COMMANDER *plus*

Operator's Manual

67020603 (8/03)

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® COMMANDER Plus sprayer were suggested by growers. There is no substitute for "on farm" experience and we invite your comments and suggestions.

Please address your correspondence to the Service Manager at one of these branches:

HARDI® MIDWEST
1500 West 76th St.
Davenport, Iowa 52806
Phone: (563) 386-1730
Fax: (563) 386-1710

HARDI® WEST COAST
5646 W. Barstow, Suite 101
Fresno, California 93722
Phone: (559) 271-3106
Fax: (559) 271-3107

HARDI® GREAT LAKES
290 Sovereign Rd.
London, Ontario N6M 1B3
Phone: (519) 659-2771
Fax: (519) 659-2821

Sincerely,

Tom L. Kinzenbaw
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 COMMANDER Plus 750 and 1200 trailer sprayers consist of a powder coated frame with a tank, diaphragm pump, ECP control (Electric Control Plus), HARDI® SMART VALVE system, Self-Cleaning Filter, Paralift™ Boom Lift System, and 45', 50', 60' or 66' EAGLE™ series spray boom. The 1200 trailer sprayers additionally offer 80', 88', 90', or 100' EAGLE™ series spray boom and 80', 88', 90', 100', or 120' FORCE™ series spray boom.

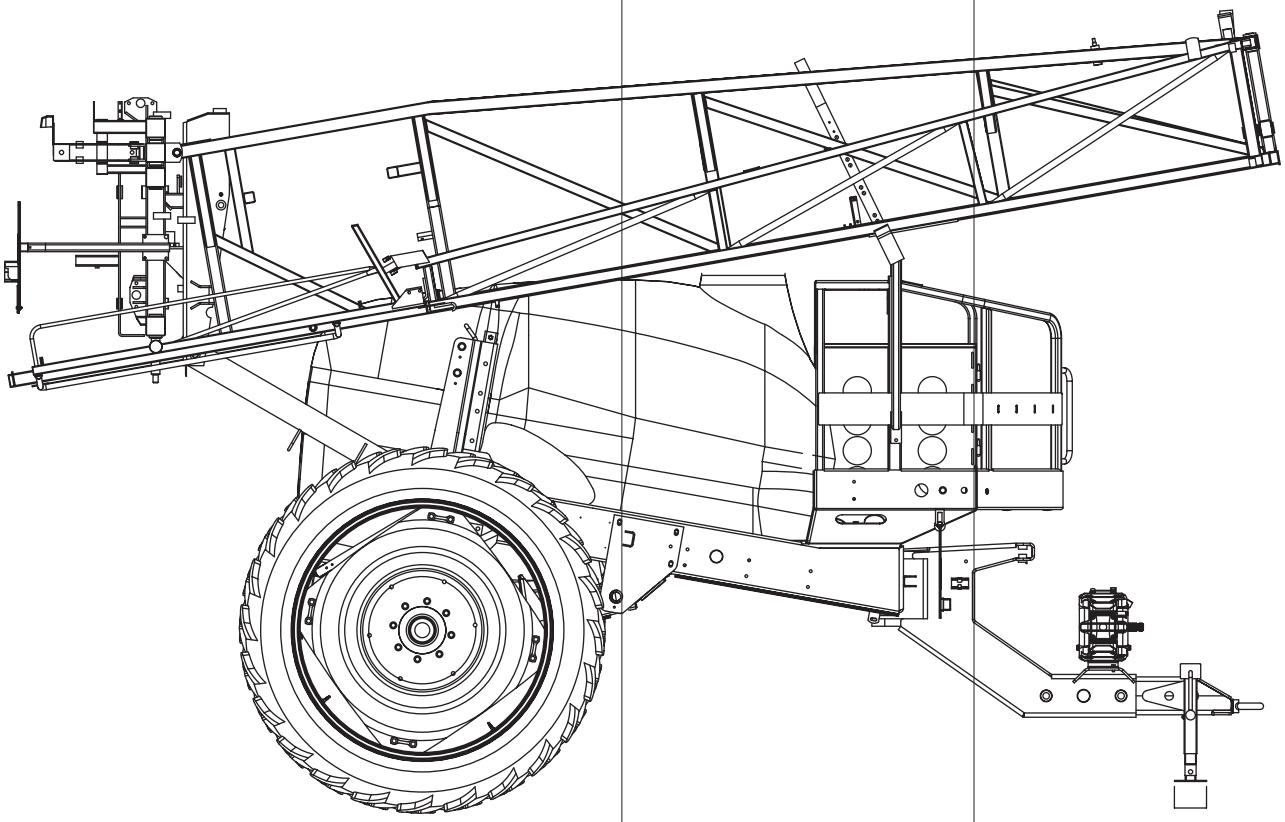
Commander plus 1200 gallon with 120' Force™ boom

Commander plus 750 gallon with 60' Eagle™ boom

Introduction

COMMANDER Plus

The COMMANDER Plus is divided into three zones: a Clean zone, a Working zone and an Application zone, referring to the level of possible chemical contamination.



APPLICATION ZONE

PARALIFT™ boom lift system

Boom

Nozzles

*Suspension

WORKING ZONE

Tank level indicator

SMART VALVE System

Couplers for Quick Fill

Working platform with ladder

Hydraulic and electric components

*Boom and Work lights

*HARDI® FILLER

*Lockers for chemical containers and equipment

CLEAN ZONE

Locker for protective gear

Clean water tank

Valve for hand washing

Support leg

Pump

P.T.O. shaft

*Please note that some of the features are optional equipment

Description

Frame

Strong and compact frame with optional drawbars and wheel sizes. The frame has a strong chemical and weather resistant powder coat. Screws, nuts, etc. have been electrochemically treated to be resistant to corrosion.

Tank

The tanks, made of impact and chemical resistant polyethylene, have a purposeful design with rounded contours which allows for efficient cleaning and draining. The tanks are designed with a large deep sump, so that they can be completely emptied even when the sprayer is used on slopes up to 15% inclination. A remote operated valve drain is fitted for efficient draining.

Pump

The HARDI® diaphragm pumps have low maintenance requirements and guaranteed pump life. The bearings and crankshaft are grease lubricated and reduce contamination 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.

SMART VALVE system

All functions of the spray circuits are operated via the centrally situated SMART VALVE system with color coded plates and pictorial symbols for easy operation.

Operating unit

The ECP - Electrical Control Plus is divided into two sections. The pressure regulation valve is located at the front of the sprayer. The boom section control valves with pressure equalization are mounted at the rear of the sprayer. The on/off switch is linked to the boom section valves, which results in a very quick response to on/off operation. The built-in HARDI-MATIC mechanical rate controller ensures a constant volume per acre of the liquid (gpa) at varying forward speed within the same gear when the number of P.T.O. revolutions are between 300-600 r.p.m. (540 r.p.m pump) or 650-1100 r.p.m. (1000 r.p.m. pump).

Filters

With the self-cleaning filter, 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™ SPB boom is available in 45', 50', 60', and 66' working width.
The EAGLE™ SPC boom is available in 80', 88', 90' and 100' working width.
The FORCE™ FTZ boom is available in 80', 88', 90', 100' and 120' working widths.
Outer sections incorporate spring loaded breakaways.

Boom hydraulics

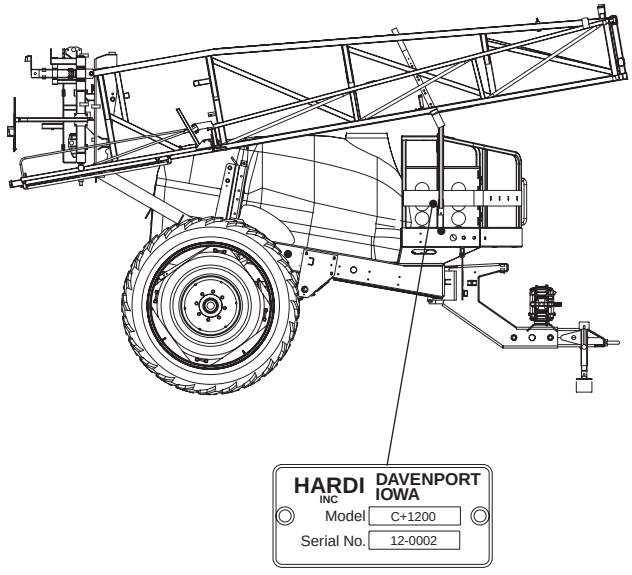
The SPB, SPC and FTZ booms are equipped with I.A.H. (Indirect Acting Hydraulics). Optional D.H. (Direct Acting Hydraulics) is available.

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

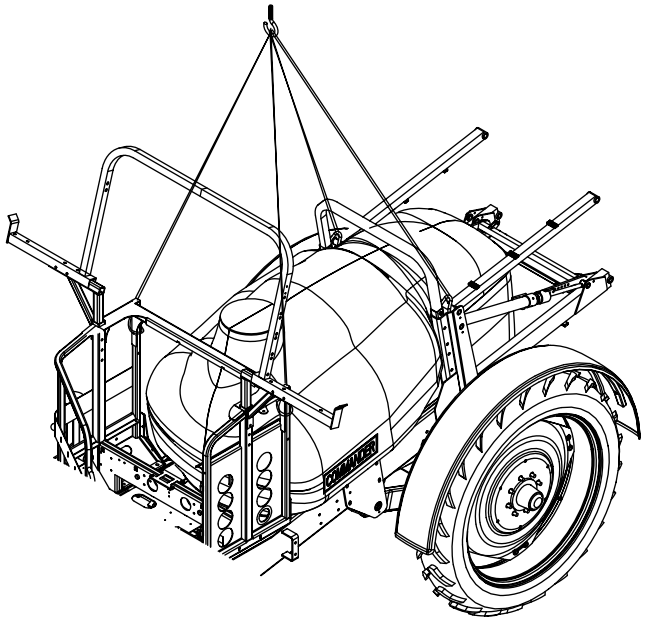
Sprayer use

The HARDI® COMMANDER Plus 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

If the sprayer needs to be "lifted" during unloading, 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. Do not permit others to ride. Only one person should be working the tractor/sprayer 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.

Safety instructions

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

Connecting the sprayer

Drawbars

Mounted on the frame in a center pivot, the drawbar can be either standard fixed or optionally steered. The steering drawbar is hydraulically operated.

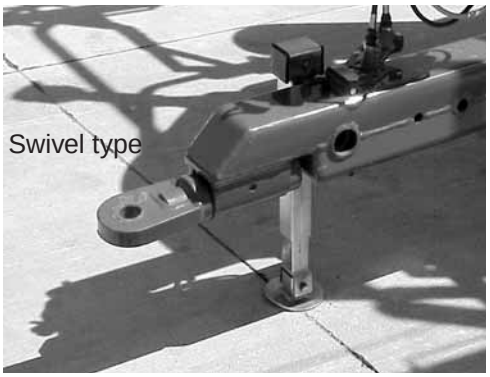
Overview - Drawbar systems

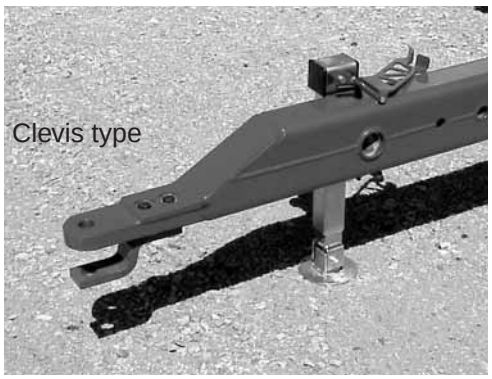
COMMANDER	FIXED DRAWBAR	STEERING DRAWBAR
750	YES	YES
1200	YES	YES

The following hitch types are available:

Overview - Hitch types

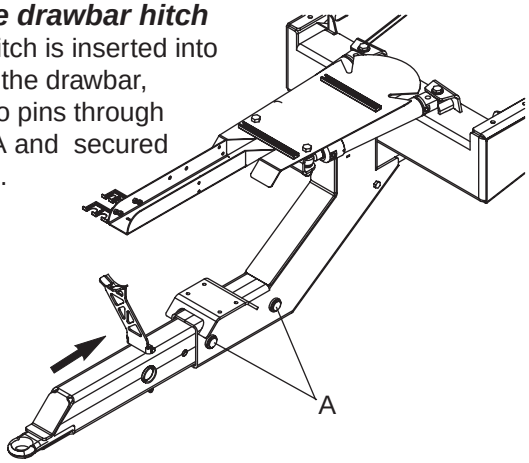
Hitch type	Commander 750	Commander 1200
Swivel type Ø36	Yes	No
Clevis type Ø33	Yes	No
Swivel type Ø42	No	Yes
Clevis type Ø42	No	Yes





Mounting the drawbar hitch

The drawbar hitch is inserted into the opening of the drawbar, fastened by two pins through the two holes A and secured by two roll pins.

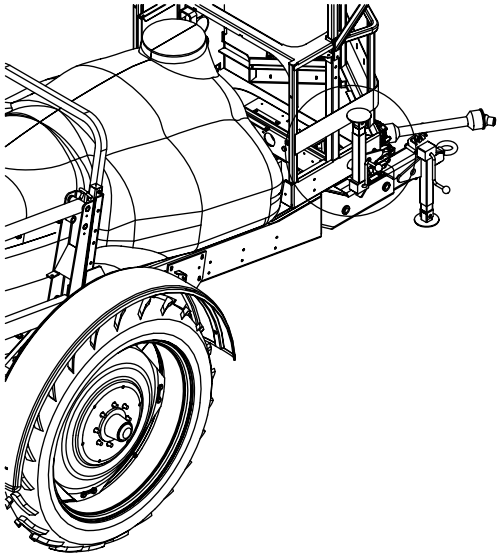


Drawbar hitch height adjustment

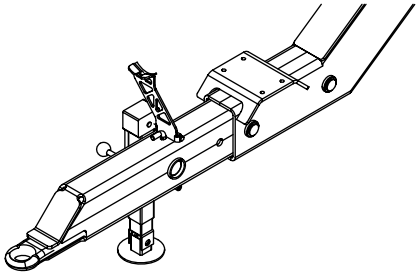
The drawbar hitch may be inverted for height adjustment. Remove the two pins (**A**) and the P.T.O. support bracket. Invert the drawbar hitch and replace the two pins (**A**) and P.T.O. support bracket.

Support jack

The support jack is stored upside-down in the bracket on the sprayer's right side when the sprayer is attached to the tractor.



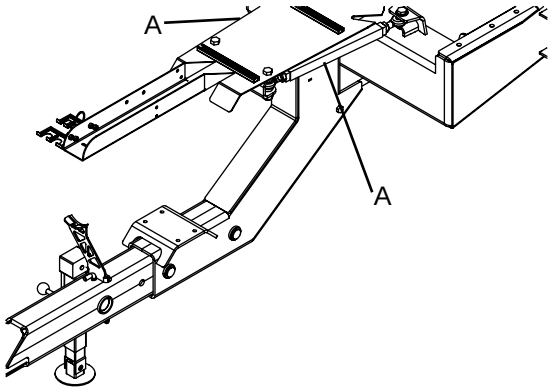
To remove the support jack from the drawbar hitch: Lift the leg, remove the linch pin and pull out the support jack. The support jack can then be mounted to the storage bracket and secured by the linch pin.



Sprayer setup

Fixed drawbar adjustment

Make sure the drawbar points straight ahead from its position on the trailer. If not, the two turnbuckles **A** can be adjusted until the drawbar is centered.

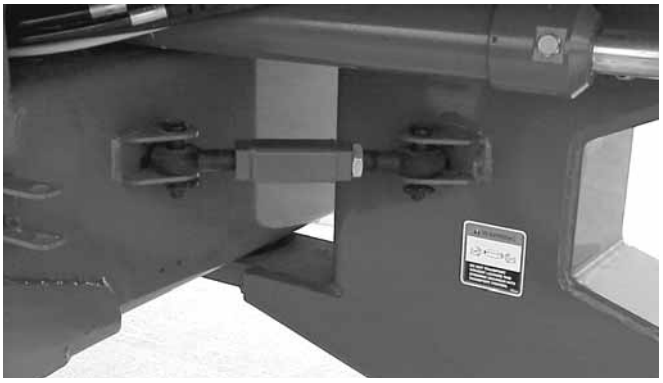


STEERING drawbar (optional)

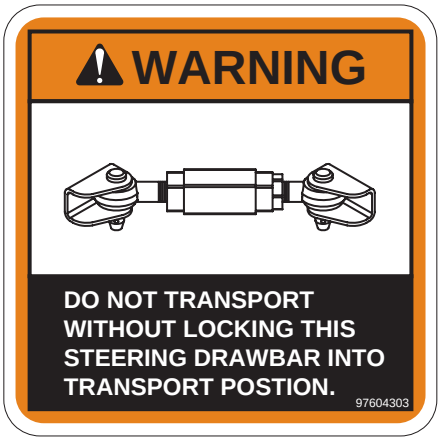
Transport lock (if fitted)

The transport lock is a safeguard that will keep the drawbar in a centered position in case of hydraulic leakage during transport on public roads.

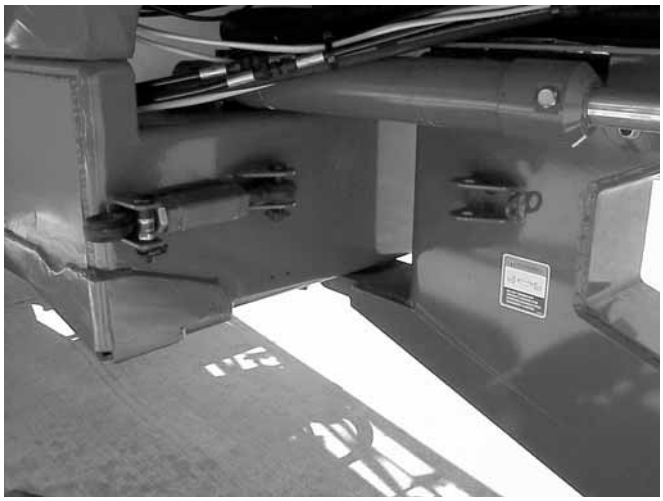
The transport lock is held in place by pins and snap rings. If necessary, the transport lock can be adjusted by turning the turnbuckle.



