Ranger

Operator Instruction Manual

P/No: 67000204 - HAU - 03/2008

Version 1.00

HARDI Australia

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HARDI Australia
Cross Keys Road Cavan
South Australia

To our valued customer:

Congratulations on your purchase and thank you for choosing the HARDI "RANGER" Series Sprayer. This "Operators Instruction Manual" covers the Safety, Operation and Maintenance procedures for the 2500 Litre model.

Warning: Any persons intending to use this equipment, or any of it's parts or systems must read and understand these publications (plus any related material) paying close attention to the Safety warnings prior to operation.

In addition, all operators must be of a suitable age, have undergone appropriate training and hold correct licenses where applicable, as required by state and federal law. The safety sections and warnings in this publication and all related material must be thoroughly read and understood before attempting to operate this equipment.

Danger: Failure to comply with the above may result in personal injury, death or damage to the equipment, property, crops or the environment.

Attention: The technical data contained herein is to the best knowledge of HARDI Australia Pty Ltd correct at the time of publishing. HARDI Australia Pty Ltd reserves the right to make changes in design, features, accessories, specifications and instructions at any time without prior notice and is without obligation in relation to products purchased before or after such changes and assumes no responsibility for any errors, inaccuracies or omissions.

Please visit our web site at: **www.hardi.com.au** for more information about research and development, our product range, spraying techniques and crop protection. For sales, service and spare parts information contact your local HARDI dealer.

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Operator safety

Introduction

This manual contains safety information which could prevent crop damage, personal injury or death. It is compulsory that ***all*** operators intending to use this equipment read and understand this manual *and related literature*. Safety information in each section must be read carefully, and if any doubt remains contact your HARDI dealer for further information.

Safety alert icons

Safety information in this manual is highlighted by the following icons according to the level of potential risk:

Danger: This indicates the highest level of hazard alert. Failure to comply with the information contained here could result in personal injury or death.

Warning: This indicates that mandatory action is required . Failure to comply with the information contained here could result in damage to crops, the equipment and / or the environment.

Attention: This indicates practical information regarding safe and effective use of the equipment and it's systems.

Chemical safety

Danger: Avoid risk of chemical contamination. Always read chemical labels and pressure test the equipment with clean water prior to filling. Never eat, drink or smoke when spraying or working with contaminated equipment. *Never drink water from any of the sprayer's tanks.* Never assume that the contents of the 'clean water' tank is safe to drink.

Remove and store safety wear and clothing after spraying to prevent contamination of the tractor cab. Dispose of, or clean appropriately. If poisoning occurs identify the chemicals and seek medical advice urgently. (for more info see "Chemical Safety" pg. 2.3).

Mechanical safety

Danger: Never operate any part of the equipment if any of it's components or safety shields are damaged. Never service or repair the equipment while it's operating and replace all safety devices and shields after service procedures.

Always de-pressurise the equipment and disconnect the power after each use and before servicing. Ensure all hydraulics are in the recommended position. Do not walk under any part of the sprayer or the boom unless it is properly secured.

When using an arc welder disconnect any power leads to the sprayer prior to welding and remove any flammable or explosive material from the area.

Danger: Never attempt to enter a tank or allow some one else to do so for any reason.

Attention: The tractor's drivers seat is the only intended working place during operation.

Danger: No persons are allowed in the operations area of the sprayer. Keep unauthorised persons and children away from the equipment at all times. Do not allow any one to ride on the equipment while it is operating.

Danger: Do not exceed the max. recommended RPM for any part of this equipment.

Danger: Local laws may require operators to be certified before using spray equipment and some chemicals. Consult your local authorities before commencing operation.

Warning: Although every effort has been made to include as much safety information as practical, it is impossible to anticipate every hazardous scenario. It is therefore the responsibility of the operator to exercise safe operating practices.

Warning: This equipment is intended for the application of crop protection chemicals and liquid fertilisers only. HARDI Australia does not authorise or endorse it's use for any other purpose.

Beware of overhead power lines!

Danger: Operating agricultural machinery near power-lines presents a potentially fatal hazard. It is the responsibility of the operator to ensure that minimum safe clearances are strictly observed, in particular when transporting the implement, spraying, raising, tilting or lowering the boom. Also be aware that during hot or windy weather sagging or swaying of power lines can reduce safe working clearances. It is vitally important to consult your local Electricity Supply Authority for details of minimum safe clearances in your area before proceeding.

Spray Drift

Warning Serious crop damage can occur as a result of spray drift. Certain climatic conditions can increase the risk of spray drift onto neighbouring crops.

Although calibration information is provided in the Spraying Techniques Manual it is vitally important that you read the chemical manufacturer's recommendations for the correct use of their product.
The manufacturers label will also state the products limitations and warnings.

Wind speed, temperature, humidity and chemical properties should all be considered when determining if conditions are suitable for spraying. Contact your local Department of Primary Industries for details of relevant publications explaining the risks and how best to minimise them. It is the responsibility of the sprayer operator to ensure that the spraying conditions are suitable for the application of the chemical to be used.

Warning: After changing chemicals or crops it is essential that the entire sprayer be flushed. This includes disconnecting hoses from the filters, relieving the pressure relief valve and cleaning residue and sediment in the hoses, valves and filters. Failure to do so may potentially lead to serious crop damage.

Chemical Safety

Danger: Chemical contamination poses a serious health risk. It is the responsibility of the operator to ensure safe work practice is observed and correct safety equipment and clothing is used.

Safety equipment

Depending on the type of chemical used, some or all of the following protective clothing and equipment will be required (see diagram to right).

1: Headgear, 2: Safety goggles or face shield, 3: Respirator,

4: Chemical resistant coveralls, 5: Chemical resistant gloves,

6: Chemical resistant boots.

Contaminated clothing and equipment

Contaminated clothing should be carefully removed, safely isolated and then appropriately laundered or disposed of, taking care not to contaminate the inside of the tractor cab. Tools and equipment used must also be safely isolated and carefully washed and decontaminated.

Australian Safety Standards

Protective clothing and equipment must conform to Australian Safety Standards and must always be used when handling chemicals, operating the sprayer and during the cleaning and decontamination process.

Chemical Information

Always read the chemical manufacturer's labels as they contain critical information about your safety and the environment. Always consider the environment when disposing of chemical residue (see section on decontamination). Chemical labels are registered by the National Registration Authority. Laws vary from state to state regarding the purpose for which a chemical may be used so consult your local authorities.

Danger: Agricultural chemicals can be dangerous. Always read chemical labels and carefully follow safety recommendations to the letter.

Attention: Please refer to the chapter on "Cleaning and Decontamination" in the Operation section of this manual for further information.

Disposal of chemical containers

Please note that in addition to normal safe operating practices, and in the interests of a cleaner and safer environment HARDI Australia supports the *"drumMUSTER"* chemical drum recycling program:

-Rinse empty drums immediately after use.

-Puncture metal drums through the base from the inside.

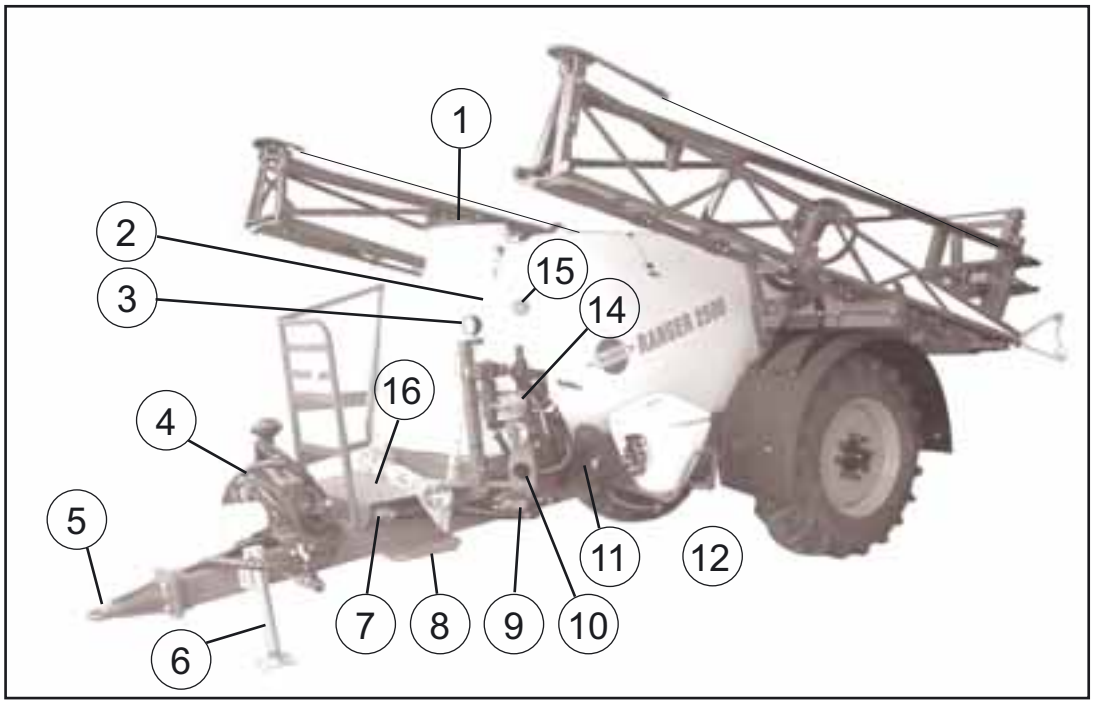
-Remove lids to allow drums to dry completely.

-Recycle with *"drumMUSTER"*

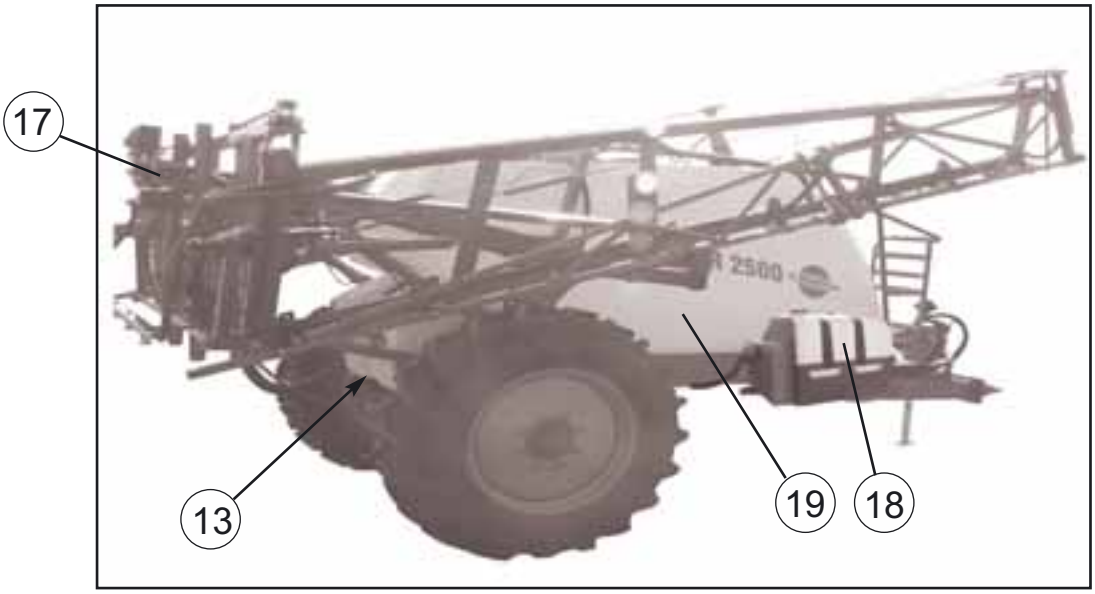
Warning: Used chemical containers pose a severe threat to persons, animals and the environment. Before disposal, contact the Environmental Protection Authority or the Department of Primary Industries in your area for more information.

General info

View



1. Main tank lid
2. Tank level indicator
3. Spray pressure gauge
4. Pump
5. Hitch
6. Support jack
7. Suction filter
8. Step
9. Suction manifold
10. Filtered Fill
11. Cyclone filter
12. HARDI® Turbo Fill or Granni Pot
13. Flush tank
14. Pressure manifold
15. Clean water tank
16. Platform
17. Distribution valves
18. Foam marker tank
19. Main tank



3 - Description

Identification plates

An identification plate fitted on the frame indicates producer name, model and serial number.

Frame, boom center frame and other main steel components have identification plates indicating type and part number. (not illustrated)

Roadworthiness

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

ATTENTION! Max. driving speed is 40 km/h. Be aware that this may differ due to local law. Contact local authorities for information of max. driving speeds.

Sprayer use

The HARDI® sprayer is for the application of crop protection chemicals and liquid fertilizers. The equipment must only be used for this purpose. It is not allowable to use the sprayer for other purposes. If no local law demands that the operator must be certified to use 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 your spray job.

Frame

Very strong and compact frame which also has a strong chemical and weather resistant electrostatic powder coat. Screws, nuts, etc. have been DELTA-MAGNI treated to be resistant to corrosion.

Tank

The main tank made of impact-proof, UV-resistant and chemical resistant polyethylene, has a purposeful design with no sharp corners for easy cleaning. Nominal contents 2500 litres. A large, easy to read, tank contents indicator is placed beside the platform and is visible from the tractor cabin. The filling hole is placed so it can be accessed from the platform. This ensures an easy access for filling, cleaning of the tank, etc. The sprayer may also be equipped with a flush tank and a clean water tank.

Liquid system

General info - MANIFOLD system

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

The modular MANIFOLD system facilitates the addition of optional extras on both pressure side and suction side.

Pump

Diaphragm pump with easily accessible valves and diaphragms. Model 1303 with 3 diaphragms, 540 r.p.m. (30mm taper). Model 363 with 6 diaphragms. Standard = 540 r.p.m. (6 splines). Optional = 1000 r.p.m. (21 splines).

Valves and symbols

The valves at the MANIFOLD are distinguished by colored identification discs on the valves. Symbols corresponding to every possible function of use are located on the discs for easy identification and operation. A function is activated by turning the handle towards the desired function.

ATTENTION! Only the functions in use should be open - always close remaining valves.

ATTENTION! If a MANIFOLD valve is too tight to operate - or too loose (= liquid leakage) - the valve needs to be serviced. Please see the section 'Maintenance' for further information.

3 - Description

Green valves - Green disc = Pressure valve


To Spray Boom

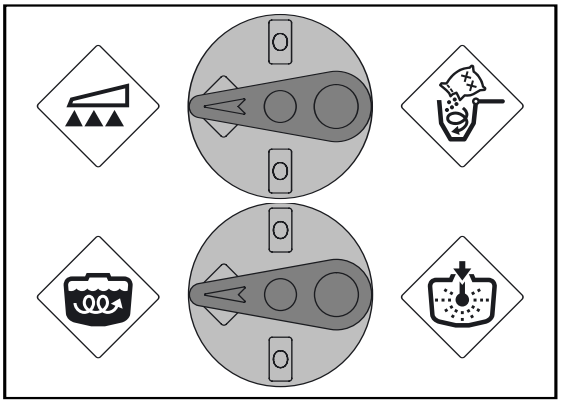

To HARDI® FILLER


To Agitation


To Tank Rinsing Nozzle

The position of the pressure manifold valves determine the direction of flow of liquid from the pump. When the arrow on the handle is pointing towards a symbol, the liquid will flow to that symbol's corresponding device (i.e. Chemfiller). When the arrow on the handle is pointing towards "O", the valve is closed. If all the green pressure valves are closed in a diaphragm pump system, the safety valve will open to allow liquid to flow back to the tank.

The bottom pressure manifold valve is adjustable. This allows for a continuously variable flow to agitation or tank rinsing.



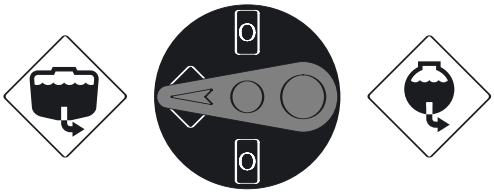
Black valves - Black disc = Suction valve


From main tank


From flush tank

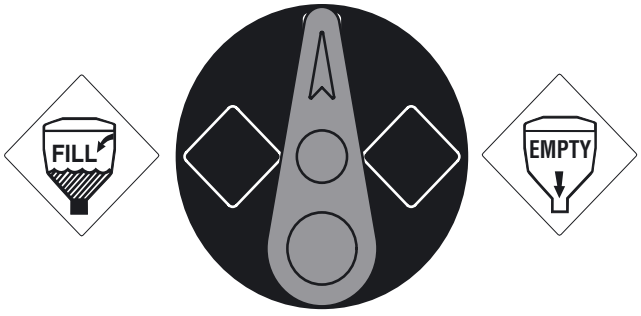

From Quick Fill

The position of the suction manifold valves determine the source of the liquid. When the arrow on the handle is pointed towards a symbol, the source of liquid correspond's to that symbol's device (i.e. Main tank) When the arrow on the handle is pointing towards "O", the valve is closed.

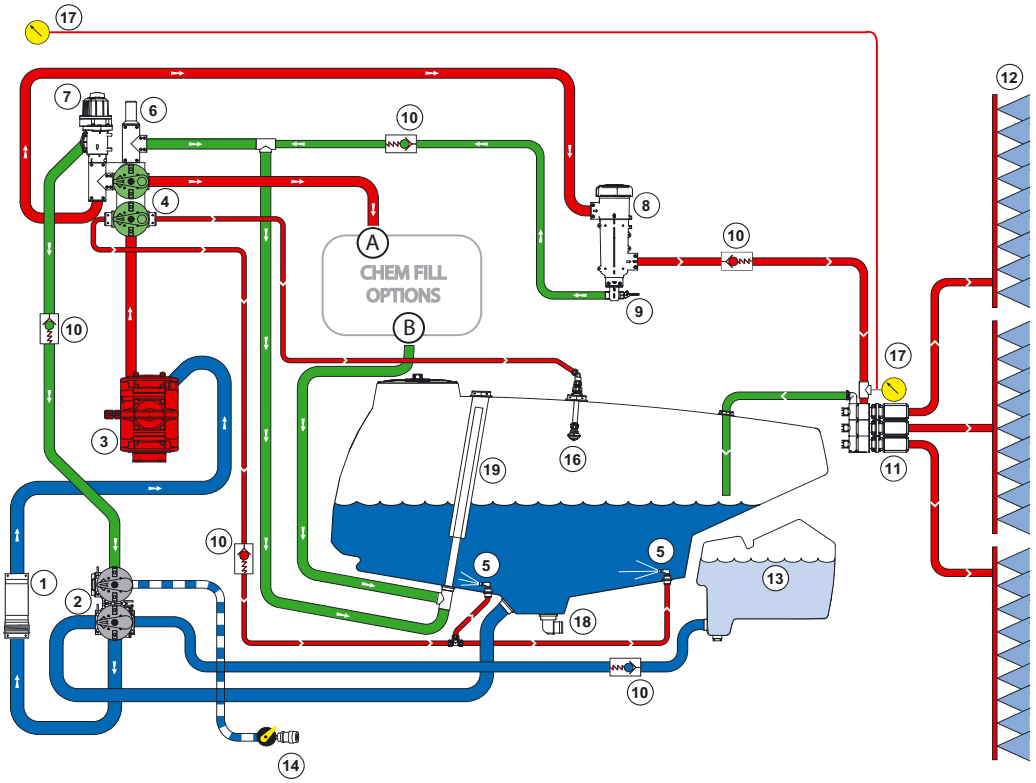


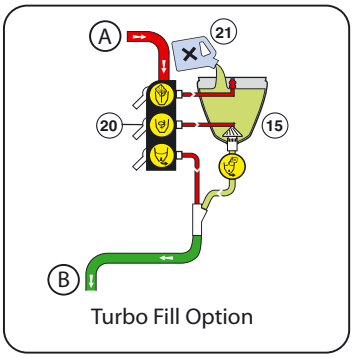
Vacuum / Transfer Valve (optional equipment)

This valve is located behind the Chemical Induction Hopper and is used to control the filling / emptying of the hopper.

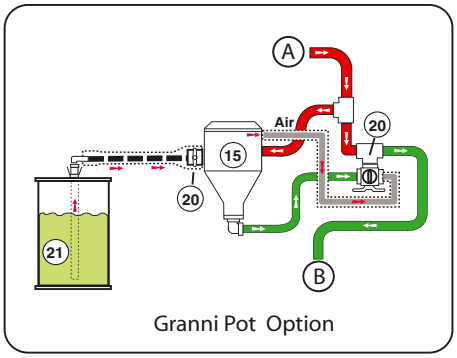


Ranger Fluid System Layout





Turbo Fill Option



Granni Pot Option

1. Suction filter (optional)
2. Suction manifold
3. Pump
4. Pressure manifold
5. Agitation
6. Safety valve
7. Pressure Control Valve
8. Cyclone filter (optional)
9. Off/On/Boost valve
10. One-way Check valves
11. Boom section valves
12. Boom
13. Flush tank
14. Filtered Fast Fill (optional)
15. HARDI® Turbo Fill or Granni Pot (optional)
16. Tank rinse nozzle (optional)
17. Boom pressure gauge
18. Drain Valve
19. Siphon break tube
20. Chem Filler control
21. Chemical source

Control unit

EVC - Electrical Valve Control. The ON/OFF is linked to the section valves, which results in a very quick response to ON/OFF. The operating unit is constructed of modules and is electrically controlled via a remote control box. The unit is fitted with built-in HARDI-MATIC.

Filters

The Ranger is fitted with a Tank Filter Basket, Suction Filter, Cyclone Pressure Filter and nozzle filters. Optional inline boom filters can also be fitted.

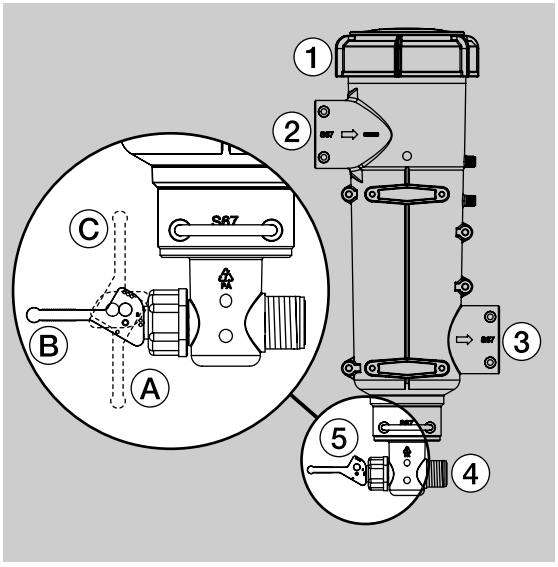
All filters should always be in use and their function checked regularly. Pay attention to the correct combination of filter mesh size. The mesh size should always be less than the flow average of the nozzles in use.

Cyclone Filter

With the Cyclone Filter, the impurities that exist in the spray liquid will by-pass the filter and be recirculated back to the tank via the return flow.

