

Cat 3 Heavy Duty Linkage Sprayer Operation and Maintenance Manual

67023004 -AU-05/05

- Safety
- Operation
- Maintenance
- Replacement parts



HARDI Australia
Cross Keys Road Cavan South Australia

Document Type	Operator's Manual
Subject	Cat III Heavy Duty Linkage
Number of pages	50
Date Produced	20 / 05 / 2005
Produced by	Technical Services
B.O.M. Included	No
Part Number	67023004

Produced by HARDI Australia Technical Services Cross Keys Road Cavan South Australia. All photographs, illustrations and technical information remain the property of HARDI Australia Pty/ Ltd. and are protected by Copy Right © May 2005.

To our valued customer

Thank you for choosing the HARDI Cat III Heavy Duty Linkage. This operation and maintenance manual is supported by booklets which cover some of the major components and the optional components supplied with your sprayer.

In conjunction with the *Spray Technique Manual* they form a complete reference and contain essential information for the safe and efficient operation of this equipment. Please read them all carefully before operating the sprayer, paying close attention to the safety sections in each publication.

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

Caution: All operators intending to use this equipment, or any of its systems must read this entire publication and its supplement manuals prior to attempting operation. The safety sections and warnings must be thoroughly read and understood. Failure to do so may result in personal injury, death or damage to the equipment, property, crops or the environment.

Please note: The technical data contained herein is to the best knowledge of HARDI Australia Pty Ltd correct at the time of printing. 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.

Copyright: Design, text, illustrations and layout in this manual are produced and published by HARDI Australia Pty Ltd and are protected by copyright law. Printed in Australia. Copyright © 2005 HARDI Australia Pty Ltd.

Foreword

About this manual

This operator's manual covers introduction, description, setup, operation, maintenance and spares specific to the sprayer's chassis, tanks, liquid system and selected optional equipment.

It is accompanied by the following supplements which form the complete documentation for the sprayer:

- Spray Techniques Booklet and Calibration Wheel
- Vacuum Granni Pot Operator's Manual
- HARDI Controller 5500 Operator's Manual
- Cyclone Foam Marker Operator's Manual
- Self Cleaning Filter Operator's Manual
- Boom Operator's and Maintenance Manual

Spray drift



Caution: 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.

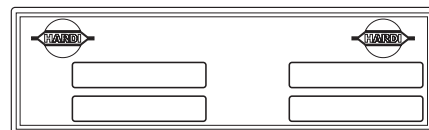


Warning: After changing chemicals or crops it is essential that the entire spraying system be flushed. This includes disconnecting hoses from the self cleaning filter and pressure relief valve and cleaning any residue and sediment found in the hoses, valve and filter. Failure to do so may lead to potential crop damage.

Sprayer details

Identification plates

Sprayer /
Chassis
ID Plate



Please record your sprayer's details here:

Model.....

Serial number.....

.....
(Please record both lines of figures in the serial number field)

Date.....

Dealer.....

Further documents

Upon delivery your HARDI Dealer will spend the time to check the equipment with you and give a detailed explanation of the sprayer's systems and functions.

Please take the time also to fill out your warranty form and return it to HARDI Australia within fourteen days of delivery.

1 - Introduction

Important information

Safety alert icons

This manual and its supplements contain safety information which could prevent crop damage or save a life. Safety information is included in each section and is highlighted by the following icons according to the level of potential risk.



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



Caution: 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.



Note: This indicates practical information regarding safe and effective use of the equipment and its systems.

Chemical safety

Always read chemical labels and follow the instructions. (See chemical safety section for further details)

Always wash and rinse equipment and tools before servicing and after use (see section on de-contamination).

Avoid un-necessary contamination risk. Pressure test the equipment with clean water prior to filling with chemicals.

Never eat, drink or smoke while spraying or working with contaminated equipment.

Always change clothes after spraying and carefully launder to prevent cross-contamination.

Never drink water from any of the tanks or assume that the contents of the 'clean water' tanks are safe.

In case of poisoning identify chemicals used and seek medical advice immediately.



Warning: Operators must read all related material before use. Local law may require operators to be certified before using spray equipment and some chemicals. Consult local authorities.

Mechanical safety

Never service or repair the equipment while it's operating.

De-pressurize equipment after use and before servicing.

Disconnect power and ensure that all hydraulics are in the recommended position before servicing.

Always replace all safety devices and shields immediately after servicing.

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.

General safety

Keep unauthorised persons and children away from the equipment at all times. Never attempt to enter a tank or allow some one else to for any reason.

Note: Although every effort has been made to include as much safety information as practical, it is impossible to anticipate every scenario that may present a risk. It is therefore the responsibility of the operator to exercise safe operating practices.



Note: Specific safety warnings appear at the beginning of each chapter where applicable. Read them carefully. If any portion of this instruction book is unclear contact your HARDI dealer for further information.

Important information

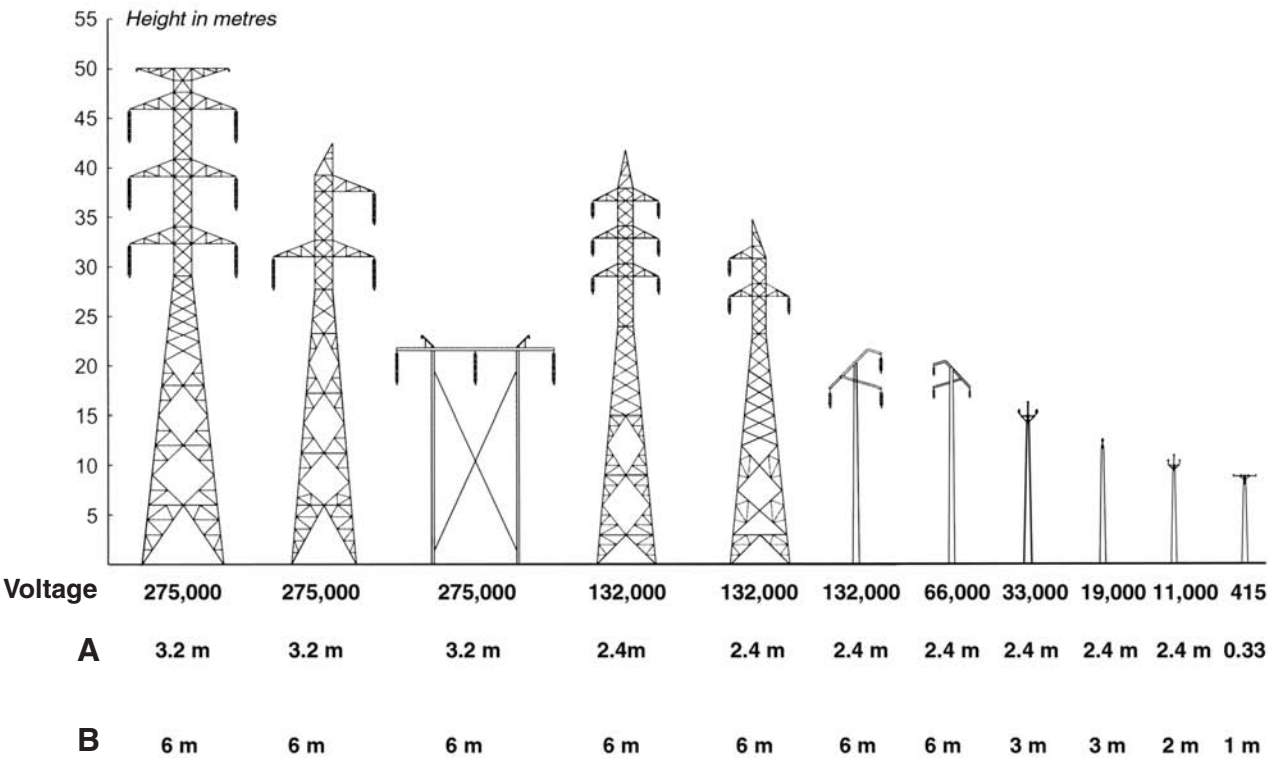
Beware of overhead powerlines



Warning: Operating agricultural machinery near powerlines 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 powerlines can reduce safe working clearances.

Typical powerline structures for South Australia (guide only and subject to change without notice)

Powerline structures and voltages can vary in different regions of Australia. Consult your local electricity supply authority for details of minimum safe clearances in your area.



A: Minimum safe clearance from conductor for vehicles and implements.

B: Minimum safe clearance from conductor for persons and livestock.

1 - Introduction

Personal safety

Personal protective clothing

Chemical contamination poses a serious health risk. It is the responsibility of the operator to ensure correct safety protection equipment and clothing is used.

Safety equipment

Depending on which type of chemical is used, some or all of the following protective clothing and equipment will be required (see diagram this page):

- 1 Headgear
- 2 Safety goggles or face shield
- 3 Respirator
- 4 Chemical resistant coverall
- 5 Chemical resistant gloves
- 6 Chemical resistant boots

Contaminated clothing

Contaminated clothing should be removed and safely stored and laundered taking care not to contaminate the inside of the tractor cab.

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

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.

Always read the chemical manufacturer's labels as they contain critical information about your safety and the environment.

Be a responsible operator

Always consider the environment when disposing of chemical residue (see section on decontamination).



Warning: Agricultural chemicals can be dangerous. Always read chemical labels and carefully follow safety recommendations.



1 Introduction

Foreword	1. 1
About this manual	1. 1
Spray drift	1. 1
Identification plates	1. 1
Further documents	1. 1
Important information	1. 2
Safety alert icons	1. 2
Chemical safety	1. 2
Mechanical safety	1. 2
General Safety	1. 2
Beware overhead powerlines	1. 3
Personal safety	1. 4
Personal protective clothing	1. 4
Safety equipment	1. 4
Contaminated clothing	1. 4
Australian Safety Standards	1. 4
Chemical Information	1. 4
Be a responsible operator	1. 4
Contents	1. 5
Contents	1. 6

2 Description

General overview of the sprayer	2. 1
Roadworthiness	2. 1
Lighting	2. 1
Signage	2. 1
Sprayer use	2. 1
Connecting the sprayer	2. 1
Sprayer and tractor	2. 1
Fluid management system	2. 2
System description	2. 2
System components	2. 2
Remote spray control box	2. 2
Foam marker	2. 2
Vacuum Granni Pot	2. 2
Sprayer Job com	2. 2
Liquid system	2. 3
Boom transport brackets	2. 3
Disconnecting sprayer	2. 3
Before you get started	2. 3

3 Set up

Transmission shaft	3. 1
Telescopic coupling	3. 1
PTO shaft installation	3. 1
Modifying the overlap	3. 1
Protection guards	3. 1
Working angles	3. 1
Electrical system	3. 2
Connecting 12 volt power	3. 2
Power supply path option	3. 2
Multiple pin plugs	3. 2
System earth	3. 3
Fuses	3. 3
Connection with optional 12 volt dist. box	3. 3
Connection without optional junction box	3. 3

Connecting the sprayer control box	3. 3
Spray control box cables	3. 3
Granni Pot hopper	3. 4

4 Operation

Remote spray control box	4. 1
Main tank strainer	4. 1
Filling tanks	4. 2
Tank capacity	4. 2
Hand wash tank	4. 2
Valve functions	4. 2
Chemical transfer	4. 3
Personal protection	4. 3
Adding chemical concentrates	4. 3
Adding the chemical via the Granni Pot	4. 3
Flushing chemical containers	4. 3
Chemical containers	4. 3
Safety precaution	4. 3
To spray	4. 4
Filling tanks via the valve manifold	4. 4
Cleaning and decontamination	4. 5
Introduction	4. 5
General precautions	4. 5
Six steps of maintenance, cleaning and storage process	4. 5
Read	4. 5
Flush	4. 5
Drain	4. 5
Decontamination	4. 6
Inspect	4. 7
Storage	4. 7

5 Maintenance

Preparation for off season storage and use ..	5. 1
Maintenance schedule	5. 1
Preparations for off season storage	5. 1
Preparing the sprayer for use after storage	5. 1
Service and maintenance schedule tables	5. 2
Recommended lubricants	5. 3
10 hour service	5. 4
Suction filter	5. 4
Self-cleaning filter	5. 4
Nozzle filters	5. 4
Spraying circuit	5. 4
Transmission shaft (power take off - PTO)	5. 4
250 hour service	5. 5
Hydraulic service	5. 5
Hoses and tubes	5. 5
Boom	5. 5
1000 hour service	5. 5
Transmission shaft	5. 5
Occasional service	5. 5
Pump valves and diaphragms	5. 5
Changing diaphragms	5. 5
EVC section valves	5. 6
Internal by-pass	5. 6
Testing EVCs	5. 6

1 - Introduction

Contents

Service procedure	5. 6
EVC disassembly	5. 7
Adjusting equalisation valves.....	5. 7
EVC pressure regulator	5. 7
Location	5. 7
Service.....	5. 8
EVC pressure regulator	5. 8
Test procedure	5. 8
PTO shaft shield replacement.....	5. 9
Replacement of universal joints.....	5. 9
Drain valve seal	5. 9
Tubes and fittings.....	5.10
Leak repair	5.10
Rules for good seals.....	5.10
Tensioning the couplings	5.10

Trouble shooting 6

Liquid system	6. 1
Introduction.....	6. 1
Checklist	6. 1
Valve function	6. 2
Emergency operation for the liquid system	6. 2
Hydraulic system.....	6. 3

Specifications 7

Conversion table	7. 1
Torque settings	7. 1
Sprayer operation temperature.....	7. 1
Pressure	7. 1
Flow	7. 1
Self cleaning filter	7. 1
Agitators	7. 1
Filters.....	7. 1

Spare Parts 8

Tank fittings	8. 1
Rinse nozzle	8. 1
Main tank drain	8. 1
Agitation.....	8. 1
Lid and filter	8. 1
Filters.....	8. 2
In-line filter B207.....	8. 2
Self-cleaning filter	8. 2
Suction filter	8. 2
Valves	8. 3
S67 valve assembly.....	8. 3
S93 valve assembly.....	8. 4
EVC distributor	8. 5
EVC pressure valve.....	8. 6
Granni Pot	8. 6
Granni Pot venturi manifold	8. 7
Pumps	8. 8
363 pump, 540rpm	8. 8
363 pump, 1000rpm	8. 9
Hydraulics.....	8.10
Standard hydraulics.....	8.10
Optional tilt cylinder and hose kit	8.11

Optional joystick hydraulic control	8.12
Optional load sensing hydraulic system	8.13
Cat 3 lift tower	8.14

Intended use

Sprayer use

The HARDI CAT 3 Heavy Duty Linkage sprayer is designed and built in Australia solely for the purpose of applying crop protection chemicals and liquid fertilisers.

HARDI Australia does not authorise or endorse the sprayer's use for any other purpose.

Please note that some local authorities require by law that operators be certified to use spray equipment.

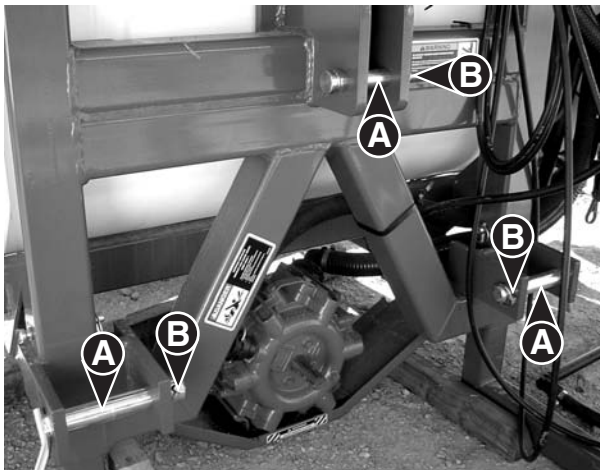
In any case it is strongly recommended that they undergo training in spray techniques and handling of plant protection chemicals to avoid unnecessary risk to persons, animals and the environment

Connecting the sprayer

The HARDI CAT 3 Heavy Duty Linkage sprayer is designed for three point suspension and is equipped with category 3 linkage pins (A).



Caution: The category 3 linkage pins are secured by spring loaded clevis pins (B), which must be in place as a safety precaution.



Lights and signage

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, be sure to observe these and equip the tractor and sprayer accordingly.

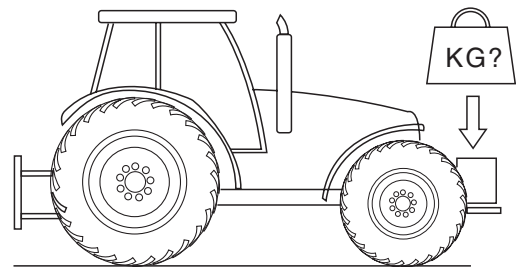


Note: As highway regulations vary from state to state, check with your local authorities for specific rules regarding lighting and signage for tractors and implements.

Weight distribution

As linkage sprayers are supported by the tractors chassis via a 3 point linkage, it is recommended additional ballast be added to the front of the tractor to balance the pay load (refer to the tractor's hand book for details).

For this reason take care when filling and lifting the sprayer for the first time.