Transport lock - Road position



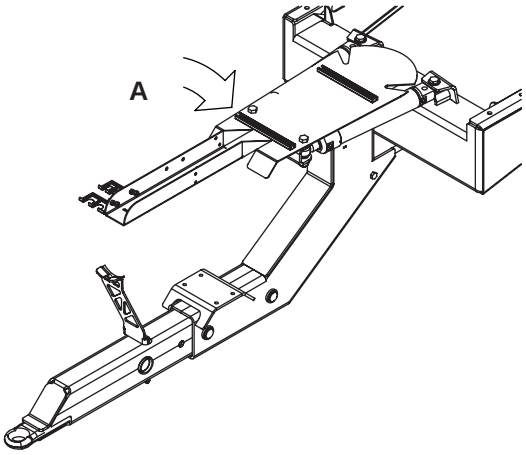
When the hydraulic steering is needed again, remove the front pin and snap ring, swing the transport lock out to the field position and secure with pin and snap ring.



Transport lock - Field position

Hose package support

To prevent hoses and wiring from being damaged by the tractor wheels, all hoses, cables and wires are held by the hose bracket **A** fitted to the drawbar.



Check that the length of the hoses and cables is sufficient in tight turns, especially when the optional steering drawbar is fitted.

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.**

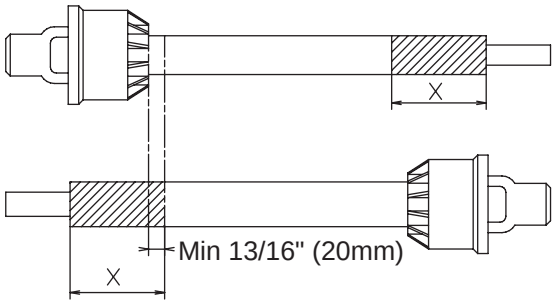
Always keep protection guards and chains intact and make sure that the guards cover all rotating parts, including CV-joints at each end of the shaft.
Do not use without protection guard.
Do not touch or stand on the transmission shaft when it is rotating - safety distance: min 5' (1.5 meters).
Prevent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

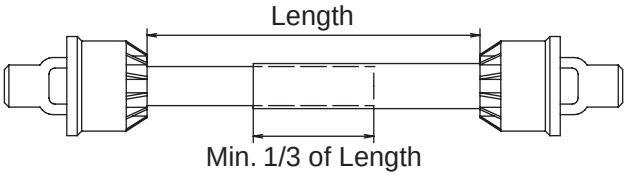
Initial installation of the shaft is done as follows:
1. Attach sprayer to tractor and set sprayer in the position with shortest distance between the tractor and sprayer pump P.T.O. shafts.
2. Stop engine and remove ignition key.
3. If P.T.O. shaft must be shortened, the shaft is pulled apart. Fit the 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.

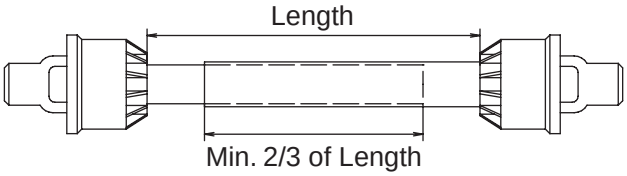
Pump with 6 splines (540 r.p.m.)

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

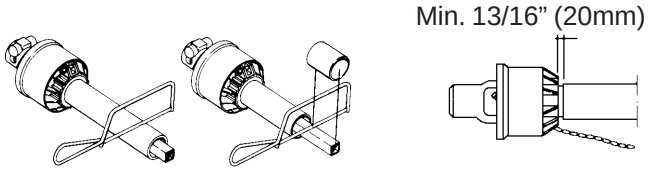


Pump with 21 splines (1000 r.p.m.)

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



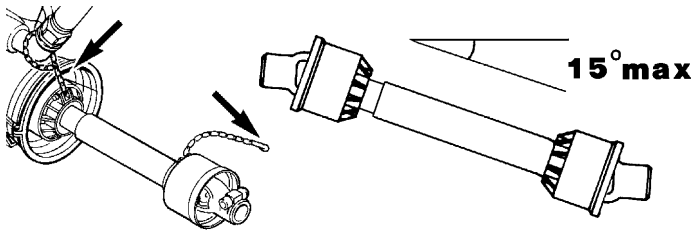
4. The two parts are shortened equally. Use a saw, and file the profiles afterwards to remove burrs.



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°.



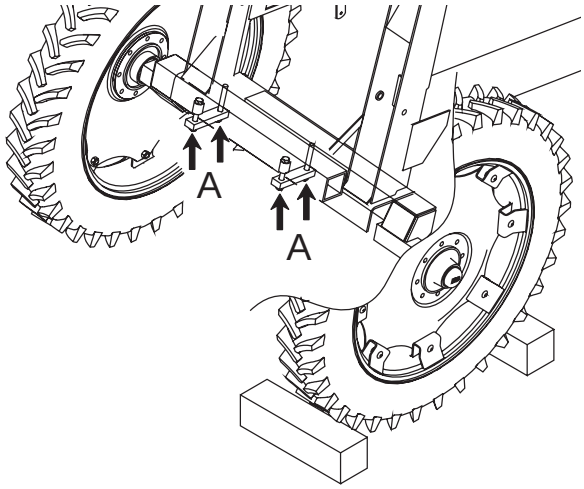
Wheel tread adjustments

Altering the wheel track width

The track width of the COMMANDER Plus can be adjusted as follows:

1. Measure the current track (center RH tire to center LH tire). Each side must be extended or retracted half the desired adjustment.

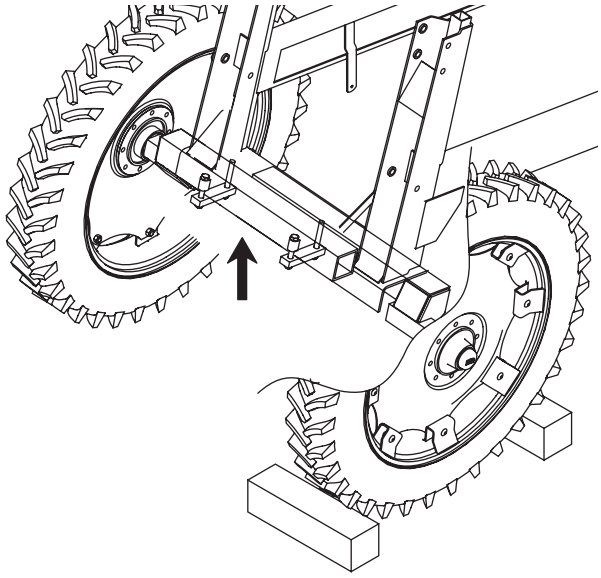
2. Attach the sprayer to tractor and engage tractor parking brake.



3. Place wheel stops in front of and behind the RH wheel. Jack up the LH wheel, support and secure the sprayer frame.

4. Loosen the axle clamp bolts **A** for the LH wheel axle.

5. Extend or retract the axle as needed.



IMPORTANT! Place the jack under the axle and lift the wheel to remove any load from the axle clamps before tightening the axle clamp bolts to the specified torque.

6. Tighten the clamp bolts to a torque of:

   207 Ft/lb (280 Nm) for CM+ 750
   289 Ft/lb (390 Nm) for CM+ 1200

7. Repeat the procedure for the RH wheel.

8. Make sure the distance from the center of the tire to the center of the tank frame is equal on RH and LH sides.

9. Retighten the axle clamp bolts and wheel bolts to specified torque after 10 hours of operation.

IMPORTANT! With Drawbar Steering models, a minimum track width of 72” is required to ensure stability and to prevent the sprayer from tipping over.

Note: The wider the track width, the better is the stability of the sprayer and boom.

Sprayer setup

Axle Systems & Tire Assemblies

COMMANDER PLUS 750

- 60”- 88” adjustable axle inserts with 2 x 12.4 x 42” tire assemblies
- 120” fixed axle with 2 x 12.4 x 42” tire assemblies

COMMANDER PLUS 1200

- 60”- 90” or 72”- 90” adjustable axle inserts with 2 x 320/90R46” tire assemblies (**Note**: 60”- 90” axle system **ONLY** available with EAGLE™ booms)
- 120” fixed axle with 2 x 320/90R46” tire assemblies
- 60”/120” Dual Wheel axle with 4 x 320/90R46” tire assemblies for 30” rows
- 88”/132” Dual Wheel axle with 4 x 270/95R48” tire assemblies for 22” rows
- 72”- 90” coil spring suspended adjustable axle inserts with 2 x 320/90R46” tire assemblies
- 76”- 90” or (80”- 90”) coil spring suspended adjustable axle inserts with 2 x 380/90R46” or (2 x 18.4R46”) tire assemblies
- 120” coil spring suspended fixed axle system with 2 x 320/90R46” or 2 x 380/90R46” or 2 x 18.4R46” tire assemblies
- 88”/132” coil spring suspended Dual Wheel axle with 4 x 270/95R48” tire assemblies for 22” rows

IMPORTANT! With Drawbar Steering models, a minimum track width of 72” is required to ensure stability and to prevent the sprayer from tipping over.

Note: The wider the track width, the better is the stability of the sprayer and boom.

Sprayer setup

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

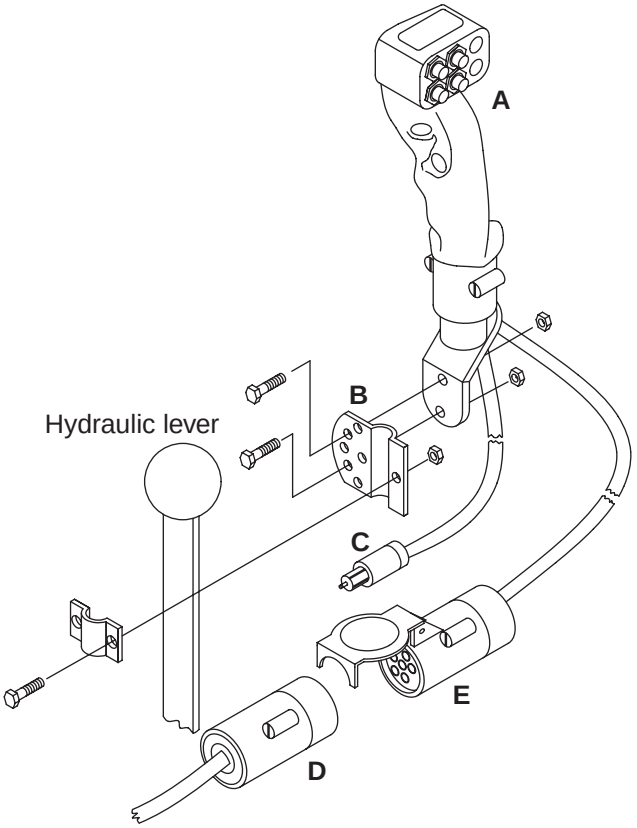
Installation of handle

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)

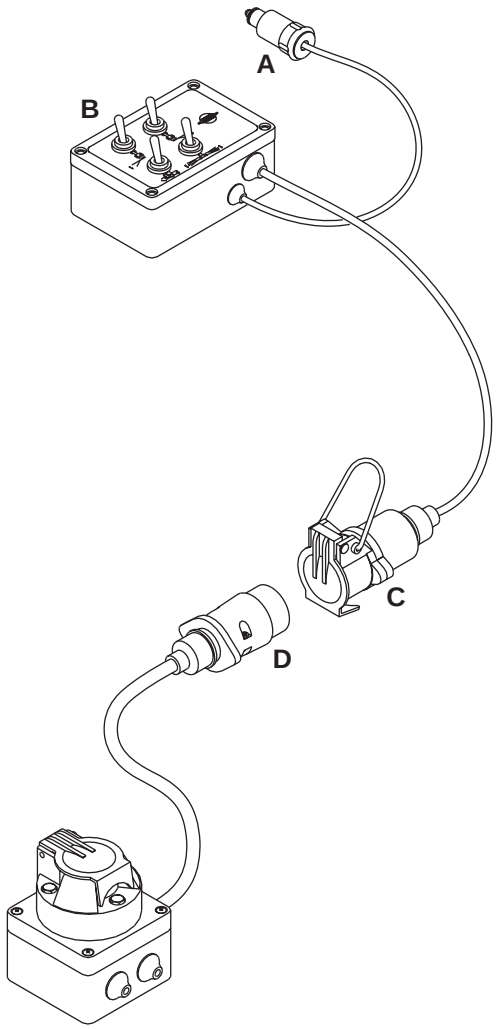
Installation of control box

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.

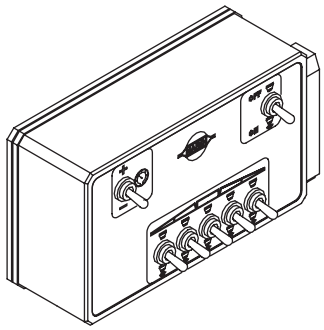
Note polarity: BROWN wire = Positive (+)
BLUE wire = Negative (-)

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 12 awg (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.

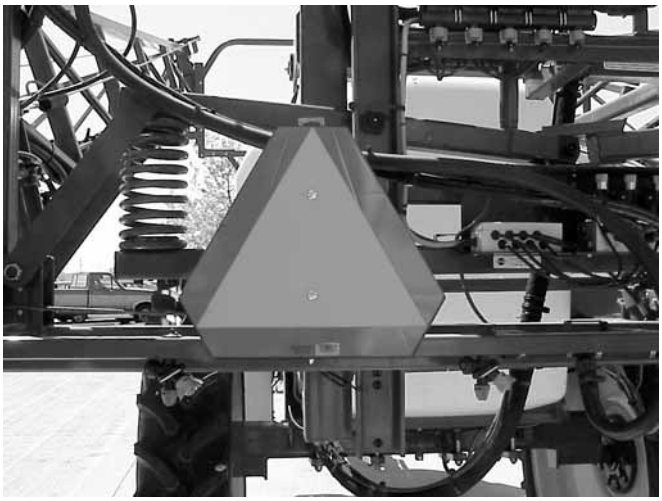
12-volt junction box (#817925) for 12-volt hook-up.

Sprayer setup

Transport

Roadworthiness

Slow moving tractors and spray equipment can create a hazard when on public roads. Make sure an S.M.V. sign is in place and clearly visible from the rear of the sprayer.



NOTE! Max. driving speed is 15 mph (25 km/h).

Rear lights

Local regulations may require the use of flashing warning lights. Connect plug for rear lights to the tractor's 7-pin socket, and check function of rear lights, stop lights and direction indicators on both sides before driving.

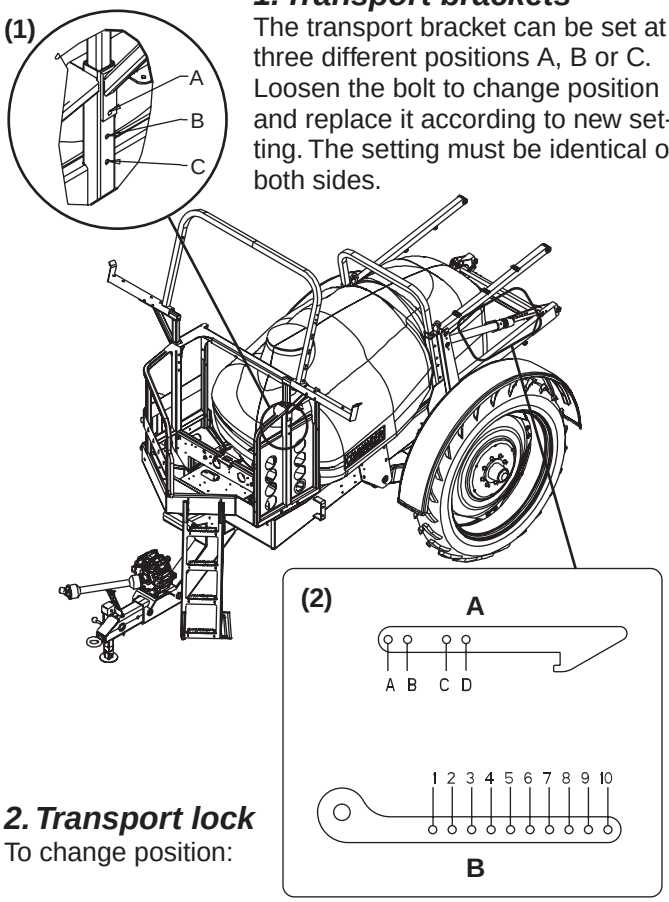
Transport brackets, height setting

The transport brackets can be set in different positions to obtain different transport heights and suitable clearance above various tractor cabins.

When changing the setting of the transport brackets it is done as a combination of adjusting the transport brackets themselves **(1)** and adjusting the transport locks **(2)**. Always choose a transport height as low as possible.

1. Transport brackets

The transport bracket can be set at three different positions A, B or C. Loosen the bolt to change position and replace it according to new setting. The setting must be identical on both sides.



2. Transport lock

To change position:

1. Lift and unfold inner sections till 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.

Note: The rear settings must correspond to the front settings so the boom is resting on the front as well as rear locks.

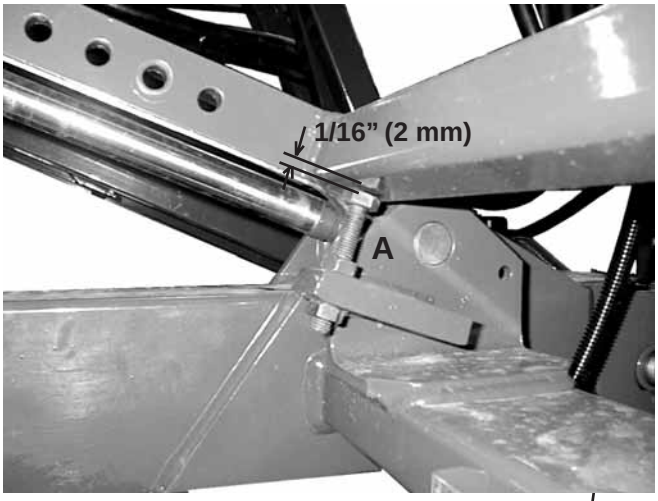
WARNING! The max. transport height must never exceed 13.1 ft. (4.0 m). Always measure the actual total height and choose settings not exceeding 13.1 ft (4.0m).