Function diagram

1. Filter lid
2. From pump
3. To boom
4. Return to tank
5. ON/OFF/PURGE Valve

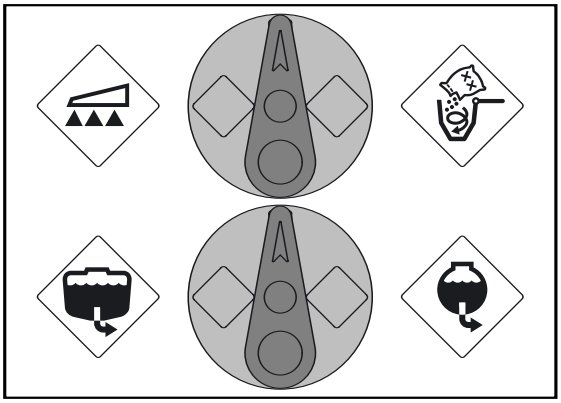


Valve (5) has three positions marked with small dots on the lever:

Position A (Marked with 1 dot): There is no return flow. Position is used when flushing the boom if there is spray liquid in the main tank. Also used when high spraying volume is required.

Position B (Marked with 2 dots): Normal spraying position. With return flow to prevent clogging the filter when spraying. Position is used when flushing the boom if the main tank is empty.

Position C (Marked with 3 dots): Flushing position, which is used if filter is clogged. Lift and hold the lever to use this position which largely increases return flow and cleans the filter.



See Maintenance section for service of filter.

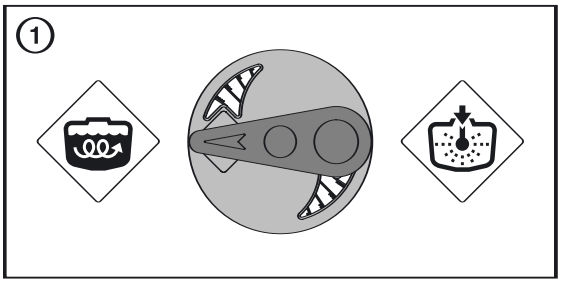
DANGER! Never open the Cyclone filter unless the top green pressure manifold valve and bottom black suction manifold valve are both closed (turned to the unused position). Otherwise, spraying liquid could hit you when opening the filter, and drain from the tank!

Agitation/Tank Rinse valve

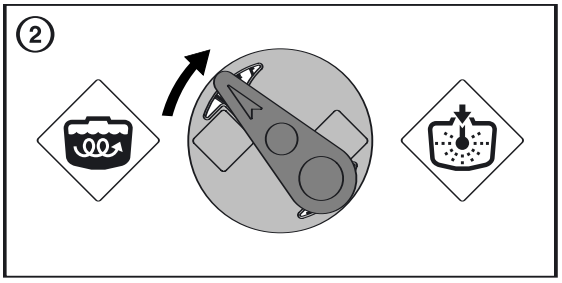
The valve is marked with an arrow on the green disc that indicates the amount of liquid that passes through the valve. If handle is turned to a position near the tip of the arrow, then only a small amount of liquid is allowed to pass the valve. Otherwise, if handle is turned to a position in the wide end of the arrow, it means that a larger amount is passing the valve. This gives the possibility to continuously adjust how much fluid from the pump is used for agitation/rinsing in the tank.

Examples on handle positions at different agitation quantities:

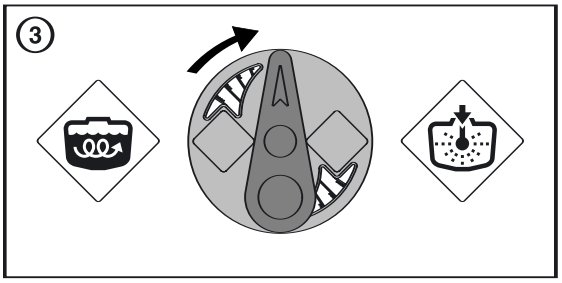
1. Handle is in the "widest end of arrow" position (full open). Agitation quantity is 100%.



2. Handle is positioned at the middle of the arrow position. Agitation quantity is approx. 50%.



3. Handle is positioned in closed position. Agitation quantity is 0%.



Quick Fill System

The filtered "Quick fill" system allows the operator to fill the sprayer from an external water source (such as a dam) using an auxiliary pump. The system includes a high capacity filter. The operator can also control the speed at which filling takes place by adjusting the quick fill ball valve on the sprayer.

Cam Lock coupling sizes:

3000& 4000 Litre models ..... .2.0 inch

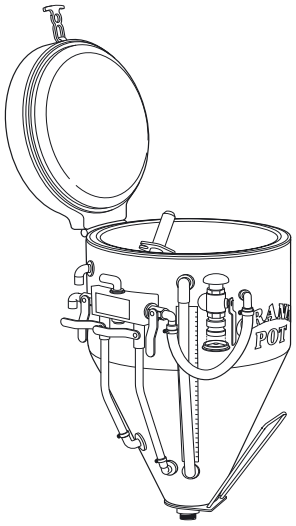
3 - Description

The optional HARDI® GRANNI POT or HARDI® TURBO FILLER are situated on the sprayer's left side, just behind the MANIFOLD valves.

These systems are designed to transfer liquid chemicals direct from a container (eg. Envirodrum, 25L drum, etc) to the calibrated hopper , then to the Main Tank.

Please see the Operation section or refer to your Vacuum Granni Pot or TurboFill Operators Manual for detailed instructions on proper use.

HARDI®GRANNI POT (optional equipment)



The HARDI VACUUM GRANNI POT™ is used for the mixing of plant protection or liquid fertiliser chemicals into a solution, and transferring the solution to your chemical application equipment.

Your Vacuum Granni Pot™ uses the latest design and technology to provide fast, safe and accurate transfer of liquids, powder or granules.

The Vacuum Granni Pot is a multi-purpose hopper. It is designed for use in closed system transfer and utilises the tough and reliable Hardi pump on your sprayer. The rate of transfer is controlled by the operator.

The Granni Pot is supported on a sturdy lift frame and is equipped with two vortex mixing jets, a control manifold and a rotating chemical drum rinse nozzle. The hopper flushing ring is connected to the sight tube to enable decontamination of both together. The unit has a water supply inlet port, and a vacuum suction outlet port — for transfer of either dilute or concentrated liquid chemicals to the spray tank.

The vortex jets provide vigorous operator-controlled agitation which mixes granules into solution, or allows liquid chemical concentrate to be pre-mixed. Any granules that do not dissolve are kept in suspension in the vortex until they disperse.

A further option available to operators is a Vacuum Transfer design, featuring a Vacuum and Transfer Valve and an in-line venturi with interchangeable restrictors (based on pump capacity), the unit can transfer liquid from a clean water source or Envirodrum into the hopper, and from the hopper to the main sprayer tank.

HARDI®TURBO FILLER (optional equipment)

The TurboFiller is situated in the working zone on the sprayers left side. When being used it should be unlocked by pulling the handle (A) situated to the right of the TurboFiller and pushed down (B) by grabbing the handle on the TurboFiller until it clicks into locked down-position.

When retracting the TurboFiller after use, then unlock it by pulling the handle (A) situated to the right of the TurboFiller and pull it back in storing position until it clicks into the lock.

WARNING! Before releasing the lock (A) always keep a hand on the grip to avoid abrubt movement of the TurboFiller!

Boom

Boom and terminology

SPB Boom

The SPB boom is available in two different hydraulic system versions :

1. SPB - Direct Hydraulics (DH) - requires 2 double acting hydraulic outlets

This type of boom is operated directly from the tractor hydraulics. This model features hydraulic lift cylinders for boom height adjustment and two cylinders for simultaneous boom wing fold and unfold.

2. SPB - Electric over Hydraulic (EOH) - requires 1 double acting hydraulic outlets

This type of boom has the same features as the above mentioned DH-model, but is provided with more advanced hydraulics. SPB-EOH also has two boom wing tilt cylinders that give the ability to obtain individual boom wing tilt as well as individual boom wing fold.

The hydraulics on the SPB-EOH are controlled via a control box.

Outer sections incorporate spring loaded breakaway and all booms have bi-fold wings.

The SPB boom is available in 15,18,20,21m working width.

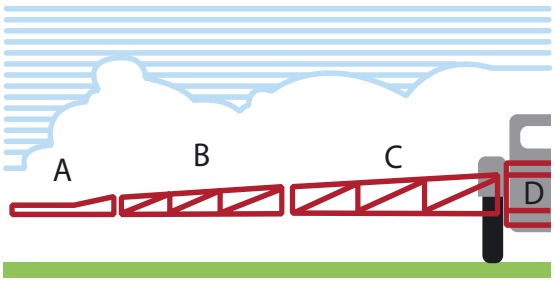
For bi-fold booms the terminology is as follows:

A - Breakaway section

B - Outer section

C - Inner section

D - Centre section



PRO Boom

The PRO Boom is available in Direct Hydraulic (DH) or Electric over Hydraulic (EOH) models. Both booms are supported by a trapeze which is fitted to the sprayer frame.

The trapeze helps the boom to stay horizontal when unfolded and it protects the boom against vibrations and shocks when driving on uneven ground. This ensures longer boom life and improves boom stability for better spray distribution.

Booms are available in 12, 12.5, 15 and 18 m working width. All booms are provided with spring loaded breakaway.

PRO Boom terminology is as follows:

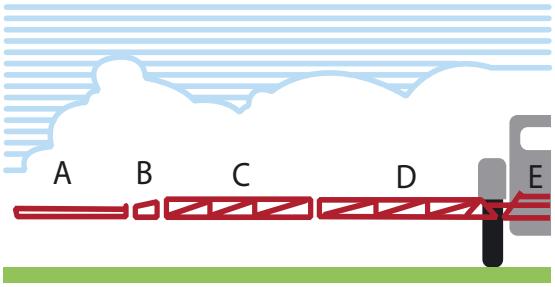
A - Breakaway section

B - Short Outer Section

C - Large Outer Section

D - Intermediate Section

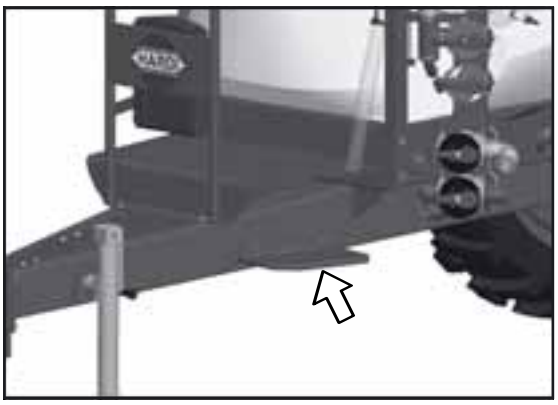
E - Centre Section



Equipment

Step

The platform step is located on the left side of the sprayer frame to make it easier to climb up to the platform.



Platform

The platform gives access to the clean water tank lid, the main tank lid.

Tank level indicator

The actual tank level in the main tank can be observed on the tank level indicator. The scale is displayed in US gallons or Liters.

ATTENTION! If very high accuracy is needed, a HARDI® FILLMETER can be fitted as optional equipment.

Remote pressure gauge

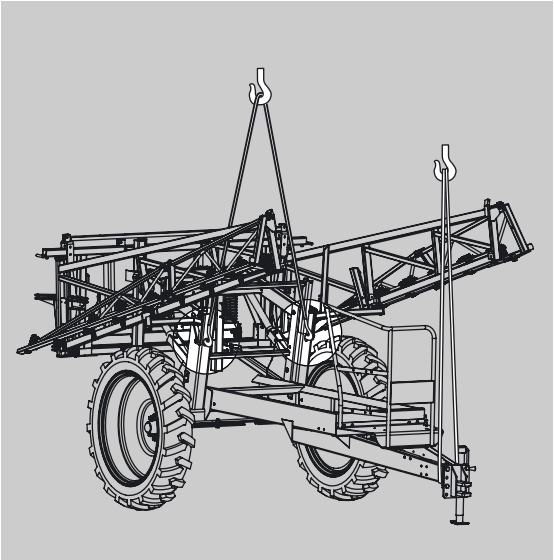
The remote pressure gauge is located above the manifold valve on the platform. A second pressure guage is mounted at the distribution valves. These gauges monitor the working pressure in the boom tubes as close to the nozzles as possible.

The outputs stated in the nozzle charts are always based on the pressure measured at the nozzle. Always adjust pressure when calibrating and spraying according to readings at the remote pressure gauge.

General info

Unloading the sprayer from the truck

When unloading with an overhead lifting device, please observe the lifting points as shown in the picture, and make sure that the straps or belts used for lifting are strong enough.



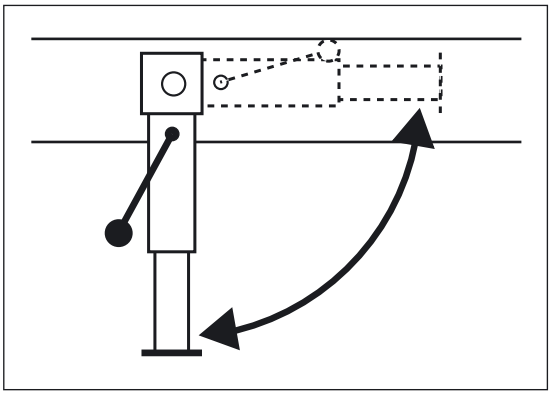
Before putting the sprayer into operation

Although the sprayer has been applied with a strong and protective surface treatment on steel parts, bolts etc. in the factory, 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. 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 clean for many years. This treatment should be carried out every time the protection film is washed off

Support jack

The support jack is stored in retracted position and secured by the linch pin when the sprayer is attached to the tractor.

To retract the support jack: Lift the jack, then pull the linch pin out and rotate the support jack into storage position. Replace linch pin to secure.



Mechanical connections

Transmission shaft - Operator's safety

1. 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.

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

3. Always keep protection guards and chains intact and make sure that it covers all rotating parts, including CV-joints at each end of the shaft. Do not use without protection guard.

4. Do not touch or stand on the transmission shaft when it is rotating - safety distance: 5' (1.5 meter).

5. Prevent protection guards from rotating by attaching the chains allowing sufficient slack for turns.

6. Make sure that protection guards around tractor P.T.O. and implement shaft are intact.

7. Always STOP ENGINE and remove the ignition key before carrying out maintenance or repairs to the transmission shaft or implement.

⚠ DANGER! ROTATING TRANSMISSION SHAFTS WITHOUT PROTECTION GUARDS ARE FATAL.

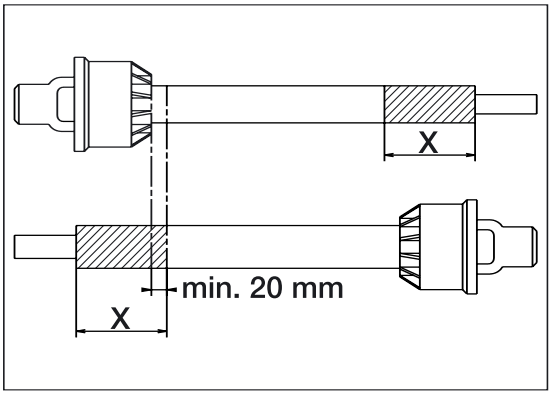
Transmission shaft - Installation

First installation of the transmission shaft is done in the following way:

1. Attach sprayer to tractor and set sprayer height in the position with shortest distance between the tractor and sprayer pump P.T.O. shafts.

2. Stop engine and remove ignition key.

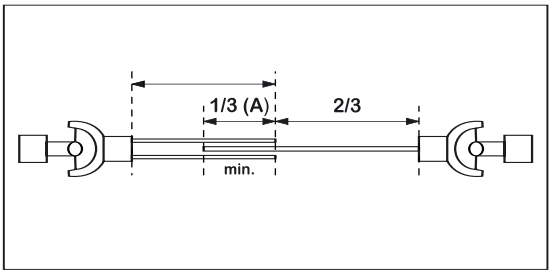
3. If transmission shaft must be shortened, the shaft is pulled apart. Fit the two shaft parts at tractor and sprayer pump and measure how much it is necessary to shorten the shaft. Mark the protection guards.



⚠ WARNING! The shaft must always have a minimum overlap. The size of this overlap depends on the pump model.

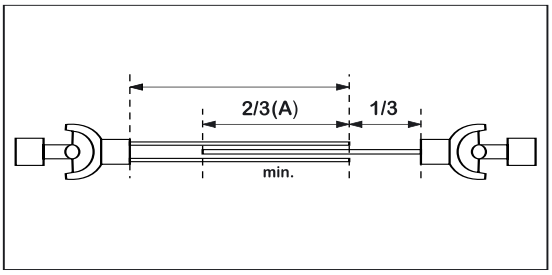
Pump with 6 splines/540 r.p.m.

The shaft must always have an overlap (A) of minimum 1/3 of the length.



Pump with 21 splines/1000 r.p.m.

The shaft must always have an overlap (A) of minimum 2/3 of the length.

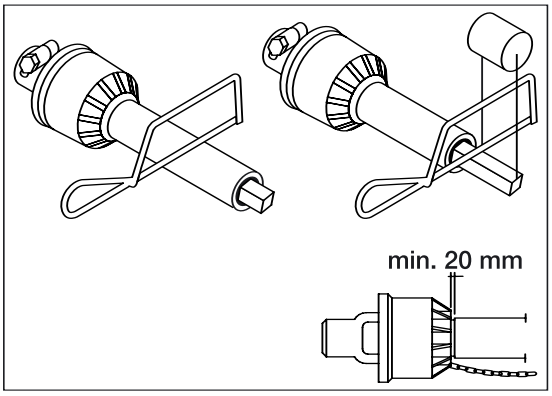


4. The two parts are shortened equally. Use a saw, and file the profiles afterwards to remove burrs.

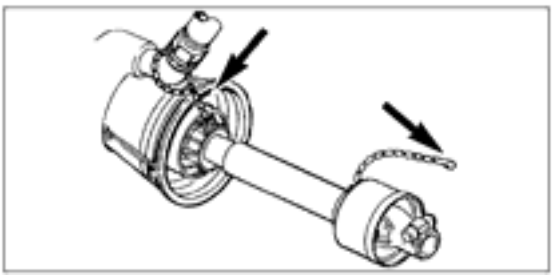
5. Grease the profiles and assemble male and female parts again.

6. Fit the shaft to tractor P.T.O. and sprayer pump shaft.

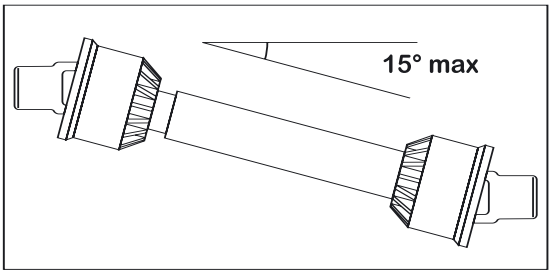
ATTENTION! Female part marked with a tractor towards tractor!



7. Fit the chains to prevent the protection guards from rotating with the shaft.



8. To ensure long life of the transmission shaft, try to avoid working angles greater than 15°.



Hydraulic systems

General info

Ensure that hydraulic quick couplers are clean before connection!

After having operated the boom and the system has been filled with oil, check tractor's hydraulic oil level and top up if necessary.

DANGER! Test of the hydraulic system should be done very cautiously. There may be air trapped in the system which can cause violent movements of the boom.

DANGER! Hydraulic leaks: Never use your fingers to locate a leakage in any part of the hydraulic system. Due to high pressure, hydraulic oil may penetrate the skin.

Requirements - tractor (DH) Direct Hydraulics

Connection requirements are:

• One single acting hydraulic outlet for the lift function of the spray boom.

• One double acting hydraulic outlets for the folding function of the sprayer.

Ensure that quick couplers are clean before connection!

The hydraulic system requires an oil flow of approximately 3 litres per minute and a minimum pressure of 1,950 PSI (130 bar).

Requirements - tractor (EOH) Electric over Hydraulics

Connection requirements are:

• One double acting hydraulic outlets for the folding function of the sprayer.

Ensure that quick couplers are clean before connection!

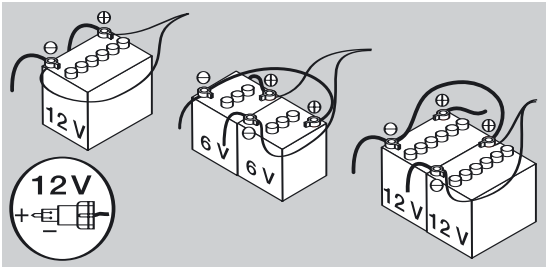
The hydraulic system requires an oil flow of approximately 3 litres per minute and a minimum pressure of 1,950 PSI (130 bar).

WARNING! 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.

Electrical connections

Power supply

Power requirement is 12V DC. Note polarity! The wires must be at least 4.0 mm^2 to ensure a sufficient power supply. For the operating unit, the tractor circuit should have an 8 Amp fuse. The supplied power connector is standard on most newer tractors. If using a tractor with a different power connector, it is necessary to disassemble connector and attach the wires to the actual tractor connector.



Control boxes

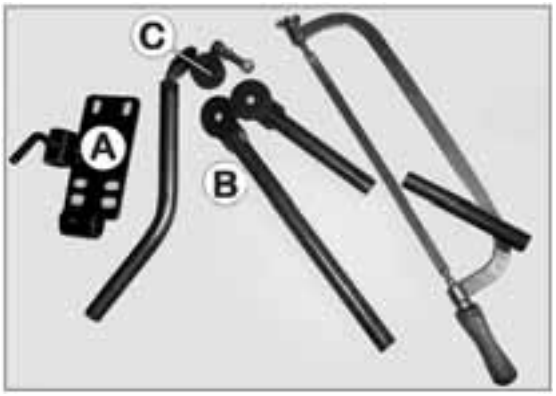
Control boxes are fitted in the tractor cabin at a convenient place.

Installation of control unit brackets

The supplied tractor pillar bracket (A) has a hole spacing of 100mm and 120mm. Check tractor instructions manual for information regarding attachment points.

Three tubes (B) are supplied. One, two or all 3 may be used. They can be bent and shortened. A spacer (C) is also supplied to allow further attachment possibilities. Find the best solution for your tractor or vehicle.

Tube (B) plate is staggered, so if correctly orientated, all boxes will line up.



Installation of control box - EVC control unit

Find a suitable place in the tractor's cabin. Best recommended placement is to the right of the driver seat and in combination with the Hydraulics control unit. It should be secured from movement.

ATTENTION! Tractor driver's seat is the intended working place during operation.

4 - Sprayer setup

System Earth and Polarity

The electrical systems of the sprayer are earthed through the wiring harness back to the tractor's battery and therefore a dedicated earth to or for the sprayer's chassis is not required. Generally the HARDI system's internal wiring uses blue wires for negative and brown wires for positive but where this found not to be the case (for example the power supply harness to the spray control box just mentioned) the usual system of black for negative and red for positive is observed.