Other considerations

Also pay attention to the following points:

-Additional weight may adversely affect the tractors braking and handling characteristics, so travel slower.

-Increase tyre pressures to improve stability and load capacity (refer to the tractor's hand book for details).

Sprayer's gross weight

CAT 3 heavy duty linkage sprayer with tanks dry:

1200 Litre model:	1475 Kg
2000 Litre model:	1500 Kg

CAT 3 heavy duty linkage sprayer with tanks full:

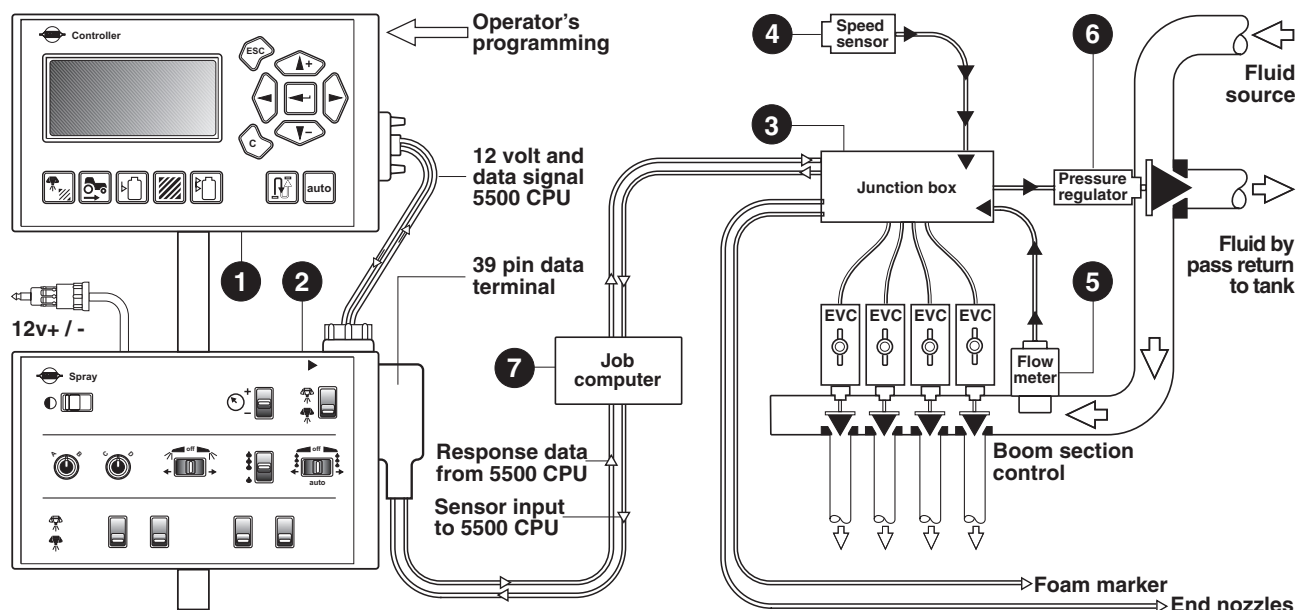
1200 Litre model:	2890 Kg
2000 Litre model:	3715 Kg



Caution: Fluid movement within the sprayer's tank may affect the tractors handling.
Remember: **1 Litre of water = 1 Kilogram**

2 - Description

Fluid management system



System description

The HARDI HC 5500 control system is designed for agricultural and horticultural use and incorporates a CPU (central processing unit), LCD display and a manual spray control box to provide the operator full system control from the tractor's cab. The CPU uses the operator's preference data, plus speed sensor and flow meter input signals to maintain the calibrated 'application rate' under a range of vehicle speeds.

System components

(1) Controller / display (2) Spray Control Box (3) Junction box (4) Trailer speed sensor (5) Flow meter (6) Pressure regulator (7) optional job computer *Job com*

Remote spray control box

The Spray Control Box (2) enables manual boom section control, end nozzle and foam marker control from the tractor cab.



Note: Please refer to Set-up section for details of installation and operation.

Foam marker

The foam marker system allows the operator a method of identifying the treated sections of the field. This assists in avoiding under and over-spraying.

For safety, operation, maintenance and spare parts information for the foam marker system please see the *Cyclone Foam Marker Operator's Manual* supplied with the sprayer's documentation.

Vacuum Granni Pot

The Granni Pot is a chemical mixing and transfer hopper designed to enable vortex mixing of granules into suspension and vacuum extraction of liquid chemicals from closed transfer containers. The patented vortex mixing action is a fast and efficient way to ensure chemicals are adequately mixed before they are transferred.

The Granni Pot is mounted to the sprayer via a mechanically assisted swing down bracket, which allows the operator to lower the hopper to a convenient height.

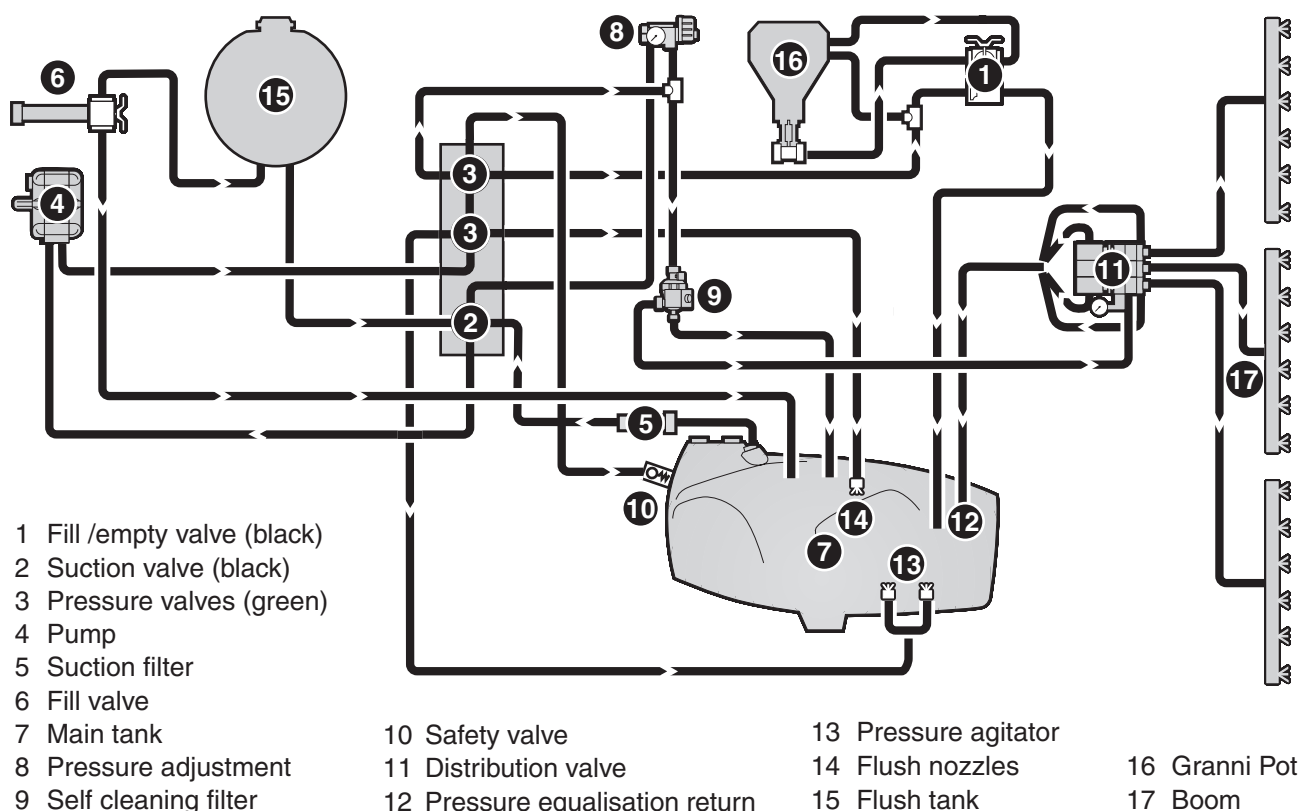
The Granni Pot controls are within easy reach of the operator and containers can be rinsed using the drum rinse nozzle.

Sprayer Job com (optional equipment)

The Job com is a sprayer mounted job computer designed to integrate with the HC5500 spray controller. The HC5500 is programmed and processes the spraying inputs within the parameters set by the operator. The Job com carries out commands sent by the HC5500 delivering rate control, pressure regulation, section control and dual boom line control. Auto section control is achieved when combined with the HARDI Co-Pilot. The Job com is a platform from which HARDI will provide more on board sprayer control functionality in the future.

2 - Description

Liquid system



Boom transport brackets

The boom transport brackets are pre-set in the factory to the minimum height considered safe for cab clearance and transport.



Caution: The total height of the sprayer may vary depending on the boom configuration and the type of tractor.

When transporting a HARDI Sprayer by truck, always measure the 'actual total overall transport height' of your sprayer to ensure that it does not exceed the legal limits set down by local authorities.

Booms

The Cat 3 Heavy Duty Linkage Sprayer is available with the SPB / SPC Eagle boom which features a two dimensional steel construction in 24, 28 and 30 metre widths and spring loaded breakaways at the outer sections for impact protection.

Please refer to the *Eagle Boom Operator's Manual* supplied with your sprayer for safety, operation, maintenance and spare parts information.



Warning: When operating the boom ensure that no persons or objects are in the area and maintain safe distance from power lines.

Disconnecting sprayer

Before disconnecting the sprayer fold the booms completely into their transport position.



Caution: Remember to disconnect all hoses and cables from the tractor.



Always clean the sprayer inside and outside before disconnecting and parking it (see section on cleaning and decontamination).



Prevent access to the sprayer by unauthorised persons, children or animals.



Warning: It is recommended the boom be completely folded into the transport position before the sprayer is removed from the tractor.

Before you get started

Read the *HC 5500 Controller Operator's Manual* plus all other related documentation before attempting operation.

Calibration

Before operation, the sprayer must be calibrated to ensure the correct application rate of chemical for the type of crop you are treating. You will need to thoroughly read the chemical manufacturers literature for the particular product you are about to use and include a range of other factors in your calculations (see spray techniques hand book for further details).

3 - Set up

Transmission shaft

Transmission shaft

The transmission shaft assembly transfers drive from the tractor's power take off (PTO) to the input drive shaft of the sprayers main fluid pump.



Warning: PTO / transmission shafts can be dangerous. Beware of unguarded shafts.

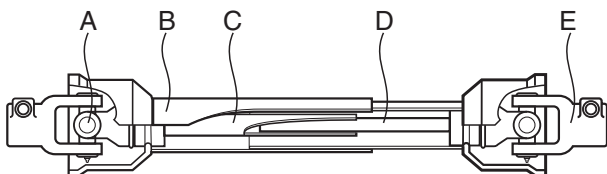
- Restrain long hair and loose clothing.
- Stop the tractor's engine and remove the ignition key before attaching or servicing the shaft.
- When installing the transmission shaft, push and pull the splined coupling until it snaps into place.
- All rotating parts must be covered by safety shields including the universal joints at each end of the shaft.
- Ensure safety warning labels are clearly visible.
- Make sure that the safety guards are prevented from rotating by chains, allowing sufficient slack for turns.
- Do not touch or stand on the transmission shaft when it is rotating: **safety distance: 1.5 metres.**

Telescopic coupling

In order to maintain drive to the sprayer's pump whilst allowing for changes in length the transmission shaft is divided into two halves with matching profiles.

The geometric shape of the profiles locks them together on the rotational axis whilst allowing free lateral movement.

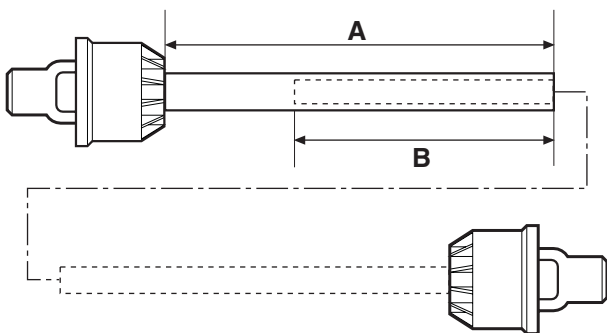
Transmission shaft components



A: Universal joint C: Female section E: Splined
B: Safety guard D: Male section -coupling

Overlap

Overlap is the amount of the two halves of the sliding coupling engaged during operation.



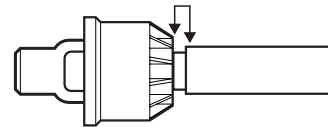
A = Total length of shaft B = Overlap

Clearance

Clearance is the amount of free play between the two halves when the implement is raised and the shaft is horizontal. There must be a minimum of 10mm clearance to avoid bottoming out and causing damage to the shaft and pump.



Caution: Minimum clearance 10mm!



Modifying the overlap

Minimum overlap is specified by the manufacturers of implements depending on the load on the shaft. For HARDI sprayers:

540 RPM pumps: minimum of 1/3 is required.
1000 RPM pumps: minimum of 2/3 is required.

If modification is required, remove the shaft and separate the male and female sections.

Using a hack-saw or similar remove the *total length of the excess from both halves* of the shaft equally and file the profiles afterwards to remove any burrs.

Carry out a similar procedure for the safety guards.

Clean and grease the shaft profiles and assemble the male and female parts being careful to re-assemble the safety guards correctly.

Re-fit the shaft to the tractor's PTO and the pump and double check your modified shaft operates within specifications.



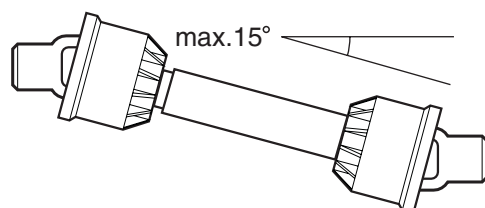
Upon installation please note that the shaft is marked with a tractor symbol at the female end to indicate the correct orientation.

Safety shields

It is vitally important for the safety of the operator that the transmission shaft maintained in good condition. The safety shields must cover the whole shaft. Including the universals at each end of the shaft. Anchor chains are connected to the shields to prevent them from rotating with the shaft.

Working angles

To ensure long life of the transmission shaft, avoid working angles greater than 15° per joint.



Electrical system

Connecting 12 volt power

To connect the sprayer's 12 volt DC electrical system to the tractor's power supply, plug the multiple pin connectors together at the rear of the tractor. Be sure to secure the cables to an appropriate anchor point.

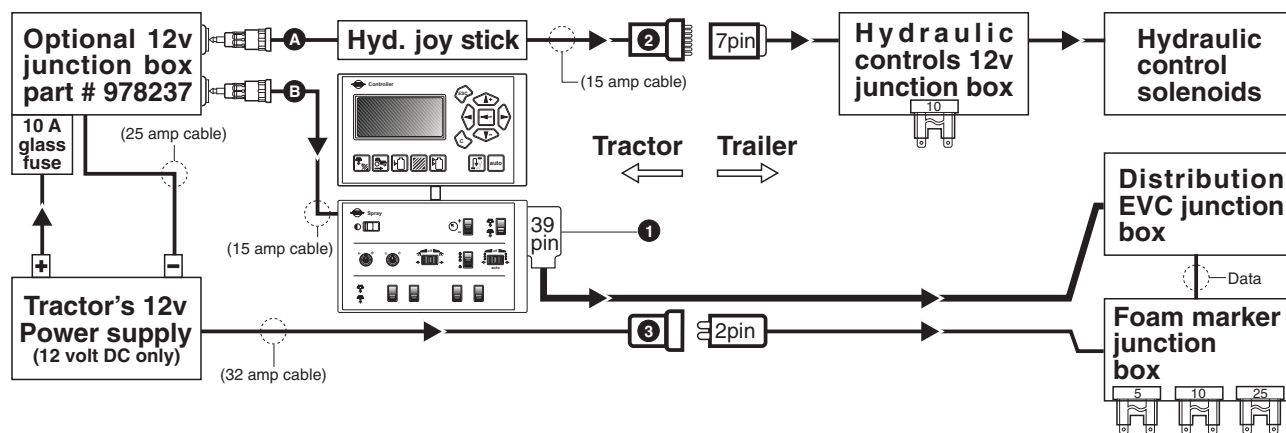
Some installation work is required to connect the system to the tractor's battery (covered later in this section)

Power supply path (no job computer)

The following diagram illustrates power flow, location and type of multi-pin connectors and fuse location and ratings. (see legend next column)

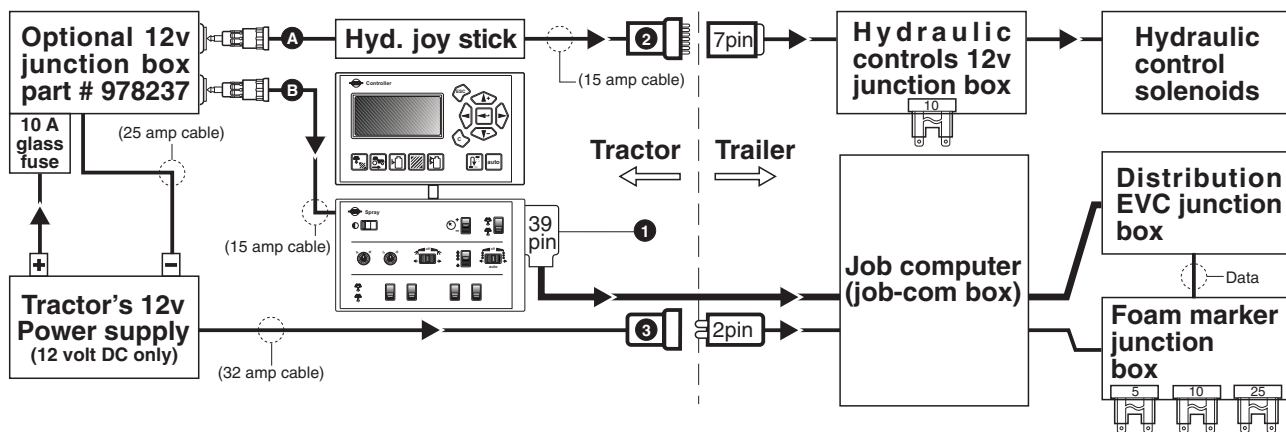
Multiple pin plugs

1. Thirty-nine pin plug from sprayer's EVC junction box to the remote spray control box in tractor cab.
2. Seven pin male/female connector for hydraulic joy stick control (connects at draw bar).
3. Two pin male/female connector for foam marker system power (connects at draw bar).
4. Seven pin male/female connector for trailer's stop, turn and tail lights (connects at draw bar).
5. Some options shown are not fitted or available.