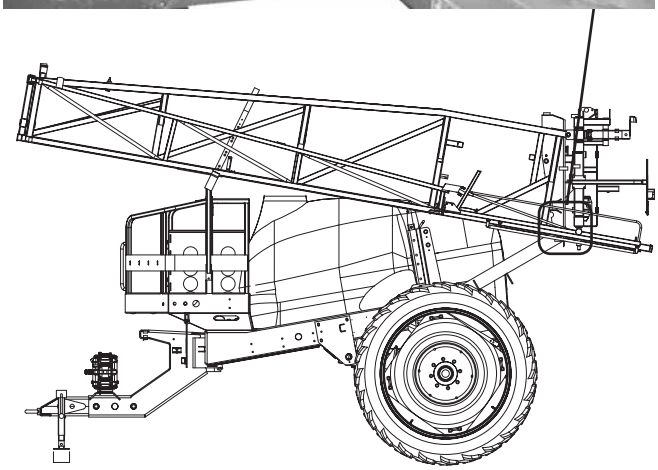
Sprayer setup

Transport lock arm stop

When the boom is unfolded: Inspect the gap between the bolt A and the frame. Correct position = 1/16” gap (2 mm).

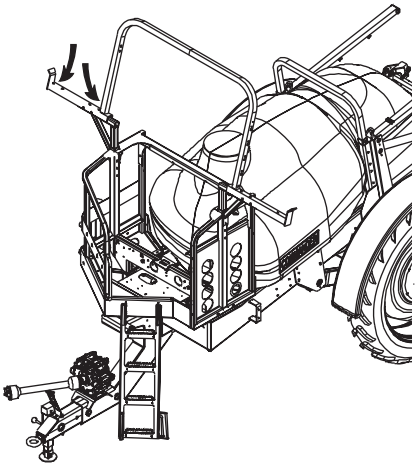
If necessary, adjust the position of bolt A.





Adjusting boom transport position

If the boom wings do not rest accurately in the transport brackets, the wings can be adjusted as described below:

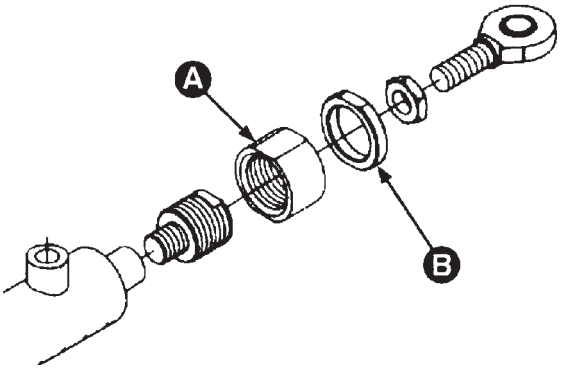


1. Lift the boom all the way to the top.
2. Fold the boom into transport position. With the fold cylinder pressurized, determine if the boom wings need to be adjusted inwards or outwards.
3. Relieve the pressure from the fold cylinder by unfolding the boom a few inches.

If the boom rests too far in on the transport brackets, loosen the nut **B** and adjust collar **A** in towards the cylinder housing.

If the boom rests too far out on the transport brackets, the collar **A** has to go out from the cylinder housing.

4. Secure jam nut **B**.
5. Pressurize the cylinder to see if the boom is properly adjusted. If not, repeat the above procedure until it is correctly adjusted.



Driving Technique

Steering drawbar (optional)

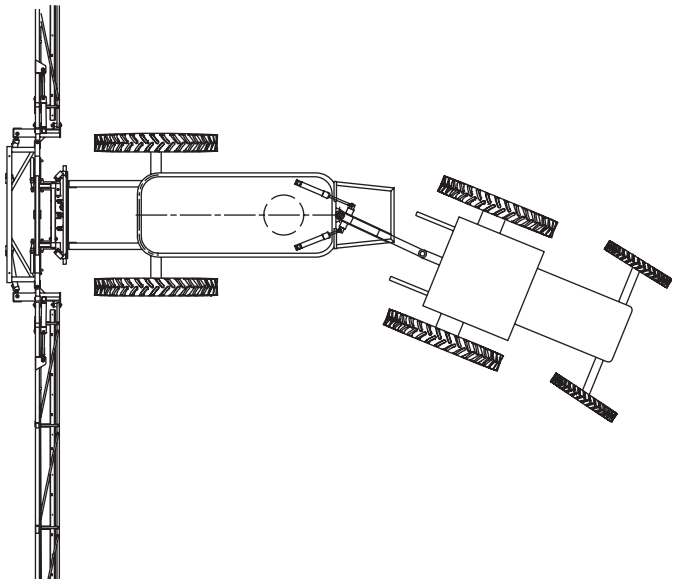
A trailer with an articulating drawbar behaves differently than a normal trailer.

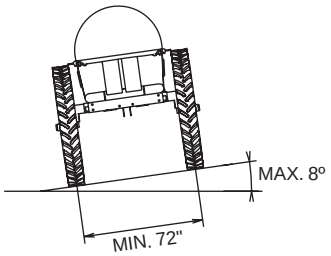
In tracking position the vehicle's center of gravity is displaced further from the vehicle's center line than that of a normal trailer.

Compared to a conventional trailer, a trailer equipped with a steering drawbar has decreased stability when turning, especially when turning on hillsides.

To avoid instability or overbalancing, pay attention to these guidelines:

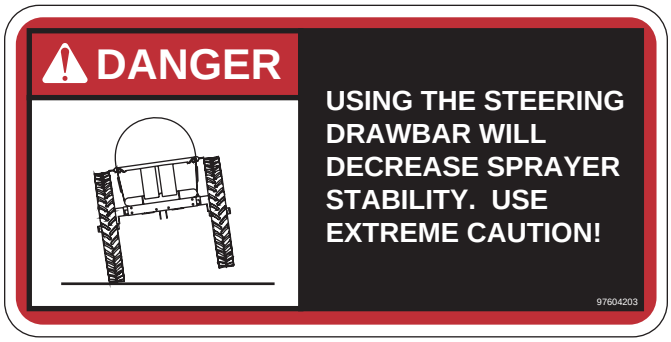
1. Avoid sudden, tight turns
2. Slow down before entering a curve or turning, and drive with a constant, low speed during the turn.
3. Never slow down too fast, never brake heavily and never stop suddenly in a curve, or when turning on a hillside, when the sprayer is articulated.
4. Be careful when turning on uneven ground
5. Set the wheel width as wide as possible
6. The proper function of the hydraulic damping is essential to obtain good stability
7. Keep stabilizer chains on the tractor's liftarms tight
8. For safety reasons, the following limitations are set for sprayers equipped with steering drawbar (with unfolded booms):



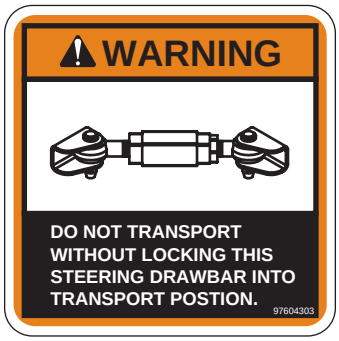


Speed while turning, max. 2.5 m.p.h. (4 km/h)
Ground inclination while turning, max. 8°
Wheel width, min. 72" with steering drawbar

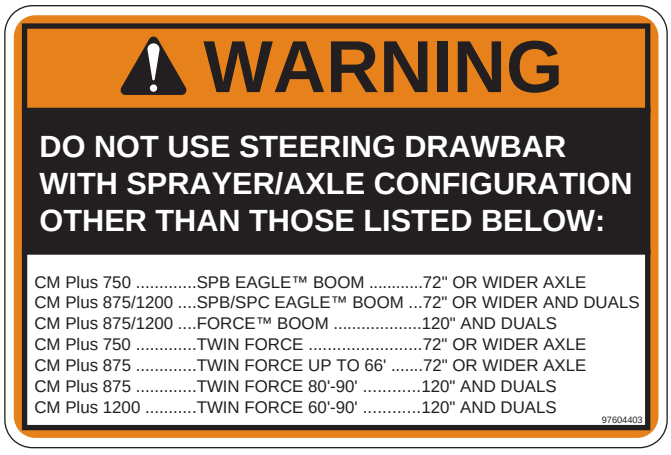
Make sure the following safety decals are in place and that you understand and follow each one:



Decal #97604203



Decal #97604303



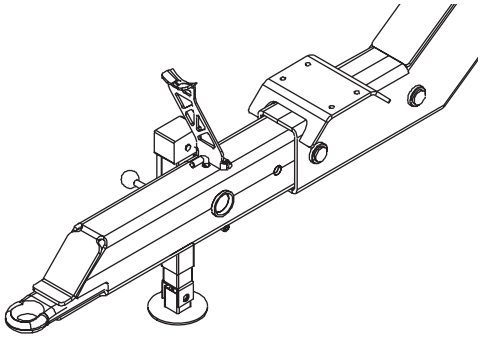
Decal #97604403

Disconnecting the sprayer

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

Support leg

Before disconnecting the sprayer from the tractor, make sure the support leg is properly fitted with the linch pin secured.



The support leg is stored in the storage bracket on the right side of the trailer when the sprayer is attached to the tractor. To remove the support leg: Lift the leg, remove the pin and pull out the support leg.

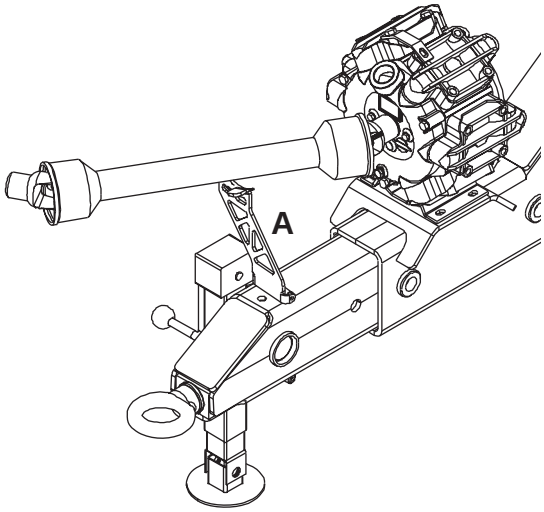
WARNING! To prevent the sprayer from tipping over, do not disconnect the sprayer from the tractor with the booms unfolded unless the boom is supported!

Remember to disconnect all hoses and cables from the tractor.

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

P.T.O. shaft support

The P.T.O. shaft rests on the bracket A when not in use.



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.

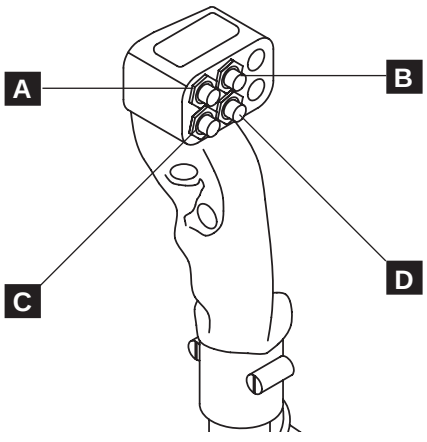
- **ENSURE THAT BOOMS ARE BACK IN THE TRANSPORT POSITION BEFORE UNHOOKING THE SPRAYER FROM THE TRACTOR.**
- **THE HYDRAULIC SYSTEM SHOULD BE CHECKED VERY CAUTIOUSLY THE FIRST TIME OF OPERATION; THERE MAY BE AIR IN THE SYSTEM AND THIS COULD CAUSE VIOLENT MOVEMENTS OF THE BOOM. ENSURE THAT NO PERSONS OR OBJECTS ARE IN THE WAY WHILE CHECKING THE SYSTEM.**
- **FOR INFORMATION ON BOOM ADJUSTMENT, SEE THE APPROPRIATE EAGLE™ OR FORCE™ BOOM OPERATOR'S MANUAL.**

Unfolding and folding the HZ EAGLE™ boom

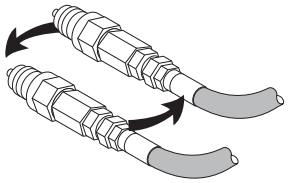
WARNING! Always put the boom wings in the horizontal position prior to folding. Never attempt to fold the boom to transport position when the boom wings are tilted - unexpected boom movements may occur, if the wings are tilted when folding.

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



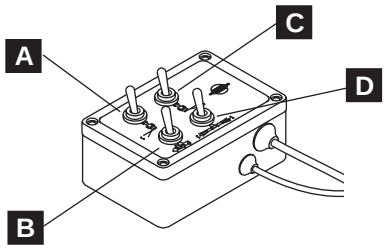
1. Raise the boom to release it from the transport brackets.
2. Depress switches **A** and **B** and move the joystick forward or rearward to activate oil flow. Switch positions of the hoses in the double acting remote outlet if you do not like the direction required to activate the boom.



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 section *'Folding one side only'*).

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.

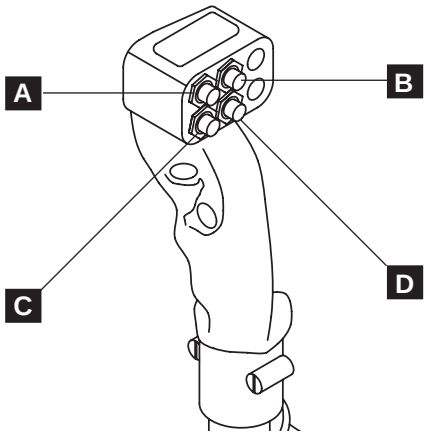
Operation

Unfolding and folding the HZ FORCE™ boom

WARNING! Always operate the boom on level ground.

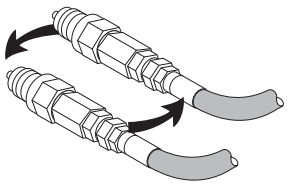
A. Hydraulic joystick controls

Switch **A** operates: Inner wing fold cylinders
Switch **B** operates: Outer wing fold cylinder
Switch **C** operates: Left hand tilt cylinder
Switch **D** operates: Right hand tilt cylinder



TO UNFOLD BOOM

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



Note: When unfolding the inner wings, the transport hooks on the two Paralift™ cylinders will disengage.

3. With the boom still at the highest point, depress switch **B** to unfold the outer wing sections (unless spraying half folded). Lower boom to desired spray height.

TO FOLD BOOM

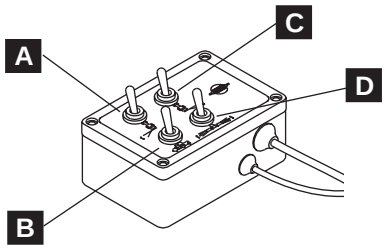
1. Raise the boom 75% of the highest point.
2. Depress switch **B** and move joystick in opposite direction as unfold to fold in the outer wing sections.

Note: Be sure that the boom is raised when folding or damage can occur when the transport hooks are engaged.

3. Tilt wings up approx. 15° (See Tilting the HZ Force™ boom - p. 23).
4. Depress switch **A** to fold in the inner wing sections allowing the bottom profile of the wing to come in contact with the vertical part of the front transport bracket.
5. Lower boom down, activating the Paralift™ lift cylinders. Make sure that the transport hooks are engaged on the cylinders. Then lower the tilt cylinders (switch **C** and **D**) until the wings are resting on the front transport supports.
6. Relieve all oil out of the system by activating the tractor levers without any switches pushed.

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

Switch **A** operates: Inner wing fold cylinders
Switch **B** operates: Outer wing fold cylinders
Switch **C** operates: Left hand tilt cylinder
Switch **D** operates: Right hand tilt cylinder



TO UNFOLD BOOM

1. Raise the boom to the highest point to release it from the transport supports and hooks.
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 the inner wing sections.

Note: When unfolding the inner wings, the transport hooks on the two Paralift™ cylinders will disengage.

4. Activate switch **B** upwards and hold to unfold the outer wing sections (unless spraying half folded). Lower boom to desired spray height.

TO FOLD BOOM

1. Raise the boom 75% of the highest point.
2. With the double acting remote outlet lever engaged, activate switch **B** downwards and hold to fold in the outer wing sections.

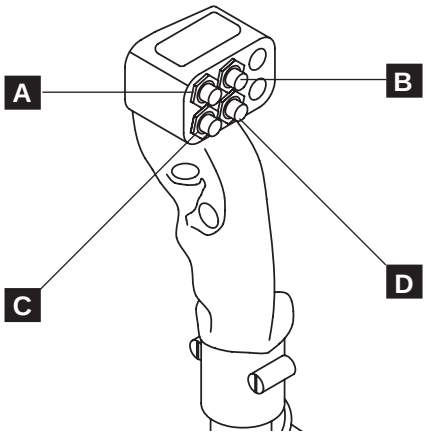
Note: Be sure that the boom is raised when folding or damage can occur when the transport hooks are engaged.

3. Tilt wings up approx. 15° (See Tilting the HZ Force™ boom - p. 23).

4. Depress switch **A** to fold in the inner wing sections allowing the bottom profile of the wing to come in contact with the vertical part of the front transport bracket.
5. Lower boom down, activating the Paralift™ lift cylinders. Make sure that the transport hooks are engaged on the cylinders. Then lower the tilt cylinders (switch **C** and **D**) until the wings are resting on the front transport supports.
6. Relieve all oil out of the system by activating the tractor levers without any switches pushed.

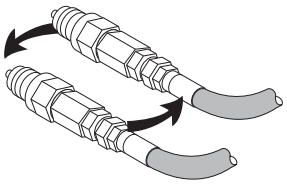
Tilting the HZ EAGLE™ & HZ FORCE™ booms

WARNING! Never attempt to work on or around boom when tilted up.



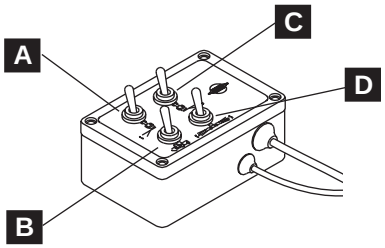
A. Hydraulic joystick controls

1. Activate switch **C** and move hydraulic handle forward or rearward to tilt left-hand boom up. To tilt the right-hand boom, activate switch **D**. Switch positions of the hoses in the double acting outlet if you do not like the direction required to activate the boom.