Connecting 12 volt power (HC 5500 Controller)

The illustration below shows that the 39 pin data cables (1) and (2) should be routed into the tractors cab and connect to the Spray '2' Control Box (A) and the Hydraulic control box (B).

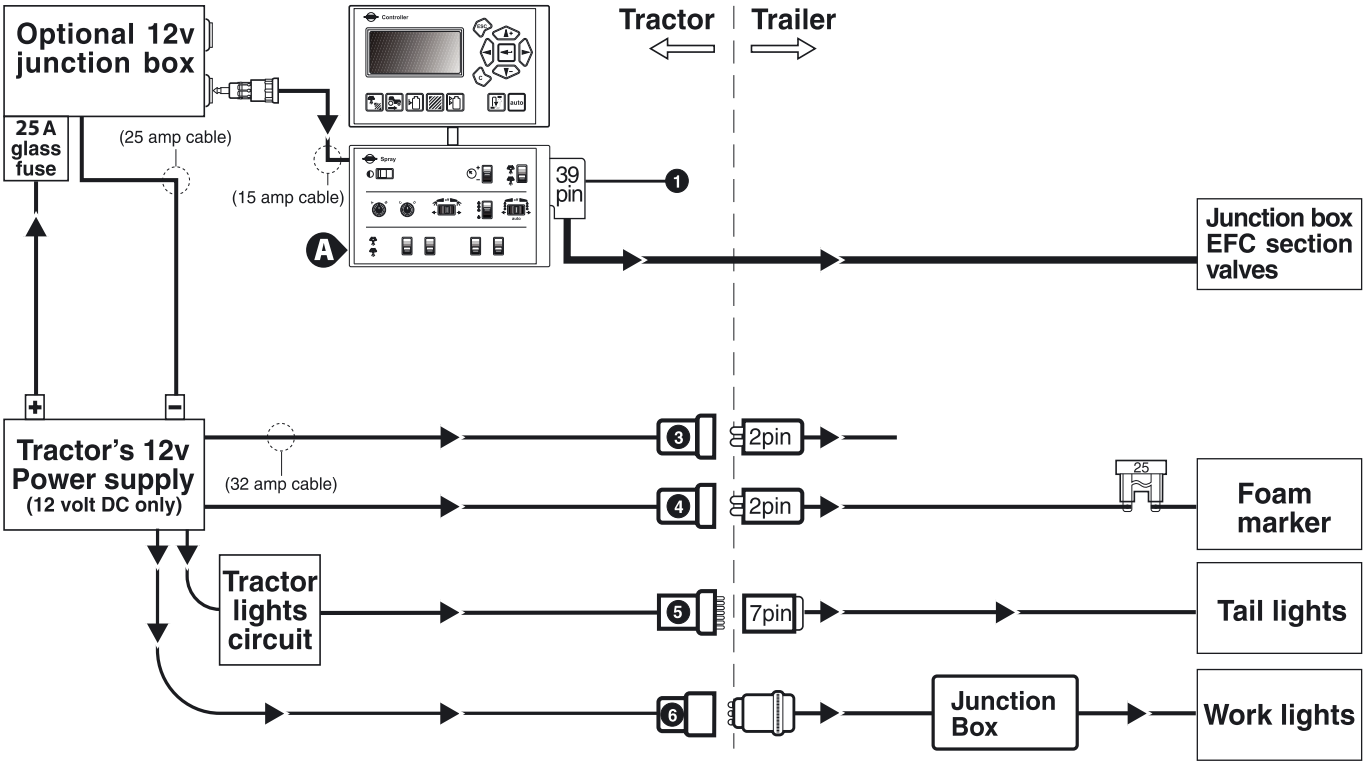
The two pin cable for the Job-com box (3) connects directly to a 12 volt power outlet as does the Foam Marker cable (4).

If optional tail, brake and turning lights (5) are fitted, connect the 7 pin plug to the tractor's 7 pin outlet in the usual fashion.

If optional work lights are fitted connect the 3 pin plug (6) to an auxiliary power outlet fed straight from the tractors battery.

HC 5500 Controller

The illustration below shows the basic lay out of the HC 5500 Controller's main electrical components and their cables.



HC 5500 Electrical connections

1. Thirty-nine pin plug from the Spray'2'control box (in the tractor's cab) to the Job-com box.

2.Thirty-nine pin plug from the Hydraulic control box (in the tractor's cab) to the Job-com box.

3. Two pin male/female power cable connector for Job-com box (connects at the draw bar).

4. Two pin male/female power cable connector for Foam Marker (connects at the draw bar).

5. Seven pin male/female connector for trailer's stop, turn and tail lights (connects at draw bar).

6. Three pin male/female connector for trailer's work lights (connects at draw bar).

System start-up (HC 5500)

When connecting the 39 pin plug from the sprayer, note the wire lock clip (A) clicks in place to secure the plug in the socket.

When disconnecting the plug, the wire lock clip must be pushed back before the plug is pulled out. After connecting the plugs:

1) Turn on the power at the Spray Box.

2) The model, software version number, number of boom sections and boom size are displayed briefly.

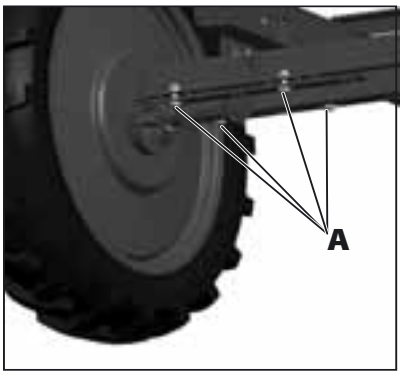
3) At initial start up, the controller also prompts you to input the time and date. (Remember, you must set the clock to activate the work register). Press ↵ to continue.

Attention: At first start-up the clock must be set. See "Menu 2.4 Set clock" in the HC 5500 Operators manual.

4 - Sprayer setup

Track width, axles and wheels

Recommended Equipment:



Overhead lifting crane or alternative safe lifting device

Lifting slings capable of lifting full load or trailer sprayer

Chassis and axle support stands and blocks

Altering the track width

The track width of the RANGER can be adjusted from 1525mm to 2300mm in 51mm increments as follows:

1. Measure the current track width (centre RH tire to center LH tyre). Each side must be extended or retracted half the desired alteration.
2. Attach the sprayer to tractor and engage tractor parking brake.

DANGER! Ensure tractor will not move during work procedure. Failure to do so could result in injury or

3. Secure lifting slings around chassis of trailer and lightly take up slack with suitable lifting equipment. Ensure wheels remain in contact with ground surface.

4. Lightly loosen wheel nuts on both wheels. DO NOT remove wheel nuts completely.

5. Raise trailer sprayer with an appropriate lifting equipment to a height that has a minimum wheel clearance from the ground.

6. Remove wheel nuts and wheels from trailer sprayer, taking note of current wheel orientation for wheel offset measurement.

7. Lower the trailer sprayer chassis on to support stands/blocks large enough to support the full load, ensure hubs are clear of the ground surface.

8. Working on one side at a time. Place blocks under axle inserts to support weight whilst moving insert. Remove axle extension bolts (A) and slide axle insert out to desired position. Ensure axle insert remains on support blocks whilst moving. Replace and tighten bolts to 250Nm (184ft/lbs). Repeat procedure for other side.

9. Raise trailer sprayer with overhead crane to a height to allow fitment of wheels to hubs. Refit wheels and wheel nuts firmly. Remove chassis stands and support blocks.

10. Lower trailer and torque wheel nuts to 650Nm (479 ft/lbs).

11. Check if the distance from tyre centre to centre of rear frame is equal at RH and LH.

12. Retighten bolts and wheel bolts to specified torque after 8 hours of work.

WARNING! Securely support the sprayer during axle adjustments. Never attempt to adjust axles with liquid in the tank. Always block wheels on opposite side when adjusting axles. Always ensure that work is carried out on a level and hard surface using appropriate lifting equipment and safe work methods.

Turning rim

Track width can be altered by turning wheel around. The rim plate can be fitted left or right. With an offset of : 75mm

Boom

Maneuvering of the boom - DH version

The SPB booms with hydraulic DH-version are operated as follows:

1. Activate the double acting hydraulic outlet to raise the boom and release it from the transport brackets.

2. Activate the double acting hydraulic outlet to unfold the boom. Both wings will now unfold simultaneously.

3. When the boom is completely unfolded, it can be raised or lowered to the desired spray height by activating the single acting hydraulic outlet.

4. Before attempting to fold the boom back into transport position, it must be raised all the way to the top by activating the single acting outlet. This will enable the rear cylinder transport lock.

5. The boom is folded by activating the double acting outlet in the opposite direction that was used to unfold the boom. The boom can now be lowered into the transport brackets.

6. The rear cylinder transport lock will automatically engage when lowering the boom after it has been raised all the way to the top. To disengage the rear transport lock, simply raise the boom back up a few inches and then lower it again.

DANGER! When folding or unfolding the boom, ensure that no other people are near the booms area of operation, failure to do so can result in death or serious injury.

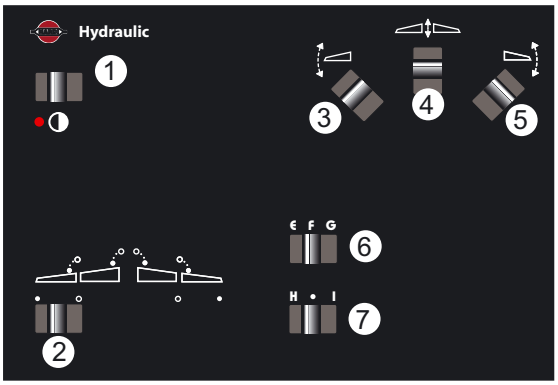
WARNING! Ensure that the rear cylinder transport lock is properly engaged before transport.

ATTENTION! Only unfold and fold the boom on level ground.

Positioning of the boom - EOH SPB Boom

The switches on the hydraulic control box, control the following functions;

1. Power ON/OFF
2. Boom Fold
3. Boom Tilt Left
4. Boom Lift/Lower
5. Boom Tilt Right
6. Optional Functions
7. Optional Functions



For unfolding of the boom follow these steps;

Ensure double acting hydraulic outlet is activated

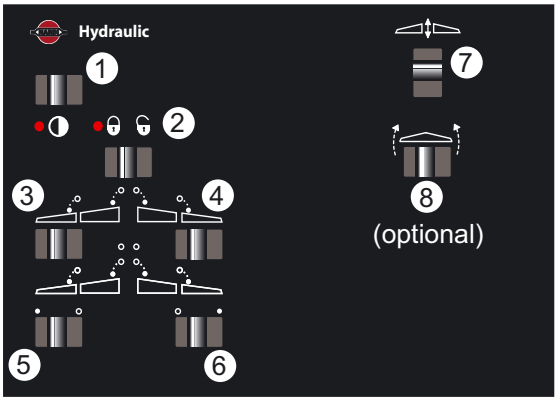
1. Push switch (4) upwards to lift the boom clear of the transport brackets.
2. Push switch (3) & (5) downward to lower individual tilt cylinders.
3. Push switch (2) to the left to unfold the boom.
4. Push switch (4) downward to lower the boom to the correct height above the crop or ground level.

The folding procedure is the reverse of unfolding.

DANGER! When folding or unfolding the boom, ensure that no other people are near the booms area of operation, failure to do so can result in death or serious injury.

ATTENTION! Only unfold and fold the boom on level ground.

Positioning of the boom - EOH PRO Boom



The switches on the hydraulic control box, control the following functions;

1. Power ON/OFF
2. Trapeze Lock
3. Boom Fold Inner Left
4. Boom Fold Inner Right
5. Boom Fold Outer Left
6. Boom Fold Outer Right
7. Boom Lift/Lower
8. Boom Slant (Optional)

For unfolding of the boom follow these steps;

Ensure double acting hydraulic outlet is activated

1. Check that pendulum (2) is locked.
2. Push switch (7) to raise the boom clear of the transport brackets.
3. Unfold inner sections by pressing switch (3) to the left and switch (4) to the right.
4. Unfold outer sections by pressing switch (5) to the left and switch (6) to the right
5. If Slant option is fitted, press switch (8) to correct slant angle.
6. Press switch (7) to lower to boom to the correct height above the crop or ground level.
7. Unlock pendulum with switch (2).

The folding procedure is the reverse of unfolding.

DANGER! When folding or unfolding the boom, ensure that no other people are near the booms area of operation, failure to do so can result in death or serious injury.

ATTENTION! If the boom is not symmetrically unfolded (eg. when using alternative boom widths) the trapeze must be locked with switch (2) during transit. Failure to do so will damage the boom!

ATTENTION! Only unfold and fold the boom on level ground.

Folding one side only (EOH Hydraulics only)

If only one side of the boom is to be used for spraying, first unfold the boom completely and then turn switches off.

Press the switch for the side that is to be folded and activate the double acting outlet to fold that side into the transport position.

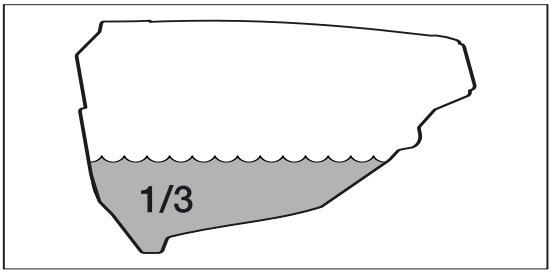
DANGER! When folding or unfolding the boom, ensure that no other people are near the booms area of operation, failure to do so can result in death or serious injury.

ATTENTION! It is not advisable to go directly from transport position to spray position with one side only. Both wings must first be completely unfolded and then one side folded back in.

Liquid system

Filling of water

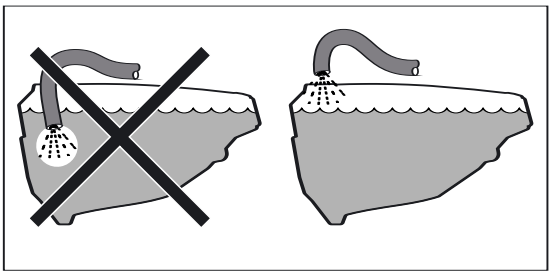
Tank should normally be filled 1/3 with water before adding chemicals. Always follow instructions given on the chemical container!



WARNING! If the sprayer is put aside with liquid in the main tank, all MANIFOLD valves must be closed.

Filling through tank lid

Water is filled into the tank by removing the tank lid located at front of sprayer tank which is accessible from platform. It is recommended to use water as clean as possible for spraying purposes. Always fill water through the strainer basket to prevent foreign particles from entering the tank. An overhead tank can be used in order to obtain high filling capacity.



WARNING! Do not let the filling hose enter the tank. Keep it outside the tank, pointing towards the filling hole. If the hose is lowered into the tank and the water pressure drops at the water supply, chemicals may be siphoned back and contaminate the water supply lines and source.

Suction filling device (optional - main tank only)

The Suction Filling Device is operated as follows:

1. Remove plug from Quick Fill coupler and connect filling hose from water supply.

2. Make sure bottom Suction Manifold valve is turned to "Off".

3. Turn top Pressure Manifold valve to "HARDI® Turbo Filler or Granni Pot" hopper if equipped. Otherwise turn to "Spray" with control unit turned "Off".

4. Engage pump and set to operating r.p.m. (540/1000).

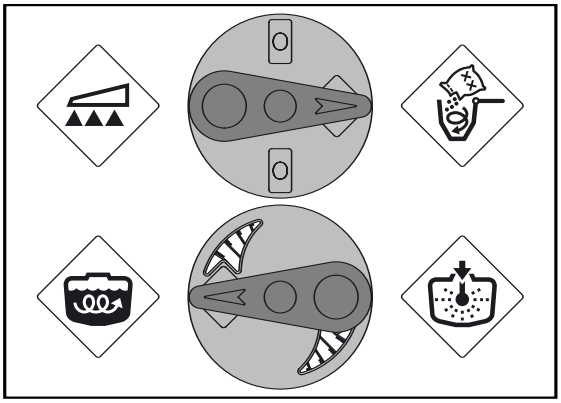
5. Turn top Suction Manifold valve towards "Quick Fill" function.

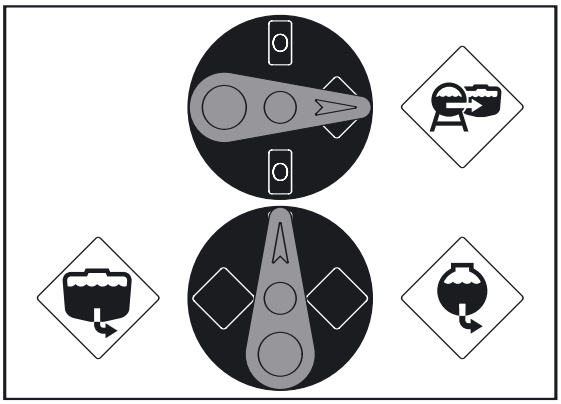
6. Water will be drawn from the water supply. Fill tank to desired level. Keep an eye on the level indicator.

7. Chemicals may be added to the HARDI® Turbo Filler or Granni Pot (optional) while using the suction filling device. Follow directions in sections Chemical Induction for HARDI® Turbo Filler or Granni Pot" .

8. Turn top Suction Manifold valve "Off" to discontinue filling process. Then disengage pump.

9. Disconnect filling hose and replace Quick Fill plug.





DANGER! Avoid contamination or personal injury. Do not turn suction valve towards "Quick Fill" unless pump is running and filling hose is connected. If this valve is open when the pump is not engaged, liquid can flow out of the valve.

ATTENTION! Observe local legislation regarding use of 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 tanks etc.) to avoid contamination.

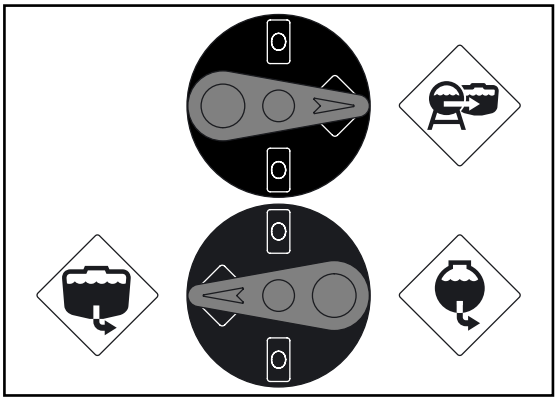
WARNING! If filling hose/filter is carried on the sprayer during spraying, it can be contaminated by spray drift which will be transferred to water source when filling!

WARNING! Do not leave the sprayer while filling the tank. Keep an eye on the level indicator in order NOT to overfill the tank.

WARNING! Never turn the bottom suction valve to "Flush Tank" while using the Suction Filling device. The Flush Tank cannot be filled using the pump, and contamination of the Flush Tank could occur if pump isn't engaged.

ATTENTION! Once water has started flowing from the water supply, the bottom Suction Manifold valve may be turned off for faster filling, but must be turned back to "Main Tank" before closing the Quick Fill valve.

Filling of main tank using Quick Fill (optional)



The main tank is filled using the Quick Fill as follows:

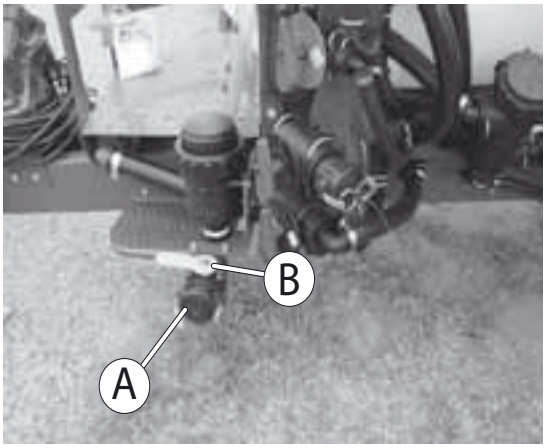
1. Turn bottom Suction Manifold valve to "Suction from Main Tank".
2. Remove plug from Quick Fill coupler and connect filling hose from water supply (i.e. overhead fill tank).
3. Turn water supply "On" so filling hose is primed with water.
4. Turn top Suction Manifold valve towards "Quick Fill" function.
5. Fill tank to desired level. Keep an eye on the level indicator.
6. Turn top Suction Manifold valve "Off" to discontinue filling process.
7. Turn water supply "Off" and remove the filling hose.
8. Replace Quick Fill plug.

DANGER! Avoid contamination or personal injury. Do not turn suction valve to "Quick Fill" unless filling hose is connected. If this valve is open when the pump is not engaged, liquid can flow out of the valve.

WARNING! Do not leave the sprayer while filling the tank. Keep an eye on the level indicator in order NOT to overfill the tank.

Filtered Fast Fill System

The 'Filtered Fast Fill' option allows the operator to fill the sprayer from an external water source (such as a dam or tank) using an auxiliary pump. The system includes a Cam-Lock coupling on the inlet and a high capacity in line filter.



1. Remove the cover from the Cam-Lock coupling (A) and connect a hose being fed from an auxiliary pump and external water source.
2. Run the auxiliary pump and engage the Quick-Fill ball valve (B) to fill.
3. Watch the tank level indicator closely to prevent over filling.
4. To stop filling close the Quick-Fill ball valve (B), turn off the pump, disconnect the hose and replace the Cam-lock coupling dust cover.

Warning: Do not leave the sprayer while filling the tank and watch the level indicator closely to prevent over filling..

Attention: Due to risk of contamination it is prohibited in some areas to fill a sprayer from open water ways such as lakes and rivers etc. Contact your local authorities for information about laws specific to your area.

Filling of clean water tank

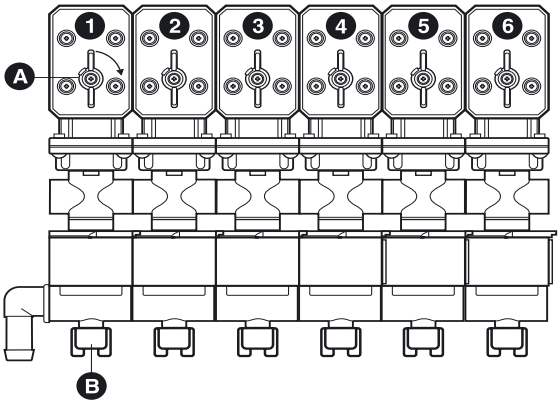
A clean water tank is integrated into the front left corner of the main tank (behind the MANIFOLD system). It is accessed for filling at the sprayer's left side when entering the platform. Remove tank lid, fill with clean water and replace tank lid.

For use of water, turn the ball valve lever to open tap. The ball valve is located at the bottom of the clean water tank on sprayer's left side. The water from this tank is for hand washing, cleaning of clogged nozzles, etc. Only fill the clean water tank with clean water.