Power supply path (with job computer) option

Connection of the electrical system to the Commander when fitted with an optional job computer is the same as the standard sprayer. Note the path of the power supply to the EVC junction box and the foam marker system is now through the job computer box.



3 - Set up

Electrical system, continued

System earth

The electrical systems of the sprayer are earthed through the wiring harness back to the tractor's battery and therefore an earth to or for the sprayer's chassis is not required.

Fuses

The various electrical circuits are protected by spade terminal automotive type fuses except for the 12 volt distribution box which uses a glass barrel type fuse. Please see the diagrams on the previous page for fuse location and rating.



Note: When trouble shooting an electrical problem always check the fuses first. A blown fuse indicates a problem exists in the circuit and should be investigated for the cause.



Caution: Never replace a fuse with a higher rating than specified.

Connection with optional 12 volt distribution box (p/n 978237)

The optional 12 volt distribution box (if fitted) is circuit protected by a 10 amp glass barrel type fuse located in the side of the unit's casing. To connect the unit to the tractor proceed as follows:

Red wire to the positive terminal of the tractor's battery.

Black wire to the negative terminal of the tractor's battery.



Note: If these cables require extending use an insulated multi-core cable of a minimum 15 amp rating.

Connection without optional junction box

If no compatible female power supply sockets exist in the tractor the cables for the hydraulic joy stick and remote spray control box (A+B) must be individually fused (10A) and wired directly to the tractors battery.

To individually connect the joy stick and control box cables proceed as follows:

Remove the push in plugs (A+B) and connect the **Blue** wires to the **negative** battery terminal.

Fit a 10 amp fuse to each of the **Brown** wires and connect to the **positive** battery terminal.



Note: If these cables require extending use an insulated multi-core cable of a minimum 10 amp rating.



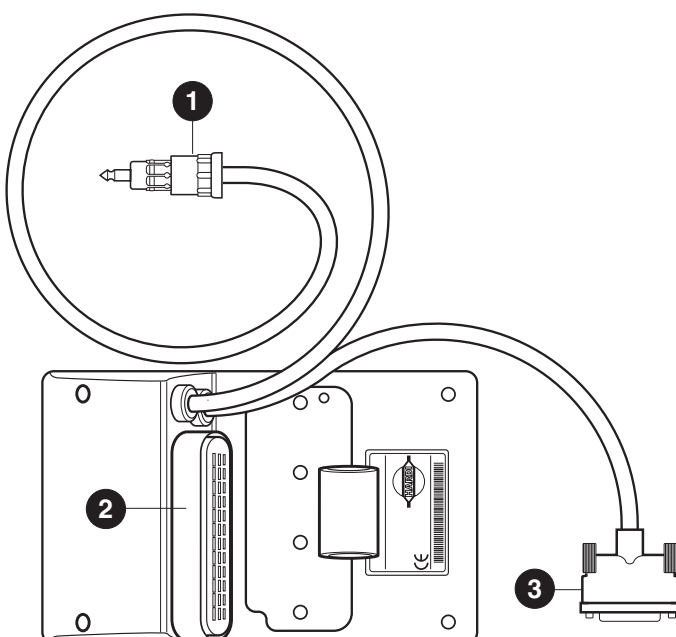
Caution: Do not connect to the starter motor or alternator circuits. Connecting to any source other than directly to the tractors 12 volt DC battery voids warranty.

Connecting the spray control box

The control box requires 12 Volt DC power supplied directly from the tractors battery or via the 12 volt DC distribution box (p/n 978237) if fitted (see electrical set up this section). Power is then distributed from the control box to the 5500 controller and the Job computer (if fitted) via their respective multi core wiring harness.

Control box cables

The location and function of the control box cables are as follows:



1

Power supply (12 volt DC)

2

39 pin terminal (to job computer)

3

Multi pin data cable and power supply to 5500 controller.



Note: See the *5500 Operator's Manual* for further details of installation and operation.

Granni Pot hopper

Description

The Granni Pot chemical hopper is mounted to the chassis via a drop-down transport bracket.



The Granni Pot is secured by a spring loaded retaining pin (A) and is lowered into the operating position by grasping the handle (B) with one hand and releasing the retaining pin with the other.



Granni Pot, continued...

Lower the Granni Pot to the operating position whilst keeping your back straight and bending your knees.



Return to transport position

Once the chemical transfer has been completed the hopper should be returned to the transport position, by reversing the above procedure.



Caution: The Granni Pot must be raised and secured in its transport position before the sprayer can be moved. Failure to do so could result in damage to the sprayer and increase the risk of personal injury.

The transport bracket assembly is spring loaded and is designed to assist the operator in the movement of the hopper when empty.

Under no circumstances should the operator attempt to lift or transport the hopper whilst it contains fluids.

Granni Pot operation

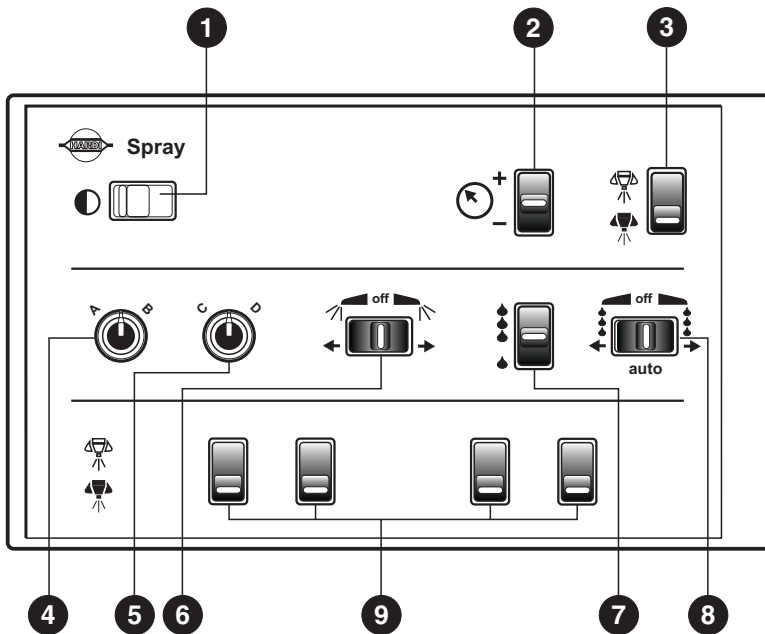
For chemical transfer hopper operation and safety details see the *Granni Pot Operator's Manual*.

4 - Operation

Remote spray control box

Remote spray control box

The spray control box plays an important roll in the sprayer's fluid management system and enables manual section control, end nozzle control and foam marker control from the tractor's cab.



- 1 Power switch
- 2 Manual pressure adjustment
- 3 Main ON/OFF valve
- 4 Optional function (A+B)
- 5 Optional function (C+D)
- 6 End nozzle ON/OFF
- 7 Foam marker regulation
- 8 Foam marker left / off / right
- 9 Section valves on / off

Spray control box

The HARDI Spray Control Box has been designed to integrate with the HC5500 controller to provide an advanced user-friendly spray control system. Featuring: power supply, pressure control, main on/off valve control, and boom section control, foam marker control. Optional end nozzle control and dual boom line control are also features of the spray control box.

- 1. Main power switch controls 12 volt input.
- 2. The manual pressure regulation can be manually adjusted and will override the HC5500 auto mode when activated
- 3. A single main on/off switch will turn all active boom sections on and off simultaneously when coming into and out of headlands.
- 4 + 5. Optional A/B and C/D switches provide for

auto and manual dual boom line operation where each line can be individually selected or work automatically through a range of forward speeds.

6. Left or right side end nozzles control (optional) is selected when fence line spraying is required.

7. A foam marker frequency switch controls the amount of foam discharged.

8. Left/ right side foam marker control can be selected and when the switch is in auto mode the foam marker will swap sides when the main on off valve is turned off at the end of each run.

9. Boom sections can be selected on and off as required to suit the spray application and the standard 4-section spray control box can be optioned up to 13 sections.

Main tank strainer

When filling the main tank with water via the lid always use the strainer (A) to prevent rust or other particles from entering the tank.



Warning: Never allow the supply hose, to enter the tank. Direct the flow of water towards the filling hole from a safe distance to prevent chemicals being siphoned back up the hose and contaminating the water supply.



Filling tanks

Filling tanks

Tanks can be filled through tank lids or (with the exception of the hand wash tank), via the filtered fill system by an external pump (eg. external transfer pump or optional Banjo pump) .



Warning: Do not overfill any tank as this may cause chemical spillage out of the tank and possible rupture of the tank.



Important: Always read the instructions on the chemical container as mixing procedures can vary.

The main tank should normally be filled with 25% of the required spraying water, before adding the chemicals.



Note: Sight gauges on sprayers are to be used as a guide only.

Although all possible care is taken to ensure consistency and accuracy in manufacture, during the Rotomoulding process slight variations in tank size can occur.

This may result in small variations in capacity and therefore affect the accuracy of sight gauge calibrations.

To attain maximum accuracy in chemical solution ratios it is recommended that water and chemical concentrates are measured with a correctly calibrated flow meter, or other reliable measuring device.

Tank capacity

Main tank.....1200 or 2000 litres
Foam marker tank.....100 litres
Flush tank.....100 litres
Hand wash tank.....15 litres

Always use water as clean as possible for spraying purposes.

Always fill the clean water hand wash tank separately to ensure that there is no risk of contamination.

Never fill tanks so rapidly that air cannot escape as this could cause tanks to rupture. If using a high capacity pump, remove tank lids while filling.

Hand wash tank

The hand wash (clean water) tank must be filled through the lid to rule out the possibility of contamination. Always physically unscrew the clean water tank lid and fill with clean water only.



Warning: Due to the risk of contamination, *never* drink from the hand wash tank or *any* tank on the sprayer.

Valve functions

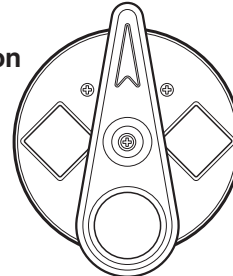
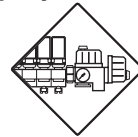
Valve identification and functions

The fluid system of the Cat 3 linkage sprayer is controlled by four function valves located on the left side of the sprayer. The following illustration shows their position, description and functions.

Pressure valve
(green)

(Off)

Spray Function



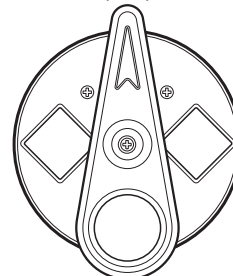
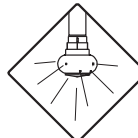
Granni Pot



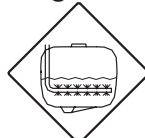
Pressure valve
(green)

(Off)

Tank Rinse



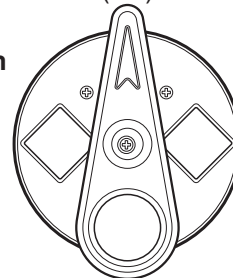
Agitation



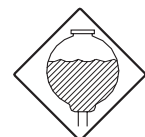
Suction valve
(black)

(Off)

Suction Main



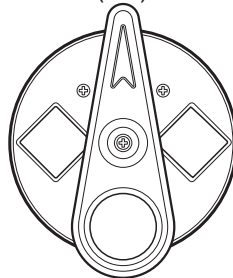
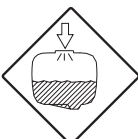
Suction Flush



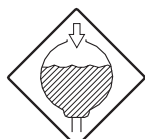
Filling valve
(black)

(Off)

Fill Main



Fill Flush



4 - Operation

Chemical transfer



Warning: Agricultural chemicals can be dangerous. See section on chemical safety at the front of this manual.

Personal protection

Protective clothing and equipment should be used when preparing the spray liquid, during the spraying work and when cleaning the sprayer (see section on chemical safety at the front of this manual).

Adding chemical concentrates

Dry and liquid chemical concentrate can be transferred to the main tank by means of the Granni Pot chemical induction and transfer system (refer to your *Granni Pot Operator's Manual* for detailed instructions)



Note: Some chemicals are readily soluble, while others will not remain in suspension for extended periods.

If particles have a tendency to settle, keep the PTO shaft engaged so the spray liquid is continuously agitated until it has been sprayed onto the crop. This will prevent blockages in the sprayer system and promote consistent application of the chemical.



Important: All chemicals should be inducted through the Granni Pot.

Adding the chemical via the Granni Pot

Set the top pressure valve to the Granni Pot and suction valve to Suction Main.

Follow the chemical manufacturer's label on mixing instructions. Refer to the *Granni Pot Operator's Manual* for using the hopper.

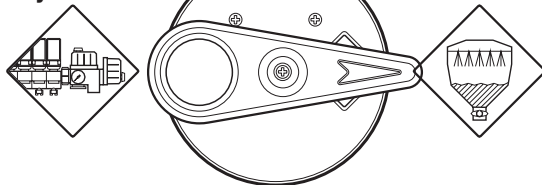
Flush the Granni Pot with clean water.

Pressure valve
(green)

(Off)

Spray Function

Granni Pot

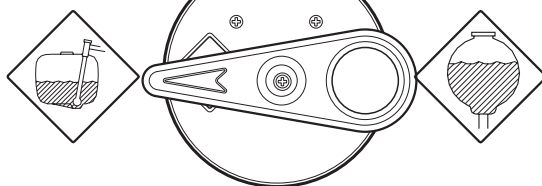


Suction valve
(black)

(Off)

Suction Main

Suction Flush



Flushing chemical containers

Chemical containers

The Granni Pot hopper is fitted with a flushing device for flushing chemical concentrate from empty chemical containers.

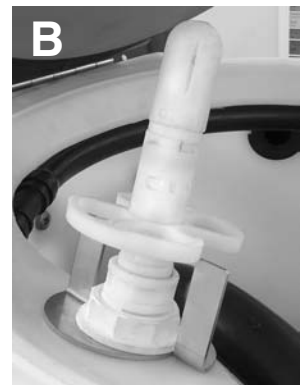


Warning: The flushing device can use main tank or flush tank liquid for flushing containers of concentrated chemical. Never open the Granni Pot and press on the discharge nozzle unless it is covered by a container.



Safety precaution

A safety feature has been incorporated into the rinse nozzle design to help prevent the drum rinse nozzle from being activated accidentally.



Note the slots in the flange and the stainless steel safety tabs beneath.

Figure 'A' shows the activating flange in the locked out position. The stainless steel tabs prevent the nozzle being accidentally pressed and activated.

Figure 'B' shows the flange rotated by 90 degrees to its active position enabling the flange to be depressed and activating the flushing nozzle. Remember to rotate the safety flange to the locked position, figure 'A' when finished.

Flushing containers

To operate, rotate the flange to the active position, invert the container over the nozzle and push down. This should be done using flush water. Set handle (A) to flush tank.

Be aware that the rinse nozzle discharges spray liquid (a solution of chemical and water) to flush chemical concentrate from the used container. Remember to rinse your containers afterwards several times with clean water and empty the Granni Pot of dilute chemical solution.

