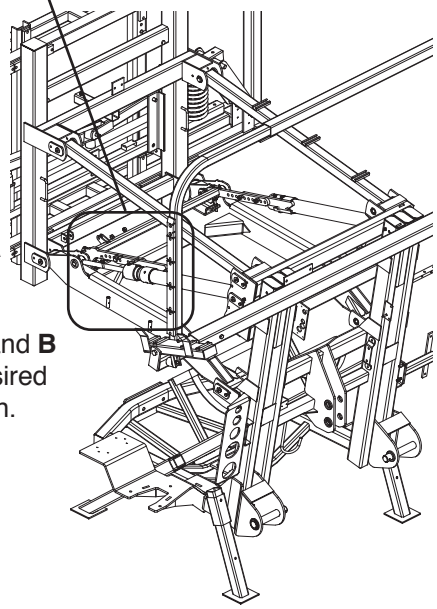
Transport lock

The setting of the transport lock determines the bearing point of the boom when it rests in the transport brackets.

The setting is adjusted by means of the hole combination in the brackets **A** + **B**.



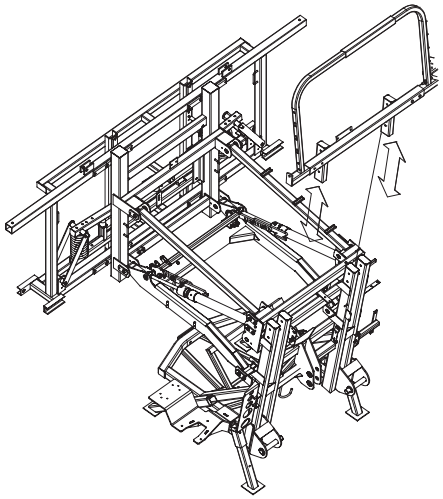
1. Lift and unfold inner sections until lock is disengaged.
2. Loosen and remove the two bolts, which keep the parts **A** and **B** assembled.
3. Reassemble **A** and **B** according to desired hole combination.



Note: Always use both bolts to assemble the lock. The setting must be identical on both sides.

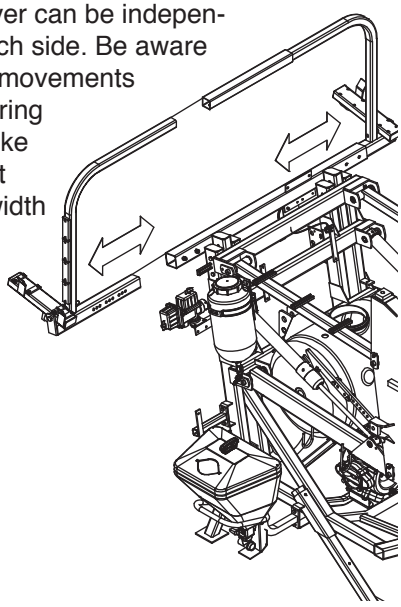
Transport brackets

The height of the transport brackets can be adjusted up and down as shown on the drawing. Simply loosen the bolts in both sides, adjust the height of the brackets and fasten the bolts again according to the new position.



Width setting

The width of the sprayer can be independently adjusted for each side. Be aware of the risk of sideway movements of the folded boom during transportation and make sure to leave sufficient room for such in the width setting.



Roadworthiness

When driving on public roads and other areas where the highway code applies, or areas where there are special rules and regulations for marking and lights on implements, you should observe these and equip implements accordingly.

Rear lights

Connect plug for rear lights to the tractor's 7-pin socket and check the functions of rear lights, stop lights and direction indicators on both sides of the sprayer before driving.

The wiring is in accordance with ANSI/ASAE S279.11 (See Technical Specifications - p.48).

Operation

Operating the boom

BEFORE UNFOLDING THE BOOM, IT IS IMPORTANT TO HAVE THE SPRAYER HOOKED TO THE TRACTOR TO PREVENT OVERBALANCING THE SPRAYER. ONLY THEN LIFT THE BOOM OFF THE TRANSPORT BRACKETS WHICH HOLD IT IN THE TRANSPORT POSITION.

- **ENSURE THAT BOOMS ARE BACK IN THE TRANSPORT POSITION BEFORE UNHOOKING THE SPRAYER FROM THE TRACTOR.**

- **THE HYDRAULIC SYSTEM SHOULD BE CHECKED VERY CAUTIOUSLY THE FIRST TIME OF OPERATION; THERE MAY BE AIR IN THE SYSTEM AND THIS COULD CAUSE VIOLENT MOVEMENTS OF THE BOOM. ENSURE THAT NO PERSONS OR OBJECTS ARE IN THE WAY WHILE CHECKING THE SYSTEM.**

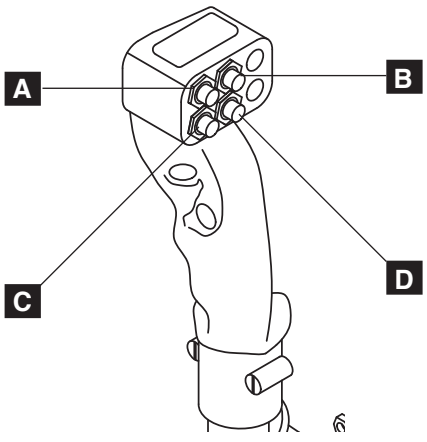
- **FOR INFORMATION ON BOOM ADJUSTMENT, SEE THE APPROPRIATE EAGLE™ BOOM OPERATOR'S MANUAL.**

Unfolding and folding the HZ EAGLE™ boom

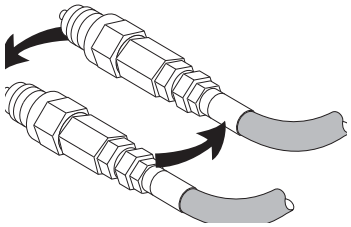
WARNING! Always put the boom wings in the horizontal position prior to folding. Never attempt to fold the boom to transport position when the boom wings are tilted - unexpected boom movements may occur, if the wings are tilted when folding.

A. Hydraulic joystick controls

Switch **A** operates: Left hand fold cylinder
Switch **B** operates: Right hand fold cylinder
Switch **C** operates: Left hand tilt cylinder
Switch **D** operates: Right hand tilt cylinder



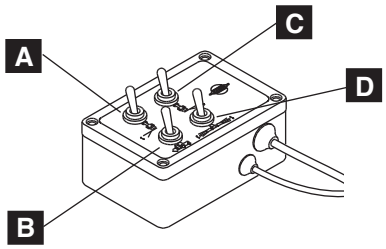
1. Raise the boom to release it from the transport brackets.
2. Depress switches **A** and **B** and move the joystick forward or rearward to activate oil flow. Switch positions of the hoses in the double acting remote outlet if you do not like the direction required to activate the boom.



3. 'One side folding' is achieved by following the above procedure - except that only one of the switches is depressed (See *'Folding one side only'* below).

B. D.H. Hydraulic control box (optional)

Switch **A** operates: Left hand fold cylinder
Switch **B** operates: Right hand fold cylinder
Switch **C** operates: Left hand tilt cylinder
Switch **D** operates: Right hand tilt cylinder



1. Raise the boom to release it from the transport brackets.
2. Engage the tractor's double acting remote outlet lever and lock it in the engaged position.
3. Activate switch **A** upwards and hold it to unfold left hand boom wing. (Holding the switch in the 'down' position will fold the boom wing). To unfold right hand boom, activate switch **B**.
4. 'One side folding' is achieved by following the above procedure - except that only one of the switches is activated. (See below).

Folding one side only

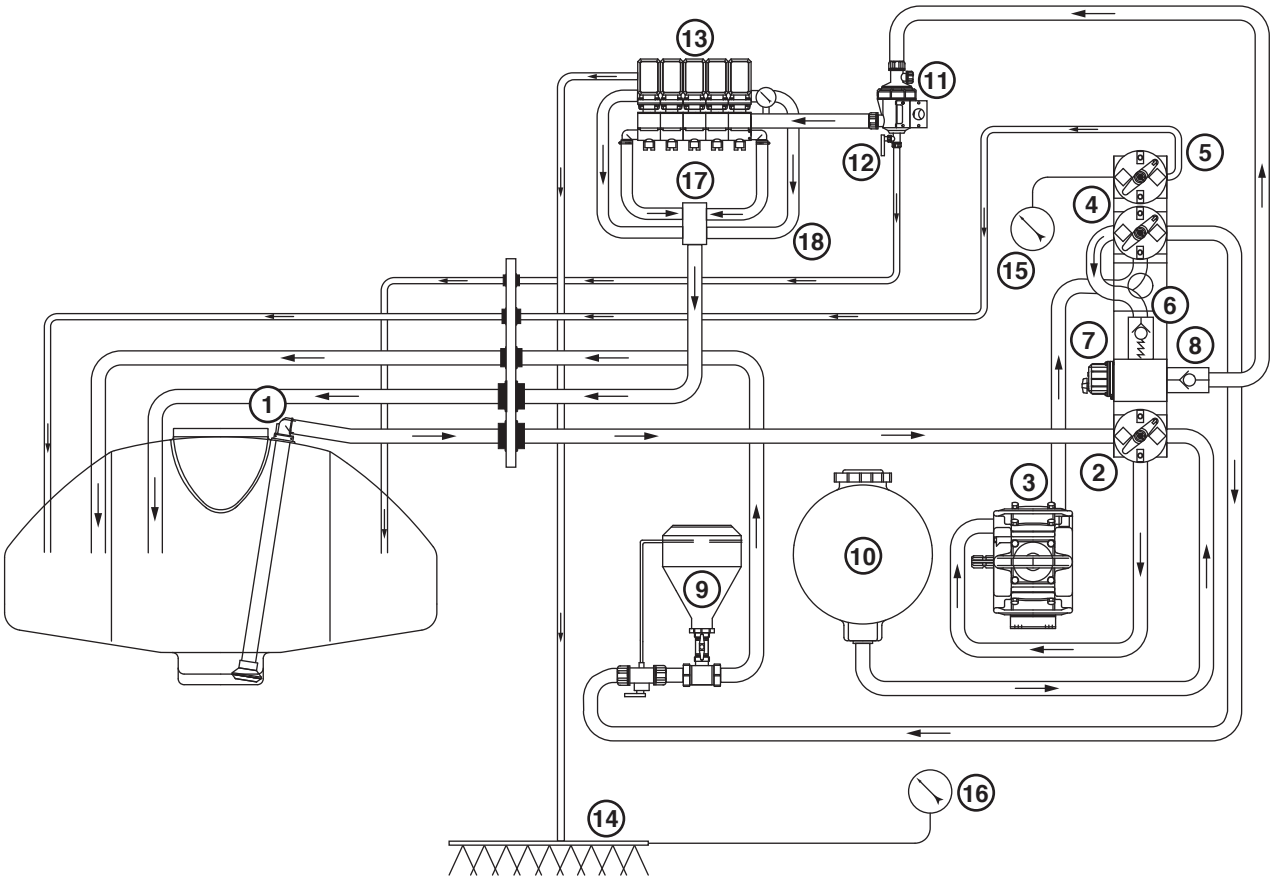
If only one side of the boom is to be unfolded, first unfold the boom completely and then turn switches off. Then flip the switch for the side that is to be folded and activate the double acting outlet to fold that side into transport position.

Note: It is not advisable to go directly from transport position to spraying position with one side only. Therefore, first unfold both boom wings completely.

Operation

The HARDI® DELTA 3-PT. Sprayer is available with either diaphragm or centrifugal plumbing systems. Take time to review and study the plumbing diagram for your sprayer. By following the flow through the diagram, you will better understand the various functions of your sprayer system.

ECP PLUMBING DIAGRAM (for diaphragm pump systems)

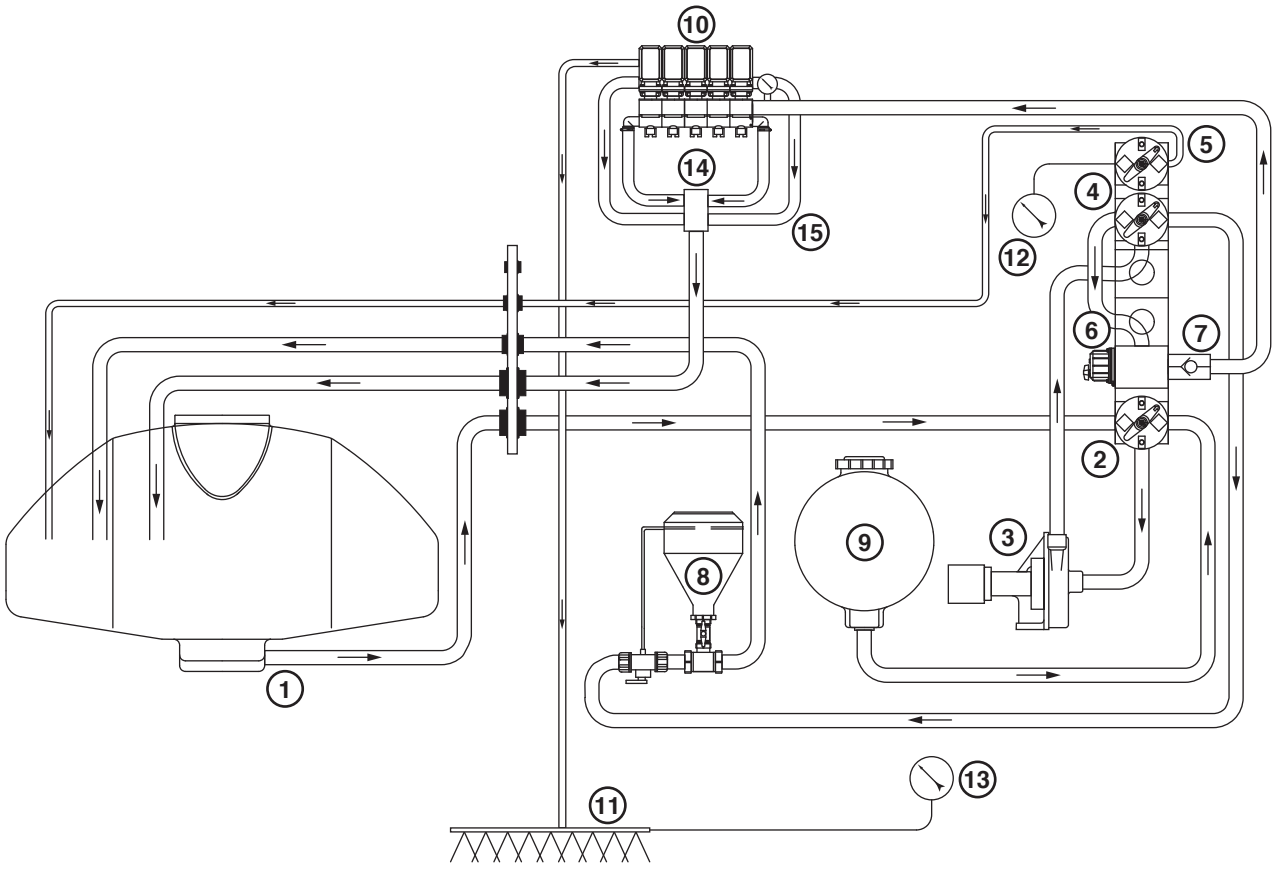


1. Suction filter
2. Suction manifold
3. Pump
4. Pressure manifold
5. System air bleed-off
6. Safety valve
7. HARDI-MATIC
8. Check valve
9. HARDI® Filler (optional)
10. Flush tank (optional)
11. Self-cleaning filter
12. Self-cleaning filter return valve
13. Distribution valves
14. Boom
15. Manifold pressure gauge
16. Boom pressure gauge
17. Pressure equalization return
18. Feed hose pressure return

Operation

The HARDI® DELTA 3-PT. Sprayer is available with either diaphragm or centrifugal plumbing systems. Take time to review and study the plumbing diagram for your sprayer. By following the flow through the diagram, you will better understand the various functions of your sprayer system.