Capacity: 4.8 gal. (18 liters).

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

Adjustment of EVC operating unit



Before spraying, adjust the EVC operating unit using clean water (without chemicals).

1. Choose the correct nozzle for the spray job. Make sure that all nozzles are the same type and capacity. See the "Spray Technique" book.

2. Make sure all distribution valves (A) are turned on.

3. Set pressure regulation valve to minimum pressure (activate pressure regulation switch "down" until emergency handle stops rotating).

4. Put the tractor in neutral and adjust the P.T.O. revolutions to the number of revolutions that will typically be used while spraying. Remember the number of revolutions on the P.T.O. must be kept between 300-600 r.p.m. (540 r.p.m. pump) or 650-1100 rpm (1000 r.p.m. pump).

5. Activate pressure regulation switch "up" until the required spraying pressure is shown on the pressure gauge.

Adjustment of pressure equalization:

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

2. Note the pressure on the pressure gauge. This reading will be used throughout the adjustment.

3. Manually close one of the distribution valves by turning the green handle (A).

4. Turn the adjusting screw (B), under the valve just closed, until the pressure gauge again shows the same pressure as before (clockwise for higher pressure, counterclockwise for lower pressure).

5. Turn the distribution valve (A) back on.

6. Adjust the other sections of the distribution valve in the same way.

ATTENTION! HEREAFTER ADJUSTMENT OF PRESSURE EQUALIZATION WILL ONLY BE NEEDED WHEN:

1. YOU CHANGE TO NOZZLES WITH OTHER CAPACITIES

2. THE NOZZLE OUTPUT INCREASES AS THE NOZZLES WEAR

Chemical Handling and Usage

Safety precautions - crop protection chemicals

Always be careful when working with crop protection chemicals!

WARNING! Always wear correct protective clothing before handling chemicals!

Personal protection

Depending on chemical type, protective gear /equipment should be worn to avoid contact with the chemicals, e.g.:

- Gloves
- Waterproof boots
- Headgear
- Respirator
- Safety goggles
- Chemical resistant overall

WARNING! Protective clothing/equipment should be used when preparing the spray liquid, during the spray job and when cleaning the sprayer. Follow the chemical manufacturer's instructions given on the chemical label.

WARNING! It is always advisable to have clean water available, especially when filling the sprayer with the chemical.

WARNING! Always clean the sprayer carefully and immediately after use.

WARNING! Only mix chemicals in the tank according to directions given by the chemical manufacturer.

WARNING! Always clean the sprayer before changing to another chemical.

Filling chemicals through tank lid

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

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

1. Make sure the control unit is switched off.
2. Turn the bottom Suction Manifold valve handle towards "Suction from main tank". Turn the top Pressure Manifold valve handle towards "Spray" and the bottom Pressure Manifold valve towards "Agitation".
3. Engage pump and set to operating r.p.m. (540/1000).
4. Add the chemicals through the main tank opening or lid.
5. When the spray liquid is well mixed, keep P.T.O. engaged so the spray liquid is continuously agitated until it has been sprayed on the crop.

5 - Operation

Chemical Infilling

It is possible to use either the Hardi Granni Pot or the Hardi Turbo Filler as a means to infill chemicals into the main tank.

Both units can be used for;

1. Induction of Dry Granules, Powders or Flowables by adding chemical product to hopper.
2. Induction of Liquid Chemicals by adding chemical product to hopper.

The Granni Pot has a further option to allow vacuum transfer of chemical product from Envirodrums or other sources.

Please choose to read the sections relevant to your choice of Chemfill option

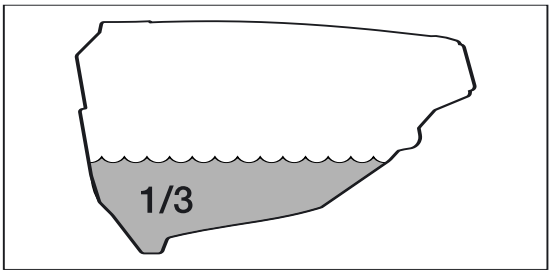
WARNING! Only compatible and complimentary chemicals should be mixed.
When combined, incompatible chemicals may cause a potentially dangerous reaction, or result in unwanted effects on the crop to be sprayed. ALWAYS follow label instructions!

WARNING! To prevent severe damage to equipment and crops, before moving sprayer ensure Granni Pot and Turbo Filler are empty, the lid closed and fastened, and the hopper is secured in Transport position.

WARNING! Do not attempt to lift the Granni Pot or Turbo Filler into Transport position unless the hopper is completely empty.

WARNING! Protective clothing/equipment should be used when preparing/handling the spray liquid, during the spray job and when cleaning the sprayer. Follow the chemical manufacturer's instructions given on the chemical label.

Tank should normally be filled 1/3 with water before adding chemicals. Always follow instructions given on the chemical container!

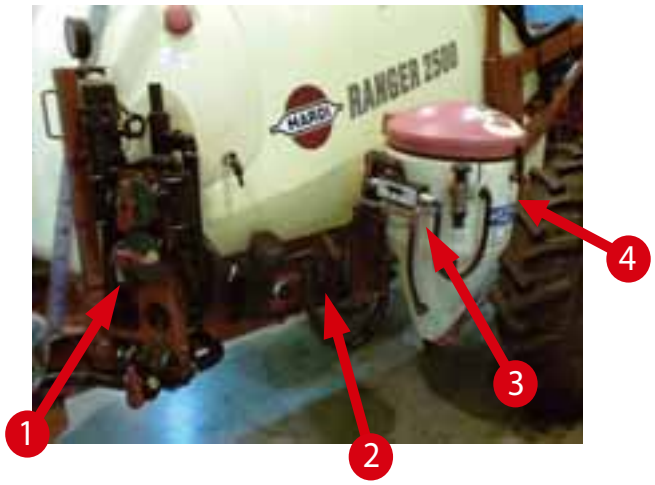


Chemical Induction by Granni Pot (optional)

The Granni Pot chemical induction can be carried out in any one of the three following methods;

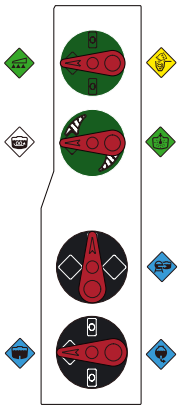
1. Induction of Dry Granules, Powders or Flowables by adding product to Granni Pot Hopper
2. Induction of Liquids by adding product to Granni Pot Hopper
3. Usingthe optional Vacuum Transfer feature to add Liquid chemicals from Envirodrums and other containers

Granni Pot System Components

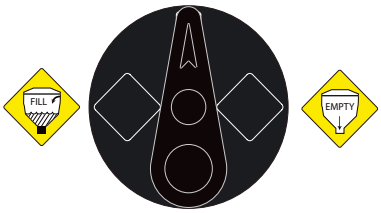


1. Pressure/Suction Control Valves Manifold
2. Vacuum / Transfer Valve
3. Control Manifold
4. Granni Pot Hopper

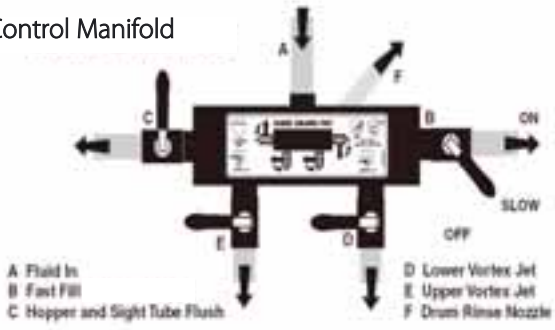
1. Pressure/Suction Control Valves Manifold



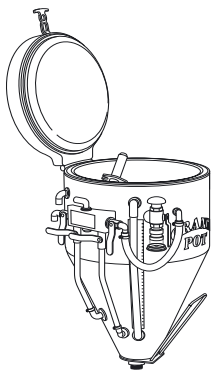
2. Vacuum / Transfer Valve



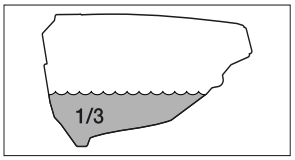
3. Control Manifold



4. Granni Pot Hopper

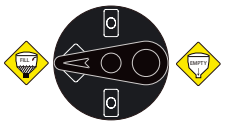


Filling the Hopper with water



Engage the pump. Set at 540 or 1000 rpm, whichever is relevant to your pump.

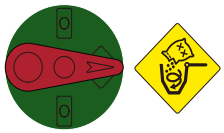
Before using the Granni Pot to add chemical solution/s to your sprayer, fill the main sprayer tank with water to 1/3 of required spray liquid volume.



Set Vacuum and Transfer Valve to Fill position

Turn the Pressure Manifold Valve on your sprayer toward the ChemFiller icon. This will allow you to activate the Granni Pot system.

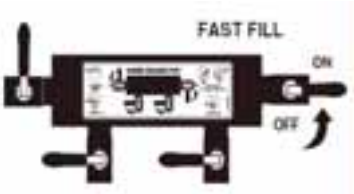
Turn Fast Fill handle on, to fill hopper.



Watch the level of water. Fill to the 25 Litre level, which will be just above the upper jet. (NOTE: Sight gauge is a guide only to fluid volume in hopper).

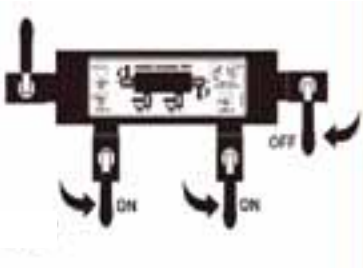
When sufficient water is in the hopper turn Fast Fill handle off.

Check operation by briefly operating all valves before introducing any chemical product. Check for leaks that may indicate loose fittings, faulty valves or damaged hoses.



Do not use faulty equipment.

Vortex Generation (General)



To start a vortex in the hopper by turning Upper & Lower Jet handles ON and turn Fast Fill handle to OFF.

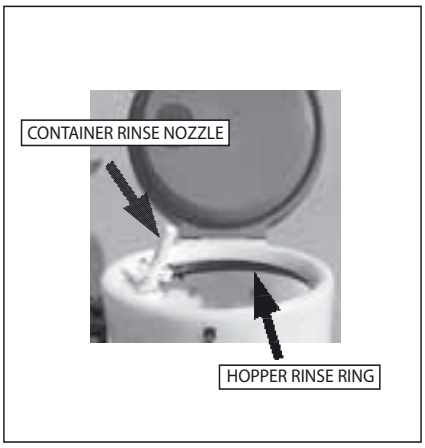
Vortex force can be controlled by positioning the Fast Fill Handle between on/off to achieve desired rate of swirl action. Further control of the vortex action can be achieved by partially or fully closing one of the jets.

WARNING! At this stage no fluid is being removed from the hopper - Do Not Overfill.

Granni Pot Rinsing

The Granni Pot comes equipped with a container rinsing nozzle which uses spray liquid from the main tank to rinse chemical containers.

It also has a rinsing ring located under the upper lip of the hopper that uses spray liquid to flush the walls of the hopper.



Chemical Container Rinsing Device

DANGER! Do not press the nozzle unless it is covered by a container to avoid spray liquid hitting the operator.

ATTENTION! Rinsing device uses spray liquid to rinse containers. Always rinse the chemical containers with clean water several times before disposal.

The rinse nozzle lock is released by turning the upper section 90 degrees

Note: This lock acts as a safety measure to prevent injury to operator.
Ensure lock is repositioned correctly after use.

Once unlocked, the rinse nozzle can be used by placing a container upside down on top of the nozzle and pressing down. The will force a powerful jet of water up into the inside of the container.

Hopper Rinsing Ring

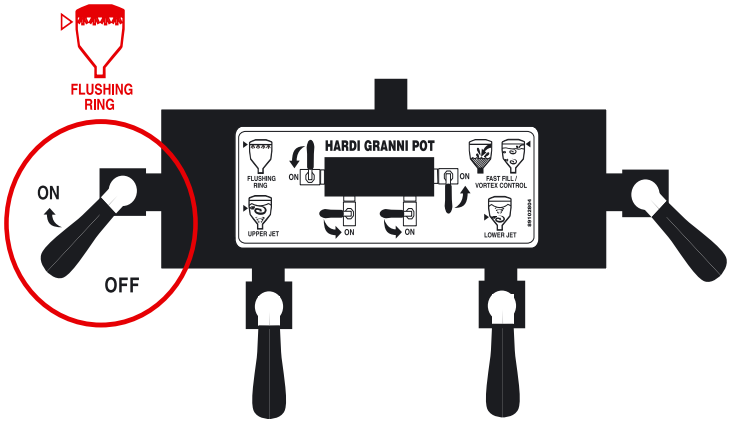
DANGER! Do not activate the rinse ring unless the hopper lid is closed to avoid spray liquid hitting the operator.

ATTENTION! Rinsing device uses spray liquid to rinse hopper. Always avoid contact with chemical solution.

With the lid closed, flush the hopper using the rinse ring.

Control the rinse by turning flush ring handle on Granni Pot control manifold to the ON / OFF position.


HOPPER RINSE RING
(viewed from inside hopper)



ATTENTION! The hopper rinsing devices use spray liquid for rinsing the hopper. The Granni Pot must always be cleaned/decontaminated together with the rest of the sprayer with fresh water when the spray job is complete.

5 - Operation

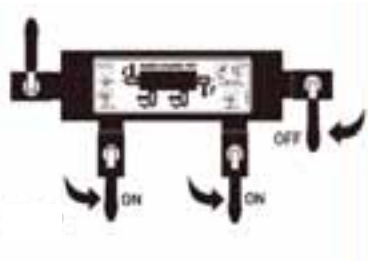
Filling with liquid or granular chemicals by Granni Pot (optional equipment)

WARNING! Only compatible and complimentary chemicals should be mixed.
When combined, incompatible chemicals may cause a potentially dangerous reaction, or result in unwanted effects on the crop to be sprayed. ALWAYS follow label instructions!

1. Fill the hopper with water to the 25 litre level.

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

2. Start a swirling action in the hopper by turning ON the upper and lower jet handles and turning Off the Fast Fill handle.



WARNING! At this stage no fluid is being removed from the hopper Do Not Overfill.

3. Pour pre-measured chemical amount into vortex stream (not into centre of hopper). Vortex action will be reduced during the addition of chemical.

Note: Large unmixed chemical will be held by centrifugal force to the outside wall of the hopper. Continue mixing in the hopper until chemical is fully integrated into water.

Note: Always ensure that enough pressure is maintained to drive the vortex. A drop in level may cause air to enter the suction line, and too high a level will cause slowing of the vortex, resulting in incomplete mixing of chemicals which may affect the accuracy of application rates when spraying.

4. When all chemical has been thouroughly mixed, close vortex jet handles.

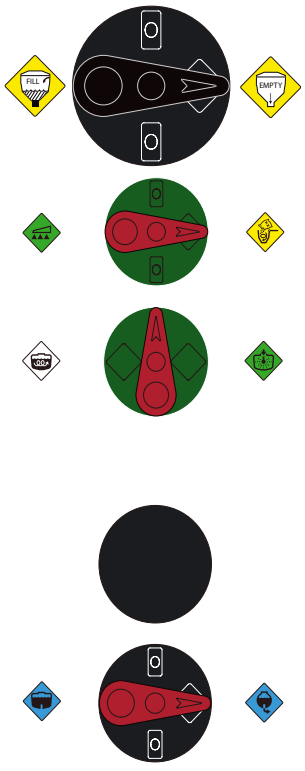
Transfer chemicals to Main Tank by Granni Pot

5. To transfer the mixture to the sprayer tank. Turn the Vacuum Transfer Valve to the EMPTY position. This will allow a venturi to create a vacuum inside the Granni Pot hopper and allow the hopper contents to flow through to the main tank.

6. With the lid closed, flush the hopper using the hopper rinse ring between batches of chemical.

7. After all chemicals have been added to the sprayer tank, and the Granni Pot Hopper is empty, set the suction ball valve on the sprayer manifold to Flush Tank in order to flush the Granni Pot system with clean water.

8. Refill the hopper with clean water, operate all valves as in mixing procedure, empty and repeat until the system is clear of residue chemical.



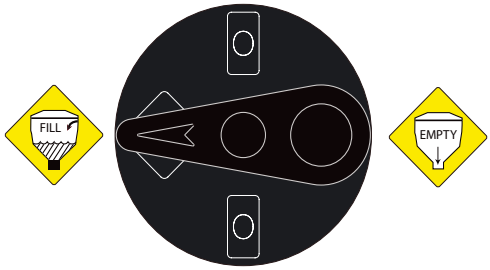
Filling chemicals by Vacuum Granni Pot Method (optional equipment)

Before adding any chemicals fill, hopper with water to test functions as described under Filling Granni Pot with water section.

1. Connect Chem Probe camlock to Ball Valve on Granni Pot Hopper, OR

   Connect suction hose to the camlock fittings on the ball valve of the hopper and the Drum coupling.

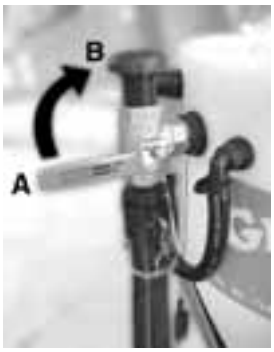
2. With lid of Granni Pot closed, turn the Vacuum and Transfer Valve to FILL position, to activate the venturi, which will create a vacuum inside the hopper.



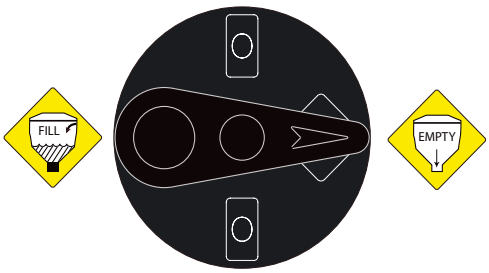
3. The vacuum is controlled by the ball valve and vent. In the CLOSED (A) position,the ball valve is open to the suction line,

and liquid chemical will be drawn from the drum into the hopper.

4. To stop the flow of liquid chemical from the drum, move the ball valve to OPEN (B) position - this allows air from the atmosphere to be introduced to the hopper through the vent, and closes off the suction line.



5. To transfer measured volume of chemical mixture to the sprayer tank, turn the Vacuum and Transfer valve to EMPTY.



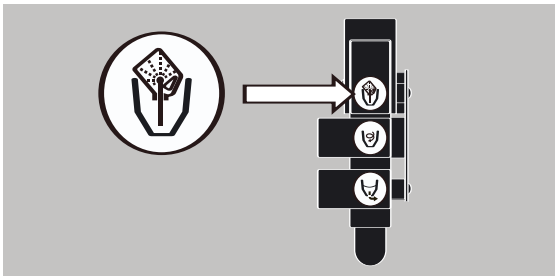
6. Flush Hopper and Sight Tube between different chemicals.

7. Hose from drum coupling to hopper should always be rinsed with water.

ATTENTION! The hopper rinsing devices use spray liquid for rinsing the hopper. The Granni Pot must always be cleaned/decontaminated together with the rest of the sprayer with fresh water when the spray job is complete.

Chemical induction by HARDI TurboFiller (optional equipment)

Chemical container cleaning lever



The upper lever located to the left of TurboFiller are used for two purposes:

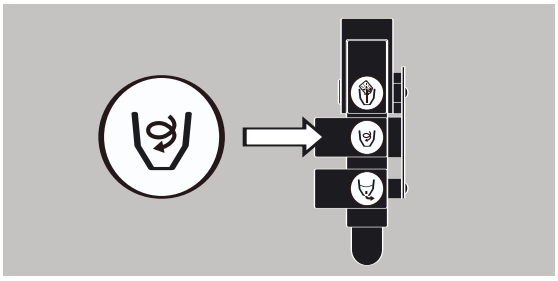
When TurboFiller lid is open: For cleaning empty containers. Put container over the rotating flushing nozzle in the middle of the TurboFiller to rinse inside of the container.

When TurboFiller lid is closed: Use the Chemical Container Cleaning lever to rinse the hopper after filling of chemicals has ended.

 Chemical container cleaning

 DANGER! Do not press lever unless the multi-hole nozzle is covered by a container or lid to avoid spray liquid hitting the operator.

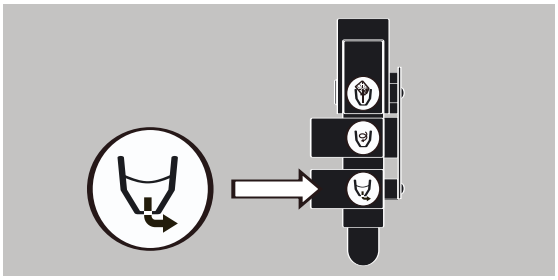
TurboDeflector valve



This TurboDeflector valve activates the Vortex flushing of the TurboFiller. The valve is the middle valve situated to the left side of the TurboFiller and is activated in two ways. Push the valve lever down to get a quick flush in the hopper. Lift the lever to lock it in open position for continous liquid rotation in the hopper.

 Start TurboDeflector

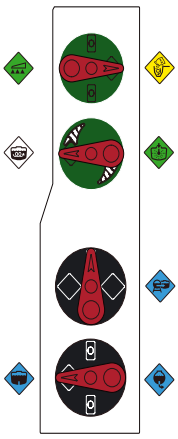
TurboFiller suction valve



The valve is used simultaneously with the TurboFiller. The valve is the lowest valve situated to the left side of the TurboFiller and is activated in two ways. Push the valve lever down to get a quick soak out in the hopper. Lift the lever to lock it in open position for continous suction from the hopper into main tank. Open valve when chemicals are going to be filled into the TurboFiller.

 Filling chemicals without TurboDeflection

Fillng the HARDI TurboFiller

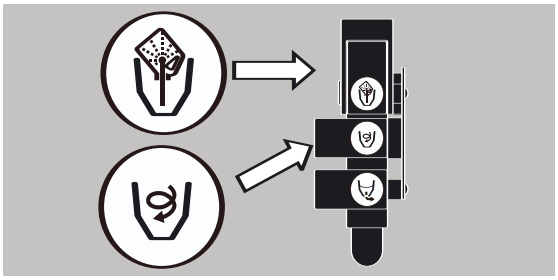


1. Engage the pump and set P.T.O. speed at 540 r/min or 1000 r/min (depending on pump model).

2.Fill the main tank at least 1/3 with water (unless something else is stated on the chemical container label). See section "Filling of water".

3. Turn the handle at the suction valve towards "suction from Main tank". Turn Pressure Valve towards "Hopper". Turn the AgitationValve towards "Agitation". Close all remaining valves.

4. Open TurboFiller lid. Open TurboDeflector valve and TurboFiller suction valve.



5. Measure the correct quantity of chemical and sprinkle it into the hopper as fast as the transfer device can flush it down.