4 - Operation

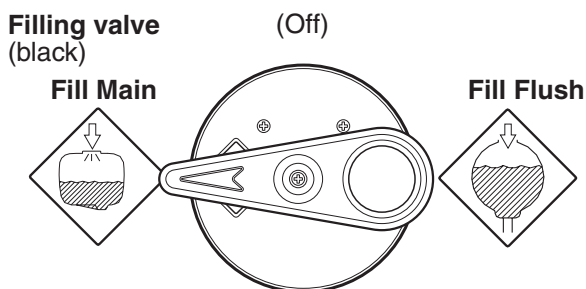
Spraying

Filling tanks via the valve manifold

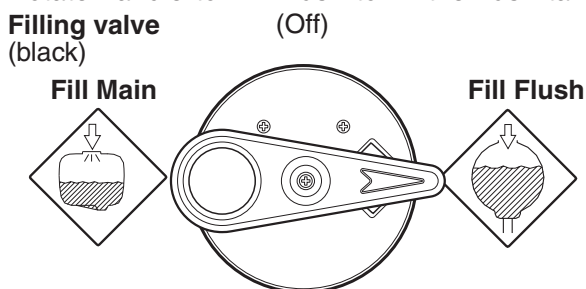
The filling valve is positioned at the bottom of the valve manifold, and incorporates a camlock coupling for a suction hose.



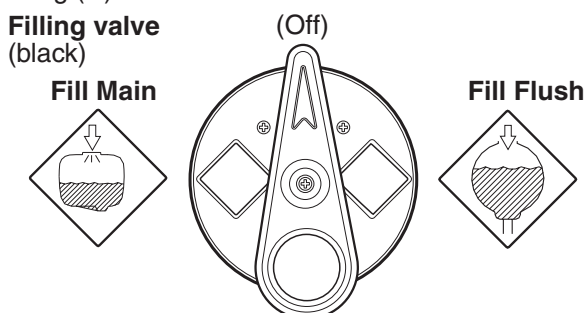
To fill via the valve manifold, Set handle to Fill Main to fill the main tank.



Rotate handle to Fill Flush to fill the flush tank.



Always set the handle to the off position when not filling (C).



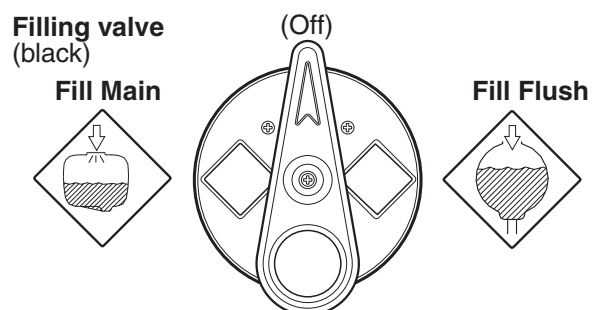
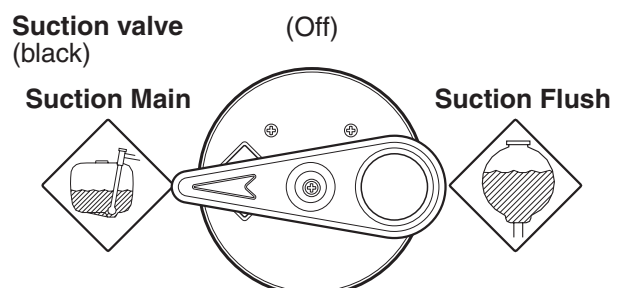
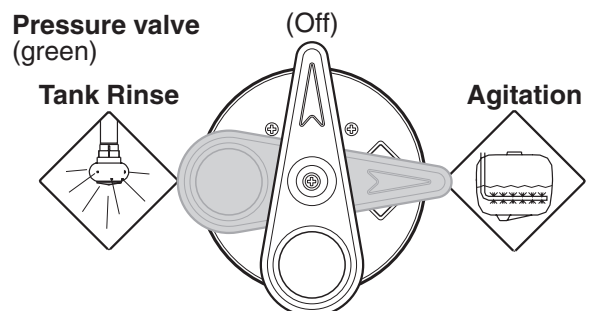
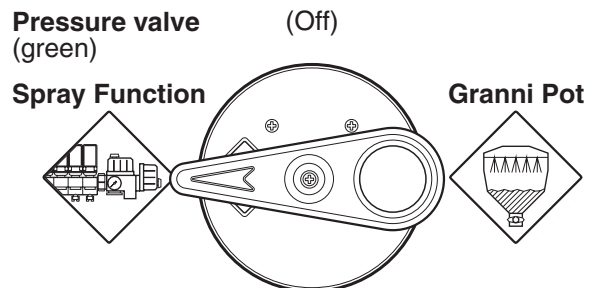
To spray

Set the top pressure valve to Spray Function.

Set suction valve to Suction Main.

Set blue valve (located on top of the main tank) to the **relief** position.

Agitation can either be on or off via the 2nd green valve according the chemical instructions.



4 - Operation

Cleaning and decontamination

Introduction

Good sprayer cleaning is essential. It avoids risks to other crops sprayed and ensures the sprayer is ready for the next job. It is especially critical after using herbicides where even tiny traces of chemical left in machinery can damage later sprayed crops. Washing also helps avoid blockages. It is therefore necessary to neutralise any chemical residues within the sprayer's fluid system, before changing crops, chemicals or off-season storage. This includes the main tank, flush tank, chemical induction system, all hoses, valves, spray lines, nozzles and the external surfaces of the sprayer and tractor

General precautions

Always use personal safety equipment and clothing. See page 1.4.

Contaminated equipment and clothing must be cleaned and laundered in an appropriate manner.

Some chemicals require stringent decontamination procedures to ensure any particles that may have adhered to sprayer system surfaces are rendered neutral before spraying a new crop or using another chemical.

Chemical labels contain important information regarding cleaning and decontamination and must be read thoroughly. Take note of the recommended safety precautions and de-activating agents.

Local laws vary from state to state regarding the use and disposal of certain agricultural chemicals. Contact your local authorities for details. Information can also be obtained from the Department of Agriculture or the Environmental Protection Authority.

Never postpone cleaning until later. Once plant protection chemicals have dried out on the sprayer's surfaces, their removal becomes more difficult and time consuming.

When using high pressure cleaners check lubrication points and reapply lubricants where necessary (see *maintenance* section for details of lubricants). Remember to clean the sprayer and tractor's external surfaces using detergent and neutralising agent if necessary.

Accurate calibration will help to minimise leftover spray solution when the job is finished.



Caution: Cross contamination of one chemical to another can adversely affect chemical properties and damage or destroy your next crop. It is essential that the sprayer be cleaned and decontaminated when changing chemicals or crops.

A complete maintenance cleaning and storage process consists of six steps

- | | | |
|----------|--------------------|------------|
| 1. Read | 3. Drain | 5. Inspect |
| 2. Flush | 4. Decontamination | 6. Store |

1. Read

Before you begin cleaning your sprayer, be sure to review the label of the product you've applied. The label will:

- Tell you how to properly dispose of residual product.
- Provide any special cleaning instructions that might be necessary.
- Recommend decontaminating products.
- Outline the Personal Protective Equipment (PPE) you need to safely clean your sprayer.

2. Flush

The goal of rinsing is to remove any concentrated or large areas of the product that might still be in or on the sprayer.

Cleaning spray equipment involves circulating water through the whole system and then applying it to an area that is recommended on the label of the chemicals you have used. Several rinses using a small volume (up to 10 percent of the spray tank capacity) are better than just filling the spray tank once with clean water. Select a location where the washings won't contaminate water supplies, streams, crops or other plants and where large puddles won't accumulate, creating a hazard to humans, animals and the environment.

3. Drain

Inevitably a quantity of spray solution will remain in the system, which cannot be sprayed on the crop as the pump takes in air when the tank is nearly empty.

This left over liquid is called dilute residue and is defined as the remaining liquid in the system when the first clear pressure drop is indicated on the pressure gauge. Continue to run the sprayer until air comes out the nozzles.

The typical volume of residue in the 1200 and 2000 litre Cat 3 sprayer is approximately 50 litres when using agitation but can vary depending on surface inclination.

It is recommended that before cleaning the sprayer the dilute residue be further diluted another 10 times with clean water and sprayed onto an area of the crop just treated, provided the treated crop has not received the maximum dose. It is important to ensure that the statutory maximum dose on the label is not exceeded.

To make sure you have a suitable area for discharge of flushing water / solution either leave an area untreated or under expose a selected part of the field. Alternatively spray out onto another approved crop but remember not to spray out onto a sensitive crop or land intended for cropping with a sensitive crop.



Note: Chemical washings can also be sprayed out onto a soak way. This is an area of ground that is not used for cropping for example a fence line.

Cleaning and decontamination, continued

4: Decontamination

After your sprayer has been rinsed and drained, it's time to clean and decontaminate it. Using the recommended decontamination agent and dose listed on the product label (personal protective equipment is essential). Be sure to decontaminate both the interior and exterior of the machine, running liquid through the boom structure and out the nozzles.

As most chemicals used have a tendency to block nozzles and filters, remove and clean in the appropriate decontamination solution with a soft brush. Check also for sediment on the pressure side of the safety valve.

Decontamination agents

Specific information on decontamination agents and procedures is contained in the chemical manufacturer's literature. Please read them carefully and follow their instructions to the letter.

Tank cleaning procedure

If tank rinse nozzles are fitted add clean water to the spray tank until it is approximately a quarter (25%) full. Then mix in a cleaning agent recommended for sprayer decontamination at the correct dilution rate for the volume of liquid in the spray tank. No further water needs to be added at this stage. Use the tank rinsing nozzles, recirculate and discharge via the boom nozzles.



Note: The tank rinse nozzle cannot guarantee a 100% effective cleaning job. It is recommended to clean the tank manually with a long handled brush or high pressure cleaner.

Flushing the main tank

Run the tank rinse nozzle until the inside of the tank has been adequately flushed with the decontamination solution.

Flushing chem fill circuit and transfer hopper

Remember to operate the chem fill flush controls to flush the chemical filling system.

The Granni Pot chemical transfer hopper has been exposed to concentrated chemicals and must be cleaned and decontaminated thoroughly inside and out. See the *Granni Pot Manual* for further details.

When flushing the boom in the spray with no agitation mode, open and close the boom distribution valves, to ensure the constant pressure return lines are flushed with decontamination solution. and then flush the nozzles.

Open t the end of the boom tubes to flush boom with decontamination solution.

Final step

Open flush taps, drain the main tank and let the pump run dry.

Once the pump has run dry, stop the pump and refit all the parts and repeat the decontamination process with clean water only.

Hidden areas

It is necessary to remove nozzle filters, tank filters, and suction filters for cleaning with recommended neutralising agent and to consider any other sources of trapped chemical traces, for example:

Dismantle the pressure relief valve and clean thoroughly. Ensure the bleed hole is clear of debris and the valve is by-passing fluid back into the main tank during normal spray operations

Inspect the delivery hose from the relief valve. Clear away built-up material and ensure the hose and connections are thoroughly cleaned and rinsed.

Tank lids

Tank lids are another potential source of trapped chemical residue. Carefully clean the main tank lid area, including the basket and the underside of the lid.



Warning: Never attempt to enter a tank for any purpose.

Draining the main tank

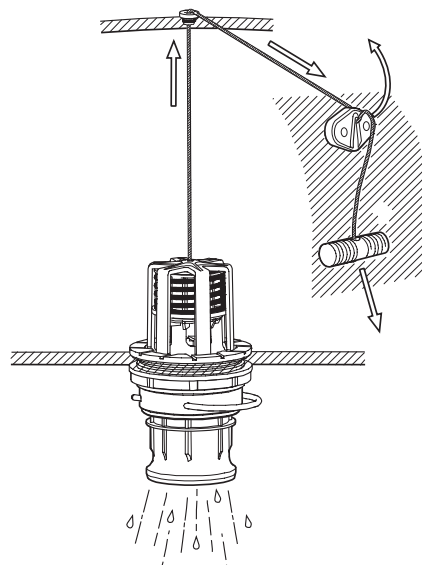
To drain the main tank, pull the string at the left hand side of the tank to open the drain valve. The valve is spring-loaded but can be kept open by pulling the string out and upwards in the V-shaped slit. To release and close the drain valve again, pull the string downwards and the valve will close automatically.

Main tank drain valve

The sprayer's main tank is fitted with a 2.5" diameter hand operated drain valve. The valve is located in the bottom of the tank and is accessible for servicing from beneath the sprayer.

Operation

To open the drain valve, pull the operating cord (A) on the left hand side of the sprayer. The valve is spring-loaded but can be kept open by pulling the cord out and upwards into the v shaped clamp (B).



4 - Operation

Cleaning and decontamination, continued

Draining the flush tank

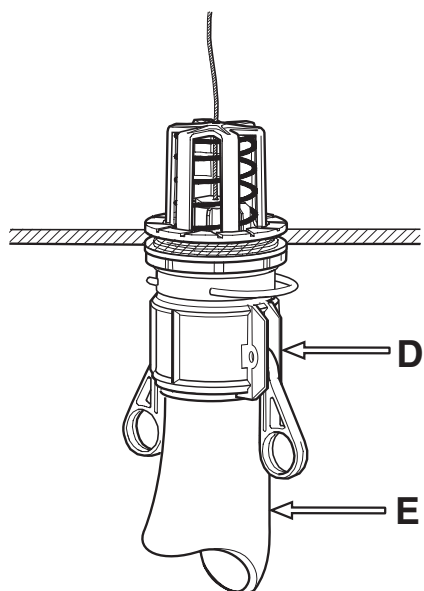
To avoid algae developing in the flush tank always drain the flush tank when the sprayer is not in use for a long period.

Draining the foam marker tank

Once mixed, foam solution deteriorates quickly. If the sprayer is to stand a few days it is recommended to drain and flush the foam marker tank, to avoid mixed foam from becoming inactive. Residue in the foam tank should be diluted, then the tank and filling hose can be drained in a suitable area using foam tank drain valve.

Draining off residual solution

If draining a residue, ie: liquid fertilisers into a storage container, a cam lock coupling (D) and hose (E) can be connected to the main tank drain valve and the liquid can be safely transferred.



5. Inspect

Check the sprayer over and repeat any step where you are not happy with the result.

Remember, time taken to properly decontaminate can save a lot of money in crop damage and lost yields.

6. Storage

See the *maintenance* section, page 5.1.

Maintenance schedule

The following section deals with regular, periodical and occasional maintenance procedures.



Warning: Maintenance and service procedures should be carried out on time in a well equipped workshop facility with lifting and safety equipment of a suitable load bearing capacity.

Preparation for maintenance and service

Before carrying out any maintenance and service procedures observe the following:

Clean and decontaminate the equipment and drain the tanks prior to servicing the fluid system.

Move the tractor and sprayer to a suitable flat surface, lower the linkage hydraulics, and shut down the tractor. Remove the ignition key, apply the hand brake and use wheel chocks as a safety precaution.

If using arc welding equipment, disconnect the tractor's electrical system.

Think each job through before commencing work and assess any danger, taking care to minimise potential risk of injury or damage to the equipment.



Warning: Re-fit all safety equipment and shields after service procedures.

If any procedure is unclear or requires facilities which are not available, refer the job to your HARDI dealer.

Note: For specific maintenance of the boom, Granni pot, foam marker system and self cleaning filter refer to the supplementary operator's manuals supplied with your sprayer's documentation.

Maintenance and off season storage

Preparation for off season storage

When the spraying season is over, you should devote some extra time to the sprayer.

Clean and decontaminate the sprayer thoroughly including all valves, hoses and auxiliary equipment (if chemical residue is left in the sprayer it can damage some components, see cleaning section).

Replace any suspect seals.

Drain all tanks and fluid circuits. Run the pump until air is forced from all the nozzles.

Service all lube points (see maintenance section)

When the sprayer is dry, remove rust from any scratches on steel components and touch up the paint.

Remove the pressure gauges and store them vertically away from frost.

Apply Castrol Rustilo or similar on external surfaces of steel components (avoid rubber parts such as hoses and tyres).

Fold the boom in the transport position.

Wrap electrical plugs and sockets in plastic to protect them from moisture.

Remove the control box and CPU / display unit from the tractor and store them in a safe dry place.

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

Apply grease to exposed hydraulic ram shafts to protect from moisture.

Place the sprayer in a shed.

Preparing the sprayer for use after storage

After a storage period the sprayer should be prepared for the next season.

Remove the grease from hydraulic ram piston rods.

Re-fit pressure gauges and seal with thread tape.

Connect the sprayer to the tractor including hydraulics and electrical system and check hydraulic and electrical functions for correct operation.

Flush the fluid system with clean water and test fluid functions for correct operation and leaks.

Repair any faults before using the equipment.

5 - Maintenance

Service and maintenance intervals

Service schedule		Service required every...		
Item	task	10 hours	250hrs	1000hrs or annual
1 Suction filter	clean	✓	✓	✓
2 Self-cleaning filter	check and clean gauze if necessary	✓	✓	✓
3 In-line filters	clean	✓	✓	✓
4 Nozzle filters	clean	✓	✓	✓
5 Spray circuit	check for leaks	✓	✓	✓
6 Transmission shaft	check and grease	✓	✓	✓
7 Hydraulic circuit	check for leaks		✓	✓
8 Hoses and tubes	check		✓	✓
9 Boom	refer to <i>Boom Manual</i>		✓	✓
10 Transmission shaft	change parts			✓

Occasional maintenance

Item	task
1 Pump valves, diaphragms	renew if req.
2 Pressure regulator	renew cone and O ring if req.
3 EVC distribution valve cone check	renew if req.
4 Wear pad	refer <i>Boom Manual</i>
5 Drain valve seal	renew if req.
6 Nozzle tubes, fittings	check if req.
7 Transmission shaft protection guards	renew if req.
8 Transmission shaft cross journals	renew if req.
9 Valves	adjust

5 - Maintenance

Recommended lubricants

General information

Always store lubricants in a clean, dry and cool place

Keep oil filling jugs, hoppers and grease guns clean. Wipe the lubricating points thoroughly before lubricating.