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

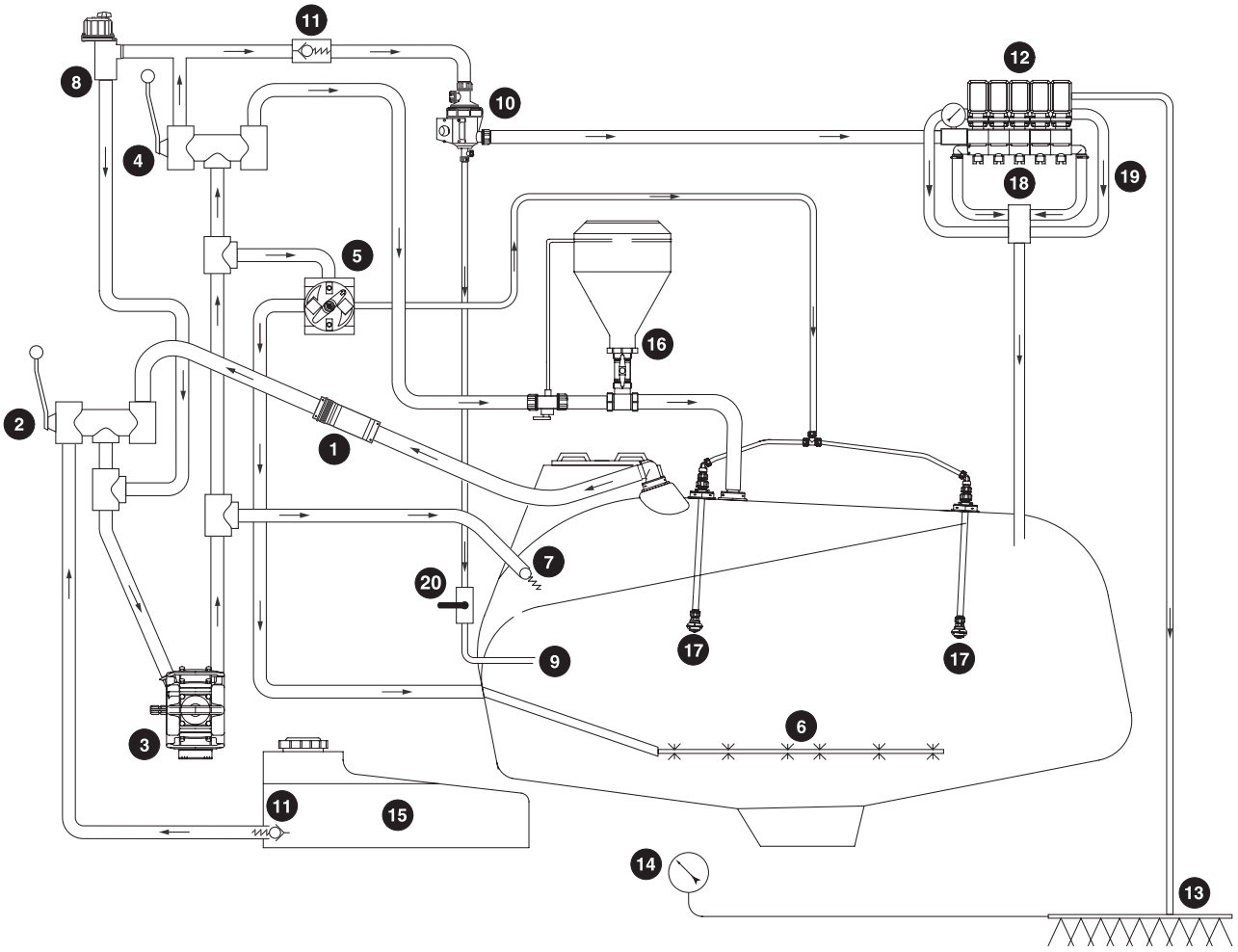
1. Engage the tractor's double acting remote outlet lever and lock it in the engaged position.
2. Activate switch **C** upwards and hold to tilt left-hand boom up (Holding the switch in the down position will tilt the boom down). To tilt the right-hand boom, activate switch **D**.



Operation

The HARDI® COMMANDER Plus trailer sprayer uses a diaphragm pump with ECP control. 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



1. Suction filter
2. Suction manifold
3. Pump
4. Pressure manifold
5. Agitation/Tank rinse valve
6. Sparge tube agitation
7. Safety valve
8. HARDI-MATIC
9. Self-cleaning filter return
10. Self-cleaning filter
11. Check valves
12. Boom section valves
13. Boom
14. Boom pressure gauge
15. Flush tank
16. HARDI® chemical inductor
17. Tank rinse nozzles
18. Pressure equalization return
19. Feed hose pressure return
20. Self-cleaning filter shut-off

Operation

Operating the liquid system

SMART VALVE SYSTEM

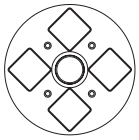
The “Smart Valve System” is located at the left side of the sprayer, permitting operation of most of the (fitted) accessories from one position. The modular design of the "Smart Valve System" allows for the easy addition of many accessories to the plumbing system of the sprayer. The system is fitted with an "Agitation/Tank Rinse valve", enabling the tank agitation and the tank rinse nozzles to be turned on or off from one valve. It also features a self-cleaning filter shut-off valve, which allows the self-cleaning filter return to be turned on or off.

Use of SMART VALVE system

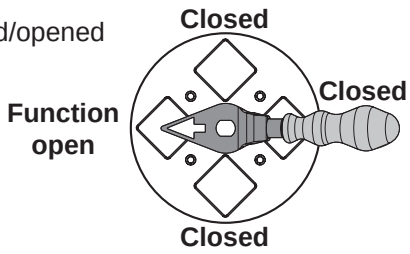
The Manifold valve faces are colored discs for easy identification:

Smart Valves

Green disc = Pressure valve
Black disc = Suction valve



A function is activated/opened by turning the handle towards the desired function. All other functions are closed.



Symbols (shown below) are fitted to the faces of the manifold valves indicating direction of flow of the liquid.

Decals - Green disc (pressure)	
Self-cleaning filter / Operating unit	
HARDI® FILLER (optional)	
Agitation *	
Tank rinsing nozzle *	
Spray gun (optional)	

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

The valves and functions may vary from machine to machine depending on optional equipment fitted.

*Agitation/Tank Rinse Valve

Green disc = Pressure valve

The Agitation/Tank Rinse Valve allows for "variable" control of both the pressure agitation and the Tank Rinse nozzles.

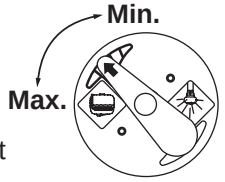
When the handle is pointed towards the "Agitation" symbol, full agitation is on.

Full agitation will consume most of the pump capacity. Normal operation will be at a lower setting.

When the handle is pointed towards the "Tank Rinse" symbol, full Tank Rinse is on.

When the handle is pointed straight up or down, the valve is off.

When the handle is between the "Off" position and either the "Agitation" symbol or the "Tank Rinse" symbol, then variable pressure is possible. The closer the handle is to the symbol, the more pressure is sent to that function.



Normally, Agitation should be on, but please refer to the following rules of thumb:

1. Close the agitation valve if a high level of foaming occurs, in order to reduce the amount of foam.

2. Choose “Agitation” when using powder chemicals in order to avoid sedimentation.

3. Close the agitation valve if spraying with a high volume and it is impossible to achieve sufficient operating pressure.

Operation

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

Note: If a MANIFOLD valve is too tight to operate - or if it is too loose (= liquid leakage), the valve needs to be serviced. Please see the part *"Adjustment of 3-way-valve (suction)" (p. 50)* for further information. Correct setting is when the valve can be operated smoothly by one hand.

Quick reference decals are located on the frame near the SMART VALVE SYSTEM for easy "in field" operation of the valves.

Filling the tanks on the COMMANDER Plus

The main tank and flush tank can be filled in two ways:

1. Filled through tank lid.
2. Filled with external Quick Fill (optional), which enables the connection to a nurse tank.

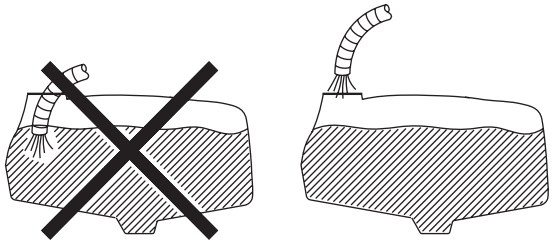
The main tank should normally be filled 1/3 with water, before adding the chemicals - always read instruction on chemical container!

1. 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.

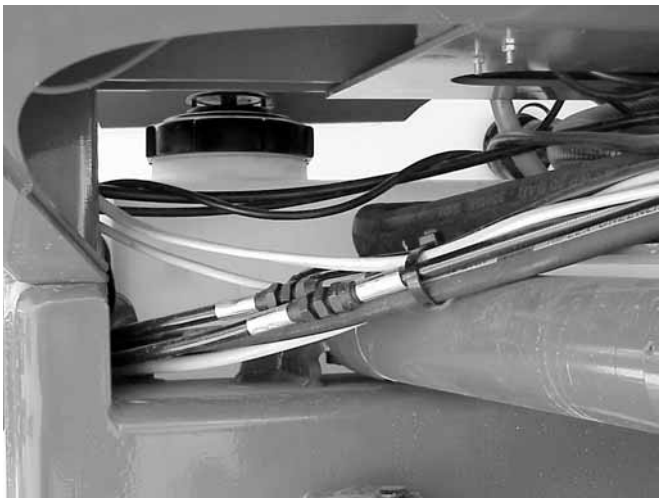
WARNING! **DO NOT LET THE FILLING HOSE ETC. ENTER THE TANK. KEEP IT OUTSIDE THE TANK, POINTING TOWARDS THE FILLING HOLE.**



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.

2. Filling flush tank (optional) through lid

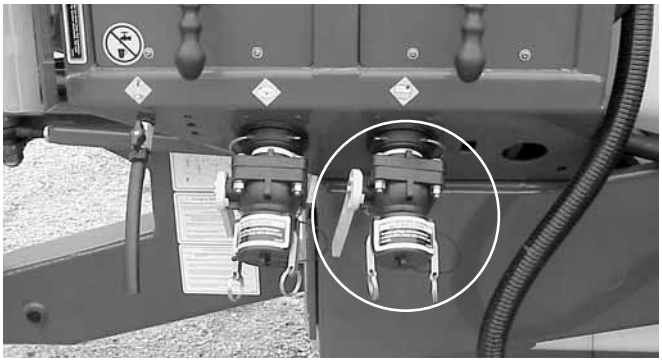
The flush tank is situated at the front under the platform and main tank. Access to the flush tank lid is at the rear of the platform. Fill only with clean water.



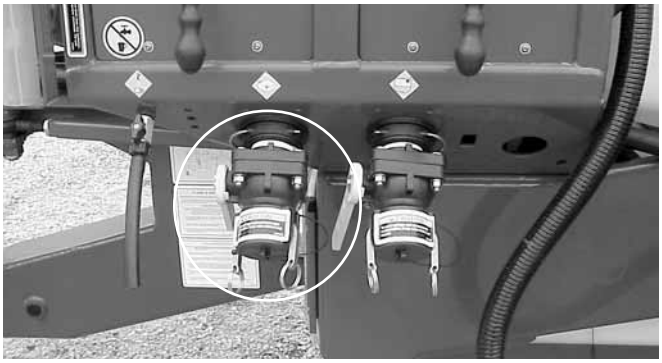
Flush tank capacity (optional)

Model	US Gal.	Liter
750	70	280
1200	110	420

3. Filling with external Quick Fill (optional)



Main tank Quick Fill coupler



Flush tank Quick Fill coupler

The Quick Fill is operated as follows:

1. Remove the plug from the quick fill coupler for the tank you wish to fill (main tank or flush tank).
2. Fit the external water supply hose to the quick coupler on the trailer.
3. Fill tank to desired level.

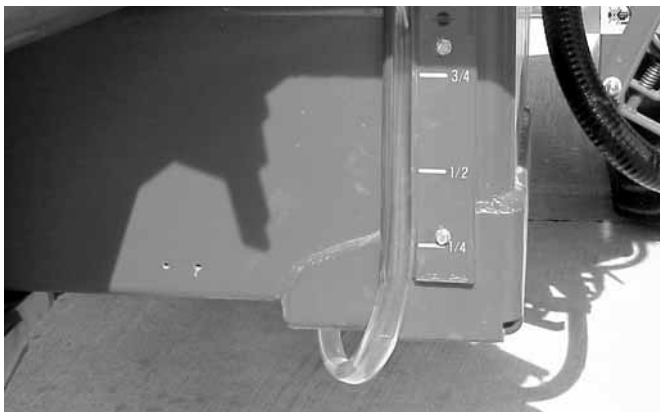
WARNING: Do not leave the sprayer while filling the tank, and keep an eye on the tank level sight gauge in order **NOT** to overfill the tank!

4. Remove external water supply hose from the quick coupler.
5. Replace the plug on the quick coupler.

Note: Observe local legislation regarding use of Quick Filling Device. In some areas it is prohibited to fill from open water reservoirs (lakes, rivers, etc.). It is recommended only to fill from closed reservoirs (mobile water tank, etc.) to avoid contamination.

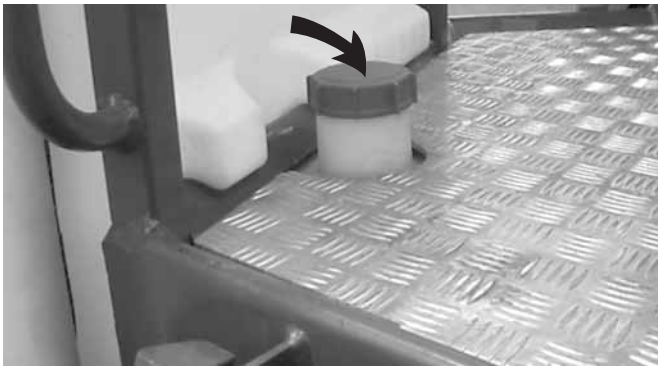
***WARNING!* IF SUCTION HOSE/FILTER IS CARRIED ON THE SPRAYER, IT CAN BE CONTAMINATED BY SPRAY DRIFT WHICH WILL BE TRANSFERRED TO WATER SUPPLY WHEN FILLING.**

A water level indicator for the flush tank (clear hose with floating ball) is situated beneath the platform.

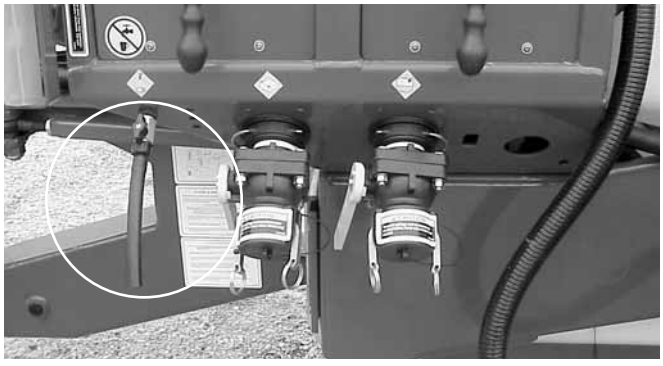


4. Filling of clean water tank

The clean water tank is integrated in the platform and has a capacity of 8 gallons (30 liters). Access to the tank lid is possible from the platform. Fill this tank with clean water only.



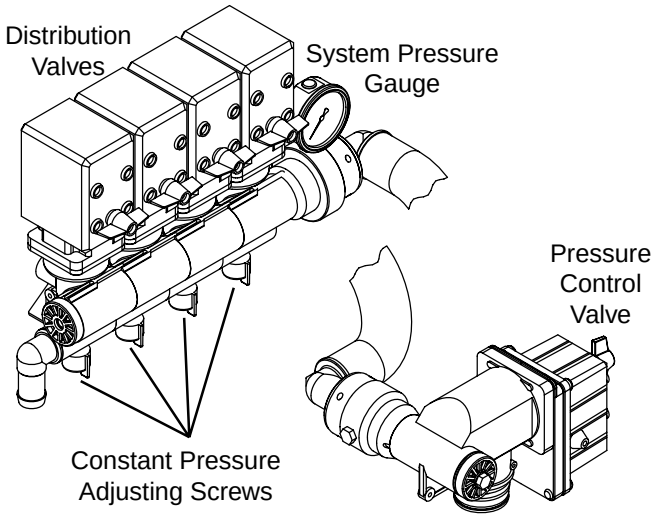
The water from this tank is for hand washing, cleaning of clogged nozzles etc. The valve is located within reach from the SMART VALVES and is opened/closed by a valve handle.

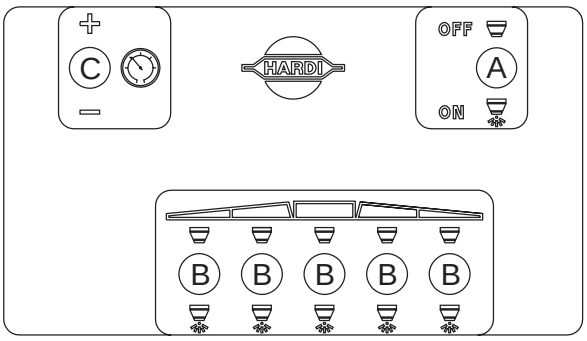


WARNING! Although the clean water tank is only filled with clean water, it must never be used for drinking.

Operation

Adjustment of ECP operating controls





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 operating unit using clean water (without chemicals).

1. Choose the correct nozzle (pp. 33-34). Make sure that all nozzles are the same type and capacity.
2. Put the tractor in neutral and set the parking brake. Adjust the P.T.O. r.p.m. to the number of revolutions that will typically be used while spraying. This 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. Turn main on/off switch **A** to the "ON" position against green symbol (down position).
4. Make sure all distribution valve switches **B** are also "ON" against green symbol (down position). All nozzles should be spraying at this time.
5. Hold pressure regulating switch **C** up (+) or down (-) until the approximate spraying pressure is shown on the system pressure gauge.

Adjustment of constant pressure

Note: Disconnect power to the control box to allow for manual operation of the boom distribution valves. Adjustment will be made one section at a time until all valves have been adjusted.

1. Perform steps 1-5 of previous paragraph and use the pressure reading from step 5 throughout the constant pressure adjustment procedure.
2. Manually shut-off the first boom distribution valve by turning the first green handle (the first boom section should shut off).
3. Turn the adjusting screw under the valve just turned off until the control pressure gauge again shows the same pressure as when all boom sections were open (Turn the screw clockwise for higher pressure, counterclockwise for lower pressure).
4. Turn the boom distribution valve back on.
5. Repeat steps 2-4 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 the 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 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 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.

Operation

Remote 4” pressure gauge

The remote pressure gauge is integrated into the front locker. This 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.