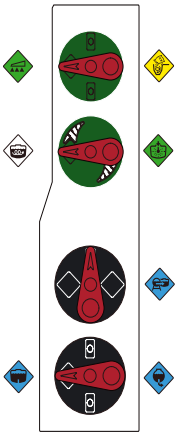
6. If the chemical container is empty it can be rinsed by the Chemical Container Cleaning device. Place the container over the multi-hole nozzle and push the Chemical Cleaning Device lever (upper lever) to the left of the TurboFiller.

DANGER! Do not press lever unless the multi-hole nozzle is covered by a container or lid to avoid spray liquid hitting the operator.

7. Close TurboFiller suction valve again when the hopper is rinsed.

8. Close the TurboFiller lid again.

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

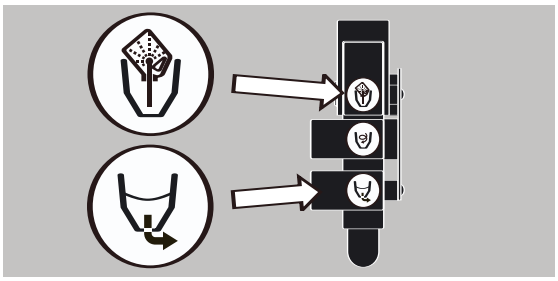


ATTENTION! Rinsing device uses spray liquid to rinse containers for concentrated chemicals. Always rinse the chemical containers with clean water several times until they are clean before disposal.

ATTENTION! The hopper rinsing device is using spray liquid for rinsing the hopper for concentrated chemical! The FILLER must always be cleaned together with the rest of the sprayer when the spray job is done.

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

TurboFiller rinsing

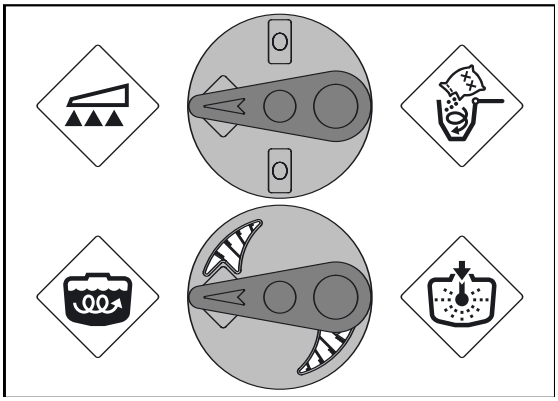


Rinsing the TurboFiller and chemical containers are done in the following two ways:

When TurboFiller lid is open: For cleaning empty containers. Put container over the rotating flushing nozzle in the middle of the TurboFiller so that the nozzle is inside the container. Press the Chemical Container Cleaning lever and TurboFiller suction valve at the same time to activate the flushing nozzle in the middle of the TurboFiller and empty out the TurboFiller rinsing liquid.

When TurboFiller lid is closed: Use the Chemical Container Cleaning lever to rinse the hopper after filling of chemicals has ended. Press the Chemical Container Cleaning lever and TurboFiller suction valve at the same time to activate the flushing nozzle in the middle of the TurboFiller and empty out the TurboFiller rinsing liquid. Do this 3 times and after last flushing then open lid to inspect if the TurboFiller is empty. If not, then place lid again and press TurboFiller suction valve until the TurboFiller is empty.

Agitation before re-starting spraying



If a spraying job has been interrupted for a while, severe sedimentation can occur depending on chemicals being used. When re-starting spray job, it might be necessary to agitate sedimented material first.

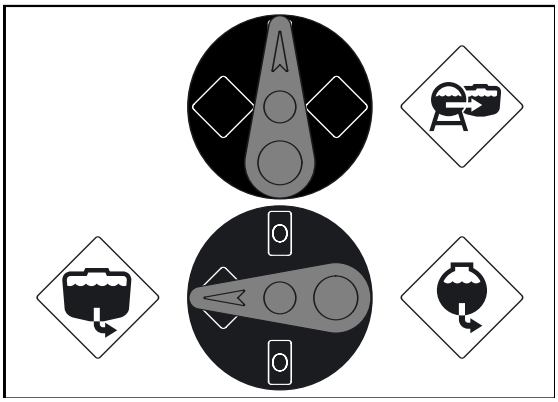
1. Make sure the control unit is switched off.

2. Turn the bottom Suction Manifold valve handle towards "Suction from main tank". Turn the top Pressure Manifold valve handle towards "Spray" and the bottom Pressure Manifold valve towards "Agitation".

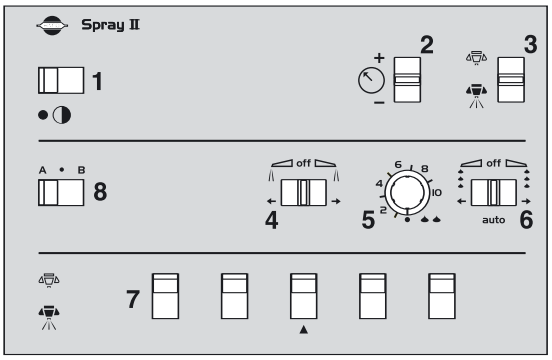
3. Engage pump and set to operating r.p.m. (540/1000).

4. Agitation will start and should be continued for at least 10 minutes.

5. Once the chemicals are mixed, spraying can resume.



Operating the control unit while spraying



The switches on the spray control box control the following functions:

1. Power switch
2. Manual pressure regulation
3. Main ON/OFF
4. End nozzle (Left/OFF/Right)*
5. Foam marker regulation*
6. Foam marker (Left/OFF/Right)*
7. Boom section valves
8. Valve function A-B*

*optional equipment

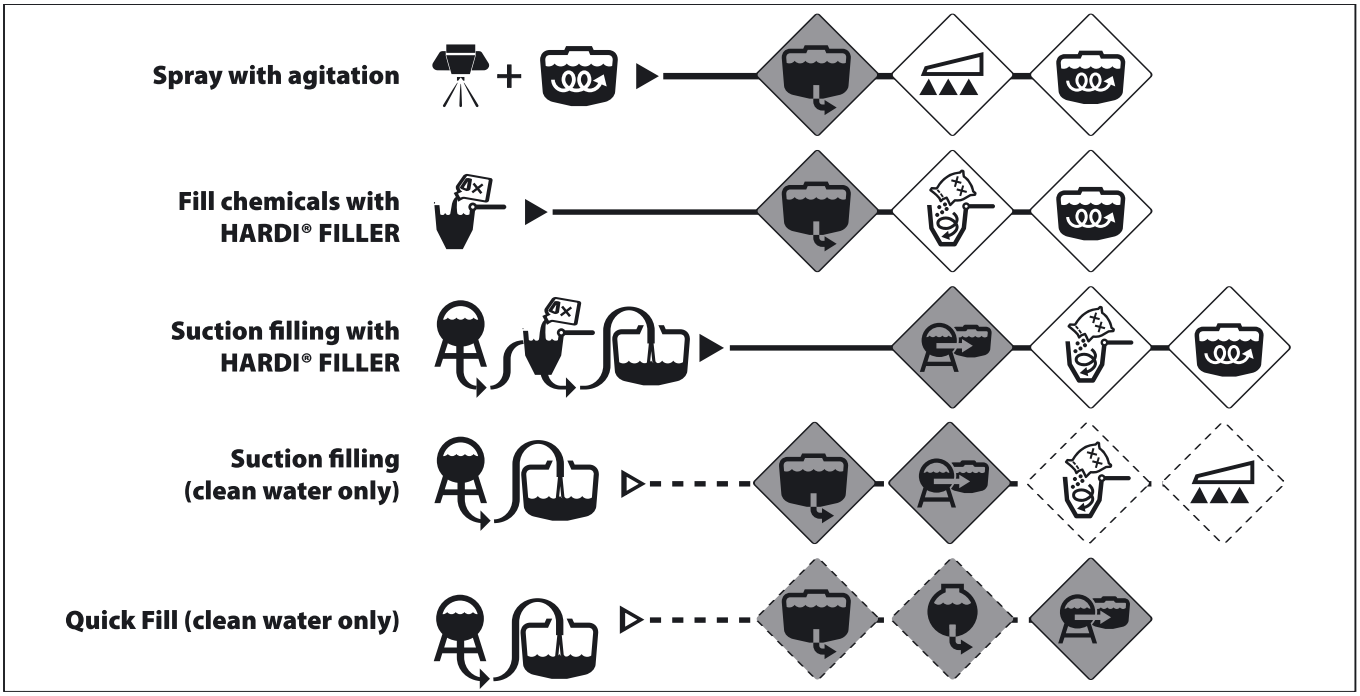
In order to close the entire boom, switch ON/OFF (3) to OFF position. This returns the pump output to the tank through the return system. The diaphragm Non-drip valves ensure instantaneous closing of all nozzles.

In order to close one or more sections of the boom, switch the relevant distribution valve (7) to off position. The pressure equalization ensures that the pressure does not rise in the sections which are to remain open.

On the sprayer, the bottom Suction Manifold valve should be turned toward "Suction from Main tank". The top Pressure Manifold valve should be turned toward "Spraying" and the bottom Pressure Manifold valve to "Agitation" if necessary.

Quick reference - Operation

In the following diagram, valve positions for different options are described.



Cleaning

General info

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

ATTENTION! Always read the individual paragraphs. Read instructions for service/maintenance jobs carefully before starting on the job. If any portion remains unclear or requires facilities which are not available, then for safety reasons please leave the job to your HARDI® dealer's workshop.

ATTENTION!

Clean sprayers are safe sprayers.

Clean sprayers are ready for action.

Clean sprayers cannot be damaged by pesticides and their solvents.

Guidelines

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

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

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

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

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

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

7. Generally most products are corrosive, it is recommended to coat all metal parts of the sprayer before and after use with a suitable rust inhibitor.

Cleaning the tank and liquid system

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.

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.

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 Cyclone filter can be flushed by engaging the lever in the bottom to flush position.

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

9. If the pesticides used have a tendency to block nozzles and filters, it is good practice to remove and clean them immediately.

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

ATTENTION! It is advisable to increase the forward speed (double if possible) and reduce the pressure to 20 psi (1.5 bar) when spraying diluted remaining liquid in the field just sprayed.

ATTENTION! If a cleaning procedure is given on the chemical label, follow it closely.

ATTENTION! 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. Check it regularly.

Use of flush tank and rinsing nozzles

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. This cleaning procedure is divided in two main steps:

Cleaning of the liquid system:

1. Empty the sprayer as much as possible. Close the bottom Pressure Manifold valve (no agitation) and spray till air comes out of all nozzles.

2. Turn Suction Manifold valve towards "Flush tank" and top Pressure Manifold valve to "Spray" with control unit turned "Off"

3. Engage and set the pump at approximately 300 r.p.m.

4. When 1/2 of content in flush tank is used, turn Suction valve towards "Main tank" and operate all valves on the pressure side of the system, so all hoses and components are rinsed. If equipped with HARDI® FILLER, open bottom valve, engage the hopper rinsing device and close it again when clean water comes out. With HARDI® FILLER lid closed, squeeze Chemical Container Cleaning lever to clean the hopper. Open HARDI® FILLER lid and open the bottom valve again until the hopper is empty. When empty, close the HARDI® FILLER bottom valve.

5. Turn the top Pressure Manifold Valve towards "Spray" and spray liquid in the field you have just sprayed.

Cleaning of Main tank:

6. Turn the Suction valve towards "Flush tank" and bottom Pressure valve towards "Tank Rinsing".

7. When another 1/4 of contents in flush tank are used, then turn Suction valve towards "suction from Main tank" and bottom Pressure valve "Off" (no agitation).

8. Turn top Pressure valve towards "Spray" and spray liquid in the field you have just sprayed.

9. Repeat steps 6 - 8 one more time.

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

Cleaning of the liquid system before main tank is empty:

1. Turn Suction valve towards "Flush tank" and top Pressure valve towards "Spraying" position.

2. Close bottom Pressure valve (no agitation).

3. Close return valve on Cyclone filter (if fitted) to prevent clean water from diluting tank contents.

4. Make sure control unit is switched "On" with all distribution valves open (boom spraying position).

5. Engage the pump and spray water from Flush tank in the field until all nozzle tubes/nozzles are flushed with clean water.

6. Disengage pump again.

ATTENTION! The rinsing nozzles cannot always guarantee a 100% cleaning of the tank. Always clean manually with a brush afterwards, especially if crops sensitive to the chemical just sprayed are going to be sprayed afterwards!

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

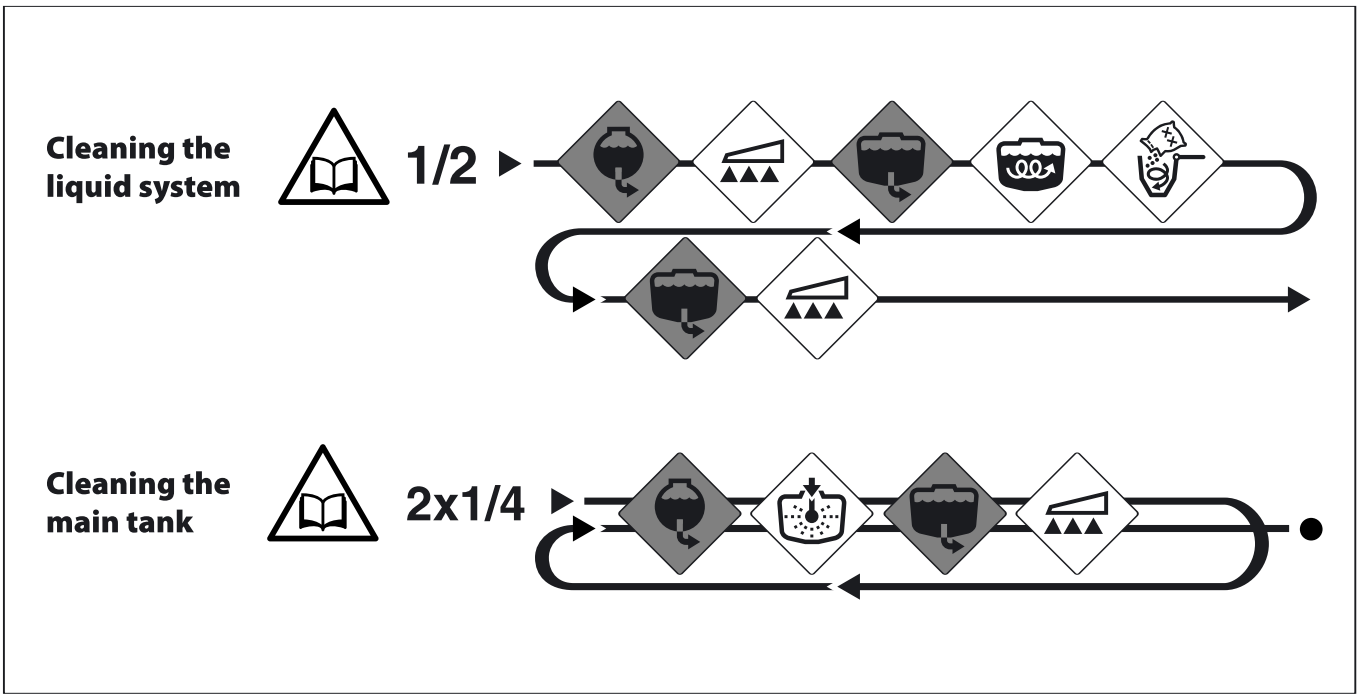
ATTENTION! If a cleaning procedure is given on the chemical label, follow it closely.

ATTENTION! When flushing the pump before main tank is empty (B - above), make sure all distribution valves are open, agitation is "Off" and Cyclone filter return is "Off" whenever the pump is running to prevent clean water from returning to the tank and diluting the contents.

ATTENTION! If the sprayer is cleaned with a high pressure cleaner, lubrication of the entire machine is recommended.

Quick reference - Cleaning

In the following diagram, valve positions for different options are described.



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.

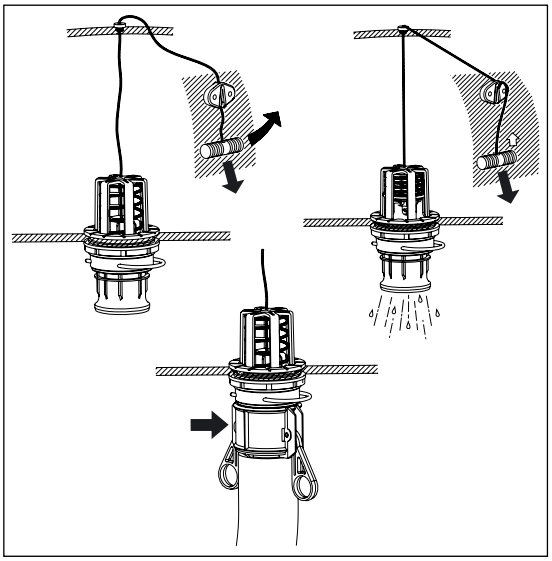
This Technical Residue is defined as the remaining liquid quantity in the system as the first clear pressure drop on the pressure gauge is read.

The residues in the tank should be diluted immediately in the relationship 1:10 with clean water and sprayed onto the crop just sprayed before cleaning the sprayer.

Using the drain valve

The drain valve is located and operated from the left hand side of the sprayer near the boom transport bracket. Pull the string to open the drain valve. The valve is spring-loaded, but can be kept open by pulling the string upwards in the V-shaped slit. To release, pull the string downward 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.

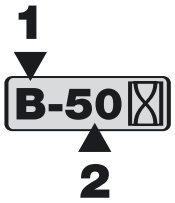


Spray Technique - see separate book.

Optional extras - see separate books.

Lubrication

General info



Always store lubricants clean, dry and cool - preferably at a constant temperature - to avoid contamination from dirt and condensed water. 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.

Always follow the shown direction concerning recommended quantity. If no recommended quantity is given, feed lubricator until new grease becomes visible.

Pictograms in lubrication & oiling plans tell the following:

1. Lubricant to be used (see "Recommended lubricants").

2. Operating hours before next lubrication.

ATTENTION! If the sprayer is cleaned with a high pressure cleaner, lubrication of the entire machine is recommended.

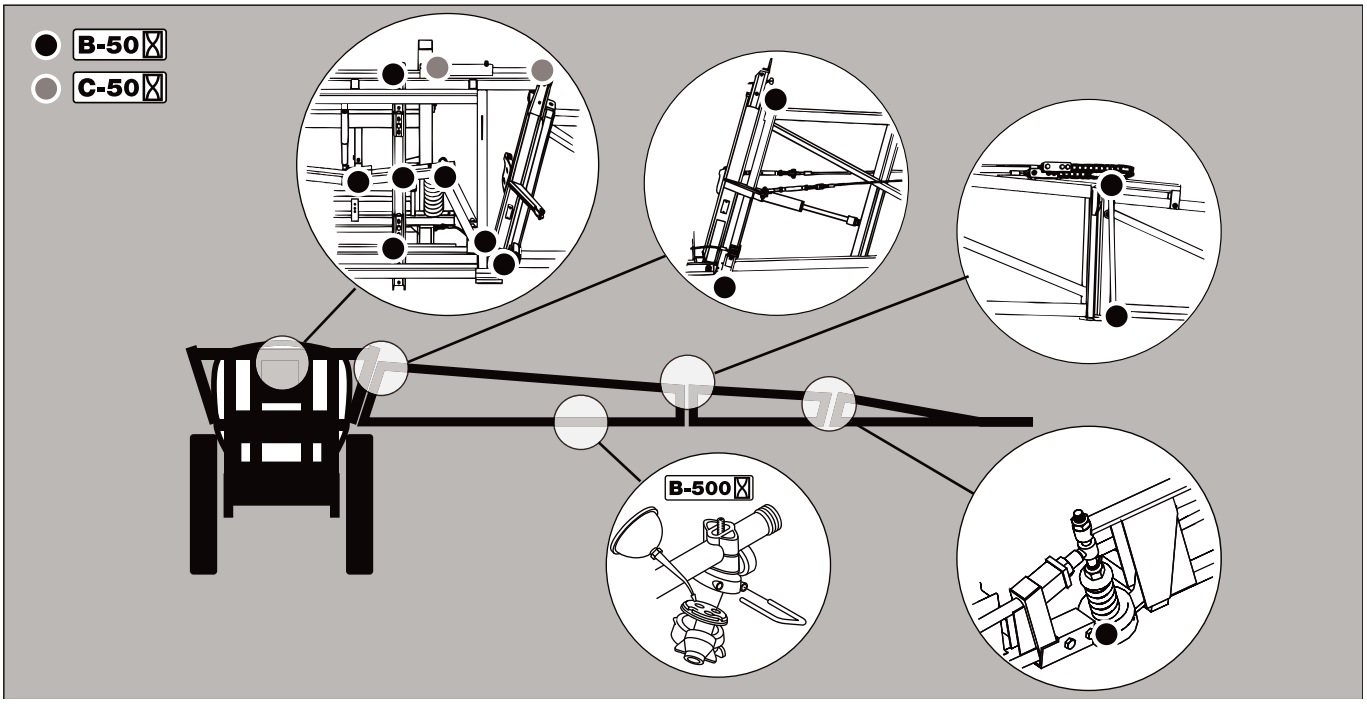
Recommended lubricants

A
BALL BEARINGS:
Universal Lithium grease, NLGI No. 2
SHELL RETINAX EP2
CASTROL LMX GREASE

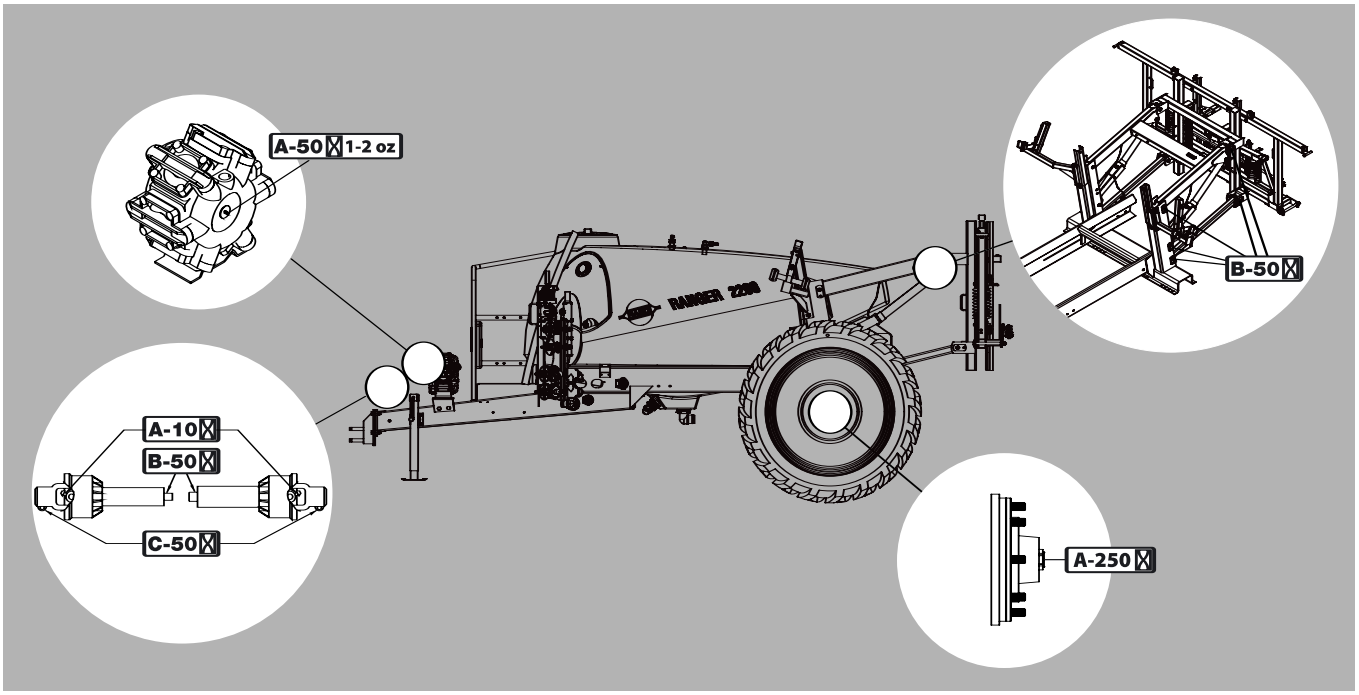
B
SLIDE BEARINGS:
Lithium grease with
Molybdenumdisulphide or graphite
SHELL RETINAX HDM2
CASTROL MOLYMAX

C
OIL LUB. POINTS:
TOTAL Transmission TM
SAE 80W/90
Castrol EPX 80W/90
SHELL Spirax 80W/90
Mobil Mobilube 80W/90

Boom lubrication & oiling plan

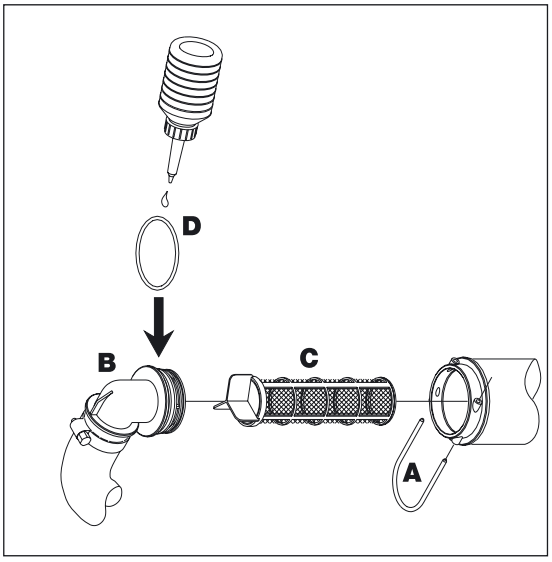


Trailer lubrication & oiling plan



Service and Maintenance intervals

10 hours service - Suction filter



To service the suction filter:

1. Turn Black Suction Valve to "O" (OFF) position.
2. Pull out the steel clip (A).
3. Lift the suction hose fitting (B) from housing.
4. Filter guide and filter (C) can now be removed.