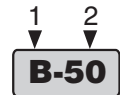
Avoid skin contact with mineral/ petroleum based products for long periods.







Note: If the sprayer is cleaned with a high pressure cleaner or fertiliser has been used, lubrication of all sections is recommended.

Adhere to directions concerning recommended lubricants and quantities. If no recommended quantity is given, feed the grease nipple till fresh grease becomes visible.

Pictograms in the lubrication indicate the following:

1. Type of lubricant recommended
2. Service interval in operating hours



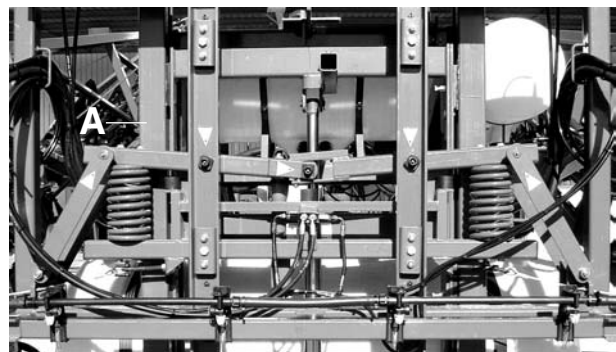
Lubrication points	Lubricant	
Ball bearings		Castrol EPL2 Grease or equivalent
Slide bearings		Castrol Grease with molybdenumdisulphide or equivalent
Oil lubricating points		Castrol EPX 80/W/90 or equivalent
Rubber grease		PBR rubber grease or equivalent
Boom joints		Caltex EP Grease C2 or equivalent
Hydraulics		Caltex Supertractor or equivalent

Lift tower lubrication points

The lubrication schedule for the lift tower (A) is detailed in the boom handbook supplied with your sprayer.

Boom service

For all other boom lubrication and service information please see the boom handbook supplied with your sprayer.



5 - Maintenance

10 hours service

1. Suction filter

To service the suction filter:

Pull the steel clip (A) out.

Lift the suction hose fitting (B) from housing.

Filter guide and filter (C) can now be removed.

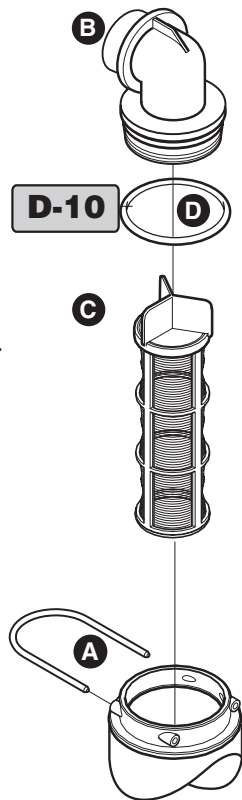
To reassemble:

Press the guide onto filter end.

Place the filter into housing with guide facing up.

Ensure the O-ring (D) on the hose fitting is in good condition and lubricated.

Refit the suction hose (B) and steel clip (A).



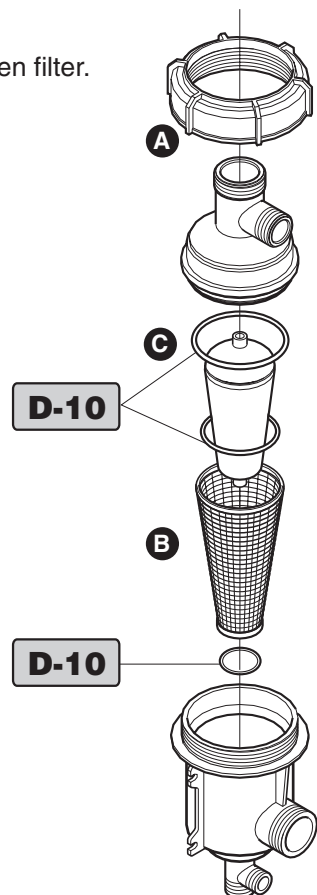
2. Self-cleaning filter

Unscrew nut (A) and open filter.

Check filter gauze (B), clean if necessary.

Lubricate O-ring (C).

Assemble filter again.

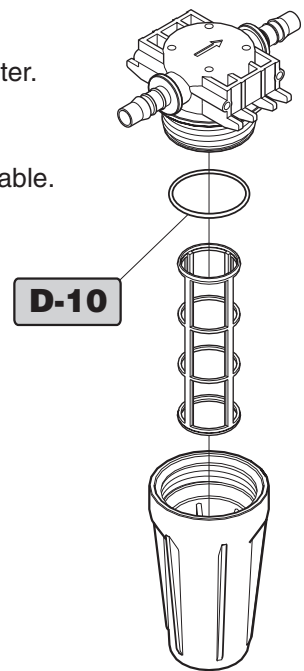


3. In-line filter (if fitted)

Unscrew the filter bowl to inspect and clean the filter.

Lubricate O-rings.

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



4. Nozzle filters

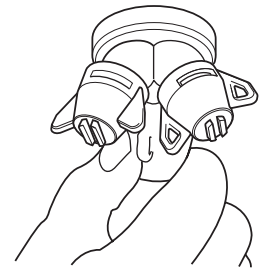
For each nozzle:

Remove the nozzle.

Check the nozzle and filter.

Clean the filter.

Refit the filter and nozzle.



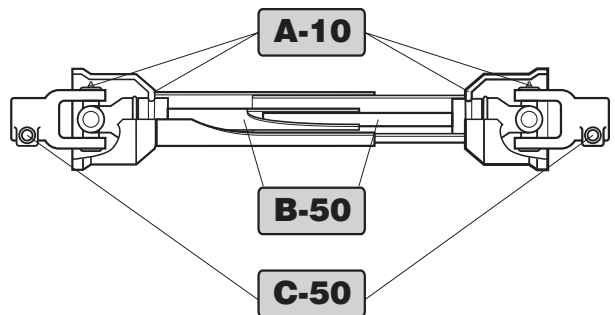
5. Spraying circuit

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

6. Transmission shaft (PTO)

Check function and condition of the transmission shaft protection guards. Grease nipples.

Transmission shaft



250 hours service

Carry out previous service procedures plus the following:

7. Hydraulic circuit

Check all hoses and tubes for possible damage and proper attachment.

Renew damaged hoses or tubes.

8. Hoses and tubes

Check all hoses and tubes for possible damage and proper attachment.

Renew damaged hoses or tubes.

9. Boom

Refer to *Operator's Boom Manual*

1000 hours service

Carry out previous service procedures plus the following:

10. Transmission shaft

Change the protection tube nylon bearings as described in PTO shaft shield replacement section, on page 5.9

Occasional service

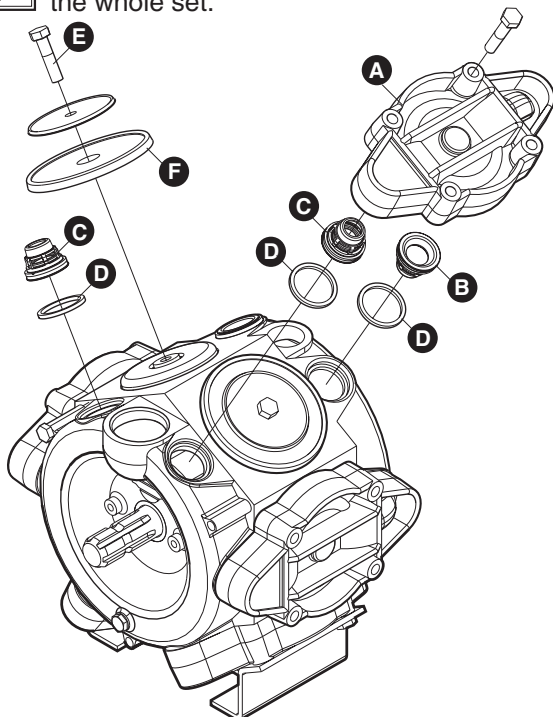
Carry out previous service procedures plus the following:

Pump valves and diaphragms

Maintenance and renewal intervals for pump valves and diaphragms depend upon conditions under which the sprayer is operated and are therefore difficult to specify.



Note: It is recommended that when servicing the pump's valves or diaphragms you replace the whole set.



Occasional service

Changing valves

Mark the valve cover positions in relation to the pump body with a small punch or scribe. Remove the valve covers (A). Note the orientation of the valves (B & C) for correct re-assembly.

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

Changing diaphragms

With the valve covers removed as explained above, remove the diaphragm bolts (E).

Change all the diaphragms (F) as required.

If fluid has entered the crankcase, clean, dry and re-grease the pump thoroughly. Also check the drain hole at the bottom of the pump is not blocked.

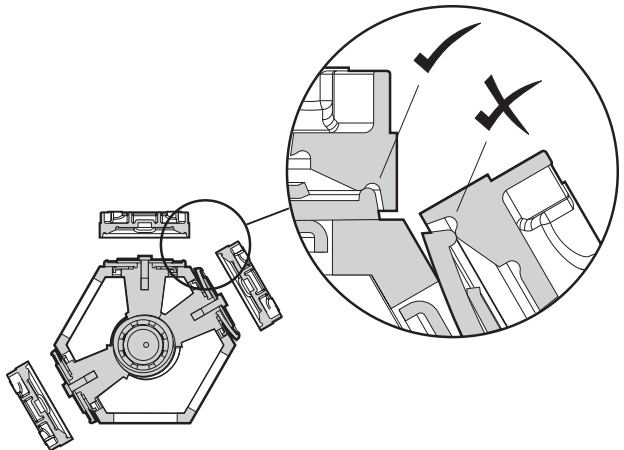
Upon re-assembly apply a thin film of non hardening sealing compound such as Loctite 515 to the mating surfaces and re-tension the cover bolts gradually to the specified torque in a diagonal sequence.



Note: When tensioning diaphragm cover bolts, rotate the pump to ensure the diaphragm is in a neutral or positive position (see illustration below).

Correct positioning will aid in cover and seal alignment and prevent damage to the diaphragm upon assembly.

See the section on specifications for diaphragm cover bolt torque settings.



Pressure regulator maintenance

If low or inconsistent pressure is experienced, check the pressure by-pass valve cone and cylinder and replace if necessary.

5 - Maintenance

Occasional service, continued

EVC section valves

Boom section control is maintained by a group of individual electrically operated valves or EVC's located on the boom centre and arranged in series on a common fluid supply and return manifold assembly.

Each EVC unit houses two valves driven via a common cam operated shaft and a third for manual pressure equalisation (constant pressure) adjustment.

The lower of the first two valves controls boom section flow and the upper dumps boom line pressure back to the return manifold when the valve is shut down.

Each valve consists of a floating nylon washer pre-loaded by a spring and secured to the shaft by a 'C' clip and washer. The springs are pre-set to specific tensions and provide mechanical dampening and the desired pressure against the valve seat.

Internal by-pass

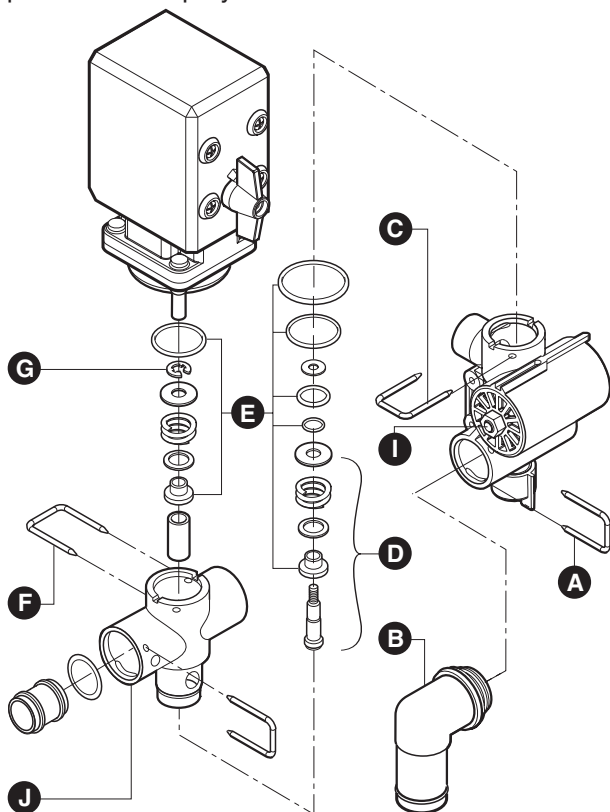
It is vitally important the section valves are maintained properly as leakage is circulated back to the tank, having already been counted by the flow meter as discharged. This affects the accuracy of calibration and results in a reduced application rate.



Warning: Before performing any service procedure involving the fluid system, clean and de-contaminate the sprayer thoroughly.

Testing EVCs

To test the section valves, run the sprayer on clean water, open the boom sections and shut down the power on the Spray Control Box.



Carefully remove the clip (A) and the fitting (B) and allow the manifold to drain completely.

Once drained, observe the opening for any sign of a continuous discharge of water.

If suspect, collect the discharged fluid in a container for a period of 60 seconds and measure the volume.

If it exceeds 2.0 percent of your calibrated application rate per hectare it is recommended you service the valves.



Note: Usually no single valve is responsible for excessive fluid by-pass but rather all the valves combined. It is therefore recommended they are all overhauled together.

Service procedure

To service the EVC's proceed as follows:

Remove the nut and cap (I) from the closed end of the manifold.

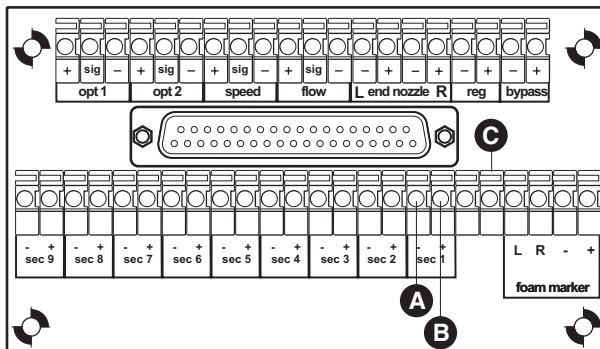
Remove the stainless steel slide clips, fittings and hoses from the valves.

Remove the lid from the EVC junction box and disconnect the section valve power wires from the circuit board.



Note: On 9 section circuit boards the terminals are numbered from right to left, on the sprayer however the EVC's are numbered left to right.

Circuit board



A: Blue wire (negative) section 1
B: Brown wire (positive) section 1
C: Terminal quick release.

Depress the terminal quick release with a small screw driver and remove each wire from it's terminal.

Cut the zip tie that anchors the wiring harness into the junction box and pull each harness free.

Beginning at the left hand valve, remove the mounting screw at the base of the EVC unit and separate it from the rest of the valves. Repeat the process for each valve in turn.

Occasional service, continued

EVC disassembly

Move the valves to a clean work bench, remove the slide clip (C) and separate the lower section.

With the end of the shaft now exposed remove the retaining screw and valve components (D).

Remove the slide clip (F), housing (J) and 'C' clip (G) and dismantle the dump valve assembly.

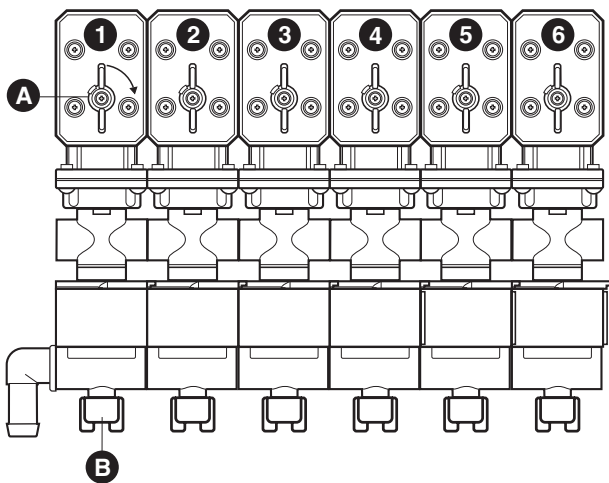
Replace the valve components (E)

Repeat the procedure for the rest of the valves and re-assemble onto the sprayer in the reverse order with new 'O' rings using rubber grease on all the joints.

Reset the pressure equalisation valves as described below and test the system for leaks and correct valve operation.

Adjusting equalisation valves (constant pressure)

With the boom section valves open run the sprayer at normal average spraying pressure. Note the reading on the pressure gauge and *manually* close the first section valve by turning the green handle (A) clockwise.