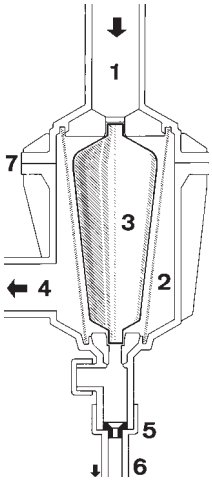
The outputs stated in the nozzle charts are always based on the pressures measured at the nozzle.

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

Self cleaning filters

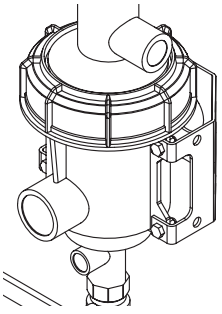
This filter automatically flushes out particles and chemical deposits, reducing routine maintenance, nozzle plugging and operator exposure. No adjustments are required, but different mesh screens may be installed for various types of products. The mesh size of the filter in use should always be smaller than the flow average of the nozzles used.

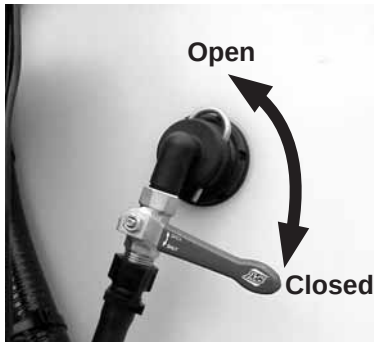
Operating diagram



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

The self-cleaning filter "flush" is operated via the shut-off valve located on the tank near the Smart Valves.





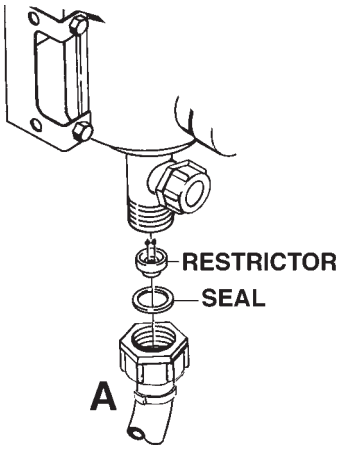
IMPORTANT! The self-cleaning filter shut-off valve should normally be open, but must be closed in the following cases:

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).

Choice of correct restrictor for S.C.F.

It is important to have a large flow through the self cleaning filter. This is achieved by choosing the restrictor size in relation to the liquid consumption of the spray boom.



The hose (**A**) is unscrewed from the self-cleaning filter. Be careful not to lose the seal ball or spring when the restrictor is put in the hose and the hose is refitted. If the required working pressure can not be obtained, the restrictor is too large. 4 restrictors are supplied. Use the **green** one (largest orifice) first. Then choose the next smaller restrictor, starting with **black**, then **white** and finally a **red** one.

Adjustment of Air Pressure in Pressure Damper (1302 Pump Only)

The air pressure in the damper on the 1302 pump is factory preset at 30 psi (2 bar). This is suitable for nozzle spray pressures between 45 psi (3 bar) and 225 psi (15 bar). If different nozzle pressures are required, set pressure damper at pressures indicated.

PSI (BAR)	PSI (BAR)
20-45 (1-3)	0-15 (0-1)
45-225 (3-15)	15-45 (1-3)

Operation

Filling of chemicals

Chemicals can be filled into the tank two different ways:

1. Through the tank lid.
2. By using the HARDI® CHEMICAL FILLER device.

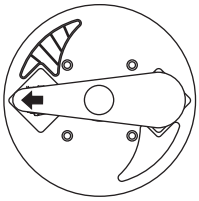
WARNING! Be careful not to slip or splash chemicals when carrying chemicals up to the tank lid!

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

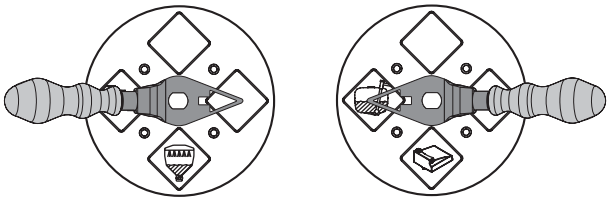
1. Filling through tank lid

The chemicals are filled through the tank lid - Note instructions on the chemical container!

1. Make sure the ECP is switched off.
2. Set the Smart Valves to correct position. Black smart valve towards “Suction from main tank”, top green valve towards “Agitation.” For maximum agitation, turn green smart valve to an unused function or one that doesn't return fluid to the tank (i.e. handgun).

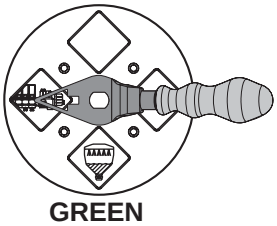


GREEN



GREEN BLACK

3. Engage the pump and set P.T.O. revolutions to 540 r.p.m. or 1000 r.p.m. (depending on pump model).
4. Add the chemicals through the main tank hole.
5. When the spray liquid is well mixed, turn handle on the green smart valve towards “Spraying” position. Keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.



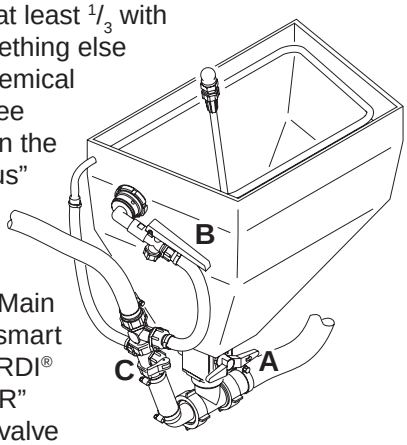
GREEN

2. Filling with HARDI® CHEMICAL FILLER

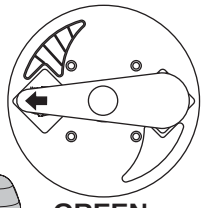
To get access to the HARDI® CHEMICAL FILLER, grab the handle, disengage the lock with your foot, and drag the HARDI® CHEMICAL FILLER all the way down. After use, push it all the way up again.

Operating with Liquid-based chemicals

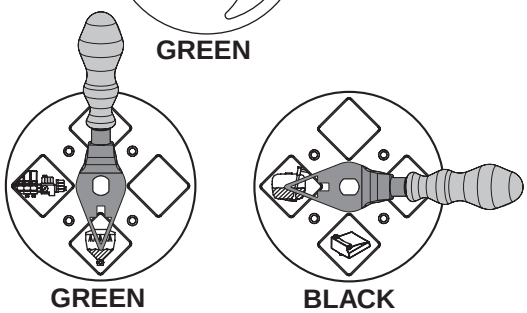
1. Fill the main tank at least $^{1}/_{3}$ with water (unless something else is stated on the chemical container label). See “Filling the tanks on the COMMANDER Plus” (pp.26-27).
2. Turn the handle at the Suction Manifold towards “Main tank” . Turn green smart valve towards “HARDI® CHEMICAL FILLER” and the top green valve towards agitation.



3. Check that bottom valve **A** at the FILLER is closed.



GREEN



GREEN BLACK

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.

Operation

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.

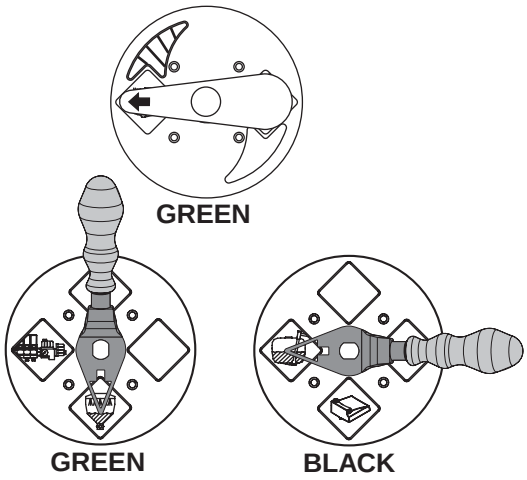
IMPORTANT! The Bag & Bottle Rinse uses spray liquid from the main tank to rinse containers of concentrated chemicals. Always rinse the chemical containers with clean water several times until they are clean before disposal.

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

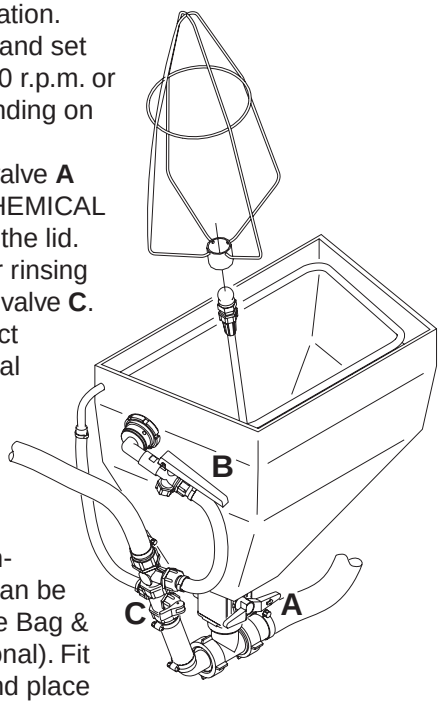
IMPORTANT! The hopper rinsing device uses spray liquid from the main tank for rinsing the hopper of concentrated chemical. The HARDI® CHEMICAL FILLER must always be cleaned together with the rest of the sprayer when the spray job is done.

11. Close valve **A** and the HARDI® CHEMICAL FILLER lid again.
12. When the spray liquid is well mixed, turn handle on the green smart valve 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 of Water" (pp. 26-27)*.
2. Turn the handle at the Suction Manifold towards “Main tank”. Turn green smart valve towards “HARDI® CHEMICAL FILLER” and the top green valve towards agitation.
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.

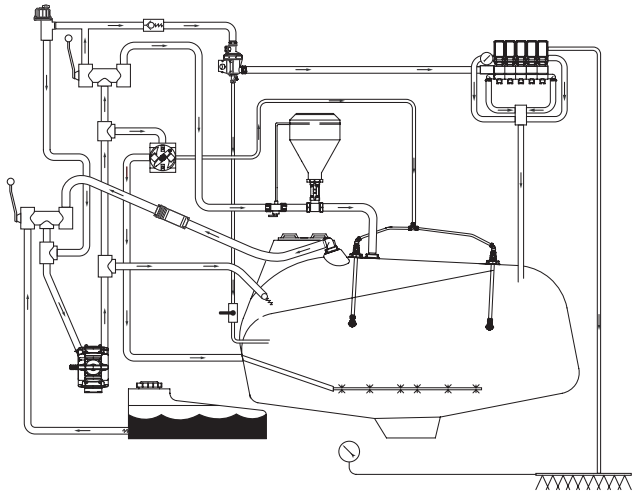
10. Close valve **A** and the FILLER lid again.

11. 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 and rinse nozzles (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 the top green pressure valve towards “No Agitation” and spray until air comes out of all nozzles.
2. Remove the tank filter basket.
3. Turn black suction valve towards “Flush tank”.
4. Turn top green valves towards “Rinsing nozzle” (optional).
5. Engage and set the pump at approx. 300 r.p.m.
6. When rinsing water corresponding to approx. 10 times the spray liquid residue (see paragraph “Technical Residue”) is used, turn black suction valve towards “Suction from main tank” and operate all valves, so all hoses and components are rinsed.
7. Turn green smart valve back to “Operating unit” and spray liquid in the field you have just sprayed.
8. Repeat point 3-7 until the flush tank is empty.

B. Rinsing 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. Close Self-cleaning filter shut-off valve.
2. Turn black suction valve towards “Flush tank”.
3. Turn top green valve towards “No Agitation”
4. Engage the pump and spray water from flush tank in the field until all nozzle tubes/nozzles are flushed with clean water.
5. Disengage pump again.
6. Open Self-cleaning filter again.

WARNING! The rinsing nozzles cannot always guarantee a 100% cleaning of the tank. Always use a cleaning agent, especially if crops sensitive to the chemical just sprayed are going to be sprayed afterwards!

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.

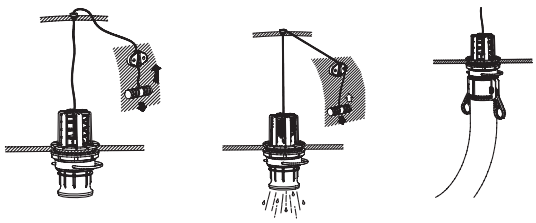
The dilutable residue must be diluted with a minimum of 10 times the amount of clean water and sprayed to the crop just sprayed before cleaning the sprayer - See “Cleaning the sprayer” (pp. 36-37).

Draining tanks

Operation of the main tank drain valve

WARNING! Before using the top drain, verify that disposal of waste is done according to chemical label instructions and local regulations.

Pull the red handle at left hand side of the tank to open the drain valve. The valve is spring loaded to close it, but can be kept open by pulling the string out and upwards in the V-shaped slot. To release and close the drain valve again, pull the string downwards and the valve will close automatically. If draining residues (e.g. liquid fertilizer) into a reservoir, a snap-coupler with hose can rapidly be connected to the drain valve and the liquid safely drained.



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.

Nozzle Selection

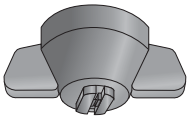
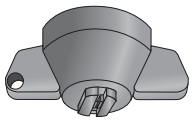
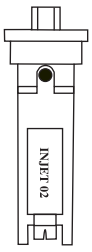
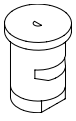
Nozzle Selection

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

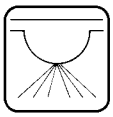
Your HARDI® sprayer has been supplied with 110° flat spray Red ISO Color Tips™ that will apply approximately 20 U.S. GPA at 30 PSI and 5 MPH.
The 110° flat spray nozzle was chosen rather than the 80 degree nozzle for two reasons: 1- It may be used at a lower minimum height which reduces the risk of wind 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.***

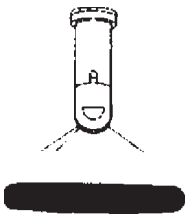
The following tables show what types of spray nozzles are suitable for different applications. It is important to use the correct nozzle.

	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 one 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 leftover chemicals, mandatory decontamination methods, etc. Contact the appropriate department, e.g. Dept. of Agriculture.

3. Leftover chemicals 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 so that the sprayer safe and ready for the next spraying 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 chemicals and their solvents.

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 and rinsing nozzles” (p. 32).

   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 chemicals 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 chemicals 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 & Rinse system is available on the COMMANDER Plus sprayers. It offers both the flushing of internal components and also a highly effective internal rinsing system of the sprayer tank.

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.