To reassemble:

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

DANGER! Top Pressure Manifold valve must always be turned to the off position before opening the Cyclone filter! If not, then spraying liquid can hit you when opening the filter and drain from the tank!

10 hours service - Cyclone filter

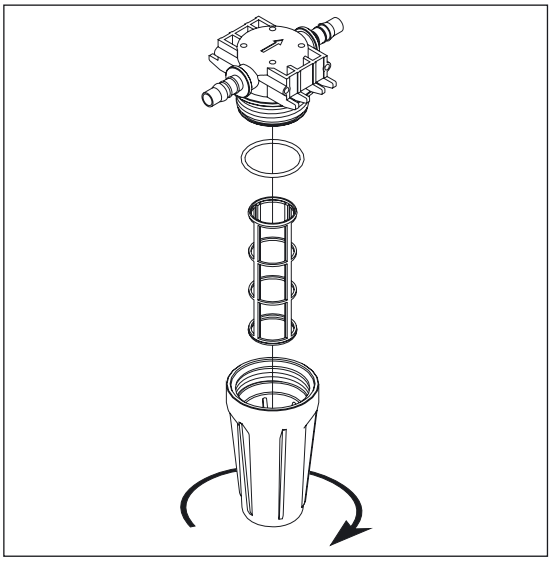
To service the Cyclone filter:

1. Turn top Pressure Manifold valve "Off".
2. Unscrew filter lid (A).
3. Lift the lid and filter (B) from housing.
4. Separate filter from the integrated filter guide in the lid and clean the filter.

To reassemble:

1. Grease the two O-rings on the lid/filter guide. Due to small space at lid for example use a brush to grease with.
2. Mount the filter onto the recess (which may not be greased) in the lid/filter guide.
3. Place the filter/filter lid into housing and screw the lid until it hits the stop.

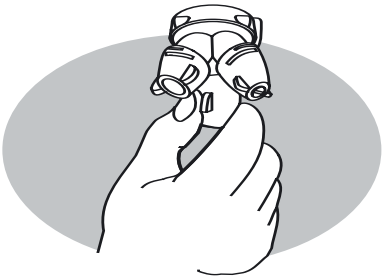
Boom Filters



If the boom is equipped with In-Line Filters unscrew the filter bowl to inspect and clean the filter. When reassembling the O-ring should be greased.

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

10 hours service - Nozzle filters



Check and clean.

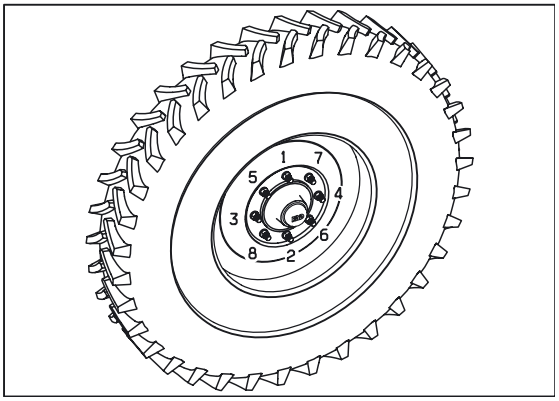
10 hours service - Spraying circuit

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.

50 hours service - Transmission shaft

Check function and condition of the transmission shaft protection guard. Replace possible damaged parts.

50 hours service - Wheel bolts and nuts



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

Wheel hub to rim plate: 650Nm (479 ft/lb)

Tightening sequence: See illustration and tighten in order of numbering.

50 hours service - Tire pressure

Check the tire pressure according to the table in "Technical specifications".

DANGER! Never inflate tires more than to the pressure specified in the table. Over-inflated tires can explode and cause severe personal injuries! See the part "Occasional maintenance - Change of tire".

WARNING! If replacing tires, always use tires with min. load index as specified.

250 hours service - Readjustment of the boom

See section "Occasional maintenance".

250 hours service - Hydraulic circuit

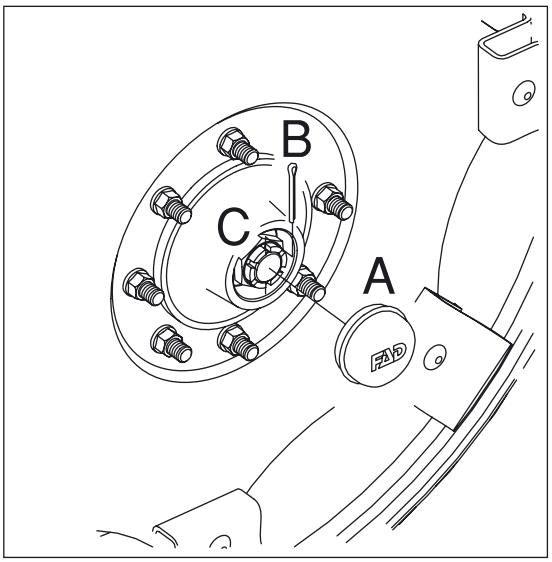
Check the hydraulic circuit for leaks and repair if any.

WARNING! Hoses for boom lifting device must be changed after every 5 years of use.

250 hours service - Hoses and tubes

Check all hoses and tubes for possible damages and proper attachment. Replace damaged hoses or tubes.

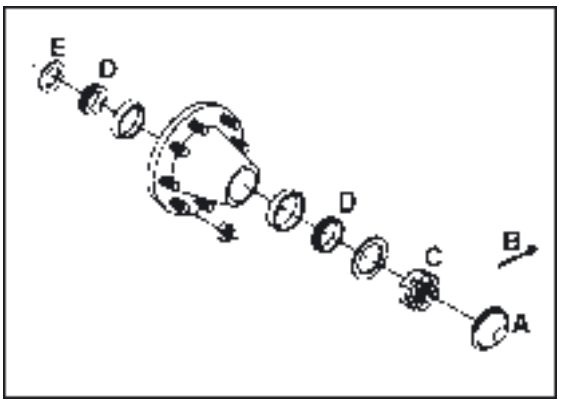
250 hours service - Wheel bearings



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 castle 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 pin and bend it.
7. Fill the hub cap with fresh grease and screw it on to the hub again.
8. Repeat the procedure on LH wheel.

1000 hours service - Wheel bearings



Check the condition of the bearings in the following way:

1. Place stop wedges in front of and behind LH wheel and jack up RH wheel.

2. Support the trailer with axle stands.

3. Remove the wheel.

4. Remove the hub cap (A), cotter pin (B) and castle nut (C).

5. Pull off the wheel hub assembly. Use a wheel puller if necessary.

6. Remove roller bearings (D), clean all parts in degreasing detergent and dry them. Replace if worn or damaged.

7. Fill the hub and bearings with fresh grease.

8. Assemble the hub and bearings using a new sealing ring (E).

9. Fit castle nut. Rotate hub and tighten castle nut until a slight rotation resistance is felt.

10. Loosen castle nut again until the first notch is aligned with the cotter pin hole in the shaft.

11. Fit a new cotter pin and bend it.

12. Fill the hub cap with fresh grease and carefully press it onto the hub.

13. Replace the wheel and tighten the wheel nuts (See "50 hours service - Wheel bolts and nuts" for torque settings).

14. Tighten again after 10 hours of work. Check the torque every day until it is stabilized.

ATTENTION! The shaft has a vertical and a horizontal cotter pin hole. Use the one first aligned with the notch when loosening the castle nut.

WARNING! If you do not feel totally confident changing wheel bearings, contact your HARDI® dealer's workshop.

1000 hours service - Transmission shaft

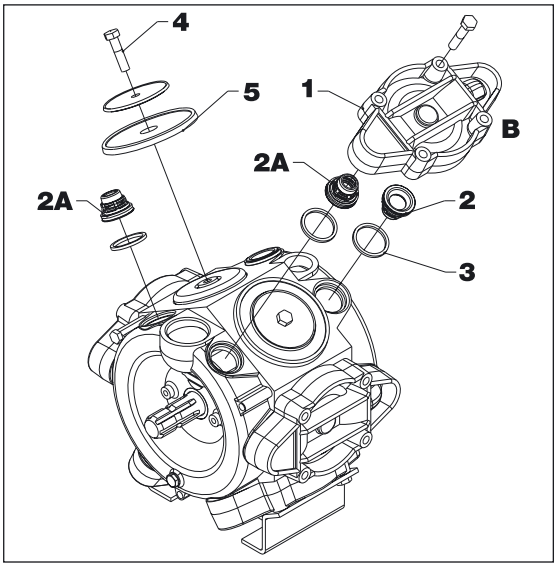
Change the protection tube nylon bearings as described under "Shield replacement on transmission shaft".

Occasional maintenance

General info

The maintenance and replacement intervals for the following will depend very much on the conditions under which the sprayer will be operated and are therefore impossible to specify.

Pump valves and diaphragms replacement



Model 363 pump:

Diaphragm pump overhaul kit (valves, seals, diaphragms etc.) can be ordered. Pump kit can be ordered at following HARDI® part No.:

Model 363: part No. 75073700

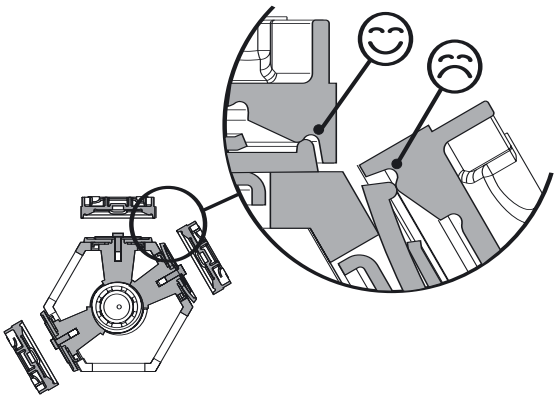
Valves

Remove valve cover (1). Before changing the valves (2) - note their orientation so they are replaced correctly!

ATTENTION! A special valve with white flap (2A) is used at the two upperside inlets. It has to be placed in the valve openings as shown. All others are the type with black flap. It is recommended to use new gaskets (3) when changing or checking the valves.

Diaphragms

Remove the diaphragm bolt (4). The diaphragm (5) may then be changed. If fluids have reached the crankcase, re-grease the pump thoroughly. Also check that the drain hole at the bottom of the pump is not blocked.



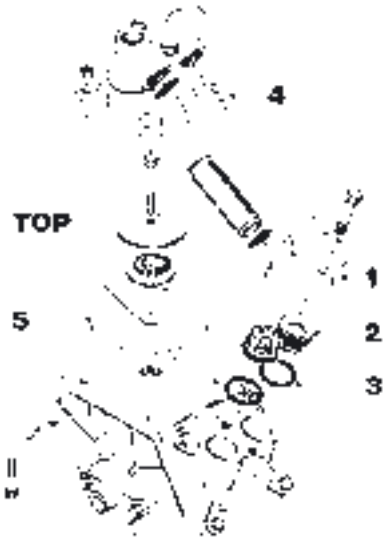
Reassemble pump model 363 with the following torque setting.

363 Diaphragm cover: 50 Ft/lb (70 Nm)

363 Diaphragm bolt: 45 Ft/lb (60 Nm)

ATTENTION! Before tightening the 4 bolts for the diaphragm cover (B) the diaphragm must be positioned between center and top to ensure correct sealing between diaphragm pump housing and diaphragm cover. Turn crank shaft if necessary.

Pump valves and diaphragms replacement



Model 1303 pumps:

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

Model 1303: part No. 75073600

Valves

Remove valve cover (1). Before changing the valves (2) - note their orientation so they are replaced correctly! It is recommended to use new O-rings (3) when changing or checking valves.

Diaphragms

Remove the diaphragm cover (4). Remove the diaphragm bolt. The diaphragm (5) may then be changed. If fluids have reached the crankcase, re-grease the pump thoroughly. Also check that the drain hole at the bottom of the pump is not blocked.

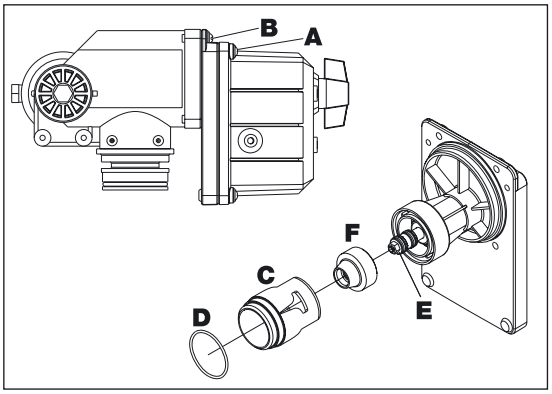
Reassemble with the following torque setting.

Valve cover: 45 Ft/lb (60 Nm)

Diaphragm cover: 50 Ft/lb (70 Nm)

Diaphragm bolt: 45 Ft/lb (60 Nm)

Cone check/replacement for EVC operating unit

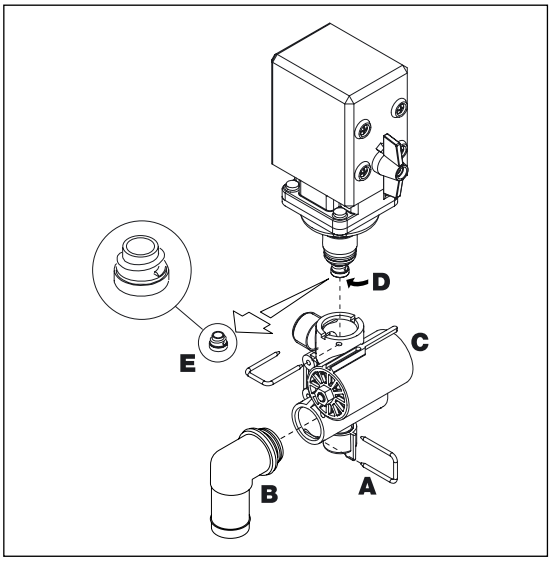


If it becomes difficult to build up sufficient pressure or if pressure fluctuations occur, it may be necessary to replace cone and cylinder.

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 for EVC distribution valve

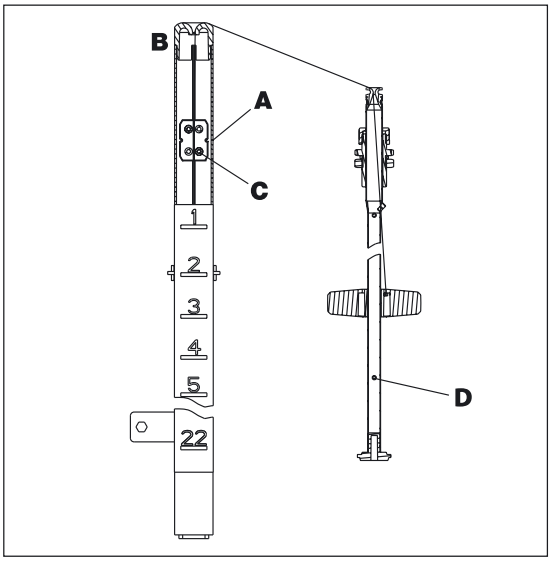
Periodically check the distribution valves for proper sealing. Do this by running the sprayer with clean water and open all distribution valves. Cautiously remove the clip (A) and pull out the hose (B) for the return line. When the housing is drained, there should be no liquid flow through the return line. 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.



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.



Level indicator cord replacement

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 "Drain valve seal replacement") 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 enter the inside of the tank - the parts can be changed from the outside of the tank!

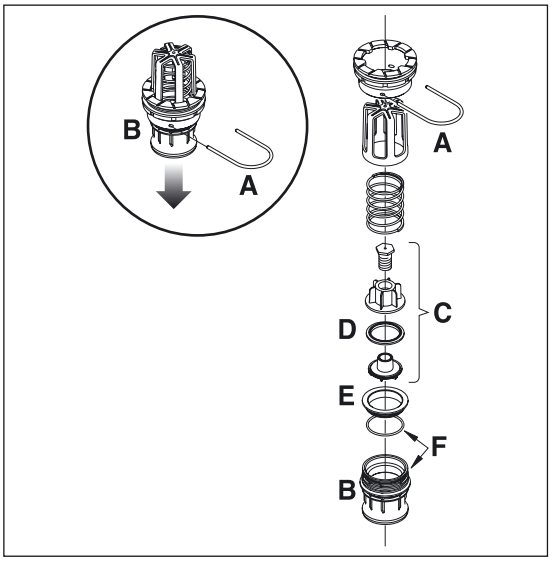
6 - Maintenance

Drain valve seal replacement

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 the outside of the tank!

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

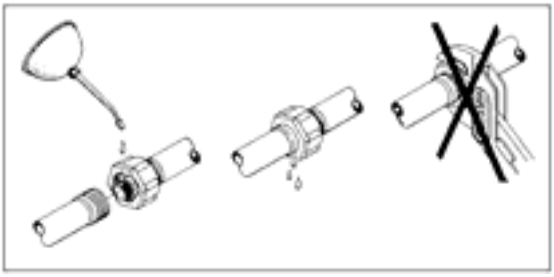


ATTENTION! Check function of valve with clean water before filling chemicals into the tank.

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



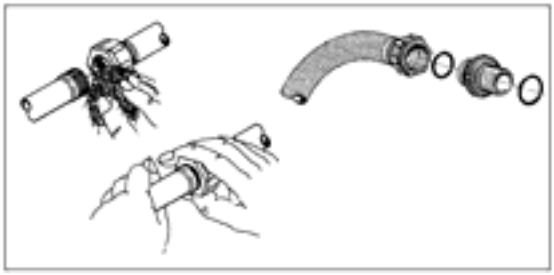
In case of leaks:

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 non-mineral lubricant.

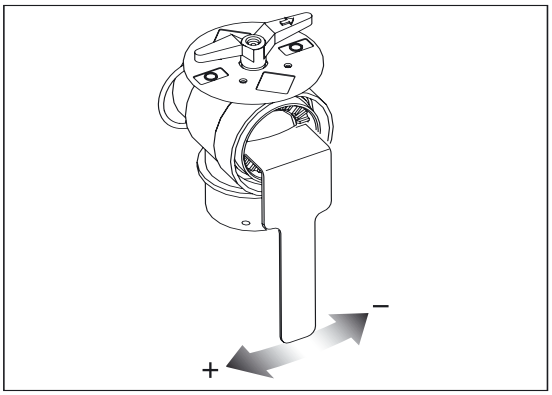
For AXIAL connections, a little mechanical leverage may be used.

For RADIAL connections only hand-tighten them.



Adjustment of 3-way-valve

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.



Readjustment boom - general info

Before commencing adjustment jobs please go through this check list.

1. The sprayer must be well lubricated (see part about lubrication).

2. Connect the sprayer to the tractor.

3. Place tractor and sprayer on level ground (horizontal).

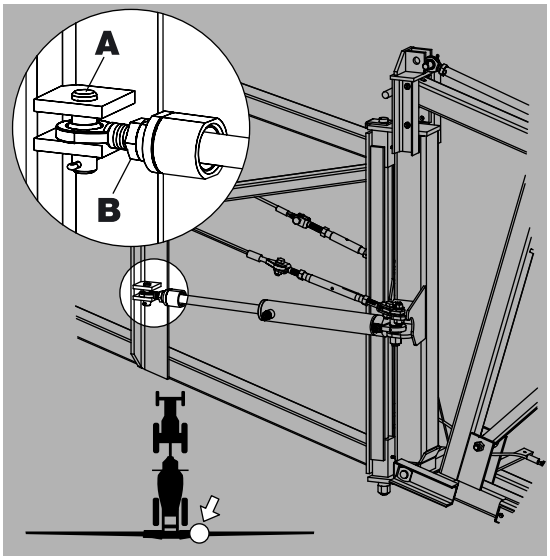
4. Unfold boom.