When the system pressure has stabilised adjust the first equalisation valve (B) until the original spraying pressure is restored and then return the valve to the open position.

Move onto the next valve in line and repeat the procedure until all the valves have been balanced.



Caution: After service procedures it is recommended the equipment be re-calibrated before spraying.



Note: The equalization procedure is generally only required after servicing, changing nozzle size or when compensating for worn nozzle jets.

EVC pressure regulator (constant pressure valve)

In order to maintain the calibrated chemical application rate, the 5500 CPU regulates return flow back to the tank via an electrically controlled by-pass valve.

For example in auto mode the CPU detects a reduction in forward speed. The valve is opened increasing return flow to the tank. The system pressure drops and fluid discharge from the nozzles is reduced. The valve may also be operated manually via the pressure control switch on the spray control box. The response rate of the valve may be altered by replacing the cone for one of a different capacity.

Location

The constant pressure valve is located on the left hand side of the sprayer as shown.



5 - Maintenance

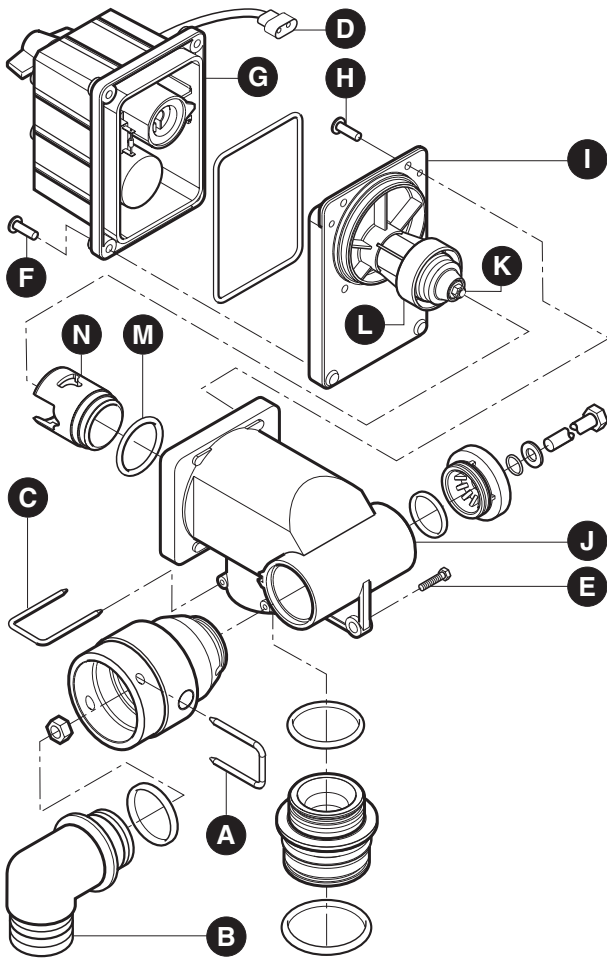
Occasional service, continued

Service

It is recommended that the valve be checked and serviced occasionally by replacing the O-ring and valve cone.

The test procedure outlined below will help confirm a leaking valve and should be included as part of your diagnostic process when presented with low or unstable fluid pressure.

EVC pressure regulator



Test procedure

Clean and decontaminate the sprayer (see cleaning section) and prepare it for servicing as detailed at the beginning of this section.

Run the sprayer on clean water. Turn on the boom sections and turn the pressure control on the spray control box towards the '+' until the yellow winder on the front of the EVC stops turning.

With the valve now closed, the system is running on maximum pressure and is ready for testing.

Observe the pressure gauge for a few moments and note the reading. It should be stable and around double the maximum value required for spraying.

If an abnormal condition is suspected remove the slide clip (A) and the return hose fitting (B) and allow the valve to drain completely.

Once drained, watch the opening for any sign of a continuous discharge of water.

If a persistent flow is observed it can be reasonably assumed that overhaul of the valve assembly is necessary.

To service the valve, shut down the sprayer and remove the slide clip (C), the wiring harness (D) and the mounting bolt (E). Remove the EVC unit from the sprayer and place it on a clean work bench.

Remove the four screws (F) and the motor drive (G). Continue to remove the four screws (H) and separate the shaft housing, operating shaft, support sleeve and spindle assembly (I) from the valve housing (J).

Remove the 8mm nut and spindle (K) from the operating shaft. Carefully slide the shaft support sleeve (L) off and replace the two O-rings on the shaft. Replace the support sleeve O-ring and re-assemble ensuring the locating lugs are correctly aligned with the slots in the shaft assembly housing. Replace the spindle (K) and reassemble the shaft using Lock-tight 243 or similar on the nut.

Always re-assemble fluid joint O-rings with rubber grease and double check their placement.

Fit the new valve cone (N) into the base of the shaft support sleeve (L) ensuring the slots in the cone are aligned with the locating tangs in the sleeve recess. Fit the new O-ring (M) against the first shoulder on the valve cone and re-assemble in the reverse order using new O-rings on all fluid joints.

Run the sprayer and check for leaks. Repeat the test procedure to confirm the repair was successful.

Occasional service, continued

PTO shaft shield replacement

To replace the transmission shaft safety guards separate the two halves of the shaft and lay one section on a work bench

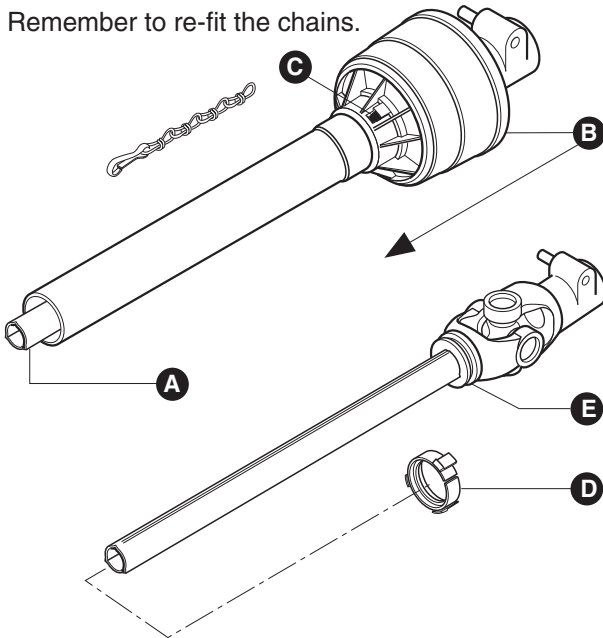
Secure the exposed end of the shaft (A) against a solid object. Pull the flared end of the guard in the direction shown (B) whilst depressing the 3 locking tabs (C) with a screw driver. Remove the protection tube.

Remove the safety guard bush (D) from the inner shaft yoke (E).

Repeat the process for the other sections

Clean and grease the shaft and re-assemble in the reverse order using new parts where necessary.

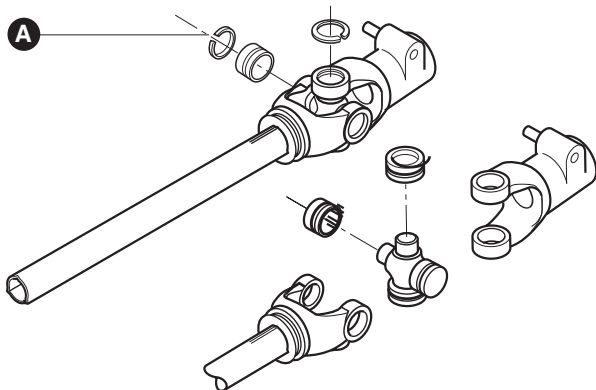
Remember to re-fit the chains.



Replacement of universal joints

Remove protection guard as described previously and remove the uni cap circlips (A) from the yoke.

Remove the joint and replace with a new assembly in the usual manner as required.



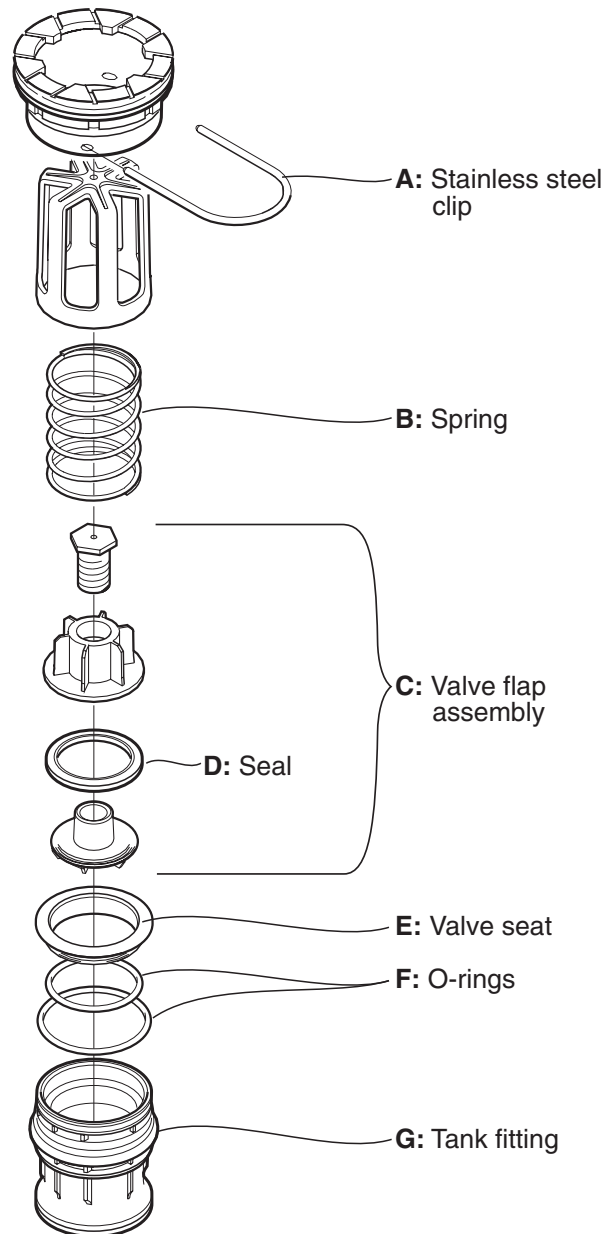
Drain valve seal

The seal and seat in the main tank drain valve are serviceable if for example a leak is detected.



Warning: Use a face shield when removing the main tank drain valve. Access the valve from under the sprayer. Never enter a tank.

The drain valve assembly



Service procedure

Make sure the tank is empty and clean.

Ensure the valve is closed and the string is loose.

Slide out the stainless steel clip (A) and remove the tank fitting (G). Remove the valve flap assembly and inspect for damage or signs of wear.

5 - Maintenance

Occasional service, continued

Service procedure continued...

Check the cord for wear and replace as necessary.

Replace the seal (D) and the valve seat (E).

Replace the O-rings (F) if required and lubricate with rubber grease.

Re-assemble the valve ready for installation.

Install the valve assembly and fit the stainless steel retaining clip (A).



Note: Check the function of the valve with clean water before introducing chemicals into the tank.

Tubes and fittings

Poor seals are usually caused by one or more of the following factors:

- Missing O-rings or gaskets
- Damaged or incorrectly seated O-rings
- Dry or deformed O-rings or gaskets
- Foreign material or over-tight couplings

Leak repair

If a leak is detected disassemble the joint, check condition and position of the O-ring or gasket and clean, lubricate, reassemble and test.

Avoid trying to repair a leaking joint by over-tightening the coupling.

Before fitting the O-ring to the nozzle tube coupling, cover it all over in a rubber safe grease (non mineral lubricant) before sliding it into position.

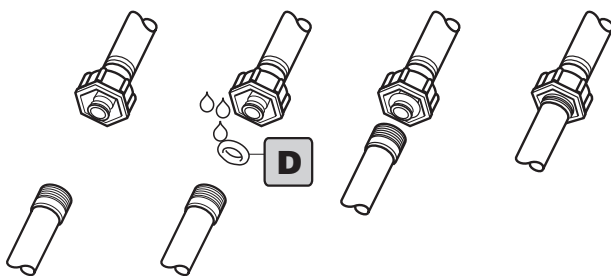
Rules for good seals:

Clean

Lubricate

Assemble

Test



Note: Assemble by hand only, no mechanical assistance or leverage.

Tensioning the couplings

For radial connections hand tighten only.

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

6 - Trouble shooting

Liquid system

Introduction

Where breakdowns occur, problems can usually be traced back to one of the following:

1. Minor leaks on the suction side of the pump will reduce the pump capacity or stop suction completely.
2. A blocked suction filter will cause the pump to labour and reduce pump efficiency.
3. Blocked pressure filters cause rising pressure at the gauge but lower pressure at the nozzles.
4. Foreign material in the pump valves results in reduced pump efficiency.
5. Worn pump valves result in reduced sealing capacity and will hinder the pumps suction and delivery capacity.
6. Poorly re-assembled pumps, especially diaphragm covers, will result in reduced or no fluid capacity.
7. Worn EVC pressure regulator valve and cone will result in a reduction in operating pressure.
8. Hydraulic components that are contaminated with dirt result in rapid wear to the hydraulic system.

Therefore 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. Replace worn parts.
7. Hydraulic components are maintained and clean.

Liquid system:

Fault	Possible cause	Suggested procedure
No spray from boom when turned on	Air leak on suction line	Check if suction filter O-ring is sealing
		Check suction hoses and fittings
		Check pump for diaphragm and valve cover leaks
	Air lock in fluid system	Fill suction hose with water for initial prime
	Blocked filters	Clean suction, in line and self cleaning filters
		Check suction pipe is not blocked
	Low pressure	Check for air leak
		Check for correct pump assembly
		Self-cleaning filter restrictor missing
		Check EVC for cone and piston wear
	Damaged pump valves	Check for obstructions and wear
	Defective pressure gauge	Check for blockage at inlet of gauge
Pressure falling	Filters becoming blocked	Clean all filters. Fill with cleaner water. If using powders make sure agitation is on
	Nozzles worn	Check flow rate and replace nozzles if found to be 10% over specifications
	Tank is air tight	Check vent is clear
	Sucking air at end of tank	Lower pump rpm
Pressure increasing	Pressure filters being blocked	Clean all filters

6 - Trouble shooting

Liquid system, continued

Fault	Possible cause	Suggested procedure
Formation of foam	Air leaking into system	Check security of gaskets & O-rings on fittings on the suction side of pump
	Excessive liquid agitation	Reduce pump rpm
		Check safety valve is tight
		Ensure return to tank is present
		Use foam damping additive
Liquid leaks from bottom of pump.	Damaged diaphragm	Replace. See changing of valves and diaphragms

Valve function

Fault	Possible cause	Suggested procedure
EVC units not functioning	Blown power box fuse	Check and replace fuses as necessary
	Wrong polarity	Brown is positive (+), Blue is negative (-)
		Check circuit board for dry solders or loose connections
	Switching problem	Check mechanical function of EVC micro-switches. Use contact cleaner and lubricating agent if the switch does not operate freely
	Motor failure	Check motors for power supply and replace if necessary
	Valves not closing properly	Check valve seals for obstructions
		Check microswitch position: Loosen screws holding switch and check function
	No power	Check fuses.
HC5500 showing 'fuse X' error	Short circuit in system	Disconnect 39 pin connection in EVC junction box. If error disappears, check for short circuit in EVC units and end nozzle solenoids and wiring harness

Emergency operation for the liquid system

In the case of power failure it is possible to operate all functions of the operating unit manually. First disconnect the 39 pin plug from the spray control box. Now manually turn the EVC control handles.

6 - Trouble shooting

Hydraulic system

Fault	Possible cause	Suggested procedure
No boom movements when activated	Insufficient hydraulic pressure	Check oil pressure - minimum 130 bar, maximum 160 bar
	Insufficient oil supply	Oil flow must be minimum10 L/minute and maximum 90 L/minute
		Check hydraulic fluid level
	Low power supply	Voltage to activated solenoid valve must be more than 8 volts
	Blown fuse(s)	Check fuses
	Corroded connections	Check electrical terminals etc
	Defective relay	Check relays, diodes and soldering in hydraulic junction box
	Restricted hydraulic flow	Remove and clean restrictors A and B in bypass block. Change hydraulic fluid and filter
Boom lift raises to maximum position when tractor hydraulics are engaged	Reversed connection	Reverse hydraulic snap couplers in tractor outlets, or engage spool valve lever in opposite direction
	Back pressure in return line exceeds 20 bar	Connect the return line with free flow to hydraulic oil reservoir
		Divide return line in two and lead return oil back to reservoir via two spool valves
Oil too hot in closed centre systems	Defective by-pass valve	Check / adjust by-pass valve
	Internal leak in flow regulator	Replace flow regulator O-rings and back-up rings. Replace flow regulator
Individual ram does not move	Blocked restrictor	Dismantle and clean restrictor

7 - Specifications

General information

Conversion table

1 Nm = 0.738 lb-ft
1 bar = 100 kpa = 14.5 psi
1 litre of water = 1 Kg
1 Kg = 2.2 lb

Torque settings

Item	Torque (Nm)	
General bolts	12mm	77
	16mm	90
363 pump		
Valve cover bolts		90
Diaphragm bolt		90

Sprayer operating temperature

2 to 40* C (36* to 104°F)

Pressure	
Operating pressure for safety valve	12 bar
Maximum on pressure manifold	20 bar
Maximum on suction manifold	7 bar

Flow

Electrically controlled pressure regulator by-pass
flow capacity: 0-1 l/m adjusted at full pressure.