ECPC PLUMBING DIAGRAM (for centrifugal pump systems)



1. Bottom Suction
2. Suction manifold
3. Pump
4. Pressure manifold
5. System air bleed-off
6. HARDI-MATIC
7. Check valve
8. HARDI® Filler (optional)
9. Flush tank (optional)
10. Distribution valves
11. Boom
12. Manifold pressure gauge
13. Boom pressure gauge
14. Pressure equalization return
15. Feed hose pressure return

Operating the liquid system

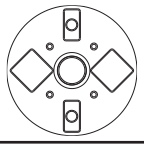
MANIFOLD SYSTEM

The “Manifold System” is located at the left side of the sprayer, permitting operation of most of the (fitted) accessories from one position. The modular design of the Manifold system allows the easy addition of many accessories to the plumbing system of the sprayer. The system is also fitted with an air bleed-off valve to aid in priming the pump. Diaphragm systems also features a self-cleaning filter return hose on/off valve, which allows the return to be turned on or off.

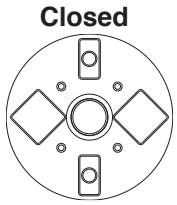
Use of MANIFOLD valve system

The Manifold valve faces are colored discs for easy identification:

Green disc = Pressure valve
Black disc = Suction valve



A function is activated/opened by turning the handle towards the desired function



Decals are fitted to the faces of the 3-way valves indicating the direction of flow of the liquid.

Decals - Green disc (pressure)	
Self-cleaning filter / Operating unit	
HARDI® FILLER (optional)	
Air bleed-off	

Decals - Black disc (suction)	
Suction from main tank	
Flush tank (optional)	

To operate the spraying functions:

- Turn the handle on a green pressure valve towards the desired function
- Turn the handle on a black suction valve towards the desired function
- Close all remaining valves by setting the handle(s) on “**O**”

Note: If a MANIFOLD valve is too tight to operate - or if it is too loose (= liquid leakage), the 3-way-valve needs to be serviced. Please see the part *“Adjustment of 3-way-valve (suction)” (p. 37)* for further information. Correct setting is when the valve can be operated smoothly by one hand.

Electrical operated MANIFOLD valves (optional)

One or more MANIFOLD valve(s) can be electrically operated via a control box in the tractor cab. In case of a power failure, these can only be operated manually when the power to the valve motor is disconnected.

Filling tanks with water

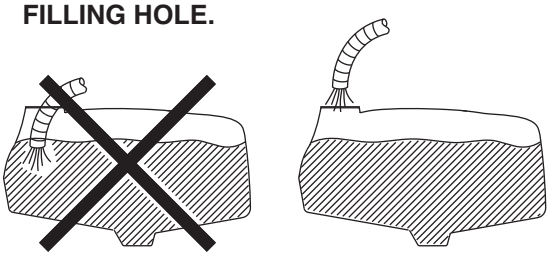
The main tank should normally be filled 1/3 with water, before adding the chemicals - always read instruction on chemical container!

Filling main tank through tank lid

Remove the tank lid and fill water through strainer basket to prevent rust or other foreign particles from entering the tank.

It is recommended to use a water supply as clean as possible for spraying purposes.

WARNING! **DO NOT LET THE FILLING HOSE ETC. ENTER THE TANK. KEEP IT OUTSIDE THE TANK, POINTING TOWARDS THE FILLING HOLE.**

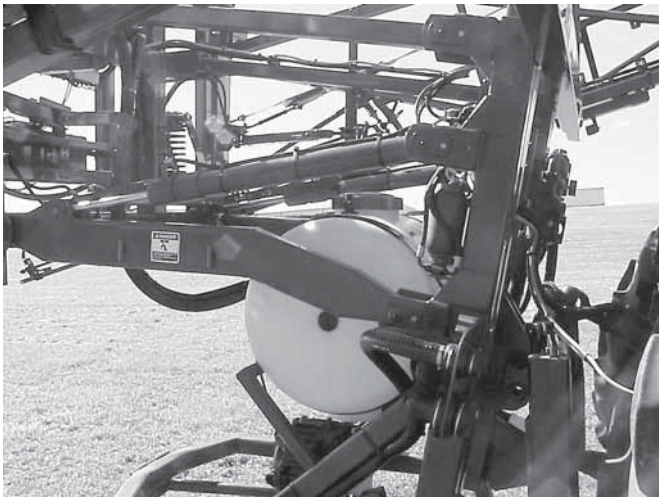


IF THE HOSE IS LEAD TO THE BOTTOM OF THE TANK, AND THE WATER PUMP AT THE WATER SUPPLY PLANT STOPS, CHEMICALS CAN BE SIPHONED BACK AND CONTAMINATE THE WATER SUPPLY LINES.

Operation

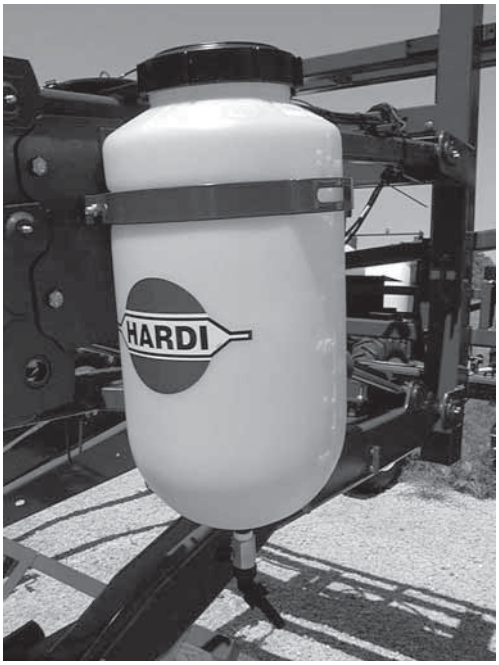
Filling flush tank (optional)

The flush tank has a capacity of 50 gallons (200 liters) and is situated just above the pump. Access to the tank is possible from the back of the DELTA 3-PT. lift. Only fill with clean water.



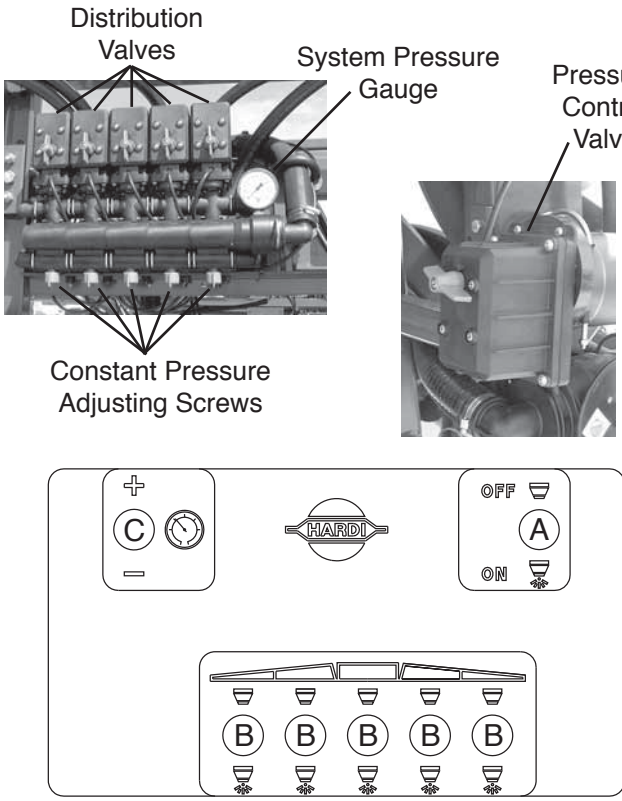
Filling of clean water tank

The clean water tank has a capacity of 4 gallons (15 liters). The water from this tank is for hand washing, cleaning of clogged nozzles, etc. Only fill this tank with clean water.



WARNING! Although the clean water tank is only filled with clean water, it must never be used for drinking.

Adjustment of ECP & ECPC operating units



A. Operating switch for main on/off
B. Operating switch for distribution valves
C. Pressure control switch (to lower or raise)

Before spraying, adjust the ECP or ECPC operating unit using clean water (without chemicals).

IMPORTANT! For first time priming of fluid system, make sure the air bleed-off valve is open (see plumbing diagrams). This line may also be used for agitation of the main tank.

1. Choose the correct nozzle (pp. 26-27). Make sure that all nozzles are the same type and capacity.
2. Put the tractor in neutral and adjust the P.T.O. r.p.m. until the number of revolutions of the pump corresponds to the intended traveling speed. Remember the number of revolutions on the P.T.O. must be kept between 300-600 r.p.m. (540 r.p.m. pump) or 650-1100 (1000 r.p.m. pump) to ensure correct operation of the HARDI-MATIC system.
3. On-off switch **A** is “ON” against green symbol (down position).
4. All distribution valve switches **B** are also “ON” against green symbol (down position).
5. Hold pressure regulating switch **C** down (-) until handle stops rotating. This will be the “minimum pressure” setting.
6. Hold pressure regulating switch **C** up (+) until desired pressure is shown on the boom pressure gauge.

Operation

Adjustment of constant pressure

Note: Adjust the constant distribution boom pressure one section at a time as follows: (Start with the valve turned closed before adjusting).

1. Shut-off the first boom distribution valve switch **B**.
2. Turn the adjusting screw(s) until the control pressure gauge again shows the same pressure as in step 6 (to left) (Turn the screw clockwise for higher pressure, counterclockwise for lower pressure).
3. Turn the first boom distribution valve switch **B** back on.
4. Repeat steps 1-3 for the remaining boom distribution valves.

Note: Hereafter adjustment of the constant boom pressure will only be needed if you change to nozzles with other capacities, but not required if only changing pressure or application rate using the same nozzles.

Operating the control unit while spraying

In order to shut off the entire boom, flip on-off switch **A** to the off (red) symbol (up position). This returns all the pump outputs to the main tank through the return system. The diaphragm anti-drip valves ensure instantaneous closing of all nozzles.

In order to shut off one or more sections of the boom, switch the relevant distribution valve **B** to off position. The constant pressure system ensures that the pressure does not increase in the sections which are still open.

In case of electrical failure, it is still possible to manually override all functions of the operating unit. To operate manually, disconnect the multiplug from the ECP or ECPC control box first and operate the handles by hand. It is possible to change pressure and turn boom sections on or off.

Note: Since the on-off switch normally operates by shutting off all the boom distribution valves, you will need to manually shut off all the distribution valves to shut off the complete control unit manually.

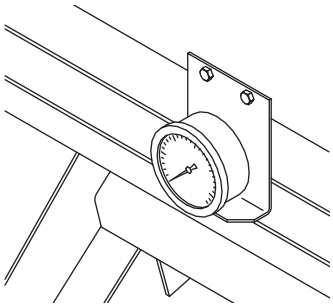
IMPORTANT! When the sprayer is stored, the ECP or ECPC control box and the multiplug must be protected against moisture and dirt. A plastic bag may be used to protect the multi plug. Store the control box in a clean dry place.

Remote 4” pressure gauge

The remote pressure gauge measures the working pressure in the boom tubes as close to the nozzles as possible. This pressure reading will always be slightly lower than the reading at the operating unit pressure gauge.

The outputs stated in the nozzle charts are always based on the pressures measured at the nozzle.

Note: Always adjust pressure when calibrating and spraying according to readings at the Remote pressure gauge.



Filters

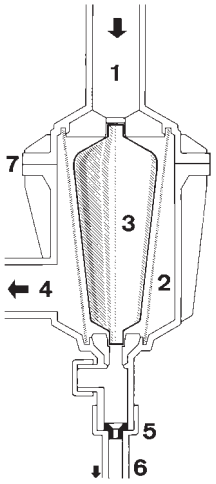
All filters should always be used, and their function checked regularly. The mesh size of the filter in use should always be smaller than the flow average of the nozzles used. Therefore, pay attention to the correct combination of filters and mesh size.

Self cleaning filters (diaphragm only)

This filter automatically flushes out particles and chemical deposits, reducing routine maintenance, nozzle plugging and operator exposure. No adjustments are required, but different mesh screens may be installed for various types of products.

Operating diagram

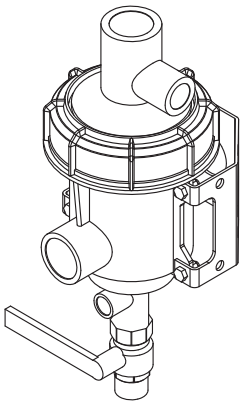
1. From pump
2. Double filter screen
3. Guide cone
4. To operating unit
5. Replaceable restrictor
6. Return to tank
7. Screw-joint



Operation

IMPORTANT! The ball valve underneath the self-cleaning filter should normally be open, but must be closed in the following cases:

1. If rinsing with water from the flush tank and a quantity of spray liquid still remains in the main tank (otherwise the spray liquid will be diluted).
2. If opening the self-cleaning filter and a quantity of spray liquid still remains in the main tank (otherwise there is a risk that spray liquid will flow out).