Maintenance

Lubrication schedule

B - 50h

- Operating hours
- Type of lubricant

5 — Position on the sprayer

1 **2** **3** **4** **5**

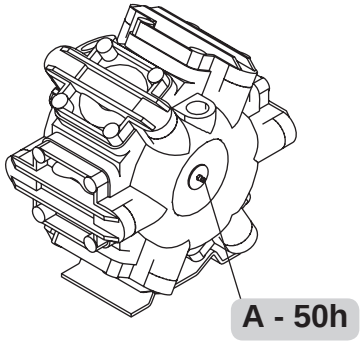
6

7

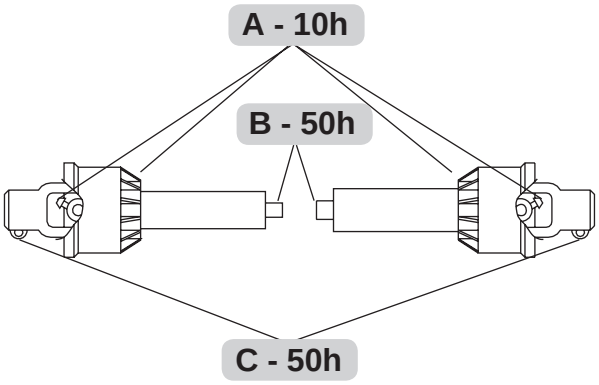
8

Maintenance

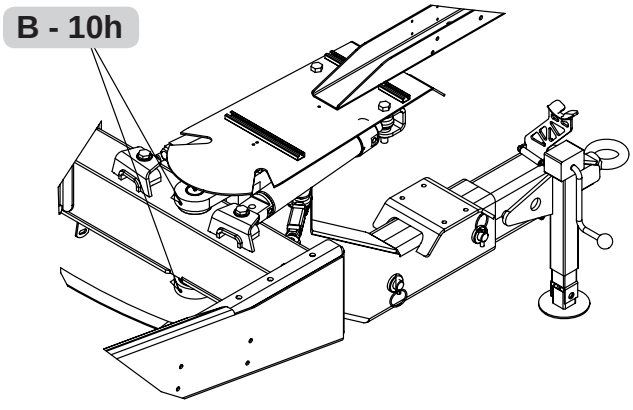
1



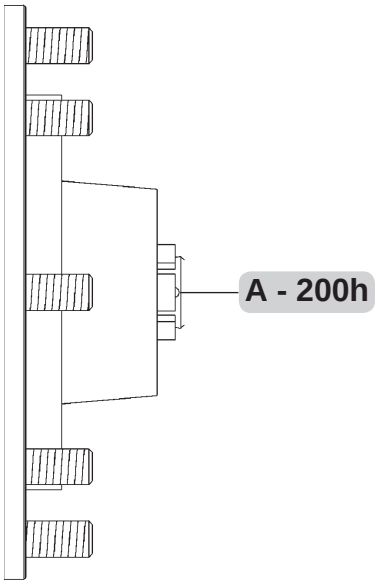
2



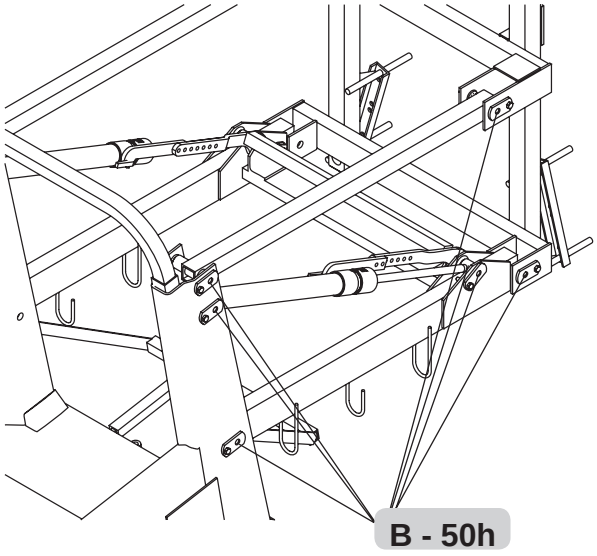
3 All models



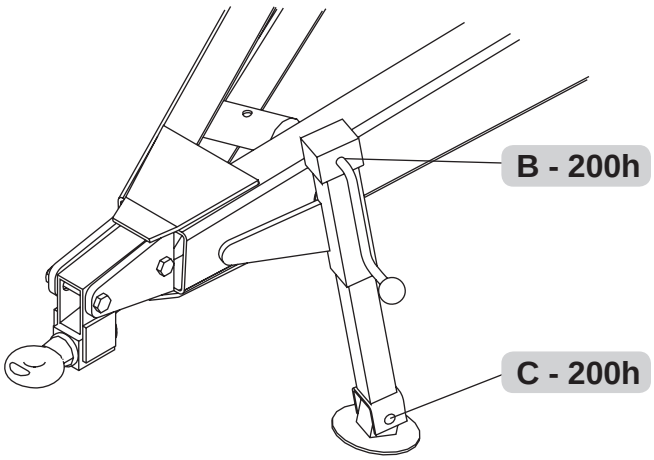
4



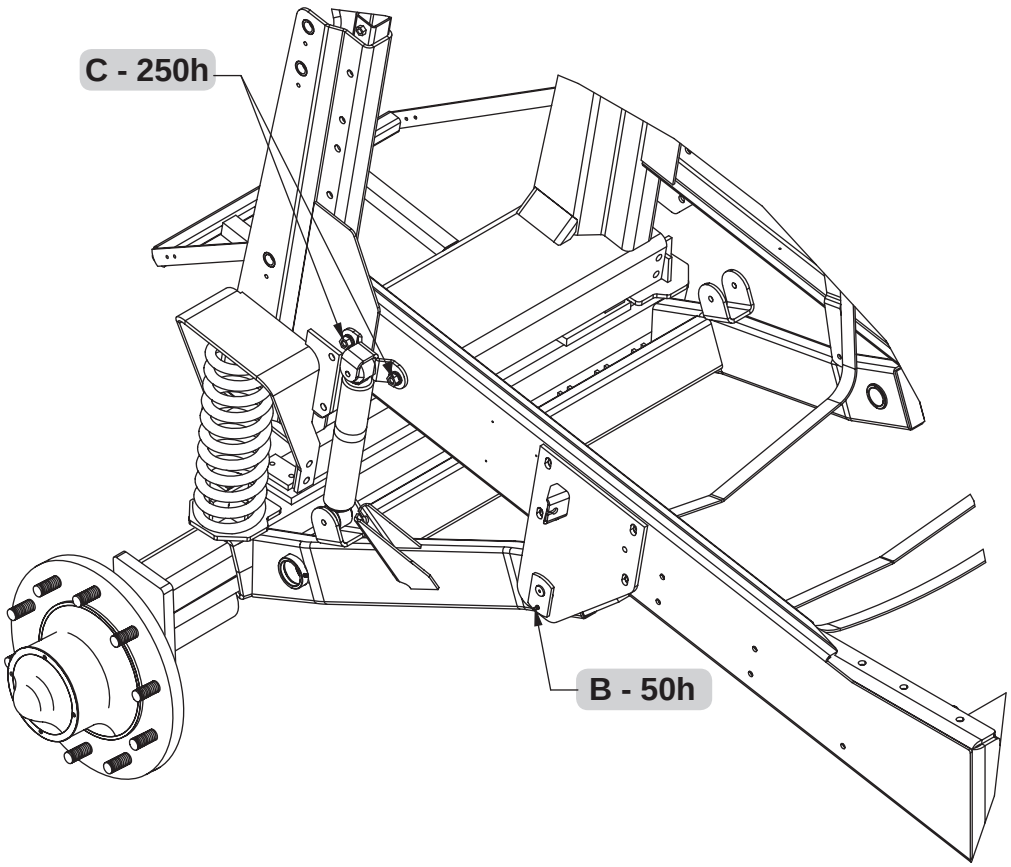
5



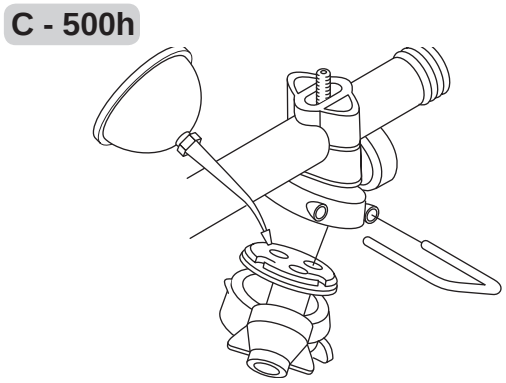
6



7



8



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. Spraying circuit, check for leaks
5. Retighten bolts (suspension only)

50 hours service or weekly (whichever comes first)

Do all previous mentioned +

1. Wheel bolts and nuts, tighten
2. Tire pressure, check
3. P.T.O. shaft, check
4. Check all fasteners
5. Lubricate according to schedule

100 hours service or bi-weekly (whichever comes first)

Do all previous mentioned +

1. Fixed drawbar, check/adjust

250 hours service or monthly (whichever comes first)

Do all previous mentioned +

1. Wheel bearings, check and adjust if necessary
2. Hydraulic circuit, check
3. Hoses and tubes, check
4. Readjustment of the boom (refer to EAGLE™ or FORCE™ Boom Operator's Manual)

1000 hours service or yearly (whichever comes first)

Do all previous mentioned +

1. Wheel bearings, dismantle, check, regrease and adjust
2. P.T.O. shaft, change parts as necessary
3. Boom center and inner section, change bearings as necessary

Occasional maintenance

Pump valves and diaphragms replacement
Cone check/replacement, ECP operating unit
Cone check/replacement, ECP distribution valve
Wear bushing replacement, boom lift
Wear bushing replacement, drawbar
Shock absorbers, inspect
Level indicator adjustment
Cord replacement, level indicator
Seal replacement, drain valve
Nozzle tubes and fittings
Adjustment of 3-way-valve

Always check that all lock nuts are tight after adjustment

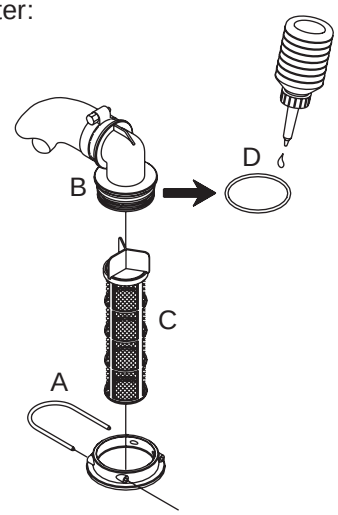
Maintenance

10 hours service

1. Suction filter

To service the suction filter:

1. Pull out the steel clip **A**.
2. Lift the suction hose fitting **B** from housing.
3. Filter guide and filter **C** can now be removed.

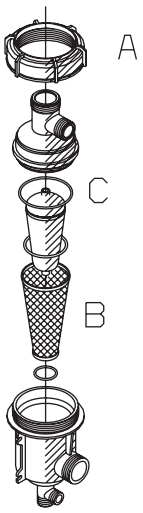


To reassemble:

4. Press the guide onto filter end.
5. Place the filter into housing with guide facing up.
6. Ensure the O-ring **D** on the hose fitting is in good condition and lubricated.
7. Refit the suction hose **B** and steel clip **A**.

2. Self-Cleaning Filter

1. Unscrew nut **A** and open filter.
2. Check filter gauze **B**, clean if necessary
3. Lubricate O-ring **C**
4. Assemble filter again.



Nozzle Size	Suction Filter	Self Cleaning Filter	Inline Filter
Pink (0075) Orange (01) Green (015) Yellow (02)	50	100	100
Lilac (25) Blue (03)	50	80*	80
Red (04) & Larger	30*	50	50*

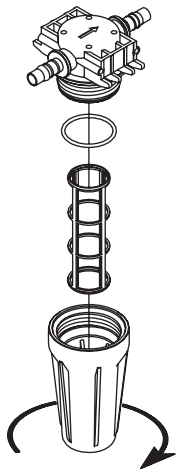
***** Standard Equipment

FILTER SIZE SELECTION TABLE

3. In-Line filter

Unscrew the filter bowl to inspect and clean the filter.

Alternative filters are available. See section on Technical specifications - Filters and nozzles.

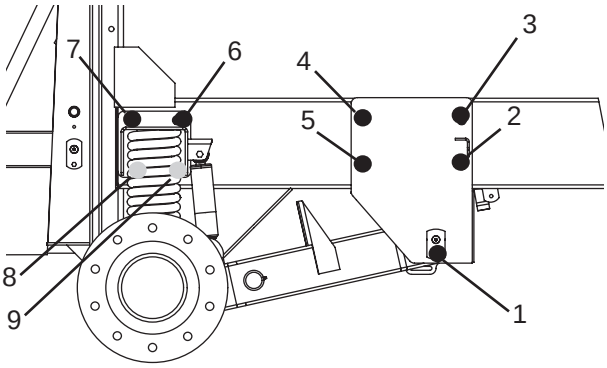


4. Spraying circuit

Fill with clean water, operate all functions and check for leaks using higher spray pressure than normal. Check nozzle spray patterns visually using clean water.

5. Retighten bolts (suspension only)

Check that these 9 bolts - on each side of the COMMANDER Plus - are tight. Retighten if necessary.
Tightening torque:
Bolt **1 = 18 Ft/lb (24 Nm)** (secure nut on the backside of the mounting with a wrench while adjusting bolt 1).
Bolts **2-9: 207 Ft/lb (280 Nm)**



Bolts 8 and 9 are situated behind the spring.

Maintenance

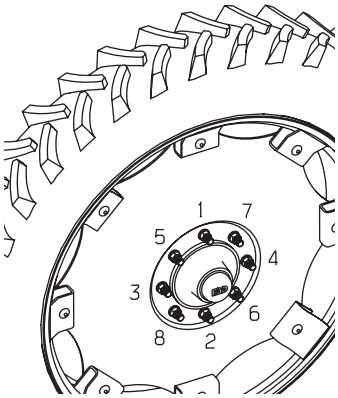
50 hours service

1. Wheel bolts and nuts

Tighten wheel bolts and nuts as follows with following torque wrench settings:

Wheel hub to rim plate: 120 Ft/lb (180 Nm)

Tightening sequence: See illustration (1-8).



2. P.T.O. shaft

Check function and condition of the transmission shaft protection guards. Replace any suspect or damaged parts

3. Tire pressure

Check the tire pressure according to the table below.

Tire Size	Recommended Inflation Pressure PSI (kPa)
12.4x42 10 ply	25 (175)
320/90R46	35 (240)
270/95R48	35 (240)
380/90R46	35 (240)
18.4R46	35 (240)

IMPORTANT! If replacing tires, always use tires with min. load index as specified in the table.

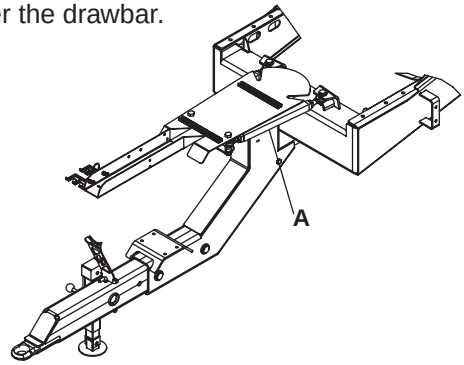
WARNING! Never inflate tires more than to the pressure specified in the table. Over-inflated tires can explode and cause severe personal injuries!

100 hours service

1. Check/adjust drawbar (Fixed drawbar only)

If too much play is found in the lateral movements of the drawbar it must be adjusted.

Adjust the turnbuckles **A** on each side in order to adjust and center the drawbar.

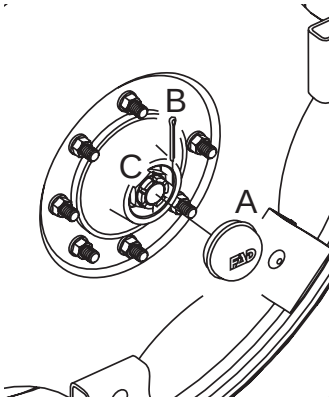


250 hours service

1. Wheel bearings

Check for play in the wheel bearings:

1. Place stop wedges in front of and behind LH wheel and jack up RH wheel
2. Rock the RH wheel to discover possible play in the bearings.
3. If any play, support the wheel axle to prevent the trailer from falling down from the jack.
4. Remove hub cap **A** and cotter pin **B**. Turn the wheel and tighten the castellated nut **C** until a slight resistance in the wheel rotation is felt.
5. Loosen the castle nut until the first notch - horizontal or vertical - is aligned with the cotter pin hole in the shaft.
6. Fit a new cotter.
7. Fill the hub cap with fresh grease and press it on to the hub again.
8. Repeat the procedure on LH wheel.



2. Hydraulic circuit

Check the hydraulic circuit for leaks and repair if any.

3. Hoses and tubes

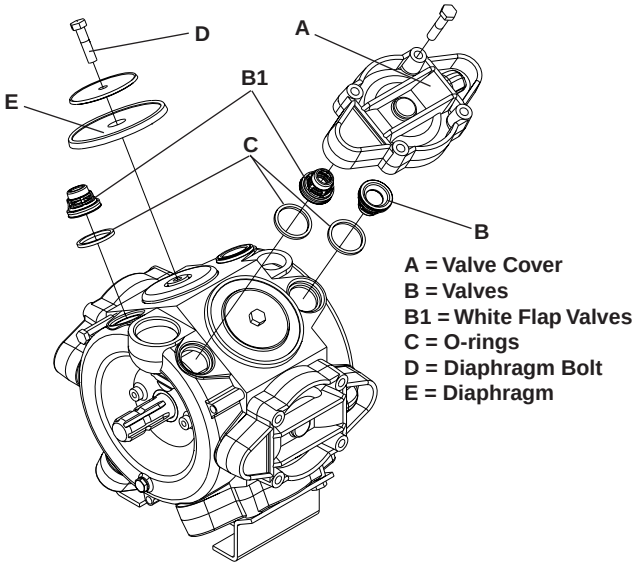
Check all hoses and tubes for possible damage and secure attachment. Replace damaged hoses or tubes.

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**).

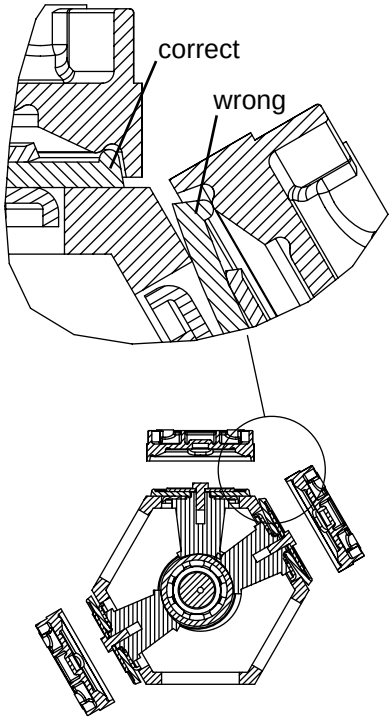
2 The diaphragms (**E**) may now be changed.

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 **A,** 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

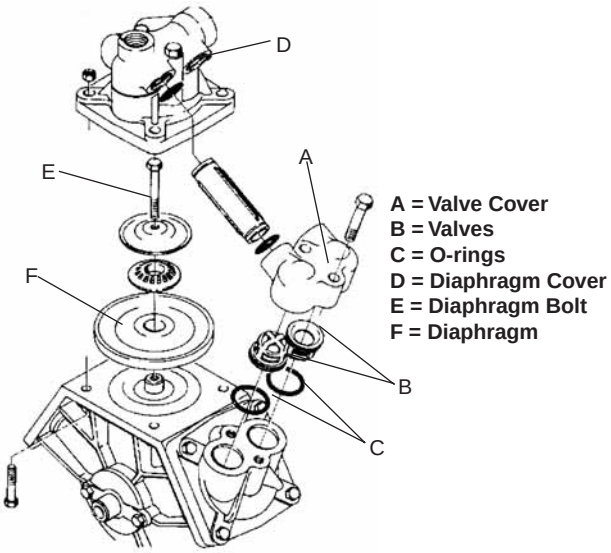
Pump Model	Valve Cover Ft/lb(Nm)	Diaphragm Bolt Ft/lb(Nm)
363	50 (70)	45 (60)
463	65 (90)	60 (80)

1 Ft/lb = 1.36 Nm

Maintenance

Pump valves and diaphragms replacement (1302 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.
1302	750175

Changing valves

1 Remove the valve covers (**A**). Before changing the valves (**B**) note their orientation so they are replaced correctly. It is recommended to use new O-rings (**C**) when changing or checking the valves.

Changing diaphragms

1 Remove the diaphragm covers (**D**).

2 Remove the diaphragm bolts (**E**).

3 The diaphragms (**F**) may now be changed.

4 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.

5 Reassemble with torque settings shown below.

Torque Settings for 1302 pumps

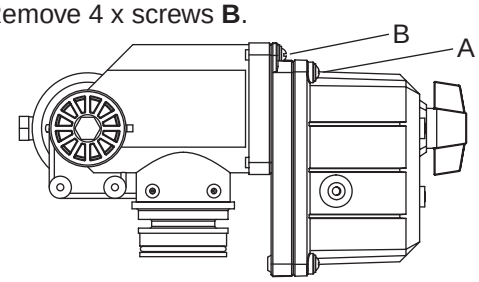
Pump Model	Valve Cover Ft/lb(Nm)	Diaphragm Bolt Ft/lb(Nm)	Diaphragm Cover
1302	45 (60)	45 (60)	50 (70)

1 Ft/lb = 1.36 Nm

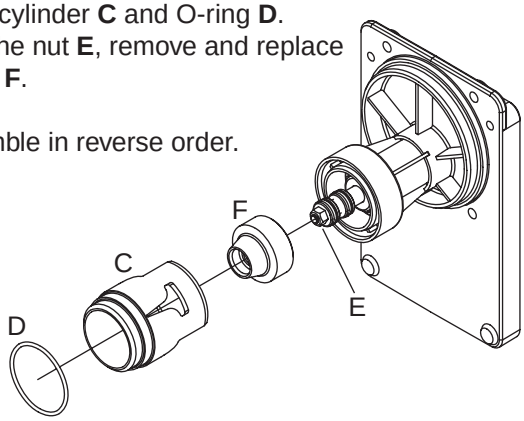
Cone check/replacement ECP operating unit

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.