5. Set slanting angle to neutral position (horizontal).

Adjustment of hydraulic cylinders are done without pressure in the system.

WARNING! Nobody is allowed to be under the boom while adjustment is carried out.

Alignment of center and inner wing sections



1. Unfold the boom and check alignment of the inner section with the center section.

2. If adjustment is necessary, relieve pressure from the cylinder by folding the boom a few inches.

3. Disconnect cylinder rod eye (A) from the inner section. Note that some cylinder rods have a machined flat which can be used for adjustments. If using this one for adjustment, leave the rod eye pinned to the boom.

4. Loosen jam nut (B) and adjust the length of the rod eye (A).

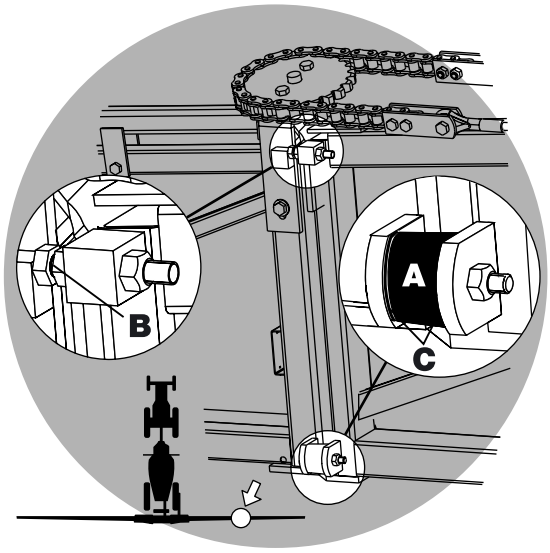
IN = to move the boom forward

OUT = to move the boom rearward

5. Tighten the jam nut (B) again. (Reattach the cylinder rod to the boom again, if it has been loosened).

6. Pressurize the cylinder to check boom alignment.

Alignment of inner and outer wing sections



1. Unfold the boom and check that the boom wing is aligned. If adjustment is needed:

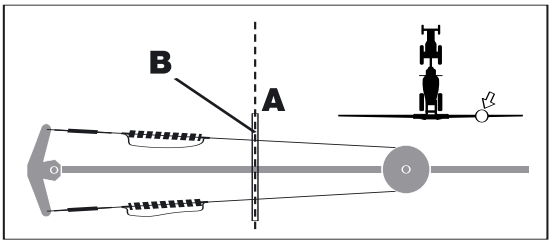
2. Remove rubber stop (A) from the inner section.

3. Adjust the position of the adjusting bolt (B) on the inner section so that the cap of the bolt head (B) contacts top stop plate on outer section with inner and outer sections aligned. Tighten it in this position.

4. Replace stop device (A).

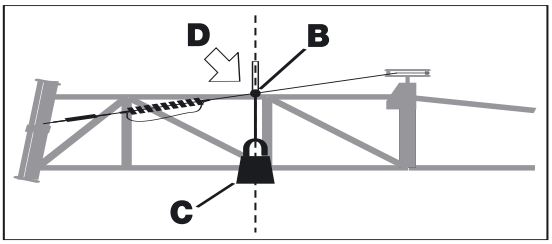
Please note that the rubber stop (A) should be compressed 3-5 mm. Therefore, check that the distance between the tabs (C) is a little less than the length of the rubber stop itself. The rubber stop may need to be spaced out with 1 or more flat washers in order to obtain correct compression. Tighten nut to hold it in place.

Adjusting the front fold cable



The performance of the SPB boom while spraying depends very much on the front fold cable adjustment. A correctly adjusted cable will also control the movement of the outer section.

WARNING! The rear cable can snap and injure you or someone else if tensioned when the boom is unfolded. Always adjust the front cable first - with the boom unfolded and the rear cable last - with the boom folded in transport



1. Unfold the boom.

2. Check security of turnbuckle anchors to its hinges.

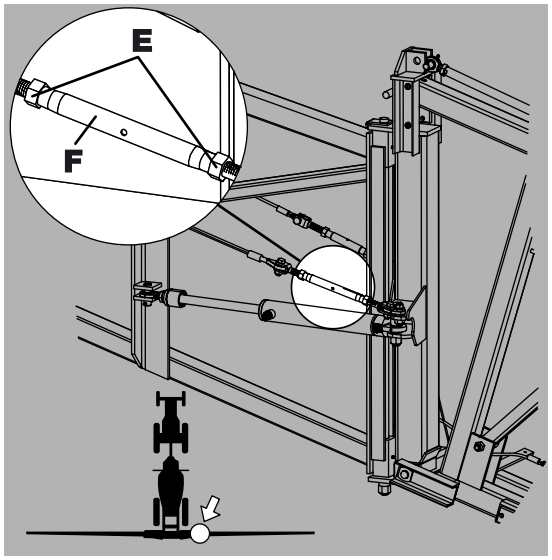
3. Slide a straight edge (A) down the underside of the inner section until it contacts the front cable = contact point (B).

4. Suspend a 10 lb (4.5 kg) weight (C) from the straight edge-to-cable contact point (B) and check deflection by measuring the distance from the straightedge to the cable (D). Cable should deflect .25 - .50 in. (13-22 mm).

If adjustment is needed:

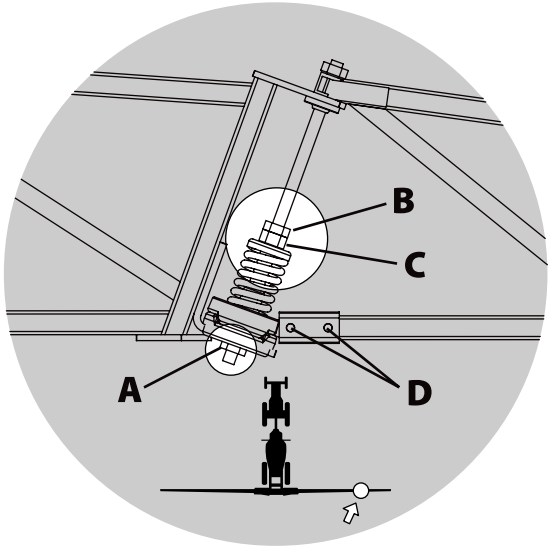
5. Loosen jam nuts (E) on the turnbuckle assembly and adjust turnbuckle (F) for proper cable deflection.

6. Tighten jam nuts (E) again and remove weight.



WARNING! Check boom alignment again. If front cable was tightened, the wing assembly will move a bit forward. If front cable was loosened, the wing assembly will move a bit rearward. Therefore, adjust fold cylinder, if necessary, as described in the section 'Alignment of center section and inner wing sections'.

Breakaway section adjustment



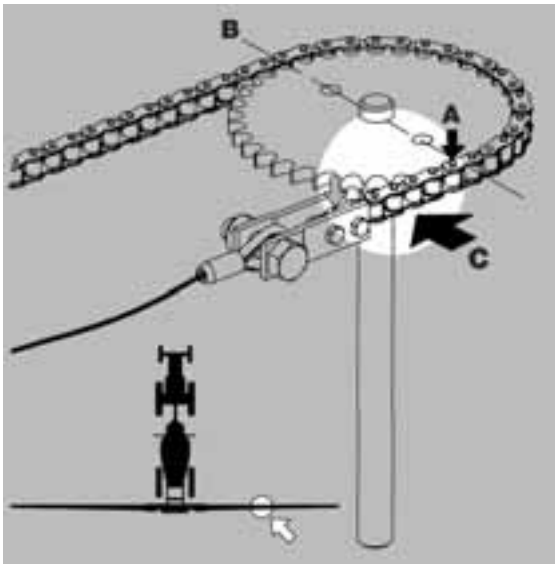
The function of the breakaway section is to prevent or reduce boom damage, should it strike an object or the ground.

Check that the lower nut (A) is fully tightened. The breakaway should release with a force of 18 lbs (80 N) at the extremity. Please note that the clutch must be well greased before adjustment is commenced.

To adjust, loosen jam nut (B). Tighten nut (C) to stiffen clutch action. Tighten jam nut (B) after adjustment.

ATTENTION! Properly lubricate clutch assembly before adjusting the tension. Bolts (D) must be torqued to 40 Ft/lb (55 Nm) every 40 hours to prevent boom damage. Lubricate every 8 hours to ensure maximum performance and life.

Check/adjust sprocket timing



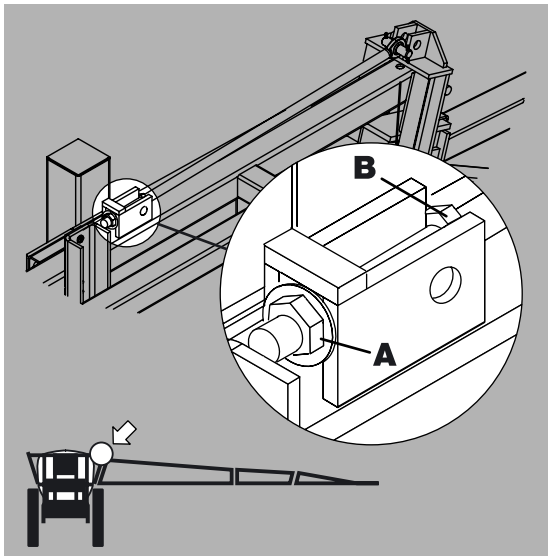
1. Unfold the boom and stand on its rear side.

2. Check that the pin connection (A) in the timing chain is aligned with the center line (B) between the sprocket. Note forward driving direction (C) - adjustment is done at rearside of the boom. (A) is the 7th pin connection on the chain.

3. To adjust timing, loosen turnbuckles on the front and rear cables until slack.

4. Line up the chain and sprocket as indicated in step 2 above.

Adjusting boom level to ground



Unfold the boom and check that the boom sections are parallel to the center frame and level to the ground. Adjust if necessary, as described below. Adjustment is carried out with the boom unfolded.

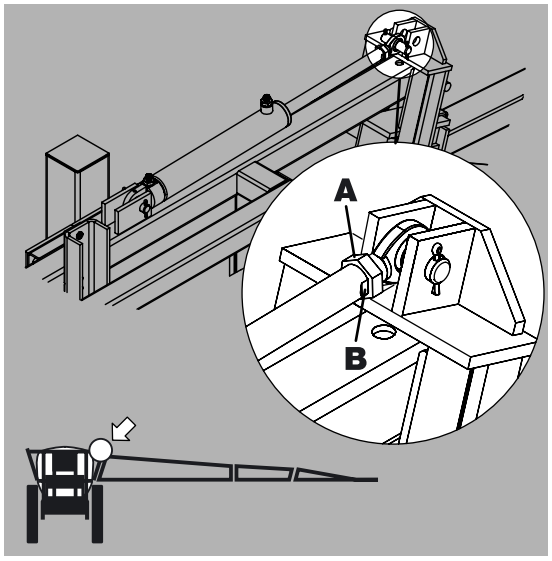
For SPB-HY models the following procedure is used:

1. Loosen jam nut (A).

2. Adjust nut (B) - in or out - until boom wing is level to the ground.

3. Secure jam nut (A) again.

Same procedure applies to both sides.



For SPB-EOH (Electric over Hydraulic) models the following procedure is used:

1. Ensure that cylinder is fully extended.

2. Loosen jam nut (A).

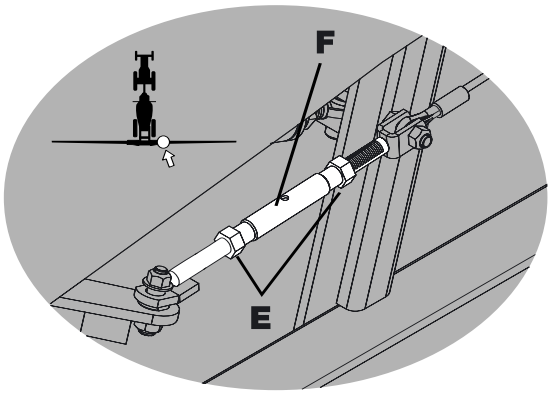
3. Apply an adjustable wrench to the machined surface at (B).

4. Turn the cylinder rod until boom is level to the ground.

5. Secure jam nut (A) again.

Same procedure applies to both sides.

Adjusting rear cable



1. Raise boom to its highest position. Fold it to transport position with tilt cylinders fully extended. Make sure that fold cylinders are pressurized and that the boom is folded all the way in.

2. Ensure the boom transport brackets are in contact with the outer wing. Adjust if necessary.

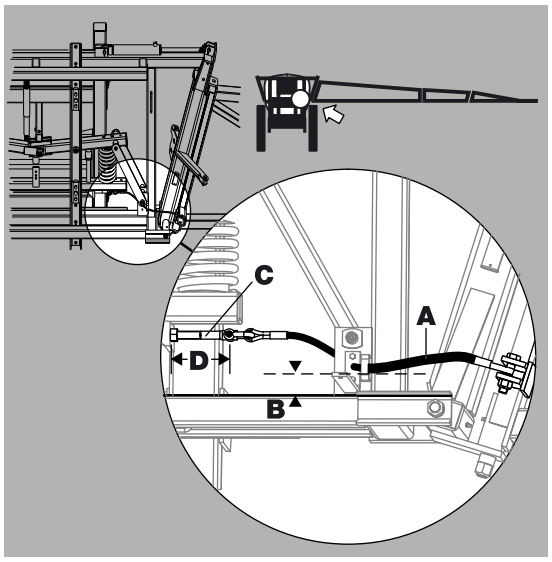
3. Loosen the jam nuts (E) on the ends of turnbuckle (F). Adjust the turnbuckle (F) so that the outer section contacts the boom transport bracket.

Turn the turnbuckle another 4 complete turns.

4. Secure jam nuts (E) again.

WARNING! The rear cable can snap and injure you or someone else if tensioned when the boom is unfolded. Always adjust the front cable first - with the boom unfolded and the rear cable last - with the boom folded in transport position.

Adjusting center section cables



The center section cables keep the center frame in correct position during folding procedure or when spraying with one side raised and folded (SPB-EOH only).

1. Fold the boom into transport position.

2. Check that the tilt cylinders are completely extended. Adjust if necessary (SPB-EOH only).

3. Check that center section cable (A) is routed over center section nozzle bracket (B).

4. Loosen jam nuts on the bolt assembly (C). This applies both boom wings.

5. Adjust the threaded bolt(s) (C). Alternate from side-to-side while making adjustments. As a guideline for adjustment, the distance (D) shown at the bolt assembly should be 4-5/16" (110 mm). Properly adjusted cables will be very tight and only deflect a small amount (fractions of an inch) when pulled by hand. Note that cables will be loose when the boom is unfolded.

6. Tighten jam nuts on the bolt assembly (C) again.

7. Unfold the boom and inspect that the center frame is correctly centered.

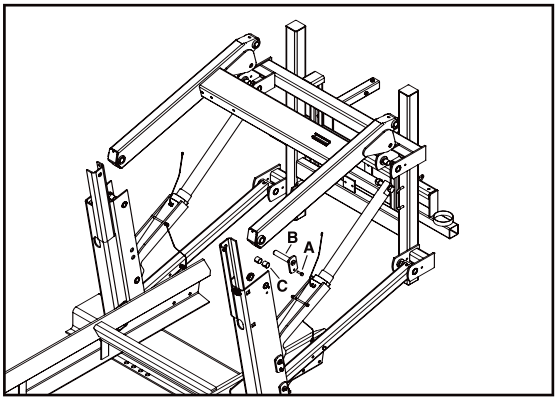
ATTENTION! Adjust both boom wings in one sequence. Adjust one cable a small amount at the time, and then the other cable, to equalize cable tension and maintain a level center frame.

WARNING! Never adjust the center cables without having folded the boom all the way into the transport position.

Shock absorbers

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

Wear bushing replacement on 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 parallelogram arms.

3. The upper arms must be disconnected simultaneously.

4. Remove the screws (A), and pull out the pins (B) for the upper parallelogram arms and replace the wear bushings (C).

5. Replace the arms.

6. Repeat this procedure with each of the lower arms.

7. Grease all grease nipples.

8. Remove the lifting gear again.

Change of tire

Should it be necessary to replace tires, it is recommended to leave this to a specialist and follow the mentioned rules.

1. Always clean and inspect the rim before mounting.

2. Always check that the rim diameter corresponds exactly to the rim diameter molded on the tire.

3. Always inspect inside of the tire for cuts, penetrating objects or other damages. Repairable damages should be repaired before installing the tube. Tires with unrepairable damages must never be used.

4. Also inspect inside of the tire for dirt or foreign bodies and remove it before installing the tube.

5. Always use tubes of recommended size and in good condition. When fitting new tires always fit new tubes.

6. Before mounting, always lubricate both tire beads and rim flange with approved lubricating agent or equivalent anti-corrosion lubricant. Never use petroleum based greases and oils because they may damage the tire. Using the appropriate lubricant the tire will never slip on the rim.

7. Always use specialized tools as recommended by the tire supplier for mounting the tires.

8. Make sure that the tire is centered and the beads are perfectly seated on the rim. Otherwise danger of bead wire tear can occur.

9. Inflate the tire to 15-19 p.s.i. (100-130 kPa) then check whether both beds are seated perfectly on the rim. If any of the beads do not seat correctly, deflate the assembly and re-center the beads before starting inflation of the tire. If the beads are seated correctly on the rim at 15-19 p.s.i., inflate the tire to a maximum of 36 p.s.i. (250 kPa) until they seat perfectly on the rim.

10. Never exceed the maximum mounting pressure molded on the tire!

11. After mounting tires adjust inflation pressure to operation pressure recommended by the tire manufacturer.

12. Do not use tubes in tubeless tires.

⚠ DANGER! Non observance of mounting instructions will result in the bad seating of the tire on the rim and could cause the tire to burst leading to serious injury or death!

⚠ DANGER! Never mount or use damaged tires or rims! Use of damaged, ruptured, distorted, welded or brazed rim is not allowed!

Change of bulbs

1. Switch off the light.

2. Loosen the screws on the lamp and remove the cover or lens.

3. Remove the bulb.

4. Fit a new bulb, refit the cover and tighten the screws.

ATTENTION! If halogen bulbs are used, never touch the bulb with the fingers. Natural moisture in the skin will cause the bulb to burn out when the light is switched on. Always use a clean cloth or tissue when handling halogen bulbs.

Shield replacement on transmission shaft

1. Remove bolt (A), lock (B) and grease nipple (C). Twist uni CV-joint cover 1/4 turn and pull it backwards.

2. Remove the synthetic bearings and protection tube.

2a. Remove inner bush from protection tube.

3. Assemble again in reverse order, using new parts where necessary. Remember to fit chains again.

4. Grease bearings.

5. Repeat procedure to the opposite part of the transmission shaft.

ATTENTION! Only use genuine HARDI® spare parts to service the transmission shaft.

Replacement of transmission shaft cross journals.

1. Remove protection guard as described previously.

2. Remove Seeger circlip rings.

3. Press the cross journal sidewards - use hammer and mandrel if necessary.

4. Remove needle bearing cups and cross journal can now be removed.

5. Carefully remove needle bearing cups from new cross journal and install it in reverse order. Before fitting the needle bearing cups again, check that needles is placed correctly. Avoid dust and dirt in the new bearings.

6. Repeat procedure to the opposite part of the transmission shaft.

Off-season storage

Off-season storage program

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

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

2. Replace possible damaged seals and repair possible 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 off 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. If stored in a frost affected area, pour approx. 50 litres of 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, operating unit, chemical inductor etc. allowing the anti-freeze mixture to be distributed around the entire circuit. Open the operating unit main on/off valve 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. Lubricate all lubricating points according to the lubricating scheme - regardless of intervals stated.

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

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

9. Apply a thin layer of anti-corrosion 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 damp, dirt and corrosion.

12. Remove the control boxes and computer display from the tractor, and store them dry and clean (in-house).

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. Chock up the wheels, to prevent moisture damage and deformation of the tires. Tire blacking can be applied to the tire walls to preserve the rubber.

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

Preparing the sprayer for use after storage

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

1. Remove the cover.

2. Remove the support from the wheel axle 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 electric's.

6. Check all hydraulic and electric functions.

7. Empty the tank for remaining anti-freeze.

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

9. Fill with clean water and check all functions.

Operational problems

General info

In cases where breakdowns have occurred, the same factors always seem to come into play:

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 functions properly. Use clean water to check.

6. Hydraulic components are maintained clean.

7 - Fault finding

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.
	Suction/pressure filters clogged.	Clean filters.
		Check for obstruction near tank sump elbow fitting.
Lack of pressure.	Incorrect assembly.	Check for obstruction near tank sump elbow fitting.
	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 in tank lid is clear.
	Sucking air towards end of tank load.	Lower pump r.p.m.
Pressure increasing.	Pressure filters beginning to clog.	Clean all filters.
		Make sure bottom valve on CycloneFilter is not left in closed position (marked with 1 dot) after flushing boom. Operating position (marked with 2 dots) keeps CycloneFilter clean.
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.p.m.
		Check safety valve is tight (diaphragm systems only).
		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.
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 1/2 turn.
	No power.	Wrong polarity. Check that brown is pos. (+), Blue is neg. (-).
		Check print plate for dry solders or loose connections.
		Check fuse holder are tight around fuse.

Hydraulic system - DH (Direct Hydraulics) model.

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).
	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 if needed.
Ram not functioning.	Restrictor blocked.	Secure boom. Dismantle and clean. Change hydraulic oil & filter.

Hydraulic system - EOH (Electric over Hydraulics) model.

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
No boom movements when activated.	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 if needed.
	Blown fuse(s).	Check / replace fuse in junction box.
	Bad / corroded electrical connections.	Check / clean connections, multi plugs, etc.
	Insufficient power supply.	Voltage on activated solenoid valve must be more than 8 Volts. Use wires of at least 10 awg. ($4mm^2$) for power supply.
	Defective relay / diodes in junction box.	Check relays, diodes and soldering at PCB in junction box.
	Restrictor blocked.	Secure boom. Dismantle and clean. Change hydraulic oil & filter.
Ram not functioning.	Restrictor blocked.	Secure boom. Dismantle and clean. Change hydraulic oil & filter.
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.

7 - Fault finding

Mechanical problems

Mechanical problems

FAULT	PROBABLE CAUSE	CONTROL/REMEDY
Boom will not fold in or out.	Cylinder.	Adjust the fold cylinder.
Boom will not fold completely.	Cables.	Check adjustment of center cables.
Boom not aligned.	Cables.	Adjust and grease complete boom cables and stops.
Boom will not stay in spraying position.	Various.	Check for hydraulic leaks through solenoid block. Check for a solenoid that is stuck open.
Wing to be kept folded swings out when unfolding other side of the boom.	Various.	Boom must be completely unfolded - then fold out the desired boom wing. Check for hydraulic leaks through solenoid block. Check for a solenoid that is stuck open.

Emergency operation - Liquid system

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.