Filling of chemicals

WARNING! Be careful not to slip or splash chemicals when carrying chemicals up to the tank lid!

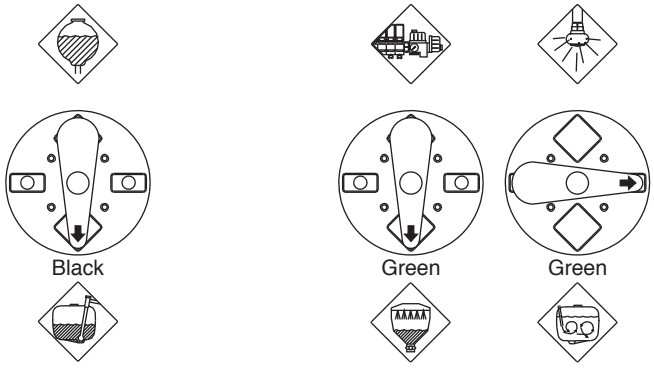
WARNING! Always use the personal protection stated on the chemical container and as a minimum, always use gloves, face protection shield and coveralls.

Filling with HARDI® CHEMICAL FILLER

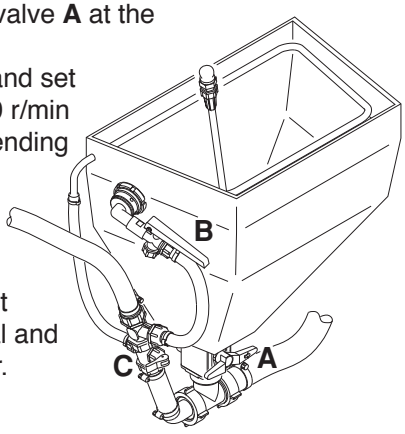
To get access to the HARDI® CHEMICAL FILLER, grab the handle, disengage the lock with your foot, and drag the HARDI® CHEMICAL FILLER all the way down. After use, push it all the way up again.

Operating with Liquid-based chemicals

1. Fill the main tank at least $^1/_3$ with water (unless something else is stated on the chemical container label). See “Filling tanks with water” (pp. 18-19).
2. Turn the handle at the Suction Manifold towards “Main tank” . Turn green valve towards “HARDI® CHEMICAL FILLER”. Close remaining valves.



3. Check that bottom valve **A** at the FILLER is closed.
4. Engage the pump and set P.T.O. speed at 540 r/min or 1000 r/min (depending on pump model).
5. Open HARDI® CHEMICAL FILLER lid.
6. Measure the correct quantity of chemical and fill it into the hopper.



Note: The measuring scale in the hopper can only be used if the sprayer is parked on level ground! It is recommended to use a measuring jug for best accuracy.

7. Open the bottom valve **A**. The chemical is then transferred to the main tank.
8. If the chemical container is empty, it can be rinsed by using the Bag & Bottle Rinse (optional). Place the container over the multi-hole nozzle and press the lever **B**.

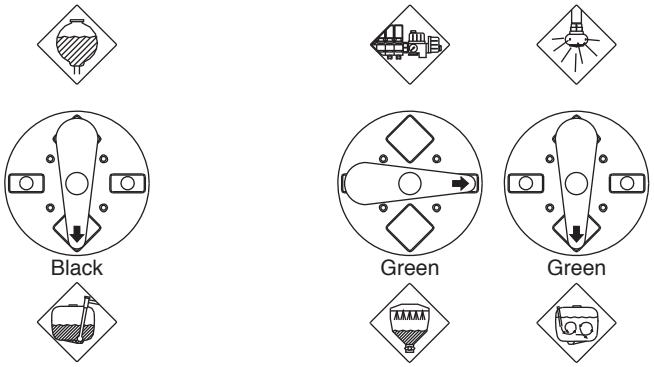
WARNING! Do not press lever **B** unless the multi-hole nozzle is covered by a container to avoid spray liquid hitting the operator.

IMPORTANT! The Bag & Bottle Rinse uses spray liquid from the main tank to rinse containers of concentrated chemicals. Always rinse the chemical containers with clean water several times until they are clean before disposal.

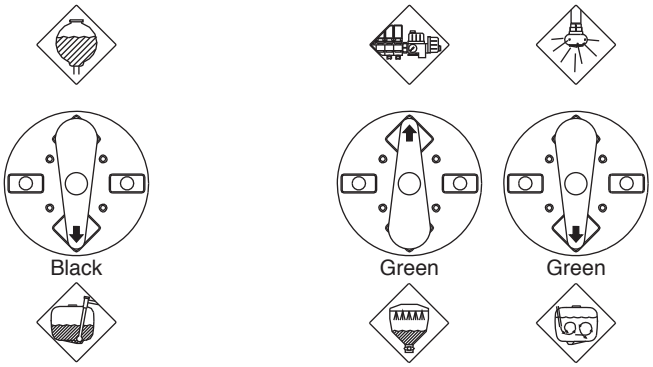
9. Engage the hopper rinsing device by opening valve **C**.
10. Close valve **C** again when the hopper is rinsed.

IMPORTANT! The hopper rinsing device uses spray liquid from the main tank for rinsing the hopper of concentrated chemical. The HARDI® CHEMICAL FILLER must always be cleaned together with the rest of the sprayer when the spray job is done.

11. Close valve **A** and the HARDI® CHEMICAL FILLER lid again.
12. Turn handle on the Pressure Manifold towards "Intensive Agitation" and close remaining valves.

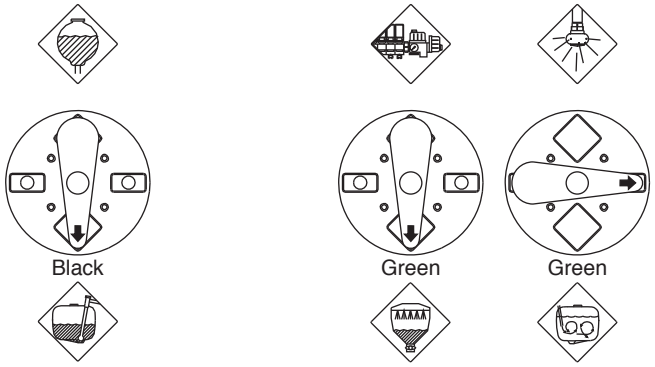


13. When the spray liquid is well mixed, turn handle on the Pressure Manifold towards "Spraying" position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.

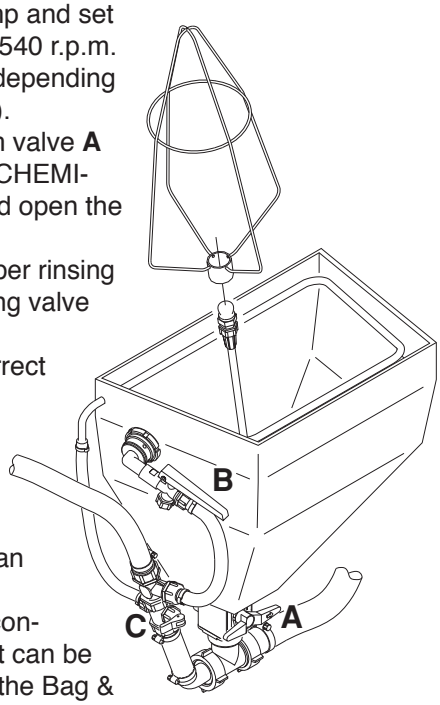


Operating with Powder-based chemicals

1. Fill the main tank at least half full with water, unless something else is stated on the chemical container label. See "Filling tanks with water" (pp. 18-19).
2. Turn the handle at the suction Manifold towards "Main tank". Turn the handle at the Pressure Manifold towards "HARDI® CHEMICAL FILLER". Close remaining valves.



3. Engage the pump and set P.T.O. speed at 540 r.p.m. or 1000 r.p.m. (depending on pump model).
4. Open the bottom valve **A** on the HARDI® CHEMICAL FILLER and open the lid.
5. Engage the hopper rinsing device by opening valve **C**.
6. Measure the correct quantity of chemical and sprinkle it into the hopper as fast as the rinsing device can flush it down.
7. If the chemical container is empty it can be rinsed by using the Bag & Bottle Rinse (optional). Fit the bag bracket and place the powder bag over the multi-hole nozzle and press the lever **B**.

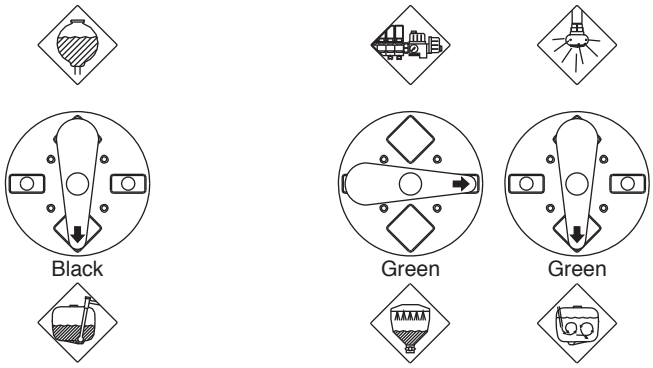


WARNING! Do not press lever **B** unless the multi-hole nozzle is covered by a container to avoid spray liquid hitting the operator.

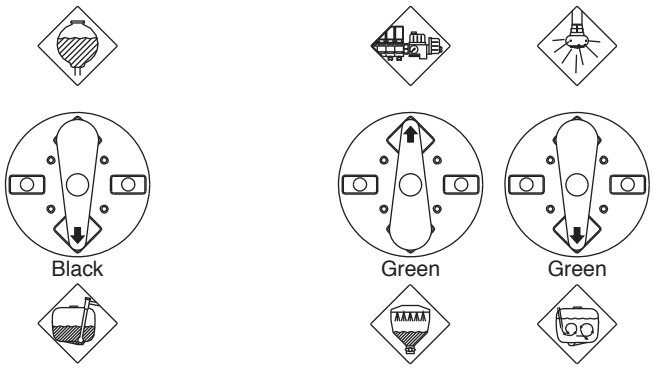
IMPORTANT! The Bag & Bottle Rinse uses spray liquid from the main tank to rinse containers of concentrated chemicals. Always rinse the chemical containers with clean water several times until they are clean before disposal.

9. Close valve **C** again when the hopper is rinsed. **IMPORTANT!** The hopper rinsing device uses spray liquid from the main tank for rinsing the hopper of concentrated chemical. The HARDI® CHEMICAL FILLER must always be cleaned together with the rest of the sprayer when the spray job is done.

10. Close valve **A** and the FILLER lid again.
11. Turn handle at the Pressure Manifold towards "Intensive Agitation" and close remaining valves to mix the spray liquid.



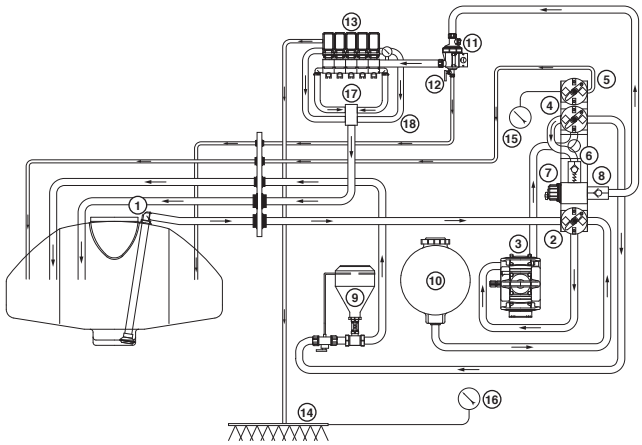
12. When the spray liquid is well mixed, turn handle on the Pressure Manifold towards "Spraying" position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.



Use of flush tank (optional)

The incorporated flush tank can be used for two different purposes.

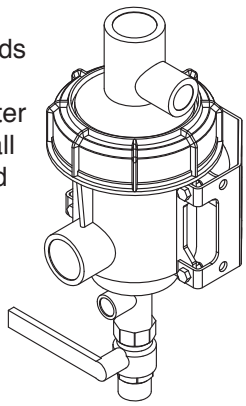
A. In-field diluting of remaining spray liquid residue in the spraying circuit for spraying the liquid in the field, before cleaning the sprayer.



1. Empty the sprayer as much as possible. Turn off self-cleaning filter return valve **12** (diaphragm system only) and air bleed-off valve **5** and spray until air comes out of all nozzles.
2. Turn black suction valve **2** towards "Flush tank".
3. Engage and set the pump at approx. 300 r.p.m.
4. When flushing water corresponding to approx. 10 times the spray liquid residue (see paragraph "Technical Residue") is used, turn black suction valve back towards "Suction from main tank" and operate all valves, so all hoses and components are flushed.
5. Turn green pressure valve back to "Operating unit" and spray liquid in the field you have just sprayed.
6. Repeat point 3-7 until the flush tank is empty.

B. Flushing the pump, operating unit, spray lines, etc. in case of interruption in spraying before main tank is empty (e.g. due to rain, etc.).

1. Turn off self-cleaning filter return valve **12** (diaphragm system only) and air bleed-off valve **5**.
2. Turn black suction valve **2** towards "Flush tank".
3. Engage the pump and spray water from flush tank in the field until all nozzle tubes/nozzles are flushed with clean water.
4. Disengage pump.
5. Open self-cleaning filter return valve **12** again.



Technical Residue

Inevitably a quantity of spray liquid will remain in the system. It cannot be sprayed properly on the crop, as the pump takes in air when the tank is about to be empty.

This Technical Residue is defined as the remaining liquid qty. in the system as the first clear pressure drop on the pressure gauge is read.

The dilutable residue must be diluted with 10 times the amount of clean water and sprayed to the crop just sprayed before cleaning the sprayer - See “Cleaning the sprayer” (pp. 29-30).

Draining tanks

WARNING! Before draining any tanks, verify that disposal of waste is done according to chemical label instructions and local regulations.

Flush tank (optional)

To avoid algae developing in the flush tank, always drain the flush tank when the sprayer is not in use for a long period.

Foam marker tank (optional)

If the sprayer is to stand a few days, it is recommended to drain and flush the foam marker tank to avoid mixed foam from becoming inactive, as once mixed, foam deteriorates rapidly.

Disconnecting the DELTA 3-PT. Sprayer

Always clean the sprayer - onside and outside - before disconnecting and parking it.