Self cleaning filter

Filter mesh flow rates at @ 3 bar:
Green - 37 l/m Black - 26 l/m
White - 18 l/m Red - 13 l/m

Agitators

Combined flow from both agitators @ 3 bar:
2.5 mm - 16 l/m 3.0 mm - 25 l/m

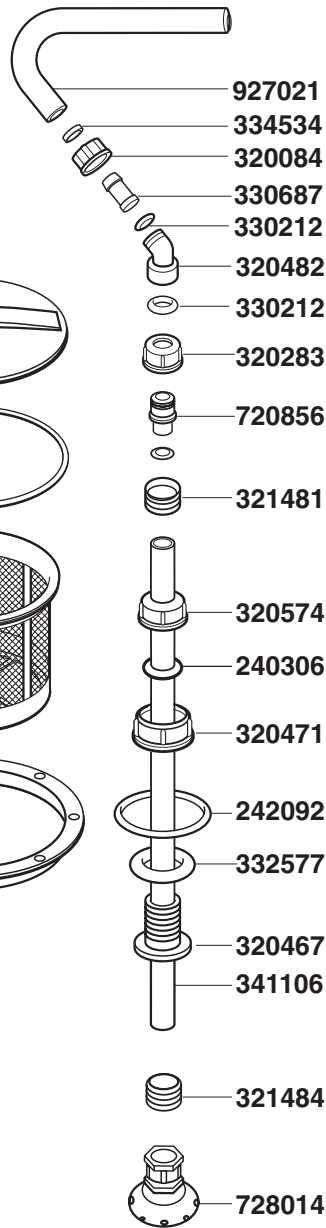
Filters

Mesh	Colour	Gauze size (mm)
30	Green	0.58
50	Blue	0.30
80	Red	0.18
100	Yellow	0.15