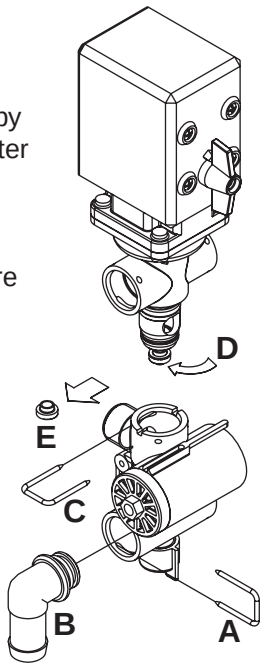


Cone check/replacement, ECP distribution valve

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

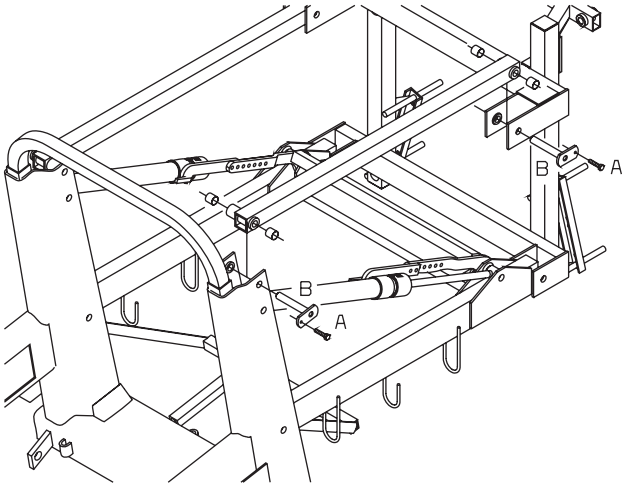
Cautiously remove the clip **A** and pull out the hose **B** for the pressure equalization device. When the housing is drained, there should be no liquid flow through the pressure equalization device. If there is any leakage, the valve cone **E** must be changed.

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

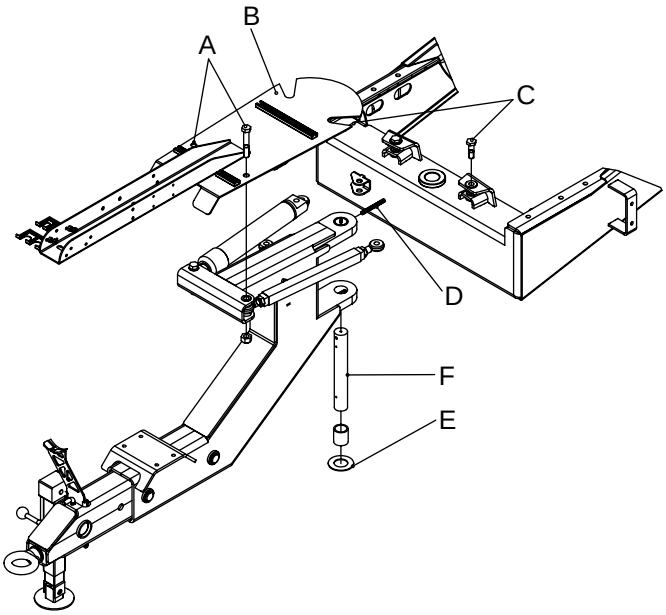
The wear bushings are inspected and replaced before they are worn through.



1. Connect the trailer 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 bushings.
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.

Wear bushing replacement, drawbar (Steering Drawbar)

If too much play is found in the drawbar, the wear bushings must be replaced.



1. Place stop wedges in front of and behind both wheels.
2. Jack up the frame and support it properly.
3. Remove the drawbar extension to reduce the weight of the drawbar.
4. Loosen the two bolts **A** and support the bracket **B** in order to keep it in a level position (e.g. by a rope fastened to the platform railing).
5. Without dismantling the hydraulic system the hydraulic rams are removed from the drawbar by loosening the nuts **C**.
6. Support the drawbar and remove the two pin bolts **D**, the washer **E** and the pin **F**.
7. Move the drawbar to the side and support it.
8. Press out the worn bushings and fit new ones.
9. Assemble again in reverse order.
10. Grease through grease nipples and remove jack and wedges.
11. Fit the extension piece in the drawbar again and place the sprayer on the support leg.

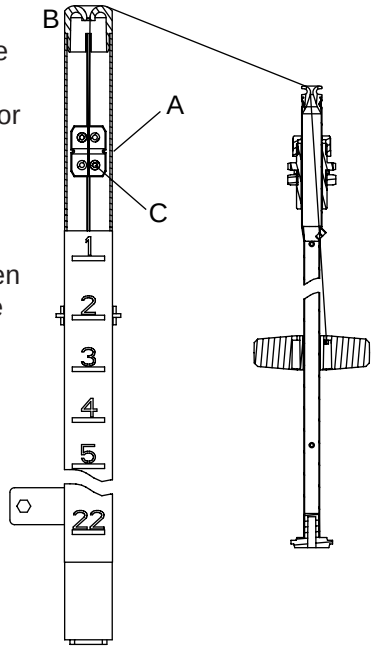
Maintenance

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

Level indicator adjustment
The level indicator reading should be checked regularly.

When the tank is empty, the float should lie on the stop pin, of the rod, and the O-ring on the indicator should be positioned at the top position line **A**.

If any deviation is found, pull out the plug **B**, loosen screws **C**, and adjust the length of the cord.



Cord replacement, level indicator
If the cord on the level indicator has to be changed, the float guide pole is removed:

1. Remove the tank drain valve (see paragraph “Main tank drain valve”) and loosen the fitting holding the pole in position.
2. Pull the pole down through the drain valve hole till it is free in the top of the tank.
3. The pole can now be taken out of the tank through the filling hole.

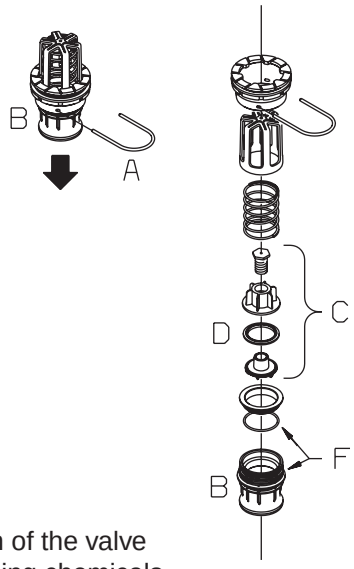
DANGER! Do not attempt to enter the tank - the float pole can be removed from outside the tank!

Seal replacement, drain valve
If the main tank drain valve leaks, the seal and seat can be changed the following way.

DANGER! Do not enter the inside of the tank - the parts can be changed from underneath the tank!

WARNING! Use eye / face protection mask when dismantling the tank drain valve!

1. Make sure the tank is empty and clean.
2. The valve must be closed and the string loose.
3. Pull out the clip **A** and pull down connecting piece **B**. The entire valve assembly can now be pulled out.
4. Check cord and valve flap assembly **C** for wear, replace seal **D** and assemble again.
5. Assemble the valve assembly again using a new valve seat **E**. Lubricate O-rings **F** before assembly.
6. Fit clip **A** again.

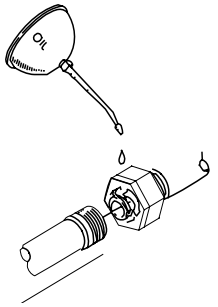


NOTE! Check the function of the valve with clean water before filling chemicals into the tank.

Nozzle tubes and fittings
Poor seals are usually caused by:

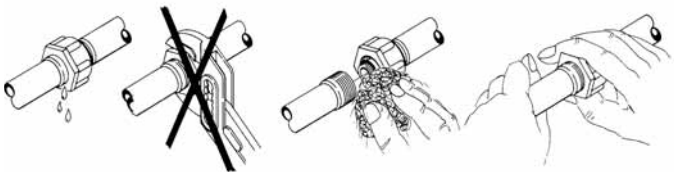
- missing O-rings or gaskets
- damaged or incorrectly seated O-rings
- dry or deformed O-rings or gaskets
- foreign bodies

In case of leaks:



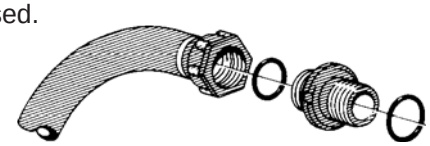
DO NOT overtighten. Disassemble, check condition and position of O-ring or gasket. Clean, lubricate and reassemble.

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



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

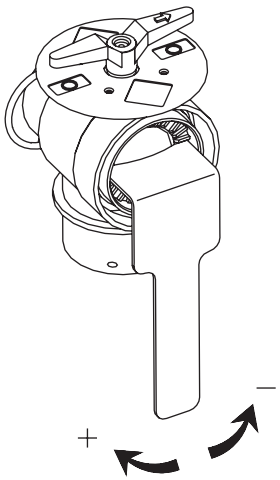
For **AXIAL** connections, a little mechanical leverage may be used.



Maintenance

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 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 the sprayer” (pp. 36-37). 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. Replace 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. Jack up the axle and place wooden blocks under the wheels to prevent moisture damage and deformation of the tires. Tire black can be applied to the tire side walls to preserve the rubber.

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

Preparation after off-season storage

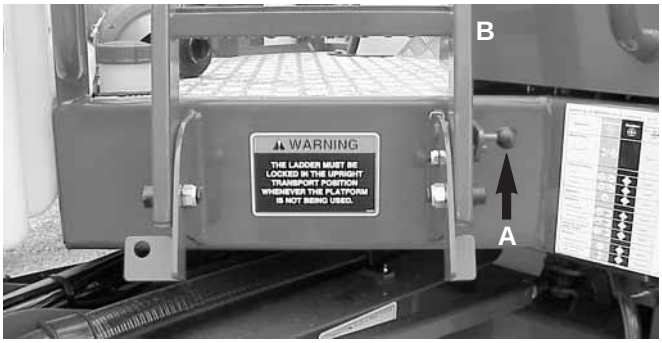
After a storage period, the sprayer should be prepared for the next season the following way:

1. Remove the cover. (If fitted)
2. Remove the blocks from under the wheels and adjust the tire pressure.
3. Wipe off the grease from hydraulic ram piston rods.
4. Fit the pressure gauges again. Seal with Teflon tape.
5. Connect the sprayer to the tractor, including hydraulics and electrics.
6. Check all hydraulic and electric functions.
7. Empty the tank of remaining anti-freeze.
8. Rinse the entire liquid circuit on the sprayer with clean water.
9. Fill with clean water and check all functions.

Equipment and Accessories

Equipment - Standard and Optional

Ladder



Down: Lift the red knob **A** to disengage the locking device and swing the ladder **B** down.

Up: The ladder will lock automatically when it is fully lifted up into it's upright transport position.

Note: Always restore the ladder to it's upright transport position before driving.

Platform

Access to the platform is possible via the ladder.

Hydraulic and electric components are situated underneath the platform floor. By lifting the platform floor, these components are accessible. Also the clean water tank is integrated in the platform.

The platform gives access to the clean water tank lid, the main tank lid, the top mounted suction filter and the self-cleaning filter, which is situated behind the access door **A** on the backside of the SMART VALVE system.

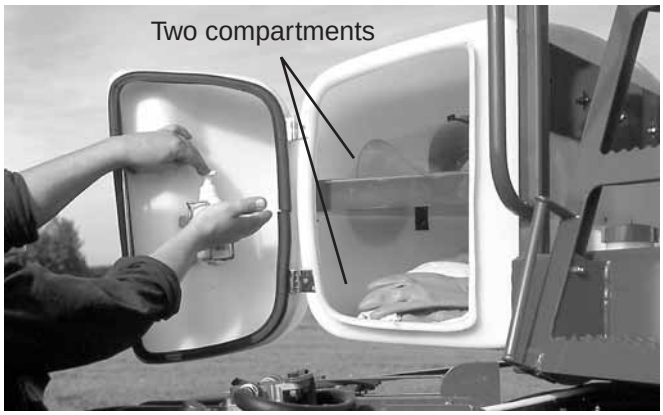
Tank Level Indicator

The actual tank level in the main tank can be observed on the tank level indicator **B**. The scale is displayed in US gal. or liters.

Front Locker

The locker is mounted to the front of the platform. It is for the purpose of storing non-contaminated protective gear, soap for hand washing etc.

The locker is split in two compartments to enable the separation of clean clothes from contaminated items.



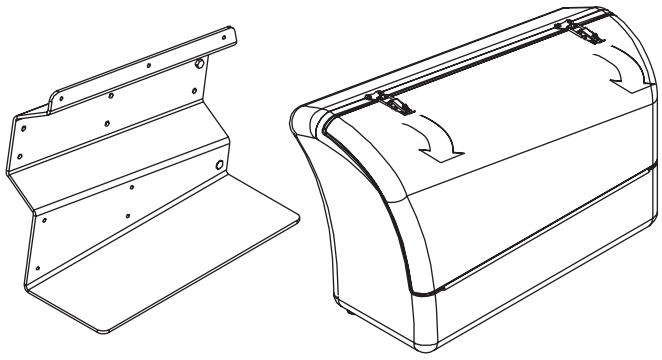
A soap dispenser can be fitted in a device on the inside of the locker door.

IMPORTANT! Although this locker is situated in the non-contaminated zone of the sprayer and is meant for storing nontoxic items, it must **never** be used for storing food, beverage or other things meant for consumption.

Large Right Hand Storage Locker (optional)

The locker can be mounted on the sprayer's right side acting as a storage for sealed chemical containers. The locker is fitted to a mounting, which is bolted to the frame of the trailer.

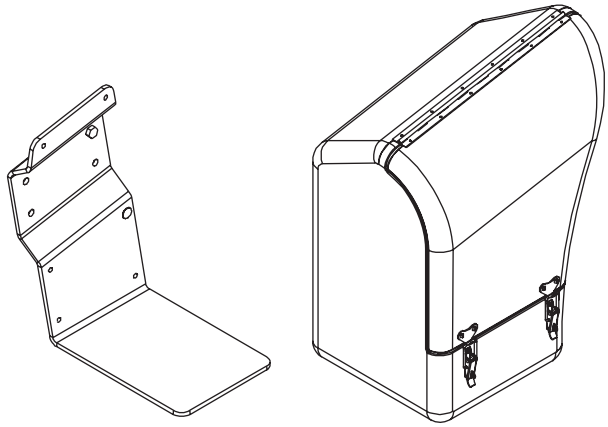
A drain in the bottom makes it possible to clean and drain the locker in case of leak by chemical containers.



Equipment and Accessories

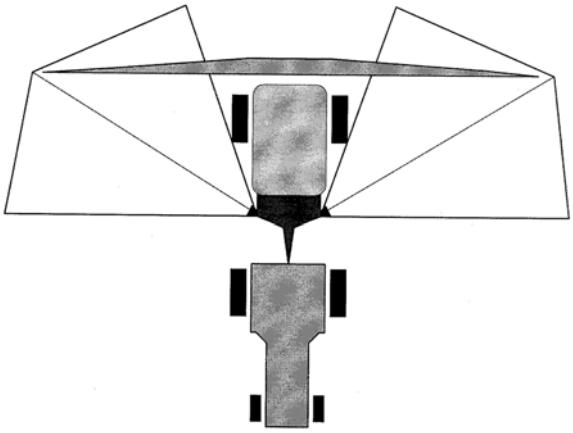
Small Left Hand Storage Locker (optional)

The locker can be mounted next to the HARDI® FILLER. It is for the purpose of storing chemical containers in use, nozzles, calibration- and compound equipment. The locker is fitted to a mounting, which is bolted to the frame of the trailer.

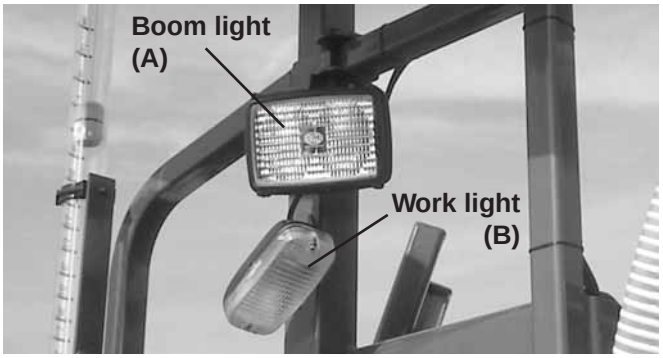


A drain in the bottom makes it possible to clean and drain the locker in case of leak by chemical containers.

Boom and Work Lights (optional)



The 2 boom light lamps **A** are mounted to the railing of the platform (one at each side) and are positioned to illuminate both boom wings.



The work light lamp **B** is also mounted to the railing of the platform above the MANIFOLD valves. This lamp is positioned to illuminate the HARDI® FILLER and the SMART VALVE system.

It is recommended to switch off the rear traffic lights of the tractor in order to save power consumption and to avoid reflection.

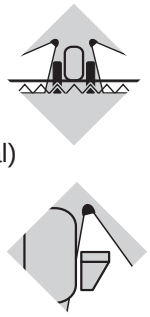
Power supply is via the 7-pin socket. Please see the *"Installation Instruction"* (p.63).

Selector switch

When mounting the selector switch **A**, it is simply "clicked" into the cutout in the frame below the SMART VALVES.

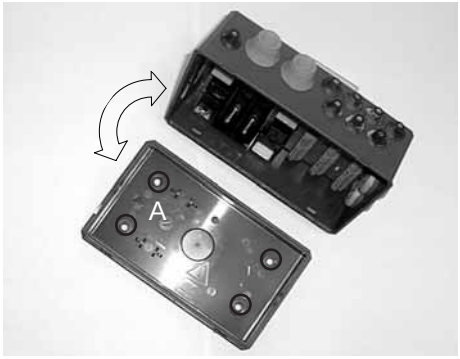
The switch has three positions:

1. Boom lights ON
2. Lights OFF (neutral)
3. Work light ON



Connection box

The connection box is mounted underneath the platform floor.



1. Lift the platform floor
2. Open the connection box and mount the flat part of the box **(A)** by 4 machine screws to the 4 pre-drilled holes in the platform base.

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.

Manifold pressure gauge (optional)

A manifold pressure gauge is available to mount below the boom pressure gauge for reading the pressure in the manifold plumbing system.