WARNING! To prevent the sprayer from tipping over, do not disconnect the sprayer from the tractor with the booms unfolded unless the boom is supported!

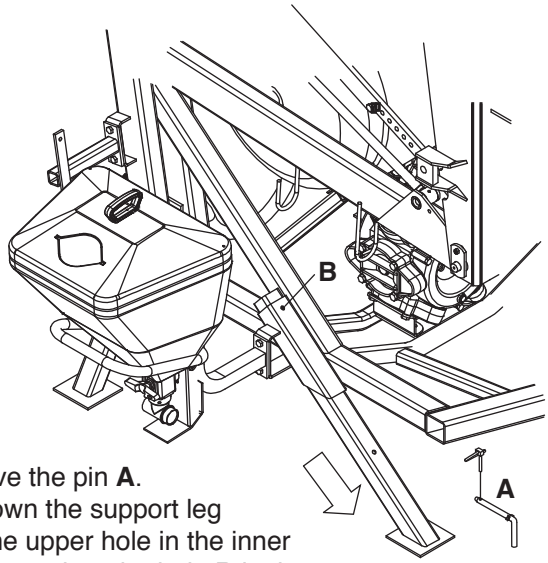
Remember to disconnect all hoses and cables from the tractor.

WARNING! If the sprayer is parked unattended, avoid unauthorized persons, children or animals having access to the sprayer.

Disconnecting the DELTA 3-PT. lift

IMPORTANT: The DELTA 3-PT. lift must be placed on a level and hard foundation. Failure to do so may cause settling of support legs - and the sprayer will tip over. If necessary, place the sprayer on a bearing plate to prevent this.

Max. ground inclination: 8.5 °.

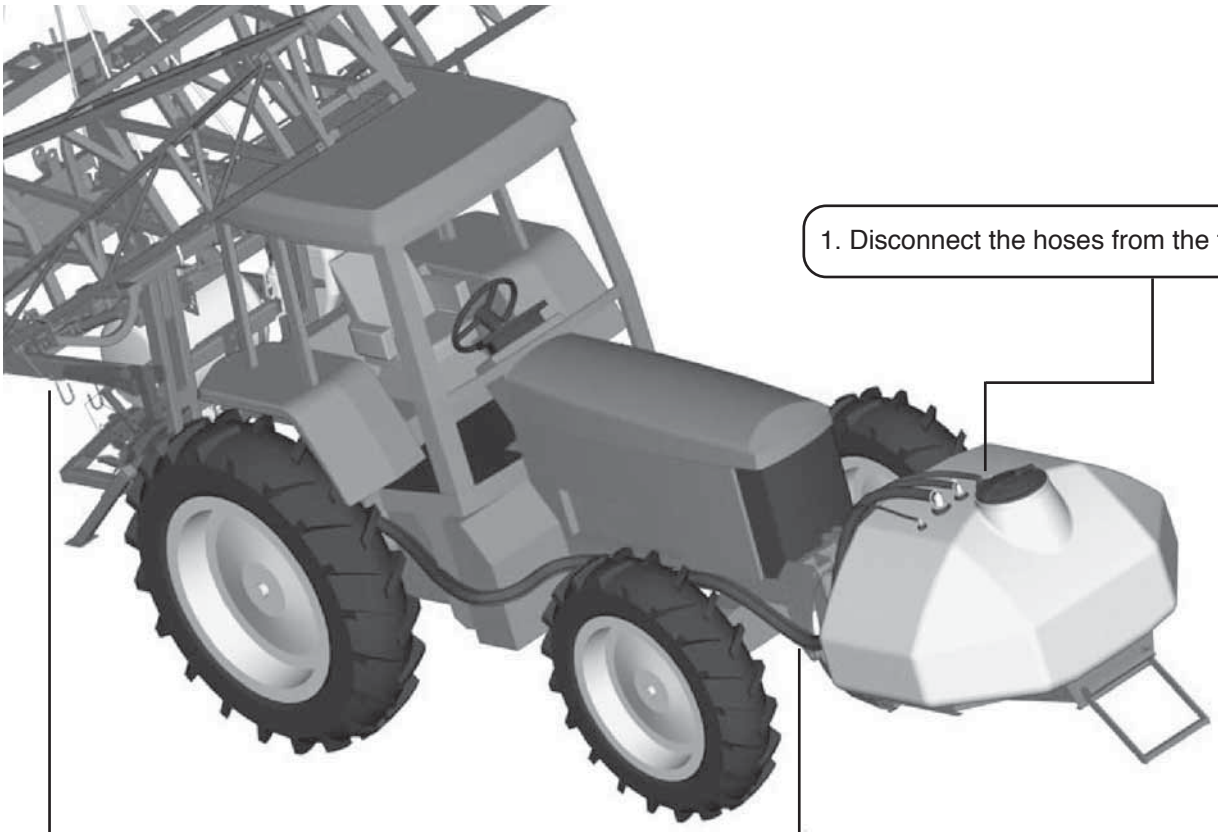


1. Remove the pin **A**.
2. Pull down the support leg until the upper hole in the inner profile matches the hole **B** in the outer profile.
3. Fasten this position by the pin **A**.

Note: All of the 4 support legs must be pulled down before lowering and disconnecting the sprayer.

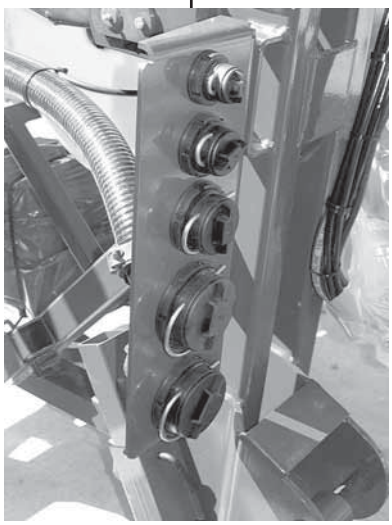
4. Lower the sprayer.
5. Disconnect top bar, stop engine and disconnect PTO-shaft, hydraulics and electric cables.

Disconnecting the hoses.



1. Disconnect the hoses from the front tank.

2. Loosen the hoses if they have been fastened to the tractor - but leave the tie straps along the hoses to keep them together.



3. Fasten the fittings/hoses to the mounting on the DELTA.

Nozzle Selection

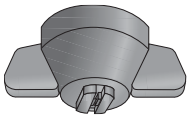
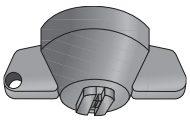
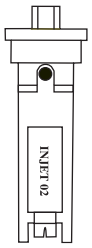
Nozzle Selection

Correct selection of nozzle and calibration of the sprayer are critical to achieve accurate and cost effective use of farm crop protection products.

Your HARDI® sprayer has been supplied with 110° flat spray Red ISO Color Tips™ that will apply approximately 20 U.S. GPA at 30 PSI and 5 MPH.
The 110° flat spray nozzle was chosen rather than the 80 degree nozzle for two reasons: 1- It may be used at a lower minimum height which reduces the risk of wind drift; 2- it's greater overlap permits better uniformity of spray distribution, particularly if boom height varies on rough ground. Normal boom height setting with 110° nozzles is 18" to 20" above the crop or weeds, whichever is taller.
Should you wish a different application rate or different type of nozzle, HARDI® manufactures a nozzle for virtually every need.

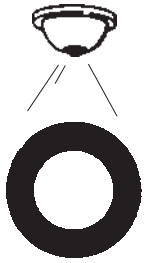
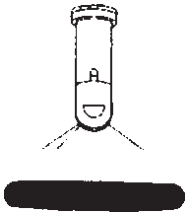
IMPORTANT: ***Always consult your chemical supplier for recommended chemical rate and water application rate. Always wear protective gloves when handling nozzles.***

The following tables show what types of spray nozzles are suitable for different applications. It is important to use the correct nozzle.

	HARDI® ISO COLOR TIPS™ 110 degree flat fan,one piece cap and nozzle; color coded for flow rate selection. For herbicides, insecticides, and fertilizer applications. 50, 80, and 100 mesh screens are normally used.	F110
	HARDI® ISO LowDrift COLOR TIPS™ 110 degree flat fan,one piece cap and nozzle, 1553 solid stream nozzle; color coded for flow rate selection.	LD110
	HARDI® INJET™ Nozzles; air inclusion nozzles with removable restrictor. Color coded for flow rate selection. In-Line Filters will normally be used.	
 	FLAT SPRAY NOZZLES in 65 degree, 80 degree, and 110 degree spray angles. For herbicides, insecticides, and fertilizer applications. 50, 80, and 100 mesh screens are normally used.	4665-65 degree 2080-80 degree 4110-110 degree Part # 330013- O-ring
	**FLOOD NOZZLES** set at 40" spacing. Designed for high volume application.	4598

Nozzle Selection

The following tables show what types of spray nozzles are suitable for different applications. It is important to use the correct nozzle.

	**HOLLOW CONE NOZZLES** for high pressure and high volume insecticide application in row crops. 1553 nozzles are ALWAYS used with swirl plates shown below EXCEPT when used as solid stream nozzles. 50,80, or 100 mesh screens are normally used with these nozzles.	1553 Must add swirl to produce hollow cone pattern
	**SWIRL PLATE** used in conjunction with cone nozzle to create desired spray pattern. These swirls work with 1553 series cone nozzles. Grey, blue, or black swirls are used to create hollow cone effect. White swirls are used to create full cone effect.	Grey Blue Black White
	**HOLLOW CONE CERAMIC NOZZLES** for high pressure and high volume fungicide and insecticide application.	1299
	**LARGE DROPLET HOLLOW CONE NOZZLE** for use where drift must be kept to a minimum. These nozzles must always be fitted with 1553 nozzles and grey swirl plates. 50,80 or 100 mesh screens are normally used with these nozzles.	371077
	**LARGE DROPLET FLAT SPRAY TIP IN 150 DEGREE SPRAY ANGLE.** Always used in conjunction with 1553-14-16-18 or 20 cone nozzle. 50,80 or 100 mesh screens are normally used with these nozzles.	371551
	**SOLID STREAM NOZZLE** for high volume liquid fertilizer application. In this application, the 1553 nozzle is always used with 330013 o-ring and 50,80 or 100 mesh screens.	1553 less swirl
	**HARDI® QUINTASTREAM - 5 HOLE LIQUID FERTILIZER NOZZLE** Five streams of liquid are distributed at different angles and flows. Highest flow is from the middle stream and lowest in the outer; overlapping streams. This allows for boom movements that do not influence distribution. Boom heights of 20" can be used as safely as 30".	372011 thru 372019

Calibration

Calibration

WARNING: **ALWAYS CALIBRATE YOUR SPRAYER WITH CLEAN WATER ONLY! IN ADDITION, WEAR PROTECTIVE CLOTHING WHEN CALIBRATING YOUR SPRAYER!**

Why must you calibrate a sprayer?
A nozzle selection chart will tell you what application rate you should expect. Variations due to nozzle wear, errors in pressure adjustment, and tractor speedometer can result in a possible error in application rate.

How do you calibrate a sprayer?
Calibration kits are available from HARDI®, #818493 for US gallons & #818492 for metric calibration.
Following are some tips to remember when using the calibration kit method:

- When determining the length of time required to drive the recommended distance, drive in actual field conditions with a half-full tank.
- Repeat the test several times, each time avoiding the tracks from the previous test. Take the average of the times recorded.
- Calibration of the sprayer should be completed at the beginning of the season and repeated after every 2 to 3 full days of spraying, and every time you change volume rate or use new nozzles.
- Before you calibrate, check the flow of each nozzle. If it puts out more than 10% of its original volume, replace it.

Select your calibration method- Ounce method or Formula method.
Then follow the steps described below:

Ounce Method

1. Determine how long it takes you to cover the test strip. Use the following chart to determine the length of your test strip. Row width for broadcast application is equal to your nozzle spacing. For your drop nozzle or band application, use row spacing.

Row width or nozzle spacing (in.)	Distance (ft.)
40	102
38	107
36	113
34	120
32	127
30	136
28	146
26	157
24	170
22	185
20	204
18	227
16	255
14	291

2. Measure the amount of time it takes you to travel the test strip when throttle is set at spraying speed.
3. In a container (with oz. measurements), catch the spray from on nozzle for that amount of time. For drop or band nozzles, catch the spray from all nozzles for the row.
4. Read the ounces in the container. That is the actual U.S. GPA applied (ounces - GPA).

Formula Method

1. Check your spraying speed. Measure a test strip of at least 200 feet (300 feet is ideal). Travel the distance at the speed you plan on spraying and record the time it takes to travel the distance. Read from the chart or use the formula to find your exact travel speed.

Travel Time (in seconds)

Speed in MPH	200 ft.	300 ft.
3.0	45	68
3.5	39	58
4.0	34	51
4.5	30	45
5.0	27	41
6.0	23	34
7.0	19	29
7.5	18	27
8.0	17	26
9.0	15	23

Formula:

$$\frac{\text{distance (ft.) x 0.68}}{\text{seconds}} = \text{MPH}$$

2. Calculate the required nozzle output. Use either the nozzle wheel (if nozzle spacing is 20 inches), or this formula:

Formula:

$$\text{GPM} = \frac{\text{GPA x MPH x W (in.)}}{5940}$$

Formula:

$$\text{GPM} = \frac{10 \times 7 \times 20}{5940} = .24 \text{ GPM}$$

Note:
W= • Nozzle spacing (in inches) for broadcast application.
• Row spacing (in inches) divided by number of nozzles per row for drop nozzle application.
• Sprayed band width or swath width (in inches) for band application divided by number of nozzles per band.
• Note that on the nozzle wheel, W = 20 inches.

Calibration / Maintenance

3. Set correct pressure. Read the required pressure from the nozzle table in the nozzle catalogue or nozzle wheel. With clean water in the tank and line, turn on the sprayer and set the target pressure. Collect the spray from one nozzle for one minute in a container. Adjust pressure until you collect the precise GPM called for.

Calibration for carriers other than water
Use the following water rate conversion chart to determine the right conversion factor. When you've determined the new converted GPM or GPA, you can follow the steps on either the pressure or ounce method of calibration.