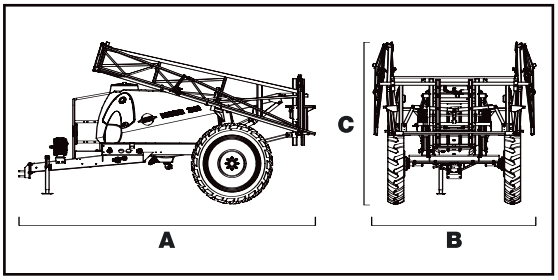
The problem may be due to a blown fuse. A fuse is placed inside the box. Fuse type: Thermo

Dimensions

Overall dimensions

	A	B	C
2200 SPB	206	120	112

All measurements are in inches.



Specifications

Main tank capacity	2500 litres
Clean water tank capacity	20 litres
Flush tank capacity	240 litres
Foam marker tank capacity	100 litres

Weight - 2500l/21m SPB

	Total	Drawbar	Axle
Boom Folded, Main Tank Empty, Flush Tank Empty, Foam Marker Empty	1826	186	1640
Boom Unfolded, Main Tank Empty, Flush Tank Empty, Foam Marker Empty	1806	86	1720
Boom Folded, Main Tank Full, Flush Tank Empty, Foam Marker Empty	4242	962	3280
Boom Unfolded, Main Tank Full, Flush Tank Empty, Foam Marker Empty	4209	869	3340
Boom Folded, Main Tank Full, Flush Tank Full, Foam Marker Full	4446	826	3620
Boom Unfolded, Main Tank Full, Flush Tank Full, Foam Marker Full	4430	730	3700

All measurements are in kilograms.

Wheel and axle dimensions

Wheel	Min. track width	Max. track width	Clearance*
12.4x24"	60" (1520mm)	90" (2250 mm)	18" (460 mm)
13.6x38"	60" (1520mm)	90" (2250 mm)	24" (610 mm)

*under axle

8 - Technical specifications

Specifications

Diaphragm pumps

Pump model 1303/9.0	PSI	RPM	GPM	HP
	0	540	30.1	2.1
	29	540	28.2	2.3
	58	540	27.5	2.3
	88	540	26.9	2.4
	147	540	26.4	3.4
	220	540	25.9	4.4

Pump model 363/5.5	PSI	RPM	GPM	HP
	0	1000	53.1	4.2
	29	1000	50.4	4.3
	58	1000	49.6	4.8
	88	1000	49.1	5.8
	147	1000	47.5	7.5
	220	1000	45.9	9.5

Pump model 363/10.0	PSI	RPM	GPM	HP
	0	540	51.2	2.4
	29	540	49.9	3.1
	58	540	49.1	3.9
	88	540	48.6	4.6
	147	540	48.0	6.4
	220	540	47.0	8.4

Filters and nozzles

Filter gauze width

30 mesh: 0.58 mm

50 mesh: 0.30 mm

80 mesh: 0.18 mm

100 mesh: 0.15 mm

Tank	Suction	Pressure	Line	Nozzle
	OPT			
	STD		OPT	OPT
	OPT	STD	OPT	STD
		OPT	OPT	OPT

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)

Max. pressure on the pressure manifold: 290 psi (20 bar)

Max. pressure on the suction manifold: 100 psi (7 bar)

Tire pressure - Road Transport 40 Km/h

Tire size	Rec. inflation pressure in BAR	P.S.I
14.9 x 24	1.2	17
11.2 x 32	2.1	30
12.4 x 38	1.3	19

⚠ DANGER! Never inflate tires more than to the pressure specified in the table. Over-inflated tires can explode and cause severe personal injuries! See the part "Occasional maintenance - Change of tire".

Materials and Recycling

Disposal of the sprayer

When the equipment has completed its working life, it must be thoroughly cleaned. The tank, hose and synthetic fittings can be incinerated at an authorized disposal plant. The metallic parts can be scrapped. Always follow local legislation regarding disposal.

Materials used:

Tank: HDPE

Hoses: PVC

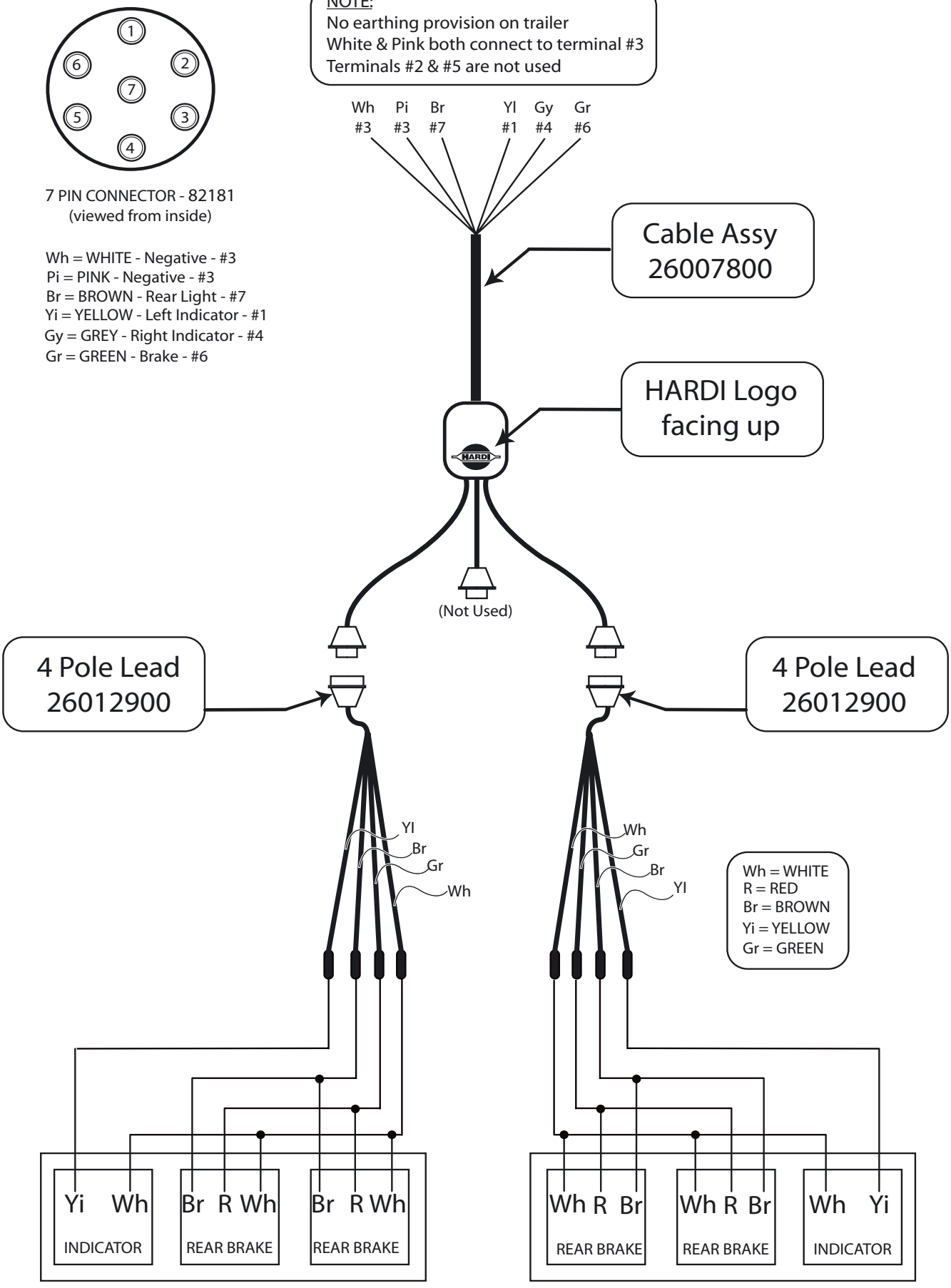
Valves: mainly glass-filled PA.

Fittings: PA

8 - Technical specifications

Electrical connections

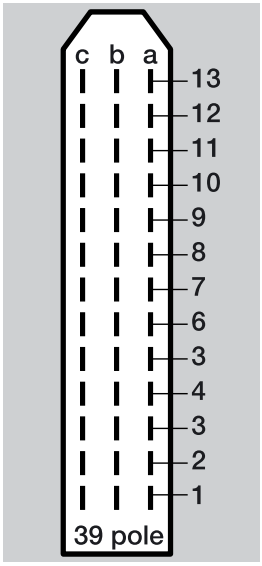
Rear lights

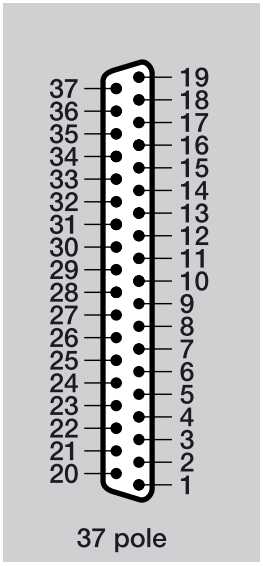


Electrical connections for SPRAY II

39 or 37 poled plug with cable.

39-pole	37-pole	SPRAY II
1a	5	S1+
1b	6	S1-
1c	26	End nozzle L
2a	7	S2+
2b	8	S2-
2c	25	End nozzle R
3a	9	S3+
3b	10	S3-
3c	29	+12V sensor
4a	11	S4+
4b	12	S4-
4c	4	PWM 1TX
5a	14	S5+
5b	15	S5-
5c	27	GND
6a	16	S6+
6b	17	S6-
6c	13	Optional 5 Reg. feedback
7a	18	S7+
7b	19	S7-
7c	33	Option 1 4-20mA
8a	37	S8+
8b	36	S8-
8c	32	Option 2 Frq
9a	35	S9+/Air angle 0-5V
9b	34	S9-/Fan speed 0-5V
9c	not connected	Option 3/Tank gauge
10a	21	On/off+
10b	22	On/off-
10c	not connected	PWM Output option
11a	23	Pressure+
11b	24	Pressure-
11c	28	Flow
12a	20	Foam blop 0-5V
12b	1	option 4 Rx
12c	31	Speed
13a	3	FM L
13b	2	FM R
13c	30	Gnd sensor



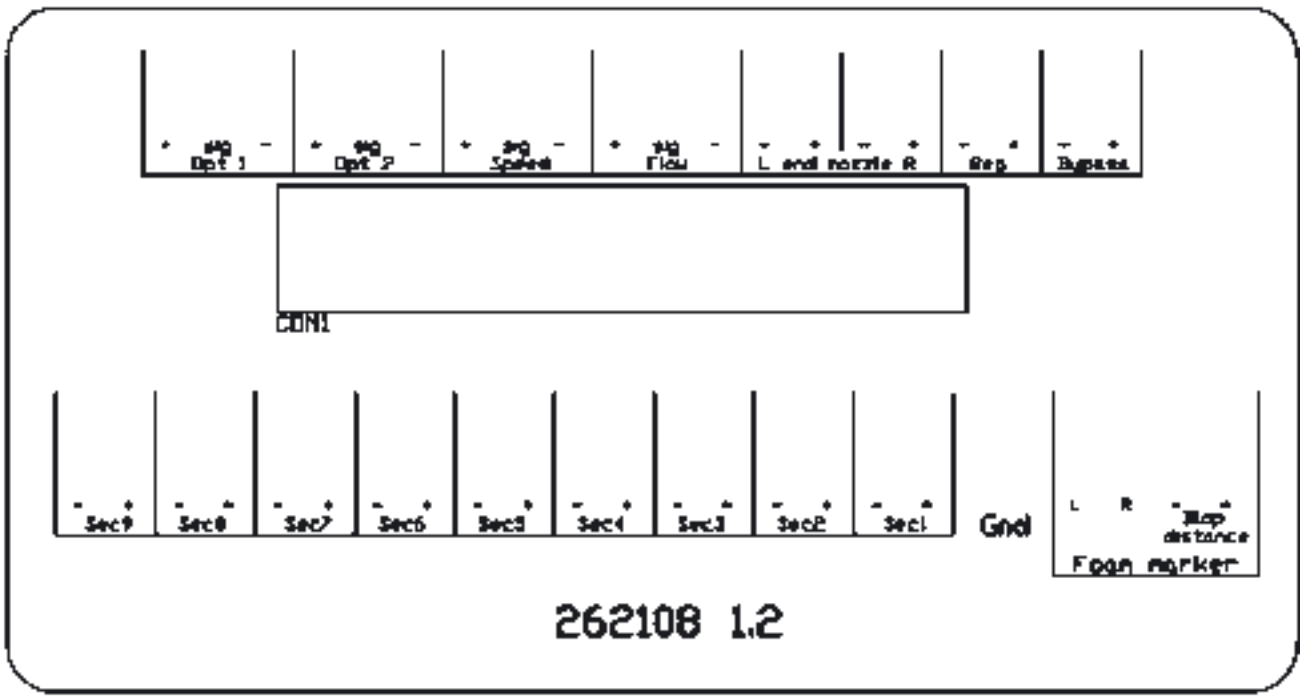


8 - Technical specifications

EVC

The EVC operating unit fulfills the EC noise reduction standards.

When connecting an optional function, be aware that maximum current for every connector is 2 Amp. Total current for the whole connector box may not exceed 10 Amp.



HC 2500	Function	+	Sig.	-
Opt 1	Pressure sensor	Brn	Blu	-
Opt 2	RPM sensor	Brn	Blu	Blk
Speed		Brn	Blu	Blk
Flow		Brn	Blu	Blk
L end nozzle	Pendulum lock at HAY/LPY	Brn		Blu
R end nozzle	Pendulum lock at HAY/LPY	Brn		Blu
Reg (Yellow)		Brn		Blu
Bypass	EC on/off	Brn		Blu
Sec 9	User defined A&B 2	x		x
Sec 8	User defined A&B 1	x		x
Sec 7	Twin speed	Brn		Whi
Sec 6	Twin angle	Yel		Gre
Sec 5		Brn		Blu
Sec 4		Brn		Blu
Sec 3		Brn		Blu
Sec 2		Brn		Blu
Sec 1		Brn		Blu

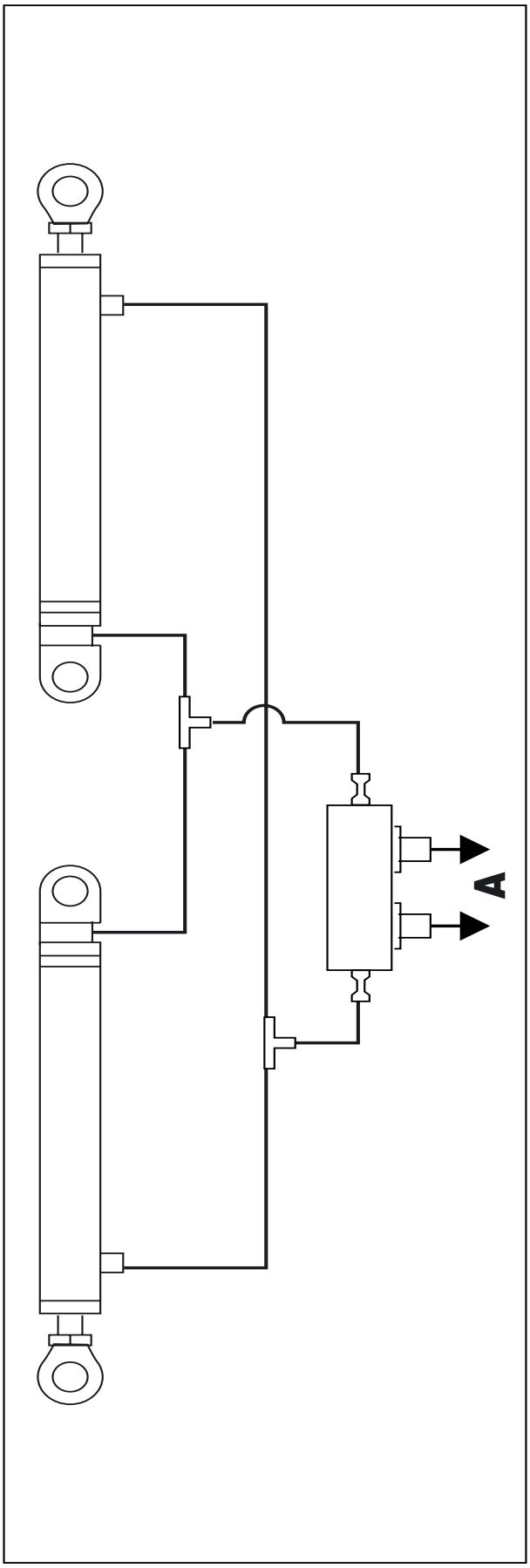
		Gnd	L	R	-	+
Foam marker	No. 4 Not used	2	6	5	1	3

HC 5500	Function	+	Sig.	-
Opt 1	Pressure sensor	Brn	Blu	-
Opt 2	RPM sensor or anemometer	Brn	Blu	Blk
Speed		Brn	Blu	Blk
Flow		Brn	Blu	Blk
L end nozzle	Pendulum lock at HAY/LPY	Brn		Blu
R endnozzle	Pendulum lock at HAY/LPY	Brn		Blu
Reg (Yellow)		Brn		Blu
Bypass	EC on/off	Brn		Blu
Sec 9	User defined A&B 2	x		x
Sec 8	User defined A&B 1	x		x
Sec 7	Twin speed	Brn		Whi
Sec 6	Twin angle	Yel.		Gre
Sec 5		Brn		Blu
Sec 4		Brn		Blu
Sec 3		Brn		Blu
Sec 2		Brn		Blu
Sec 1		Brn		Blu

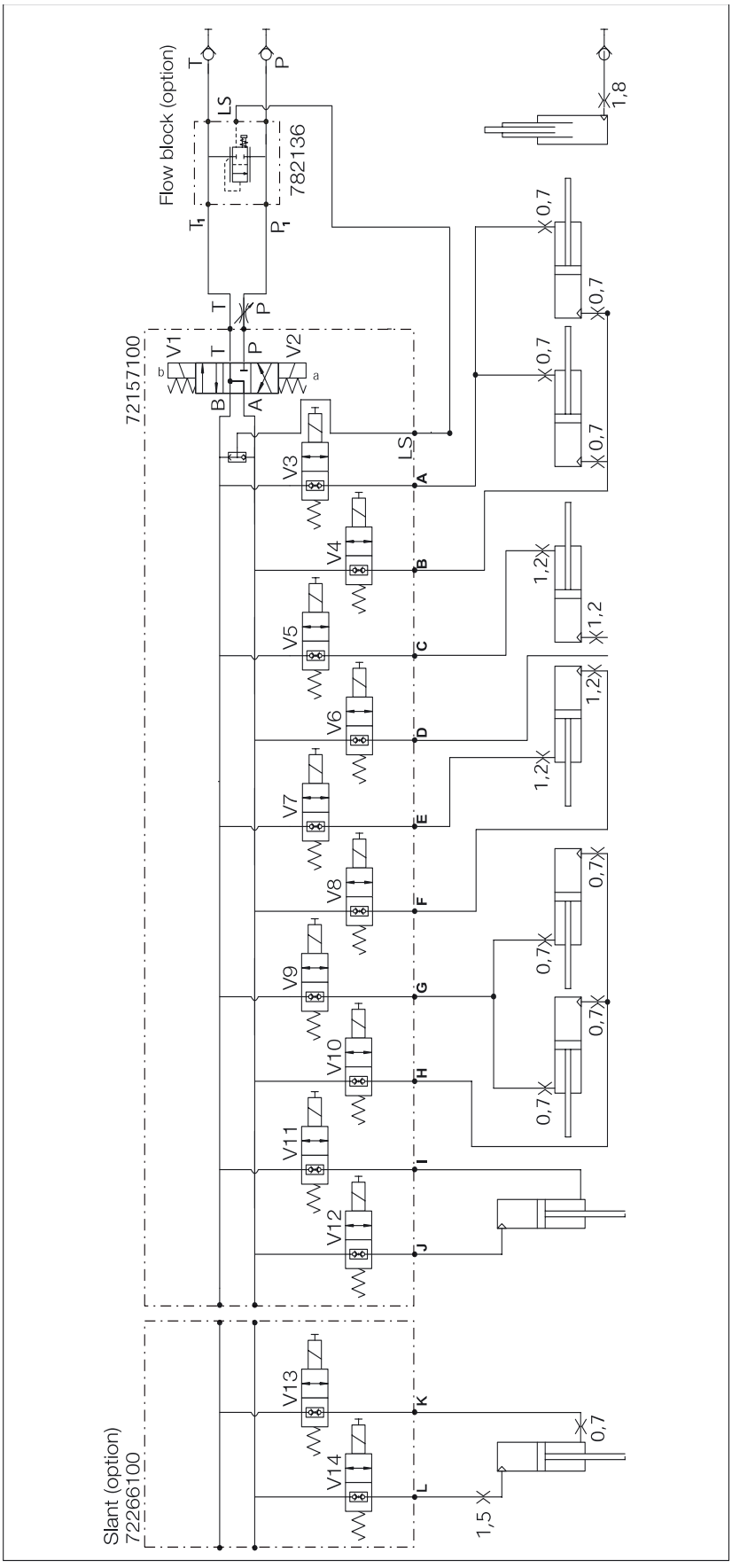
		Gnd	L	R	-	+
Foam marker	No. 4 Not used	2	6	5	1	3

Charts

Boom hydraulics - DH



Boom hydraulics - EOH



Warranty policy and conditions

HARDI® Australia P/L 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 12 months 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. Use of these products for contracting purposes will limit the warranty to a period of 90 days.

1. This limited warranty is subject to the following exceptions:

   a)Parts of the machine 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, modified or damaged by accident or 'act of God', 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 other consequential damage including loss of profit.

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)Decontamination and Transportation of any HARDI® product to and from where the warranty work is performed. Failure to properly clean/decontaminate the unit clear of ALL chemical traces prior to delivery for maintenance, may incur additional servicing fees at the discretion of HARDI®.

   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. This warranty is limited to the replacement, free of cost to the original purchaser, of any part/parts of the unit that in HARDI's judgement, show evidence of defects in material and/or workmanship, provided the said part/parts is/are returned to HARDI®, FREIGHT PRE PAID through an authorised HARDI® dealer. Parts defined as fast wearing items, i.e. tires, diaphrams and V-belts, etc (which could be subject to mis-use or abuse from high solvent content chemicals, lack of cleaning, etc) is at the discretion of HARDI® AUSTRALIA P/L.

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 unit has been operated in accordance with the Operators Manual/s, and that all safety, maintenance and cleaning 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.

8. HARDI® reserves the right to incorporate any change in design in its products without obligation to make such changes on units previously manufactured.
9. 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.
10. 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.
11. Any pump replacement must be approved in advance by the Service Manager.
12. Claims under this policy must be filed with HARDI® within thirty (30) days of work performed or warranty shall be void.
13. Parts requested must be returned prepaid within thirty (30) days for warranty settlement.
14. 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.