Boom Pressure and Manifold Pressure Gauges

Flush System (optional)

Flush Tank

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 70 gallon tank (750) or a 110 gallon tank (1200). Refer to the Flush & Rinse System™ Operator's Manual for complete operational instructions.

Equipment and Accessories

Tank Rinse System (optional)

Rinse Valve

Rinse Nozzles on Top of Tank

The Rinse system can be added to the flush system. This provides a means to rinse the main tank using pressurized water to spray the inside of the tank through specially designed spinning nozzles. See the Flush & Rinse™ Operator's Manual for complete operational 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.

Steering drawbar system

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Sprayer trails unstable	Air pockets in the hydraulic circuit	Prime hydraulic circuit
	Hydraulic circuit leaking	Repair leak, prime

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.
	Defective 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 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 is 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. Bad printboard. Defective switch in control box.
Compressor runs, but will not make foam.	Various	Bad printboard. 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. Frequency valve not opened enough. Weak foam concentrate. Water too hard (add water softener).
Keeps blowing fuses	Various	Short in electrical system or bad compressor. Bad relay on printboard. 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
System will flush, but not rinse.	Rinse valve	Rinse valve not in correct position.
Rinse nozzle has poor output.	Various	Bad flush valve or suction side air leak. Rinse valve not in correct position. Chemical filler pressure selection not in correct position (if so equipped.

Chemical Filler problems

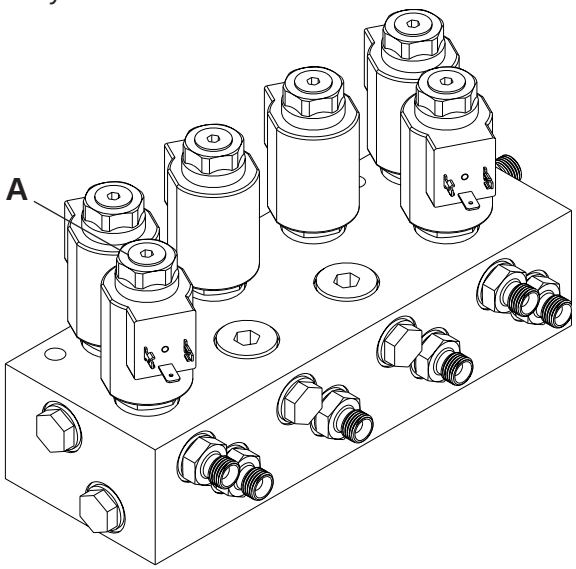
FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Filler hopper will not empty.	Various	Pressure selection valve not in correct position. Sprayer pump not running.
Filler hopper empties too slow.	Various	Bottom tank discharge valve not open all the way. Restrictor cone from pump supply not the correct size: Black - 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

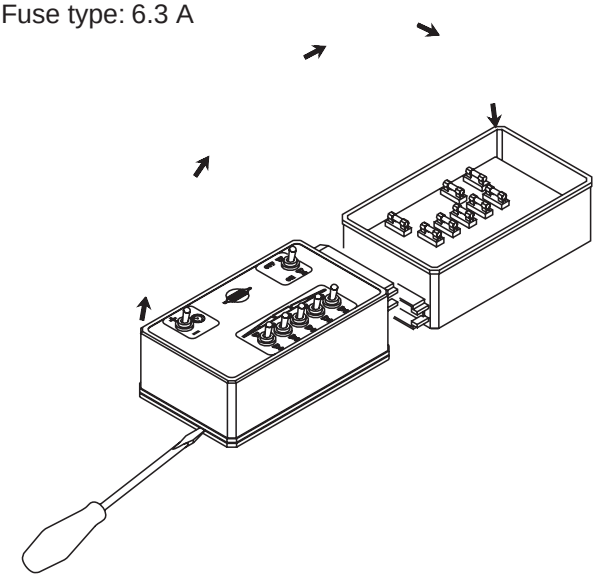
The problem may be due to a blown fuse. One spare fuse is located inside the junction box.

ECP operating unit

In case of power failure it is possible to operate all functions of the operating unit manually. First disconnect the multi plug from the control box. Now manually turn the emergency control knobs.

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

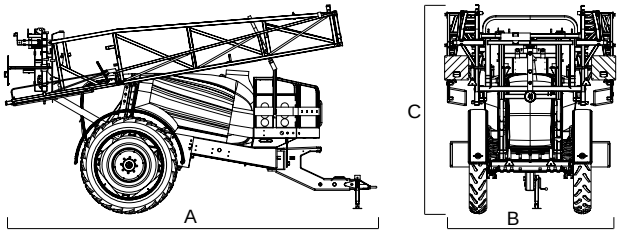
Fuse type: 6.3 A



Technical specifications

Technical specifications

Overall measurements:



			A	B	C
Tank size	Boom model	Boom size	(Total Length)	(Total Width)	(Total Height)
750 Gallon (2840 Liter)	Eagle™	60’ (18m)	228” (5790 mm)	10 ft. (3040 mm)	125” (3180 mm)
1200 Gallon (4540 Liter)	Eagle™	90’ (28m)	335” (8510 mm)	11.5 ft. (3500 mm)	148” (3760 mm)
1200 Gallon (4540 Liter)	Force™	120’ (36m)	285” (7240 mm)	11.5 ft. (3500 mm)	153” (3880 mm)

SPECIFICATIONS	750	1200
Main tank capacity	750 Gallon (2840 Liter)	1200 Gallon (4540 Liter)
Flush tank capacity	70 Gallon (280 Liter)	110 Gallon (420 Liter)
Foam marker tank capacity	10, 15, 20 Gallon	10, 15, 20 Gallon
	(40, 60, 80 Liter)	(40, 60, 80 Liter)
Axle and under frame clearance:	29" (750mm)	27"-30" (700-760mm)
Weight:		
60' (18m) Eagle™ boom - Total weight empty	4900 lbs (2225 kg)	N/A
60' (18m) Eagle™ boom - Tongue weight empty	930 lbs (423 kg)	N/A
90' (28m) Eagle™ boom - Total weight empty	N/A	7303 lbs (3312 kg)
90' (28m) Eagle™ boom - Tongue weight empty	N/A	1388 lbs (630 kg)
120' (36m) Force™ boom - Total weight empty	N/A	8509 lbs (3863 kg)
120' (36m) Force™ boom - Tongue weight empty	N/A	1872 lbs (850 kg)

Available 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)

Note: 463 High Capacity (HC) diaphragm pump fluid systems only for 80’- 120’ (24m- 36m) booms.
Note: All weight measurements are approximate values with booms in transport position, flush tank, chemical inductor and foam marker (for suspended axle systems, add approximately 550-660 lbs (250-300 kg)).
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

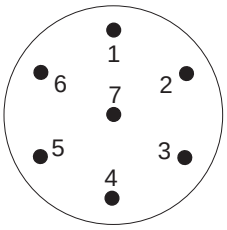
Operating temperature range:
36°F to 104°F (2° to 40° C.)

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

Electrical connections

Rear lights

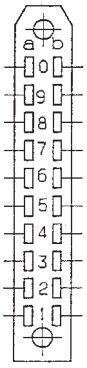
Position	Wire color
1. Ground	White
2. Work lamps	Black
3. LH flashing & turn indicator	Yellow
4. Free	Red
5. RH flashing & turn indicator	Green
6. Free	Brown
7. Free	Blue



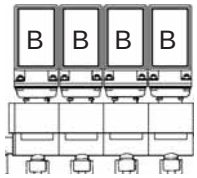
The wiring is in accordance with ANSI/ASAE S279.11.

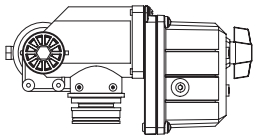
Electrical connections for ECP operating unit

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





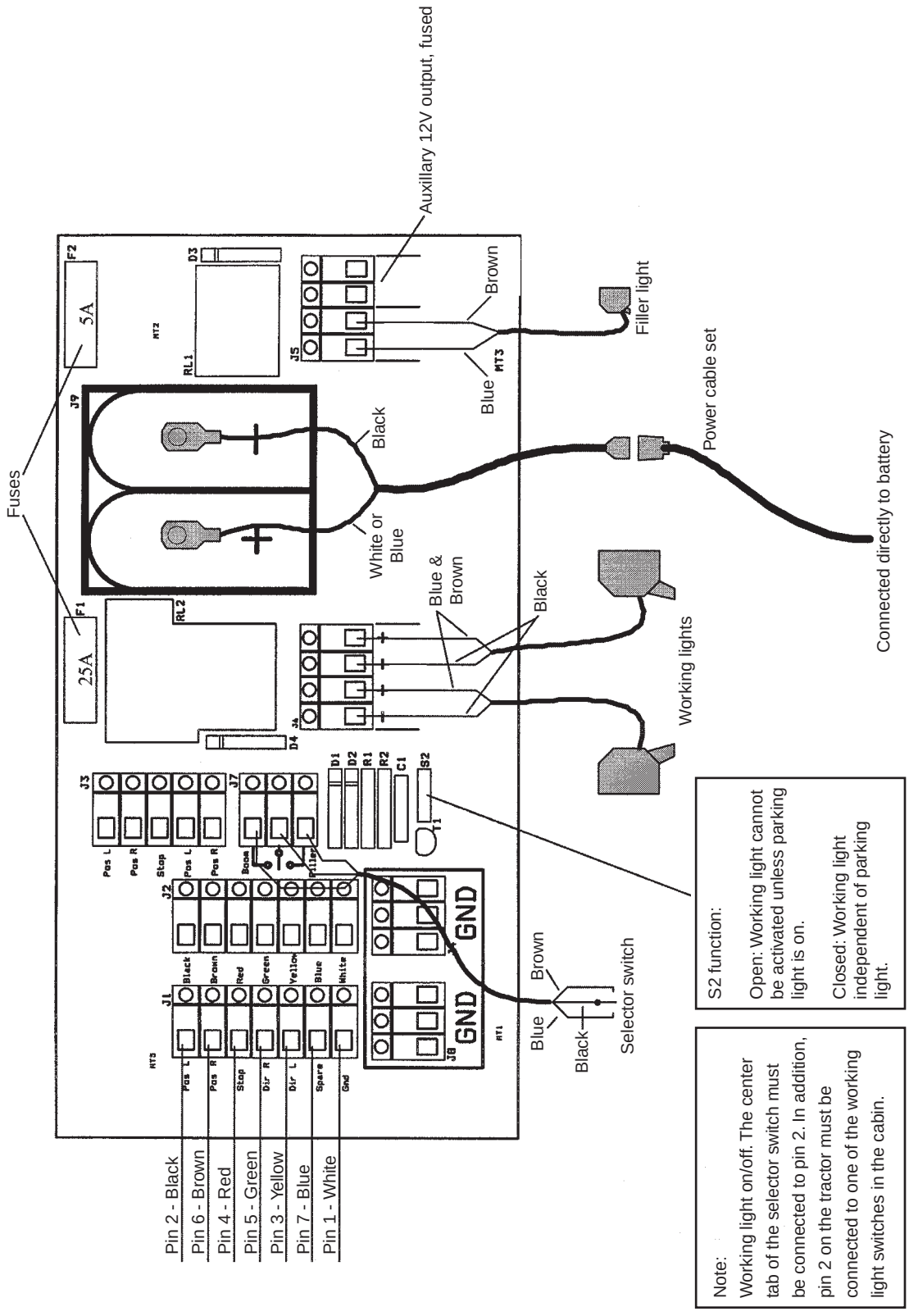
Number of distribution valves

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

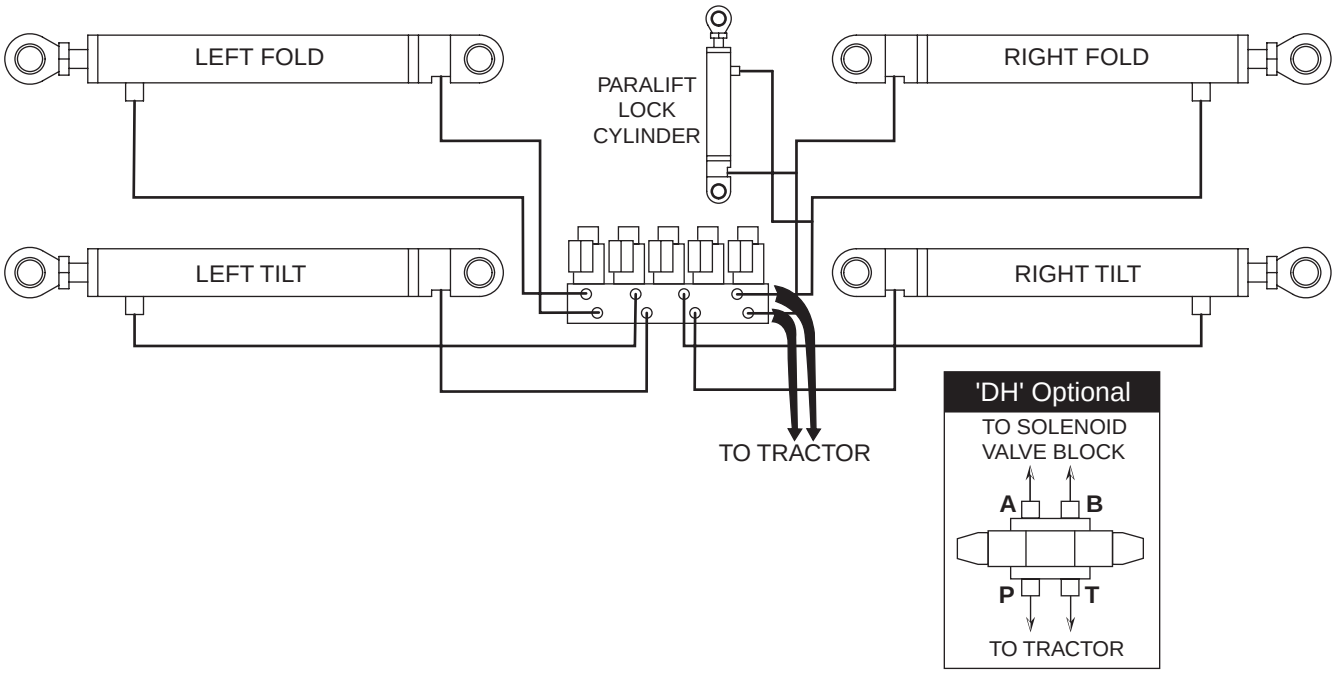
Technical specifications

Installation instruction for boom and work light

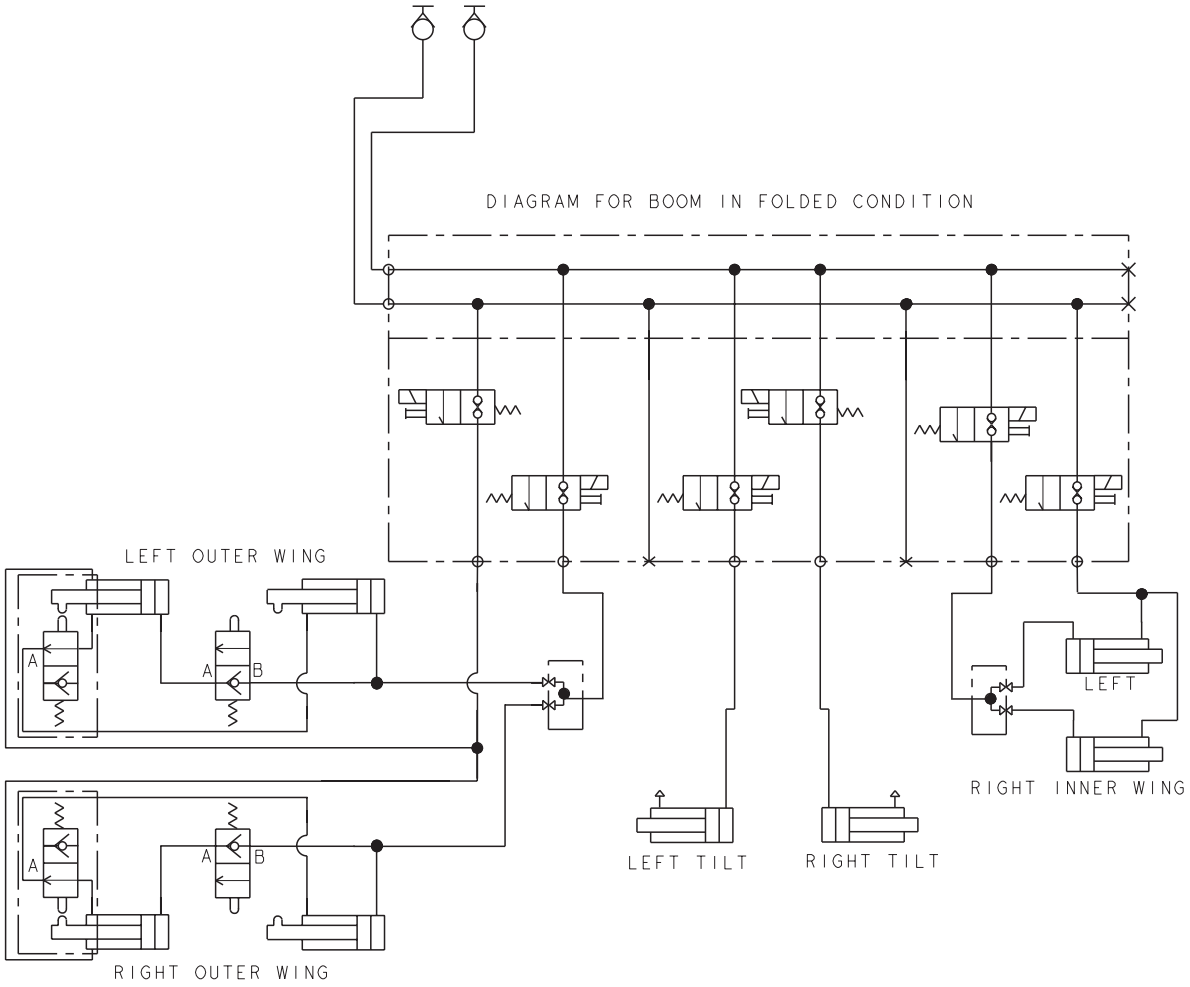


Technical specifications

EAGLE™ boom hydraulics SPB-Z and SPC-Z



FORCE™ Boom hydraulics



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

Notes