Weight of solution	Specific Gravity	Conversion Factors
7.00 lbs/gal.	84	.92
8.00 lbs/gal.	96	.98
8.34 lbs/gal-water	1.00	1.00
9.00 lbs/gal	1.08	1.04
10.00 lbs/gal	1.20	1.10
10.65 lbs/gal-28% N	1.28	1.13
11.00 lbs/gal	1.32	1.15
12.00 lbs/gal	1.44	1.20
14.00 lbs/gal	1.68	1.30

Example: 20 GPA of 28% N
Then GPA (solution) x conversion factor = GPA (water)
20 GPA (28% N) x 1.13 = 22.6 GPA (water)
Calibrate for 22.6 GPA of water

For conversion to Imperial gallons per acre,
multiply U.S. GPA by .833
For conversion to liters per hectare,
multiply U.S. GPA by 9.34
For conversion to liters per acre,
multiply U.S. GPA by 3.78
Formula for tractor speed: $\frac{\text{Distance (in feet)}}{\text{Second}} \times .682 = \text{MPH}$

Maintenance - rules of thumb

In order to derive full benefit from the sprayer for many years the following service and maintenance program should be followed.

IMPORTANT! Always clean the boom at the end of your workday or before servicing is done to avoid unnecessary contact with chemicals.

Cleaning the sprayer

Guidelines

1. Read the whole chemical label. Take note of any particular instructions regarding recommended protective clothing, deactivating agents, etc. Read the detergent and deactivating agent labels. If cleaning procedures are given, follow them closely.

2. Be familiar with local legislation regarding disposal of pesticides washings, mandatory decontamination methods, etc. Contact the appropriate department, e.g. Dept. of Agriculture.

3. Pesticide washings can usually be sprayed out on a soakaway. This is an area of ground that is not used for cropping. You must avoid seepage or runoff of residue into streams, water courses, ditches, wells, springs, etc. The washings from the cleaning area must not enter sewers. Drainage must lead to an approved soakaway.

4. Cleaning starts with the calibration, as a well calibrated sprayer will ensure the minimal amount of remaining spray liquid.

5. It is good practice to clean the sprayer immediately after use and thereby rendering the sprayer safe and ready for the next pesticide application. This also prolongs the life of the components.

6. It is sometimes necessary to leave spray liquid in the tank for short periods, e.g. overnight, or until the weather becomes suitable for spraying again. Unauthorized persons and animals must not have access to the sprayer under these circumstances.

7. If the product applied is corrosive, it is recommended to coat all metal parts of the sprayer before and after use with a suitable rust inhibitor.

Remember:

Clean sprayers are safe sprayers.
Clean sprayers are ready for action.
Clean sprayers cannot be damaged by pesticides and their solvents.

Maintenance

Cleaning the tank

1. Dilute remaining spray liquid in the tank with at least 10 parts of water and spray the liquid out in the field you have just sprayed - See paragraph “Use of flush tank” (p. 23).

   Note: It is advisable to increase the forward speed (double if possible) and reduce the pressure to 20 psi (1.5 bar).

2. Select and use the appropriate protective clothing. Select detergent suitable for cleaning and suitable deactivating agents if necessary.

3. Rinse and clean sprayer and tractor externally. Use detergent if necessary.

4. Remove tank and suction filters and clean. Be careful not to damage the mesh. Replace suction filter top. Replace filters when the sprayer is completely clean.

5. With the pump running, rinse the inside of the tank. Remember the tank roof. Rinse and operate all components and any equipment that has been in contact with the chemical.

   Before opening the distribution valves and spraying the liquid out, decide whether this should be done in the field again or on the soakaway.

6. After spraying the liquid out, stop the pump and fill at least $^{1}/_{5}$ of the tank with clean water. Note that some chemicals require the tank to be completely filled. Add appropriate detergent and/or deactivating agent, e.g. washing soda or Triple ammonia.

   Note: If a cleaning procedure is given on the chemical label, follow it closely.

7. Start the pump and operate all controls enabling the liquid to come in contact with all the components. Leave the distribution valves until last. Some detergents and deactivating agents work best if left in the tank for a short period. Check the label. The Self-Cleaning Filter can be flushed by removing the by-pass hose from the bottom of the filter. Stop the pump and remove the hose. Start the pump for a few seconds to flush filter. Be careful not to lose the restrictor nozzle.

8. Drain the tank and let the pump run dry. Rinse inside of the tank, again letting the pump run dry.

9. Stop the pump. If the pesticides used have a tendency to block nozzles and filters, remove and clean them now. Also check for sediment on the pressure side of the safety valve for the Self-Cleaning Filter.

10. Replace all the filters and nozzles and store the sprayer. If, from previous experiences, it is noted that the solvents in the pesticide are particularly aggressive, store the sprayer with the tank lid open.

    Note: If the sprayer is cleaned with a high pressure cleaner lubrication of the entire machine is recommended.

Cleaning and maintenance of filters

Clean filters ensure:

- Sprayer components such as valves, diaphragms and operating unit are not hindered or damaged during operation.
- Nozzle blockages do not occur while spraying.
- Long life of the pump. A blocked suction filter will result in pump cavitation.

The main filter protecting sprayer components is the suction filter at the top of the tank. Check it regularly.

Note: The HARDI® Flush system is available for the DELTA 3-PT. sprayers. It offers the flushing of pump, operating unit, spray lines, etc.

Lubrication

About lubricants

- Always store lubricants clean, dry and cool - preferably at a constant temperature - to avoid contamination from dirt and water condensation.
- Keep oil filling jugs, hoppers and grease guns clean, and clean the lubricating points thoroughly before lubricating.
- Avoid skin contact with oil products for longer periods.
- **Note:** If the sprayer is cleaned with a high pressure cleaner or fertilizer has been used, lubrication of all sections is recommended.

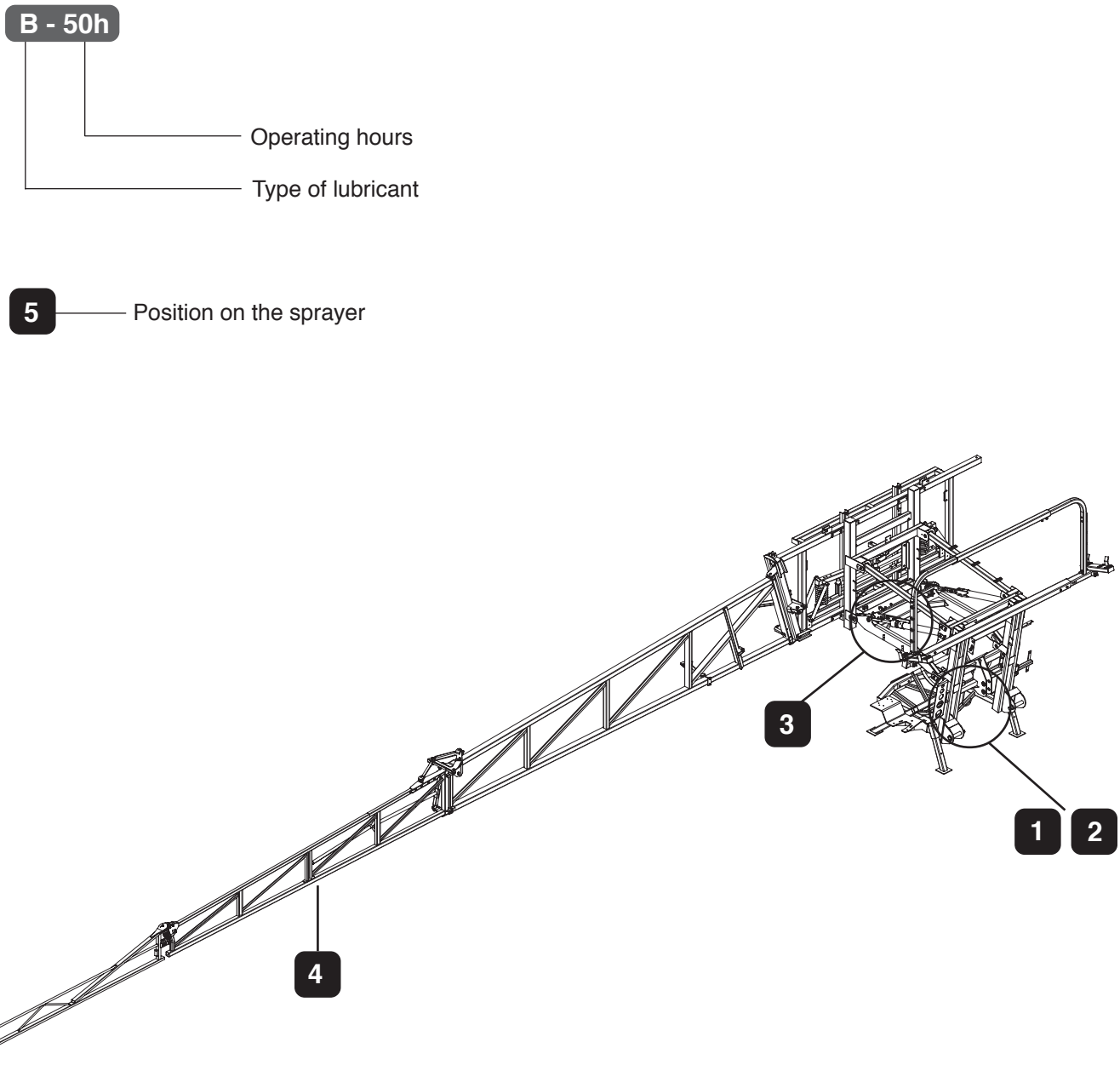
Recommended lubricants

Lubricating points			Lubricant
Ball bearings	 *)	A	Universal Lithium grease, NLGI No. 2
Slide bearings	 *)	B	Lithium grease with Molybdenumdisulphide or graphite
Oil lubricating points		C	SAE 80W/90 Gear oil CASTROL EPX 80/W90 SHELL SPIRAX 80W/90 MOBIL MOBILUBE 80W/90

*) **Guidelines - greasing**

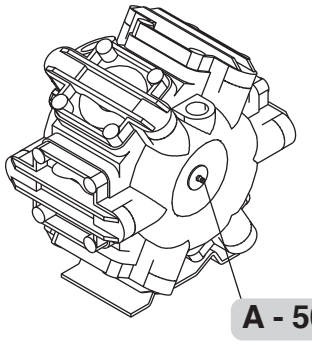
- Pump grease into zerks until new grease becomes visible.

Lubrication schedule



Maintenance

1



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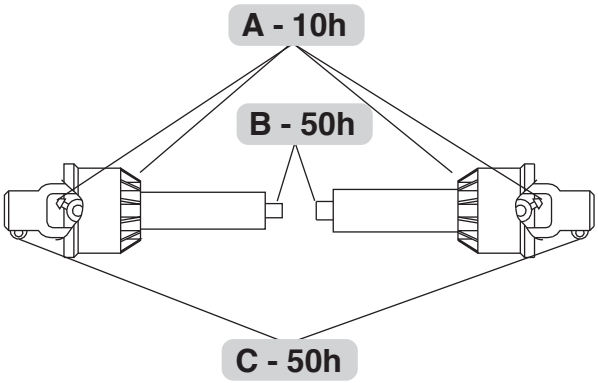

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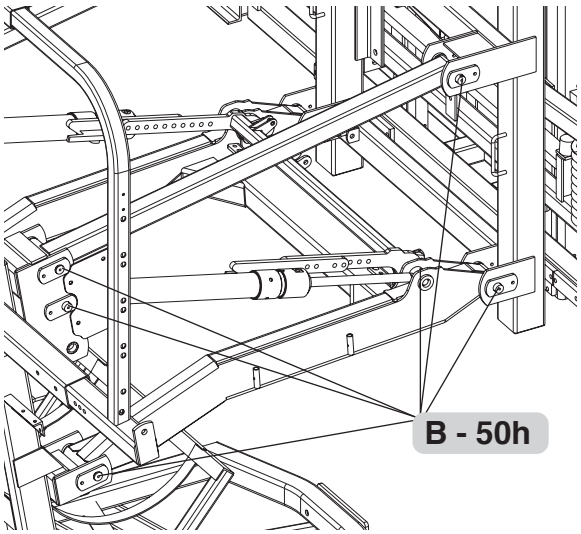
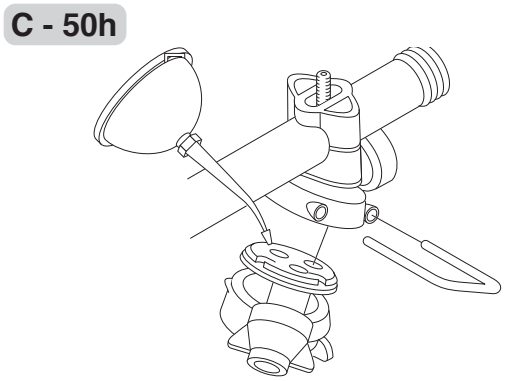


4



Maintenance

Service and Maintenance intervals

10 hours service or daily (whichever comes first)

1. Suction filter: Clean
2. Self-cleaning filter: Check and clean filter element if necessary
3. In-line filters: Clean
4. Nozzle filters: Clean
5. Spraying circuit: Check for leaks
6. P.T.O. Shaft: Lubricate as in diagram (p. 33)

50 hours service or weekly (whichever comes first)

Do all previous mentioned +

1. Pump: Grease as in diagram (p. 33)
2. P.T.O. shaft: Check condition of safety shields.
   Lubricate as in diagram (p. 33)
3. Paralift™ boom lift: Grease as in diagram (p. 33)
4. Triplets: Clean and oil as in diagram (p. 33)

250 hours service or monthly (whichever comes first)

Do all previous mentioned +

1. Hoses and tubes: Check for possible damage and proper attachment

1000 hours service or yearly (whichever comes first)

Do all previous mentioned +

1. P.T.O. shaft: Replace parts as necessary

Occasional maintenance

Pump valves and diaphragms replacement
Cone check/replacement, ECP/ECPC operating unit
Cone check/replacement, ECP/ECPC distribution valve
Wear bushing replacement, boom lift
Shock absorbers, inspect
Nozzle tubes and fittings
Adjustment of 3-way-valve

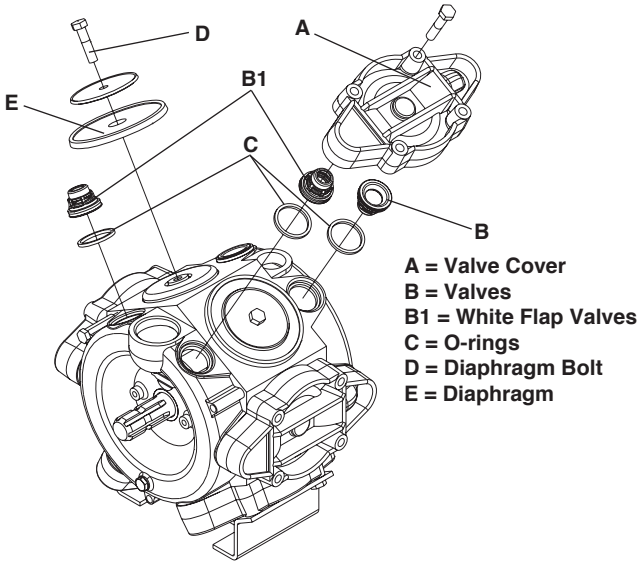
Always check that all lock nuts are tight after adjustment

Occasional maintenance

Maintenance and replacement intervals for the next points depend very much on conditions under which sprayer operates, and are therefore impossible to specify.

Pump valves and diaphragms replacement (363/463 pumps)

NOTE! It is recommended that if one or more diaphragms and/or valves need replacing they all should be replaced



Diaphragm pump overhaul kit (valves, seals, diaphragms, etc.)

Pump model	HARDI® part No.
363	750342
463	750343

Changing valves

1 Remove the valve covers (**A**). Before changing the valves (**B** & **B1**) note their orientation so they are replaced correctly.

2 The two white flap valves (**B1**) must be placed in the valve openings as shown. It is recommended to use new O-rings (**C**) when changing or checking the valves.

Changing diaphragms

1 With the valve covers removed as explained above, remove the diaphragm bolts (**D**).

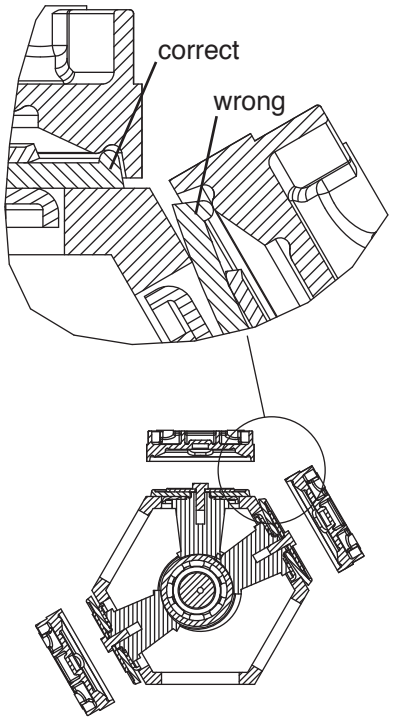
2 The diaphragms (**E**) may now be changed.

3 If fluids have reached the crankcase, re-grease the pump thoroughly. Also check the drain hole at the bottom of the pump is not blocked.

NOTE! When tightening diaphragm cover it must be ensured that diaphragm is **in neutral or out**. If the diaphragm is in negative, the edge of the diaphragm is not seated correctly in the diaphragm cover. This will damage the diaphragm so it cannot seal correctly after having been dismantled and re-assembled.
You must rotate the pump until the diaphragm is neutral or out.

4 Reassemble with torque settings shown in *Torque settings* (below).

IMPORTANT! Before tightening the 4 bolts for the diaphragm cover **B** the diaphragm must be positioned between center and top to ensure correct sealing between diaphragm pumphousing and diaphragm cover. Turn crank shaft if necessary.



Torque Settings for 363/463 pumps

Pump Model	Valve Cover Ft/lb(Nm)	Diaphragm Bolt Ft/lb(Nm)
363	50 (70)	45 (60)
463	65 (90)	60 (80)

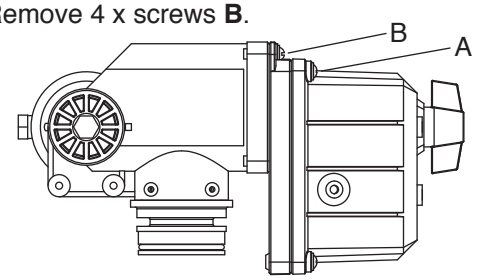
1 Ft/lb = 1.36 Nm

Maintenance

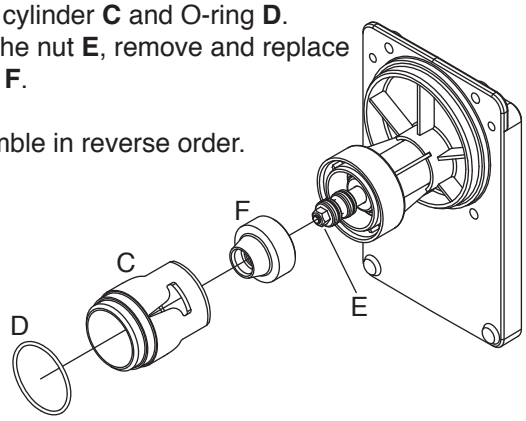
Cone check/replacement ECP/ECPC operating unit

If it becomes difficult to build up sufficient pressure or if pressure fluctuations occur, it may be necessary to replace the cone and cylinder. A HARDI® kit is available for this purpose. Ref. no. 741293.

1. Remove 4 x screws **A** and remove the housing.
2. Remove 4 x screws **B**.



3. Replace cylinder **C** and O-ring **D**.
4. Loosen the nut **E**, remove and replace the cone **F**.
5. Reassemble in reverse order.

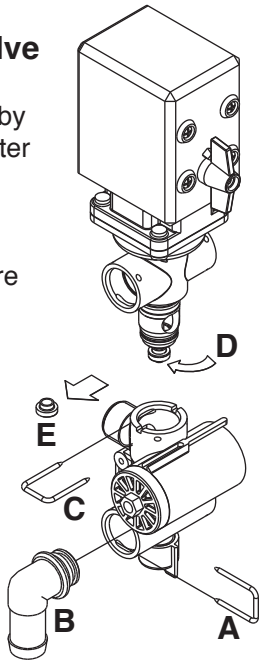


Cone check/replacement, ECP/ECPC distribution valve

Periodically check the distribution valves for proper sealing. Do this by running the sprayer with clean water and open all distribution valves.

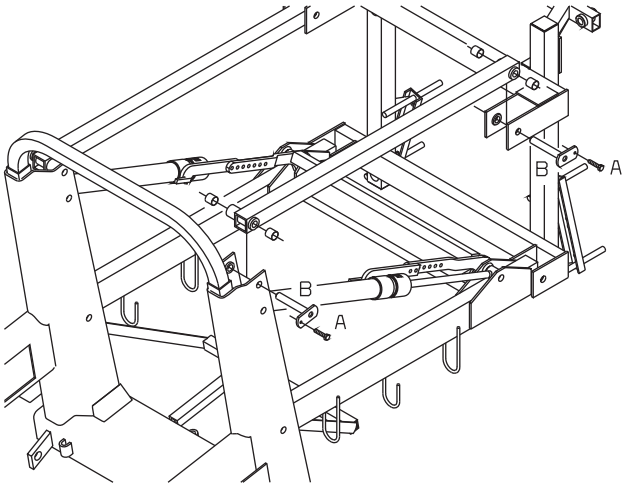
Cautiously remove the clip **A** and pull out the hose **B** for the pressure equalization device. When the housing is drained, there should be no liquid flow through the pressure equalization device. If there is any leakage, the valve cone **E** must be changed.

Remove the clip **C** and lift the motor housing off the valve housing. Then unscrew the screw **D** and replace the valve cone **E**. Reassemble in reverse order.



Wear bushing replacement, boom lift

The wear bushes are inspected and replaced before they are worn through.



1. Connect the sprayer to a tractor and unfold the booms to working position.
2. Lift the boom center frame with a lifting device and support it until the load is taken off the Paralift™ arms.
3. Remove the screws **A**, and pull out the pins **B** at one of the upper paralift arms and replace the wear bushes.
4. Refit the arm.
5. Repeat this on the other upper arm.
6. The lower arms must be disconnected simultaneously. Grease all grease nipples.
7. Remove the lifting gear again.

Shock absorbers

If the shock absorbers loose their efficiency or start leaking oil, they should be replaced.

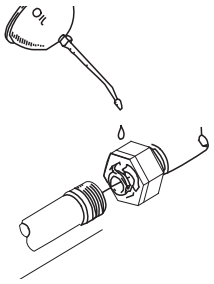
Maintenance

Nozzle tubes and fittings

Poor seals are usually caused by:

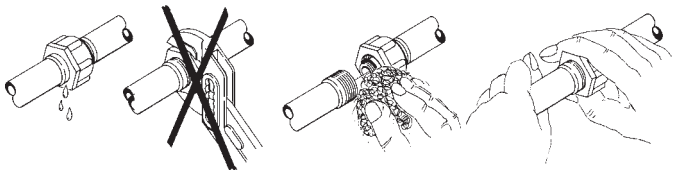
- missing O-rings or gaskets
- damaged or incorrectly seated O-rings
- dry or deformed O-rings or gaskets
- foreign bodies

In case of leaks:



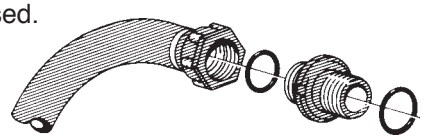
DO NOT overtighten. Disassemble, check condition and position of O-ring or gasket. Clean, lubricate and reassemble.

The O-ring must be lubricated **ALL THE WAY ROUND** before fitting on to the nozzle tube. Use non-mineral lubricant.



For **RADIAL** connections only hand-tighten them.

For **AXIAL** connections, a little mechanical leverage may be used.

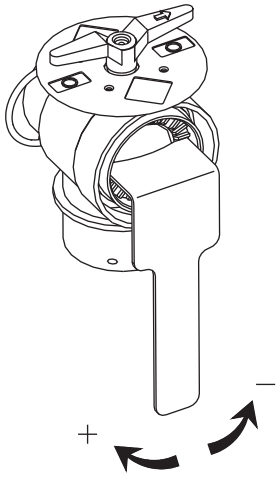


Adjustment of 3-way-valve (suction)

The MANIFOLD valve can be adjusted if it is too tight to operate - or if it is too loose (= liquid leakage).

Correct setting is when the valve can be operated smoothly by one hand.

Use a suitable tool and adjust the toothed ring inside the valve as shown on the drawing.



Off-season storage

When the spraying season is over, you should devote some extra time to the sprayer. If chemical residues are left over in the sprayer for long periods, it can reduce the life of the individual components. To preserve the sprayer and protect the components, carry out the following off-season storage program:

1. Clean the sprayer completely - inside and outside - as described under “Cleaning of the sprayer”. Make sure that all valves, hoses and auxiliary equipment have been cleaned with detergent and flushed with clean water afterwards, so no chemical residues are left in the sprayer.

2. Renew any damaged seals and repair any leaks.

3. Empty the sprayer completely and let the pump work for a few minutes. Operate all valves and handles to drain as much water out of the spraying circuit as possible. Let the pump run until air is coming out of all nozzles. Remember to drain the flush tank also.

4. Pour appr. 13 gal. (50 liters) anti-freeze mixture consisting of 1/3 automotive anti-freeze and 2/3 water into the tank.

5. Engage the pump and operate all valves and functions on the MANIFOLD system, ECP unit, CHEM FILLER, etc. allowing the anti-freeze mixture to be distributed around the entire circuit. Activate the ECP main on/off switch and distribution valves so the anti-freeze is sprayed through the nozzles as well. The anti-freeze will also prevent O-rings, seals, diaphragms, etc. from drying out.

6. When the sprayer is dry, remove rust from any scratches or damages in the paint and touch up the paint.

7. Lubricate all lubricating points according to the lubricating scheme - regardless of intervals stated.

8. Remove the glycerine-filled pressure gauges and store them in a vertical position in frost free conditions.

9. Apply a thin layer of anti-corrosive oil (e.g. SHELL ENSIS FLUID, CASTROL RUSTILLO or similar) on all metal parts. Avoid oil on rubber parts, hoses and tires.

10. Fold the boom in transport position and relieve pressure from all hydraulic functions.

11. All electric plugs and sockets are to be stored in a dry plastic bag to protect them against moisture, dirt and corrosion.

12. Remove all the control boxes (including any rate controller/monitor control box and display) from the tractor and store them in a dry and clean location.

13. Wipe hydraulic snap-couplers clean and fit the dust caps.

14. Apply grease on all hydraulic ram piston rods which are not fully retracted in the barrel to protect against corrosion.

15. To protect against dust, the sprayer can be covered by a tarpaulin. Ensure ventilation to prevent condensation.

Preparation after off-season storage

After a storage period, the sprayer should be prepared for the next season the following way:

1. Remove the cover. (If fitted)

2. Wipe off the grease from hydraulic ram piston rods.

3. Fit the pressure gauges again. Seal with Teflon tape.

4. Connect the sprayer to the tractor, including hydraulics and electrics.

5. Check all hydraulic and electric functions.

6. Empty the tank for remaining anti-freeze.

7. Rinse the entire liquid circuit on the sprayer with clean water.

8. Fill with clean water and check all functions.

Equipment and Accessories

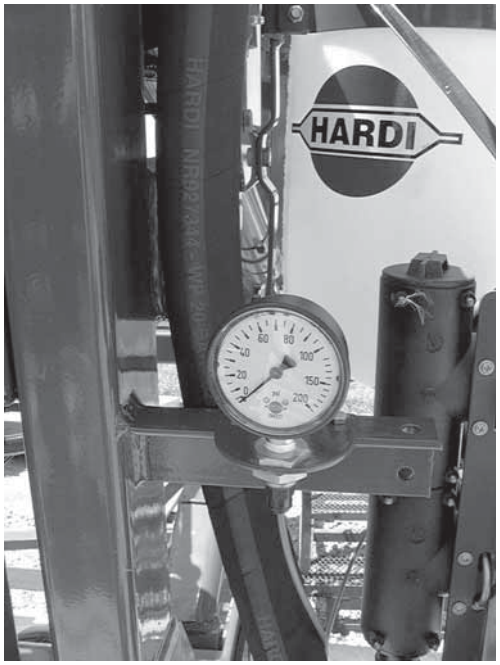
Equipment - Standard and Optional

Clean Water Tank (standard)

Clean water tank

A handy source of fresh water on the sprayer to clean up plugged nozzles and for rinsing gloves and hands after performing service or maintenance.

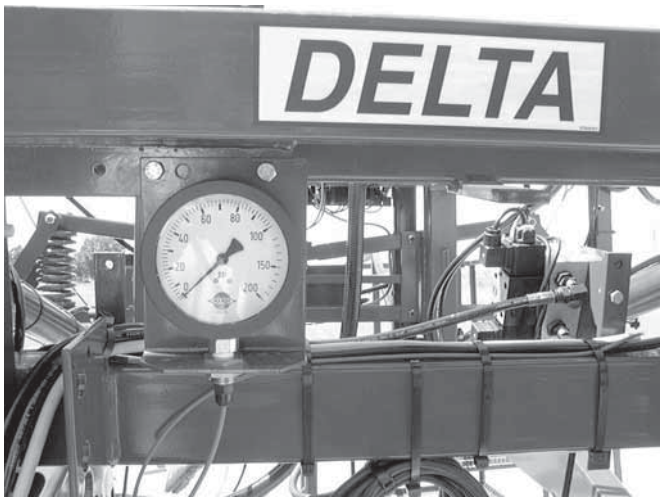
2-1/2” Manifold Pressure Gauge (standard)



2-1/2” Manifold Pressure Gauge

A 2-1/2” manifold pressure gauge is standard for reading the pressure in the manifold plumbing system. An optional 4” manifold pressure gauge is available.

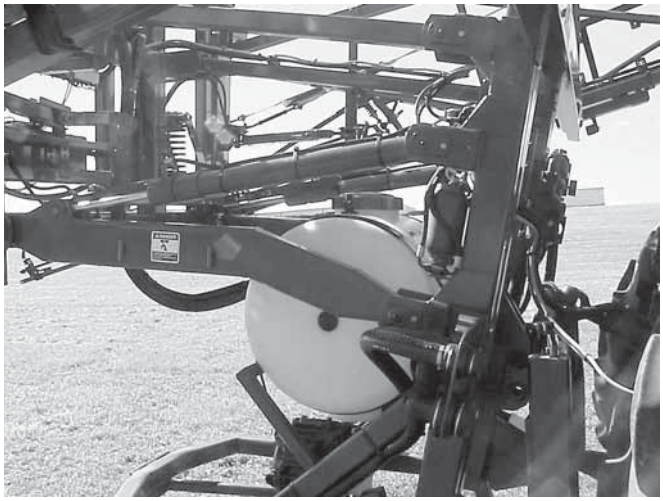
4” Boom Pressure Gauge (optional)



4” Boom Pressure Gauge

An optional 4” boom pressure gauge is available for reading the working pressure in the boom tubes as close to the nozzles as possible. This pressure reading will always be slightly lower than the reading at the manifold pressure gauge.

Flush System (optional)

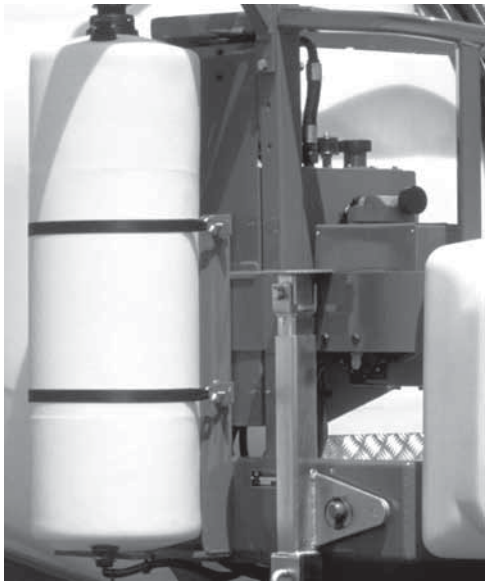


Flush Tank

The Flush system provides a means to be able to flush the pump, controls, boom feed lines and complete boom and nozzles with clean water from a 50 gallon tank. Refer to the Flush & Rinse System™ Operator’s Manual for complete operational instructions.

Equipment and Accessories

Foam marker system (optional)



Foam Marker Tank

Foam Marker Drop Assembly

The Foam Marker helps prevent skipping or overlapping during spray application of spray solution, which can be costly. HARDI® Foam Marker features a trailer mounted compressor, poly tank, extruded foamer hoses and in-cab electrical controls providing right or left drop selection and the rate/quality of foam droplets. Refer to the Foam Marker Operator's Manual for complete operation instructions.

HARDI® Monitor 1500 (optional)

The HARDI® Monitor 1500 monitors the application rate. When used with the electric control unit switch box, correct area covered and up to 8 spray boom section control is possible.

HARDI® Controller 2500 (optional)

The HARDI® Controller 2500 permits automatic control of the application rate. This allows you to concentrate on driving as the rate is automatically maintained by the HC 2500. Press the "up" or "down" arrow keys to change the application rate. Easy, quick and simple. Up to 8 spray boom section control is possible.

Mustang 3500 Controller (optional)

The Mustang 3500 Controller offers fully integrated boom controls (3 - 7 sections), integrated foam marker controls, integrated TWIN FORCE controls, 3 possible preprogrammed application rate settings, 9 different field counters, DGPS compatible, prepared for communication with Precision Farming Terminals and pocket PC's (iPAQ - models: 3650, 3670), variable rate application, rain & dust proof and 3 year warranty.

Troubleshooting

Operational problems

In cases where breakdowns have occurred, the same factors always seem to be in question:

1. Minor leaks on the suction side of the pump will reduce the pump capacity or stop the suction completely.

2. A clogged suction filter will hinder or prevent suction so that the pump does not operate satisfactorily.

3. Clogged up pressure filters will result in increasing pressure at the pressure gauge but lower pressure at the nozzles.

4. Foreign bodies stuck in the pump valves with the result that these cannot close tightly against the valve seat. This reduces pump efficiency.

5. Poorly reassembled pumps, especially diaphragm covers, will allow the pump to suck air resulting in reduced or no capacity.

6. Hydraulic components that are contaminated with dirt result in rapid wear to the hydraulic system.

Therefore ALWAYS check:

1. Suction, pressure and nozzle filters are clean.
2. Hoses for leaks and cracks, paying particular attention to suction hoses.
3. Gaskets and O-rings are present - and in good condition.
4. Pressure gauge is in good working order. Correct dosage depends on it.
5. Operating unit works properly. Use clean water to check.
6. Hydraulic components are maintained clean.

Troubleshooting

Liquid system

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
No spray from boom when turned on.	Air leak on suction line.	Check if suction filter O-ring is sealing. Check suction tube and fittings. Check tightness of pump diaphragm and valve covers.
	Air in system.	Fill suction hose with water for initial prime.
	Suction/pressure filters clogged.	Clean filters. Check yellow suction pipe is not obstructed or placed too near the tank bottom.
Lack of pressure.	Incorrect assembly.	Restrictor nozzle in Self-Cleaning Filter not fitted. Safety valve spring for Self-Cleaning Filter not tight. Too little distance between yellow suction pipe and tank bottom.
	Pump valves blocked or worn.	Check for obstructions and wear.
	Defect pressure gauge.	Check for dirt at inlet of gauge.
Pressure dropping.	Filters clogging.	Clean all filters. Fill with cleaner water. If using powders, make sure agitation is on.
	Nozzles worn.	Check flow rate and replace nozzles if it exceeds 10%.
	Tank is air tight.	Check vent is clear.
	Sucking air towards end of tank load.	Lower pump r.p.m.
Pressure increasing	Pressure filters beginning to clog.	Clean all filters.
Formation of foam.	Air is being sucked into system.	Check tightness / gaskets / O-rings of all fittings on suction side.
	Excessive liquid agitation.	Reduce pump r/min. Check safety valve for Self-Cleaning Filter is tight. Ensure returns inside tank are present. Use foam damping additive.
Liquid leaks from bottom of pump.	Damaged diaphragm.	Replace. See Changing of valves and diaphragms.

Troubleshooting

Hydraulic system

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Boom slow/erratic.	Air in system	Loosen ram connection and activate hydraulics until oil flow has no air in it (not whitish).
	Regulation valve incorrectly set	Open or close until desired speed is achieved Remember oil must be at operating temperature.
	Insufficient hydraulic pressure	Check output pressure of tractor hydraulics. Minimum for sprayer is 2000 psi (130 bar).
	Insufficient amount of oil in tractor reservoir	Check and top up if needed.
Ram not functioning.	Restrictor or regulation valve blocked	Secure boom Dismantle and clean.
Hydraulic system fold/tilt functions will not operate	Power supply	Check for proper 12V power supply
One function (fold or tilt) will not operate	Various	Check for defective switch(es). Check continuity of cables. Check for operation of applicable solenoid (coil not activating or plunger stuck). Check for short circuit in wiring junction box at rear of sprayer. Dirt in the restrictor port of the cylinder.
Multiple hydraulic functions with one switch activated	Various	Check for correct solenoid electric/hydraulic hook-up. Check for short circuit in wiring in the junction box at rear of sprayer.

Troubleshooting

ECP/ECPC Operating unit

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Operating unit not functioning	Blown fuse(s).	Check mechanical function of microswitches. Use cleaning/lubricating agent if the switch does not operate freely. Check motor. 450-500 milli-Amperes max. Change motor, if over.
	Wrong polarity.	Brown - pos. (+). Blue - neg. (-).
	Valves not closing properly.	Check valve seals for obstructions. Check microswitch plate position. Loosen screws holding plate a $^1/_2$ turn.
	No power.	Wrong polarity. Check that brown is pos. (+), Blue is neg. (-). Check print plate for dry solders or loose connections. Check fuse holder are tight around fuse.

Foam marker problems

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Compressor will not run.	Various	Short in electrical system or bad compressor. 12 volt supply not connected or bad connection. Defective switch in control box.
Compressor runs, but will not make foam.	Various	Not enough foam concentrate. Solenoid valve plugged. Solenoid not working.
Will not make enough foam.	Various	Line leak or line pinched. Solenoid valve plugged. Weak foam concentrate mixture. Water too hard (add water softener).
Foam drops will not last.	Various	Not enough foam concentrate. Weak foam concentrate. Water too hard (add water softener).
Keeps blowing fuses	Various	Short in electrical system or bad compressor. Tank filter plugged.

Troubleshooting

Flush & Rinse™ System problems

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
System will not flush (pump, control, and boom)	Various	Flush valve not in correct position. P.T.O. not engaged

HARDI® Filler problems

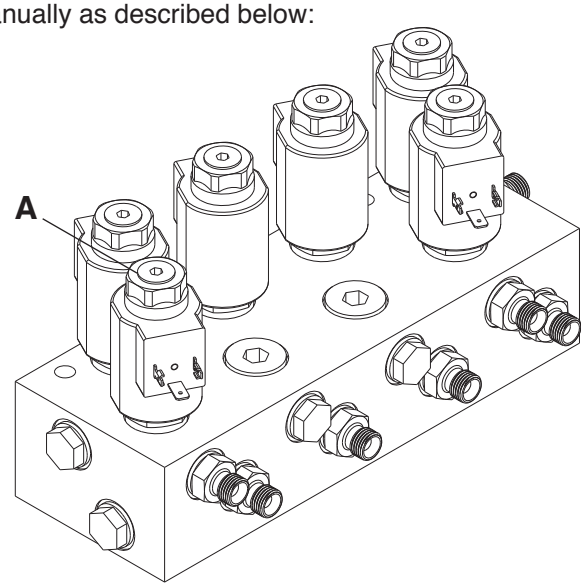
FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Filler hopper will not empty.	Various	Pressure selection valve not in correct position. Sprayer pump not running.
Filler hopper empties too slow.	Various	Bottom tank discharge valve not open all the way. Restrictor cone from pump supply not the correct size: Black - 1302 & 363 pump White - 463 pump
Filler hopper backfills when bottom tank discharge valve is open.	Various	Restrictor cone from pump supply not the correct size: Black - 1302 & 363 pump White - 463 pump Restrictor cone missing. Restrictor cone on wrong side of the valve.

Emergency operation

Emergency operation of the sprayer

The boom

In case of power failure, the boom can be operated manually as described below:



1. Unscrew top part **A** from solenoid valve. Notice the small pin in the hollow of the valve.
2. The boom can now be operated by depressing the individual pins in the valves. Use a proper tool for this purpose.

Remember to reset the system to original setting.

Cause

The problem may be due to a blown fuse. One spare fuse is located inside the junction box.

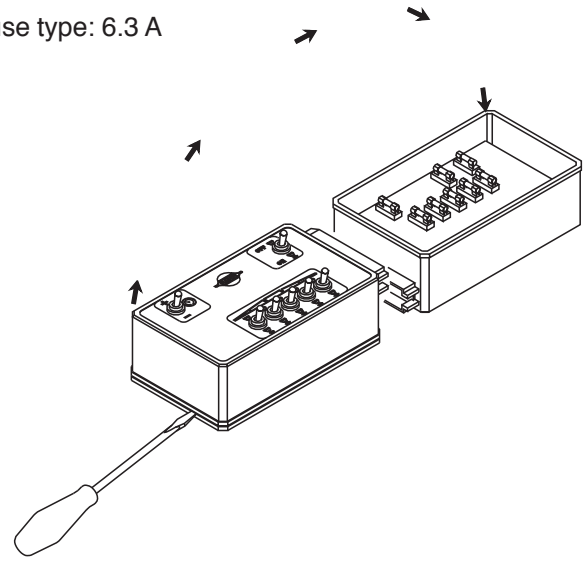
ECP/ECPC operating unit

In case of electrical failure, it is still possible to manually override all functions of the operating unit. To operate manually, disconnect the multiplug from the ECP or ECPC control box first and operate the handles by hand. It is possible to change pressure and turn booms on or off.

The problem may be due to a blown fuse. An extra fuse is placed inside the box.

Note: Since the on-off switch normally operates by shutting off all boom distribution valves, you will need to manually shut off all distribution valves to shut off the complete control unit manually.

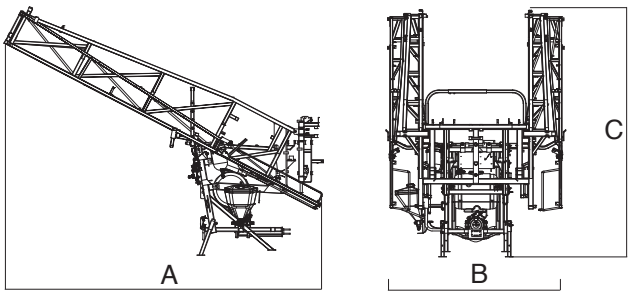
Fuse type: 6.3 A



Technical specifications

Technical specifications

Overall measurements:



	A	B	C
Boom size	(Total Length)	(Total Width)	(Total Height)
Delta 3-PT. 90' Eagle™	24 ft. (7.3 m)	12 ft. (3.7 m)	11.8 ft. (3.6 m)

SPECIFICATIONS

Flush tank capacity	50 Gallon (190 Liter)
Foam marker tank capacity	10, 15, 20 Gallon
	(40, 60, 80 Liter)
Weight:	
Delta 3-pt 90' (28m) Eagle™ boom - Total weight empty	3,970 lbs (1,800 kg)

Diaphragm pump models:	1302-540	363-540	363-1000	463-540	463-540 HC	463-1000	463-1000 HC
Max. Pump capacity	30 GPM (114 l/min)	49 GPM (182 l/min)	49 GPM (182 l/min)	69 GPM (262 l/min)	85 GPM (322 l/min)	69 GPM (262 l/min)	77 GPM (292 l/min)
Max. working pressure:	0-220 PSI (0-15 bar)	0-220 PSI (0-15 bar)	0-220 PSI (0-15 bar)	0-220 PSI (0-15 bar)	0-220 PSI (0-15 bar)	0-220 PSI (0-15 bar)	0-220 PSI (0-15 bar)

Centrifugal pump models:	ACE 206 & ACE 304
Max. Pump capacity	output will vary with PSI and usage
Max. working pressure:	output will vary with PSI and usage

Note: All weight measurements are approximate values with booms in transport position, flush tank & working platform, clean water tank, chemical inductor and foam marker.
N/A = Not Available

Technical specifications

Filters and nozzles

Filter gauze width

30 mesh: 0.023” (0.58 mm)
50 mesh: 0.012” (0.30 mm)
80 mesh: 0.007” (0.18 mm)
100 mesh: 0.006” (0.15 mm)

Temperature and pressure ranges

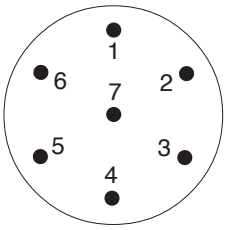
Operating temperature range:
36°F to 104°F (2° to 40° C.)

Operating pressure for safety valve:
220 psi (15 bar)

Electrical connections

Rear lights

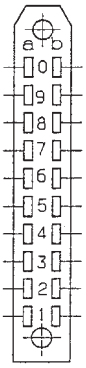
Position	Wire color
1. Ground	White
2. Work lamps	Black
3. LH flashing & turn indicator	Yellow
4. Free	Red
5. RH flashing & turn indicator	Green
6. Free	Brown
7. Free	Blue



The wiring is in accordance with ANSI/ASAE S279.11.

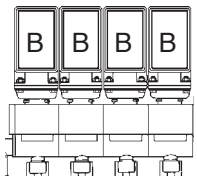
Electrical connections for ECP operating unit

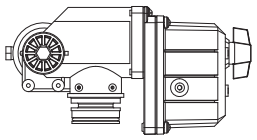
20 pole plug with cable

Number of distribution valve						
6 & 5	4	3 & 2		2 & 3	4	5 & 6
Wire number or color code						
						
13	9	9		10	10	14
G/Y	G/Y	G/Y		11	11	15
1	1				2	2
3	3	1		2	4	4
5		3		4		6
7	5	5		6	6	8
9	7				8	10
11						12

G/Y = green/yellow

ECP





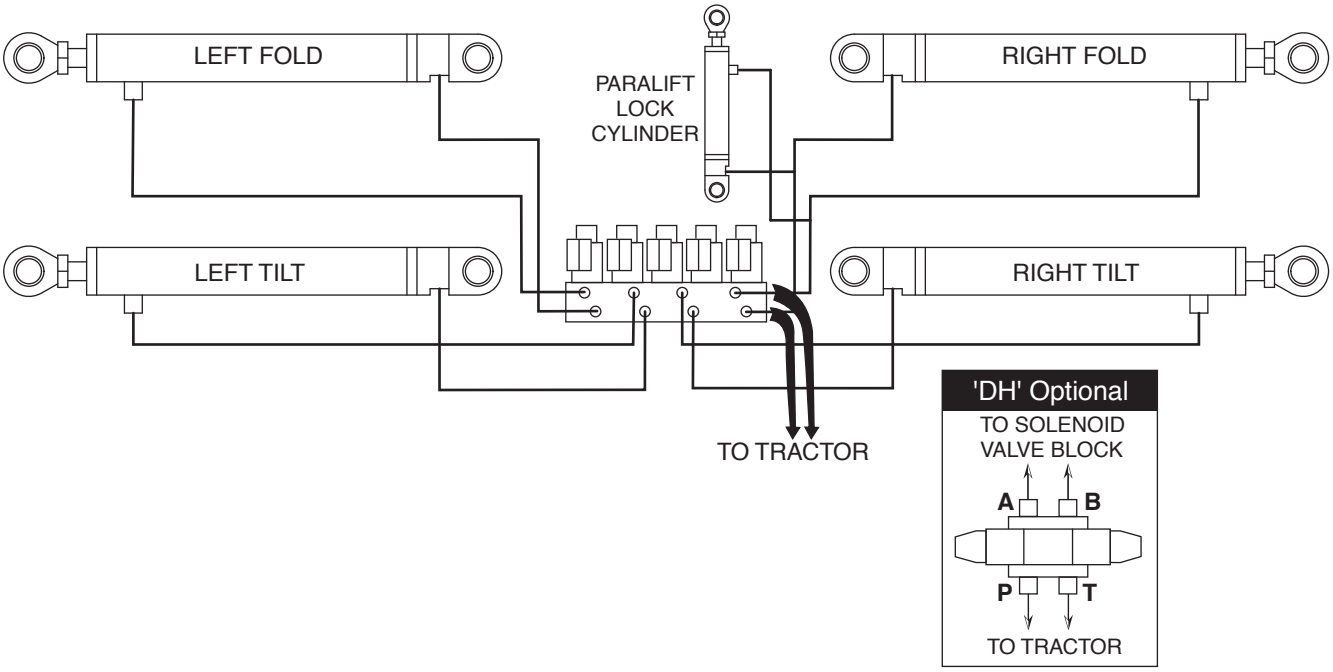
Number of distribution valves

Valve	3/4	5/6	7
	Wire number or color code		
B1	1-2	1-2	1-11
B2	3-4	3-4	2-12
B3	5-6	5-6	3-13
B4	7-8	7-8	4-14
B5		9-10	5-15
B6		11-12	6-16
B7			7-17
REG	9-10	13-14	9-10
B8			

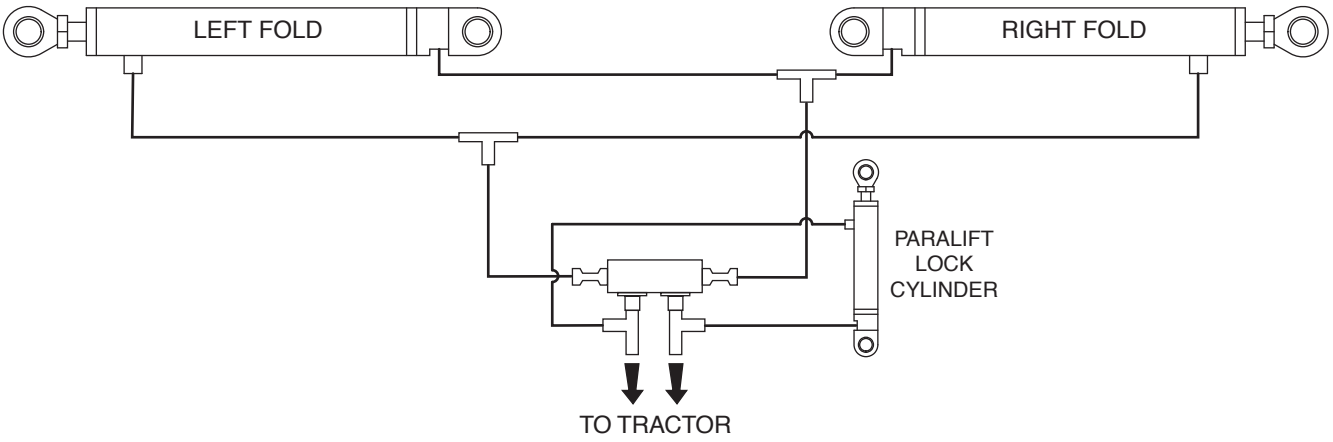
G/Y = Green/Yellow

Technical specifications

EAGLE™ boom hydraulics SPC-Z



EAGLE™ boom hydraulics SPC-HY



WARRANTY POLICY AND CONDITIONS

HARDI® INC. , 1500 West 76th Street, Davenport, Iowa, USA; 5646 W. Barstow, Fresno, California, USA; and 290 Sovereign Road, London, Ontario, Canada hereinafter called "HARDI®", offers the following limited warranty in accordance with the provisions below to each original retail purchaser of HARDI® new equipment of its own manufacturer, from an authorized HARDI® dealer, that such equipment is at the time of delivery to such purchaser, free from defects in material and workmanship and that such equipment will be warranted for a period of one year from the date of delivery to the end user providing the machine is used and serviced in accordance with the recommendations in the Operator's Manual and is operated under normal farm conditions.

1. This limited warranty is subject to the following exceptions:
   a) Parts of the machine are not manufactured by HARDI®, (i.e. engines, tires, tubes, electronic controls, and other components or trade accessories, etc.) are not covered by this warranty but are subject to the warranty of the original manufacturer. Any claim falling into this category will be taken up with the manufacturer concerned.

   b) This warranty will be withdrawn if any equipment has been used for purposes other than for which it was intended or if it has been misused, neglected, or damaged by accident, let out on hire or furnished by a rental agency. Nor can claims be accepted if parts other than those manufactured by HARDI® have been incorporated in any of our equipment. Further, HARDI® shall not be responsible for damage in transit or handling by any common carrier and under no circumstances within or without the warranty period will HARDI® be liable for damages of loss of use, or damages resulting from delay or any consequential damage.

2. We cannot be held responsible for loss of livestock, loss of crops, loss because of delays in harvesting or any expense or loss incurred for labor, supplies, substitute machinery, rental for any other reason, or for injuries either to the owner or to a third party, nor can we be called upon to be responsible for labor charges, other than originally agreed, incurred in the removal or replacement of components.

3. The customer will be responsible for and bear the costs of:

   a) Normal maintenance such as greasing, maintenance of oil levels, minor adjustments, etc.

   b) Transportation of any HARDI® product to and from where the warranty work is performed.

   c) Dealer travel time to and from the machine or to deliver and return the machine from the service workshop for repair.

   d) Dealer traveling costs.

4. Parts defined as normal wearing items, (i.e. tires and V-belts) are not in any way covered under this warranty.

5. This warranty will not apply to any product which is altered or modified without the express written permission of HARDI® and/or repaired by anyone other than an Authorized Service Dealer.

6. Warranty is dependent upon the strict observance by the purchaser of the following provisions:

   a) That this warranty may not be assigned or transferred to anyone.

   b) That the Warranty Registration Certificate has been correctly completed by dealer and purchaser with their names and addresses, dated, signed and returned to the appropriate address as given on the Warranty Registration Certificate.

   c) That all safety instructions in the operator's manual shall be followed and all safety guards regularly inspected and replaced where necessary.

7. No warranty is given on second-hand products and none is to be implied.

WARRANTY POLICY AND CONDITIONS

8. Subject to the following terms, conditions and contributions, HARDI® extends the warranty on polyethylene tanks (excluding fittings, lids and gaskets) to FIVE YEARS. To qualify for this extended warranty, the tank must be drained and flushed with fresh water after each day of use. HARDI®'s liability is limited to replacement of the tank, FOB our plant at no cost to the purchaser during the first twelve months; at 20% of the then current price during the second year ; at 40% during the third year ; at 60% during the fourth year; and at 80% during the fifth year. This five year extended warranty is subject, in each instance, to the tank being inspected and approved for replacement or repair by HARDI® personnel before HARDI® will accept any liability hereunder.

9. Subject to the following terms, conditions, contributions, HARDI® extends the warranty on HARDI® diaphragm pumps (excluding wearing parts such as diaphragms, valves, etc.) to FIVE YEARS. To qualify for this extended warranty, the pump must be drained and flushed with fresh water after each day of use. HARDI®'s liability is limited to replacement of defective parts, FOB our plants in Davenport, Iowa, USA; Fresno, CA, USA; and London, Ontario, Canada at no cost to the purchaser during the first twelve months after date of purchase, at 20% of the then current retail price during the second year ; at 40% during the third year ; at 60% during the fourth year ; and at 80% during the fifth year. This five year extended warranty is subject, in each instance, to the pump being inspected and approved for replacement or repair by HARDI® personnel before HARDI® will accept any liability hereunder.

10. HARDI® reserves the right to incorporate any change in design in its products without obligation to make such changes on units previously manufactured.

11. The judgement of HARDI® in all cases of claims under this warranty shall be final and conclusive and the purchaser agrees to accept its decisions on all questions as to defect and to the exchange of any part or parts.

12. No employee or representative is authorized to change this warranty in any way or grant any other warranty unless such change is made in writing and signed by an officer of HARDI® at it's head office.

13. Any warranty work performed which will exceed $400.00 MUST be approved IN ADVANCE by the Service Manager.

14. Any pump replacement must be approved in advance by the Service Manager.

15. Claims under this policy must be filed with HARDI® within thirty (30) days of work performed or warranty shall be void.

16. Parts requested must be returned prepaid within thirty (30) days for warranty settlement.

17. Warranty claims must be COMPLETELY filled out properly or will be returned.

DISCLAIMER OF FURTHER WARRANTY

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, EXCEPT AS SET FORTH ABOVE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION OF THE PRODUCT CONTAINED HEREIN. IN NO EVENT SHALL THE COMPANY BE LIABLE FOR INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES (SUCH AS LOSS OF ANTICIPATED PROFITS) IN CONNECTION WITH THE RETAIL PURCHASER'S USE OF THE PRODUCT.

Notes

For Product, Service or Warranty Information:
- Please contact your local HARDI® dealer.

To contact HARDI® directly:
- Please use the HARDI® Customer Service number: 1-866-770-7063
- Or send your email to: CUSTSERV@hardi-us.com

Visit us online at: www.hardi-us.com

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