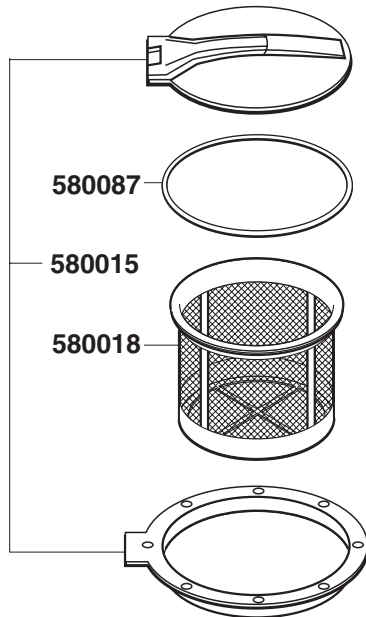
8 - Spare parts

Tank fittings

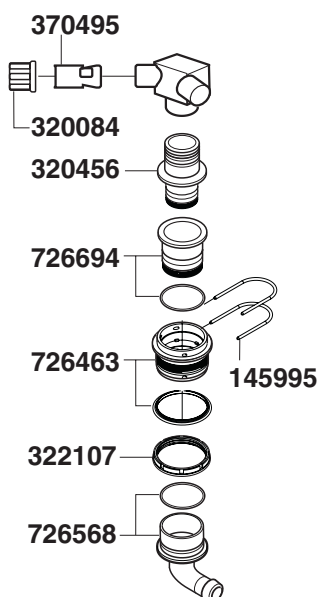
Rinse nozzle



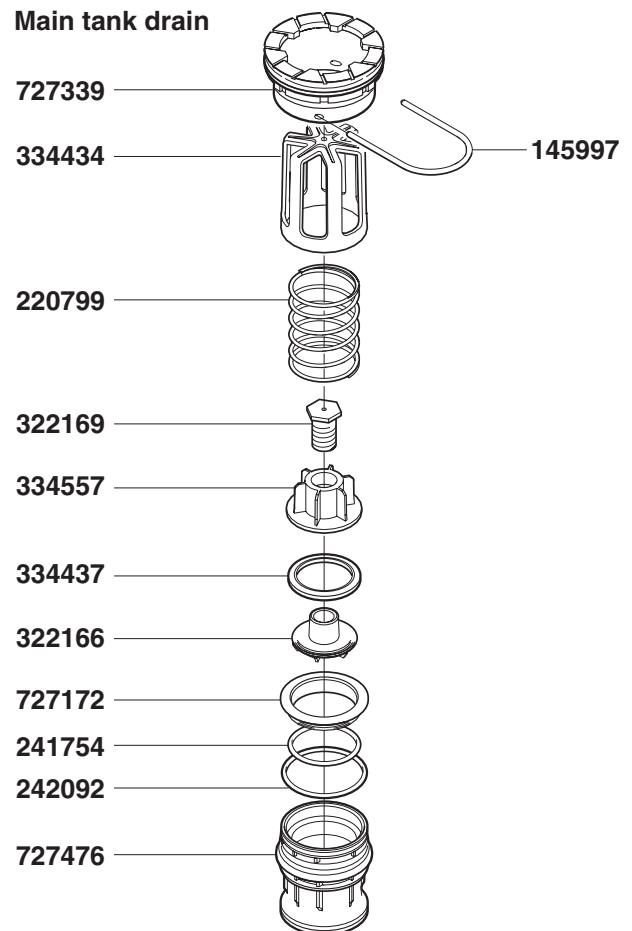
Tank lid and filter



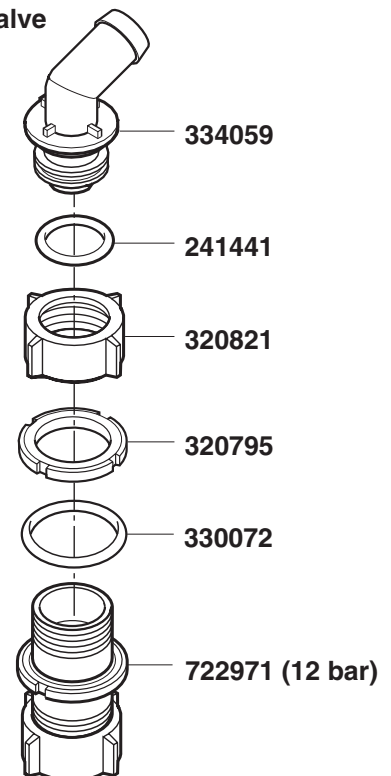
G= 1/2" S53 Agitation



Main tank drain



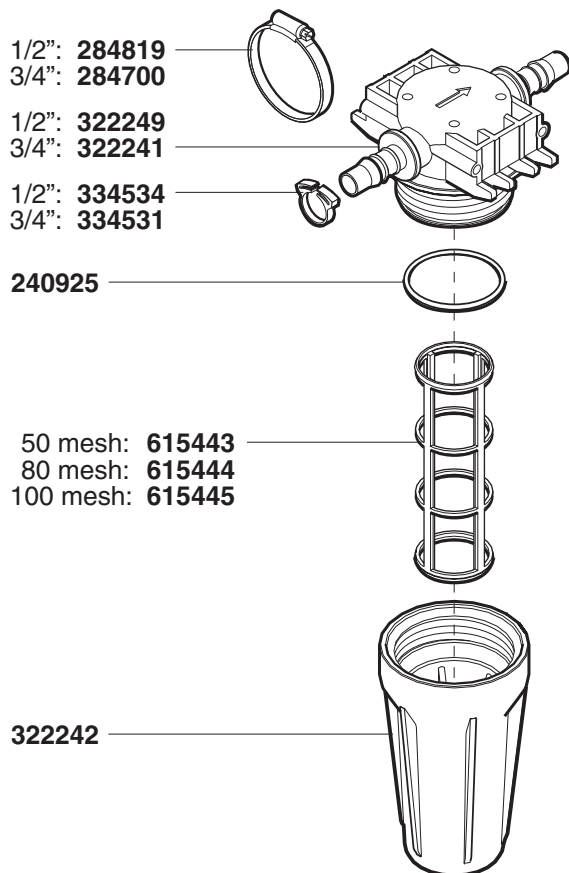
Pressure safety valve



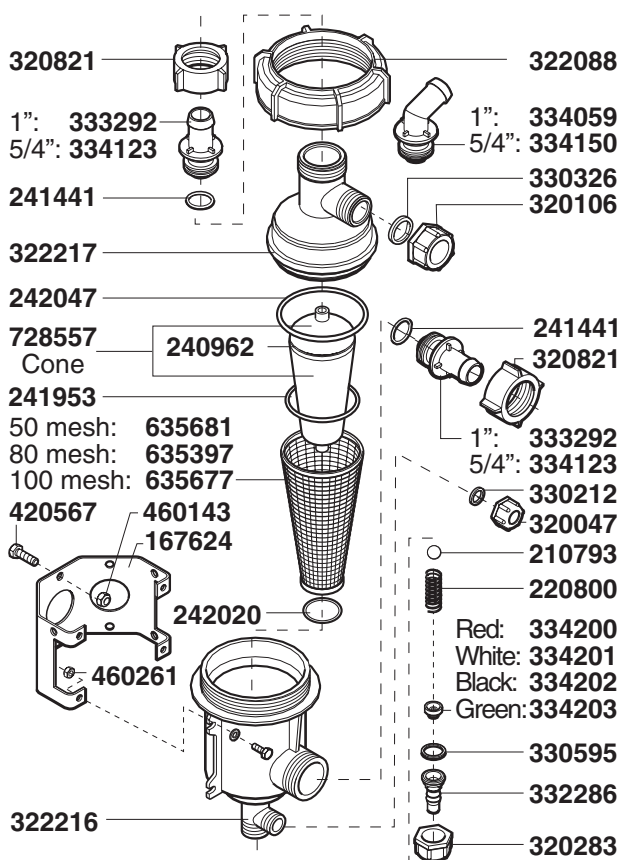
8 - Spare parts

Filters

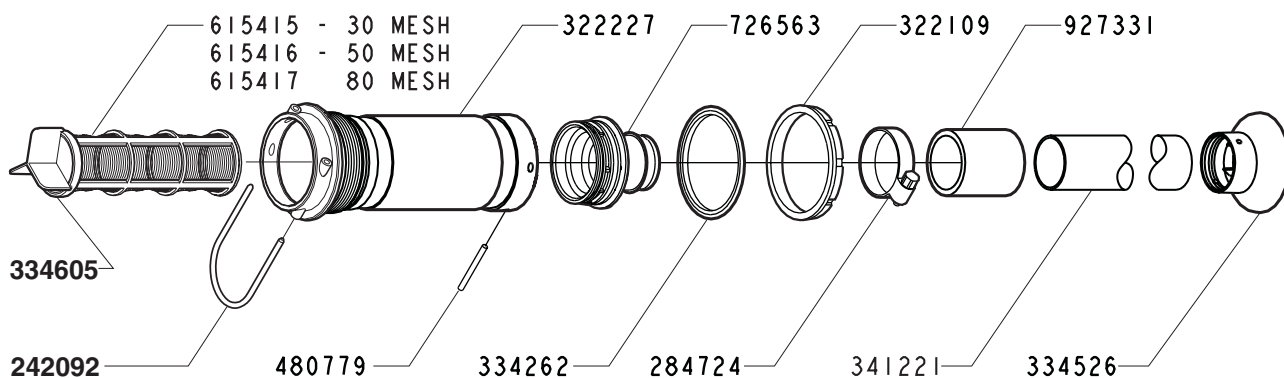
In-line filter B207



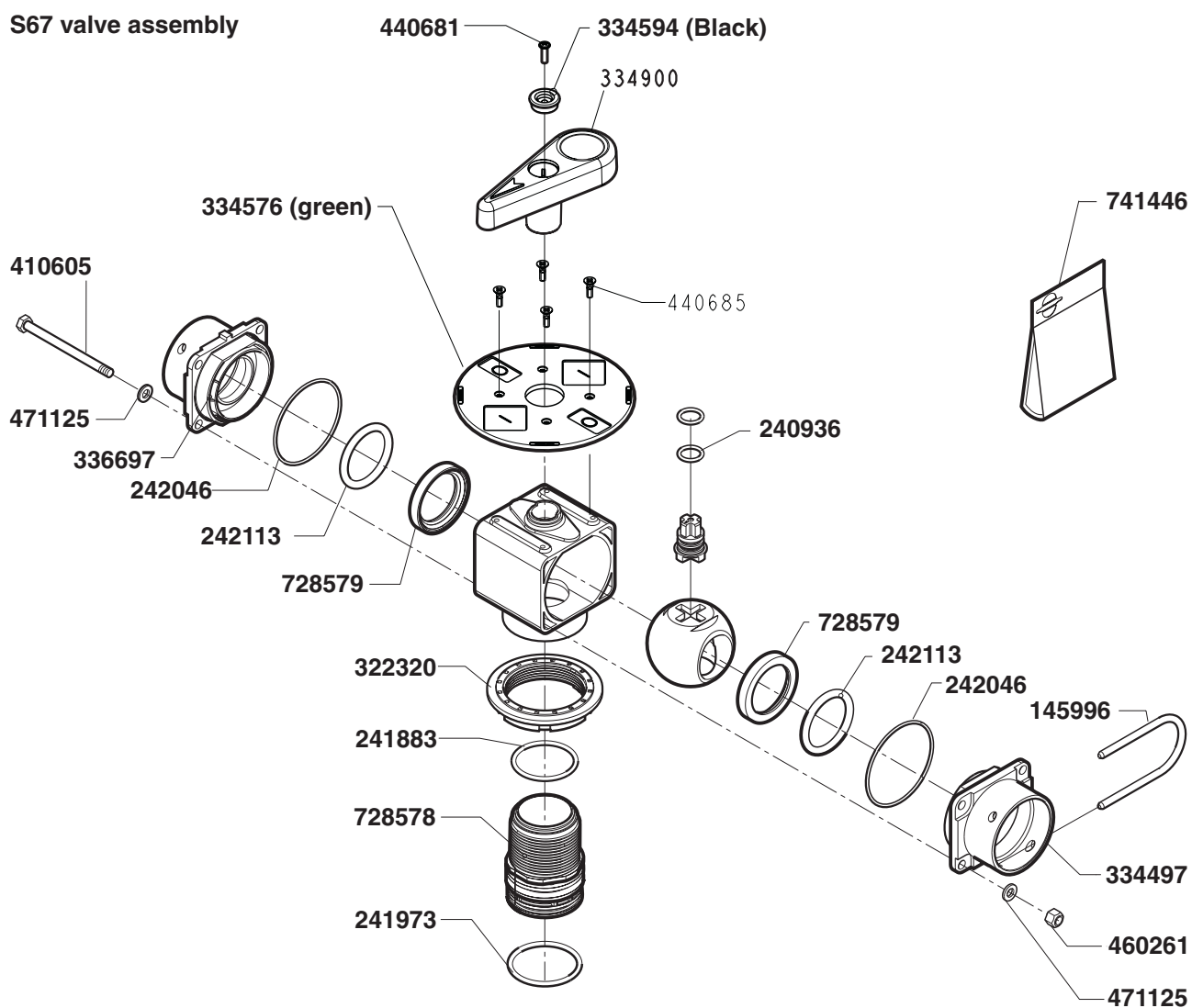
Self-cleaning filter



Suction filter



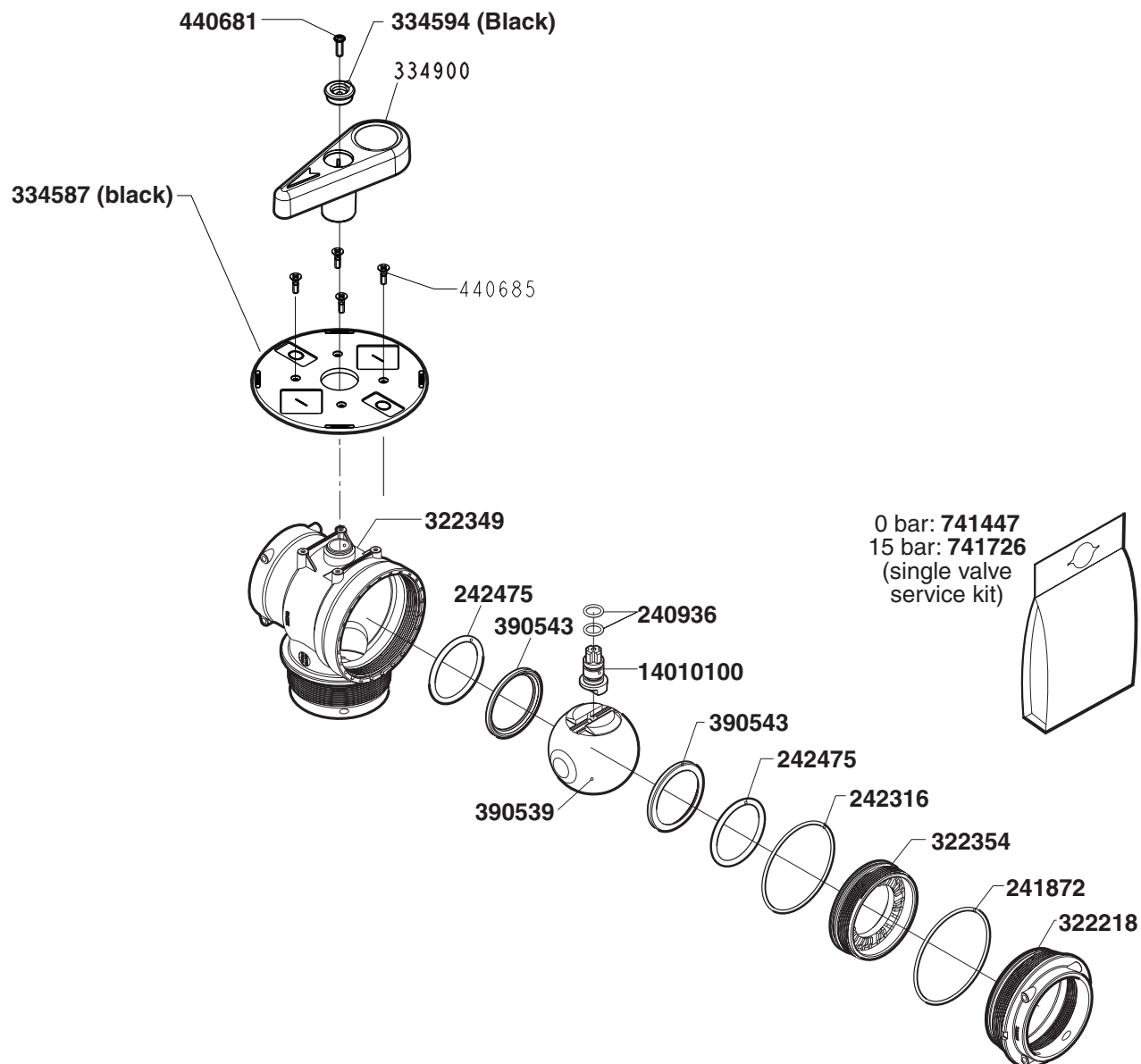
S67 valve assembly



8 - Spare parts

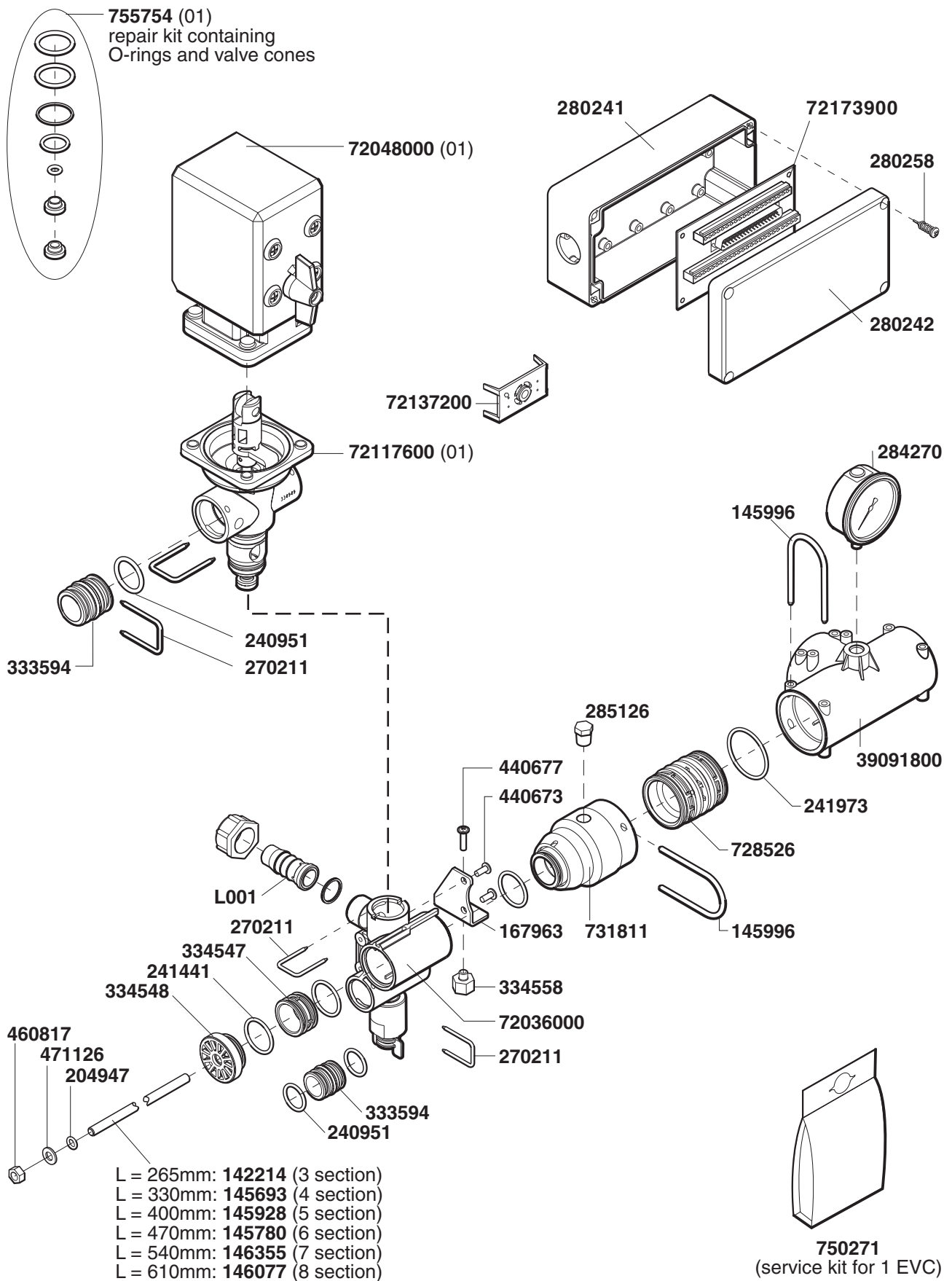
Valves

S93 valve assembly



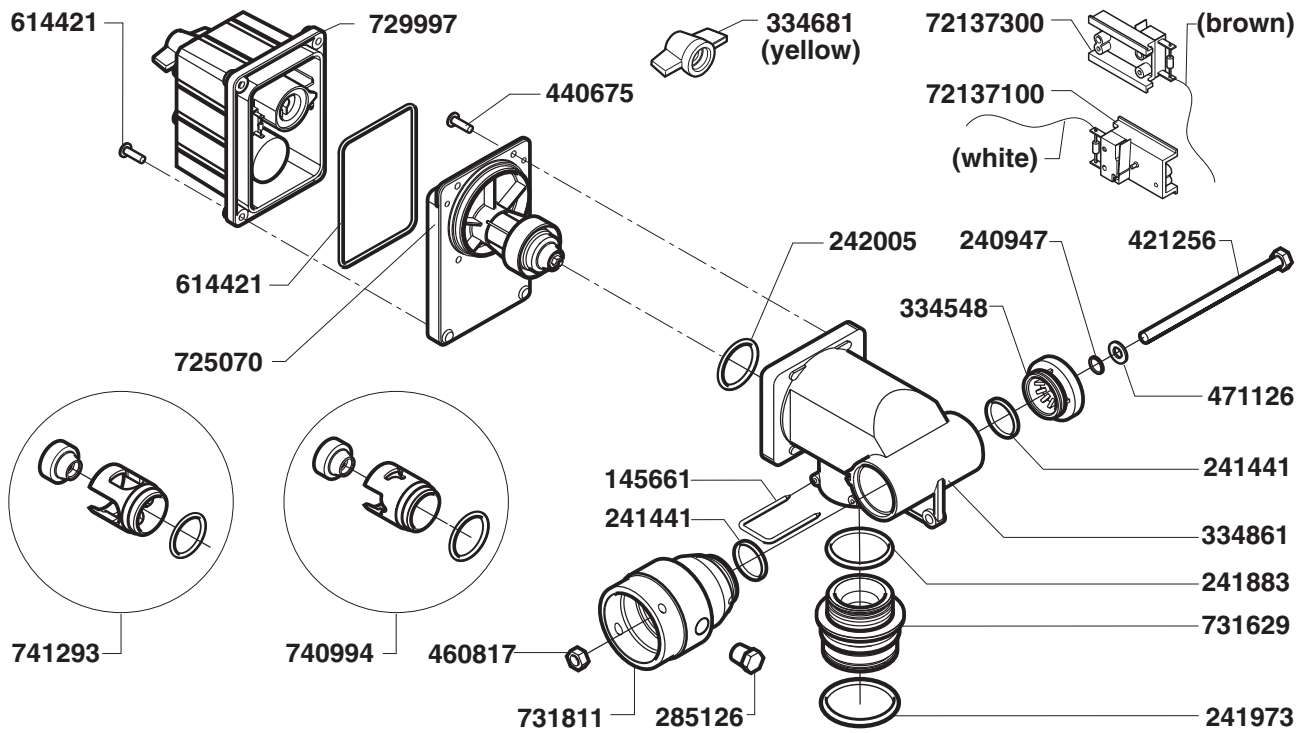
8 - Spare parts

EVC distributor

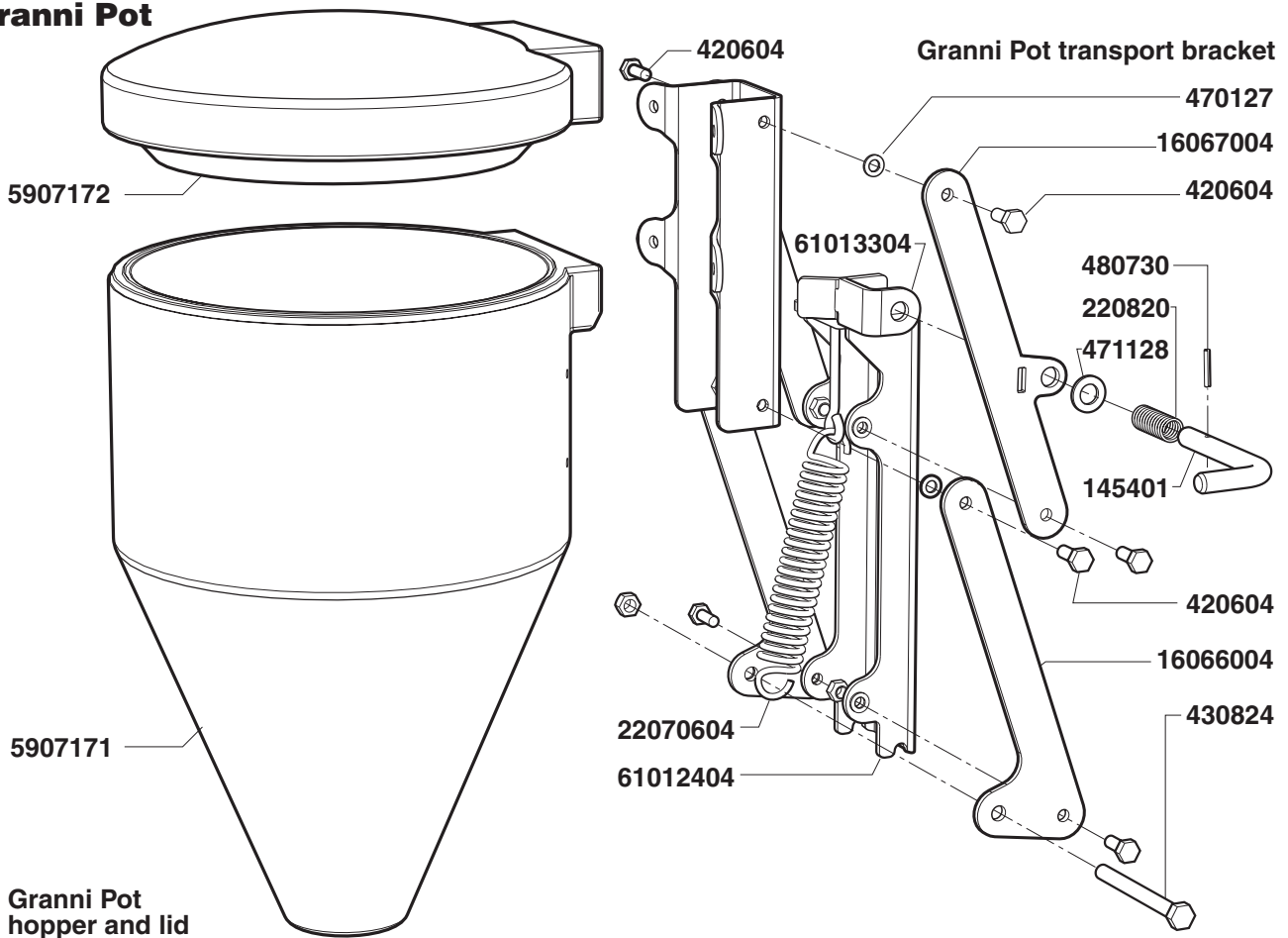


8 - Spare parts

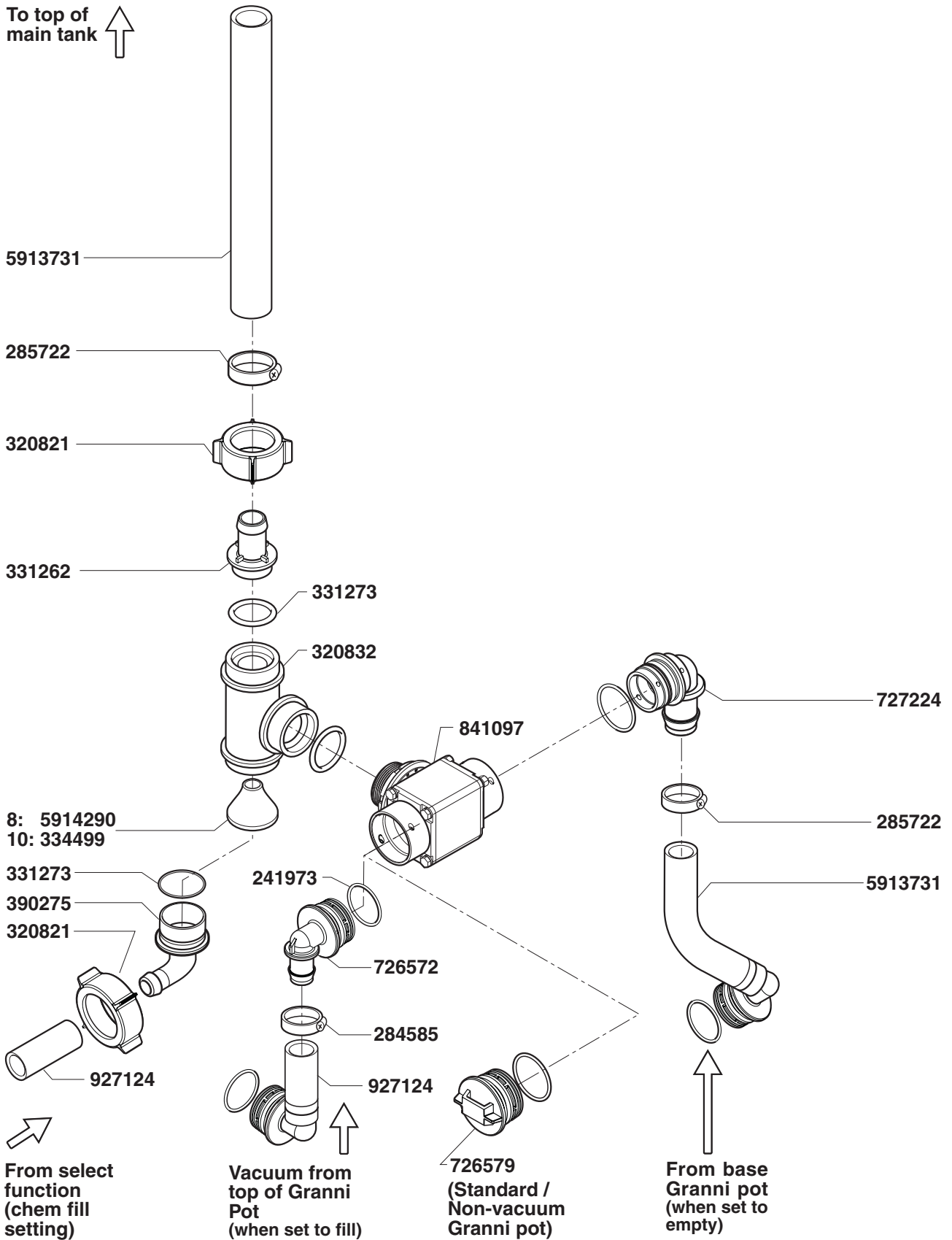
EVC pressure valve



Granni Pot



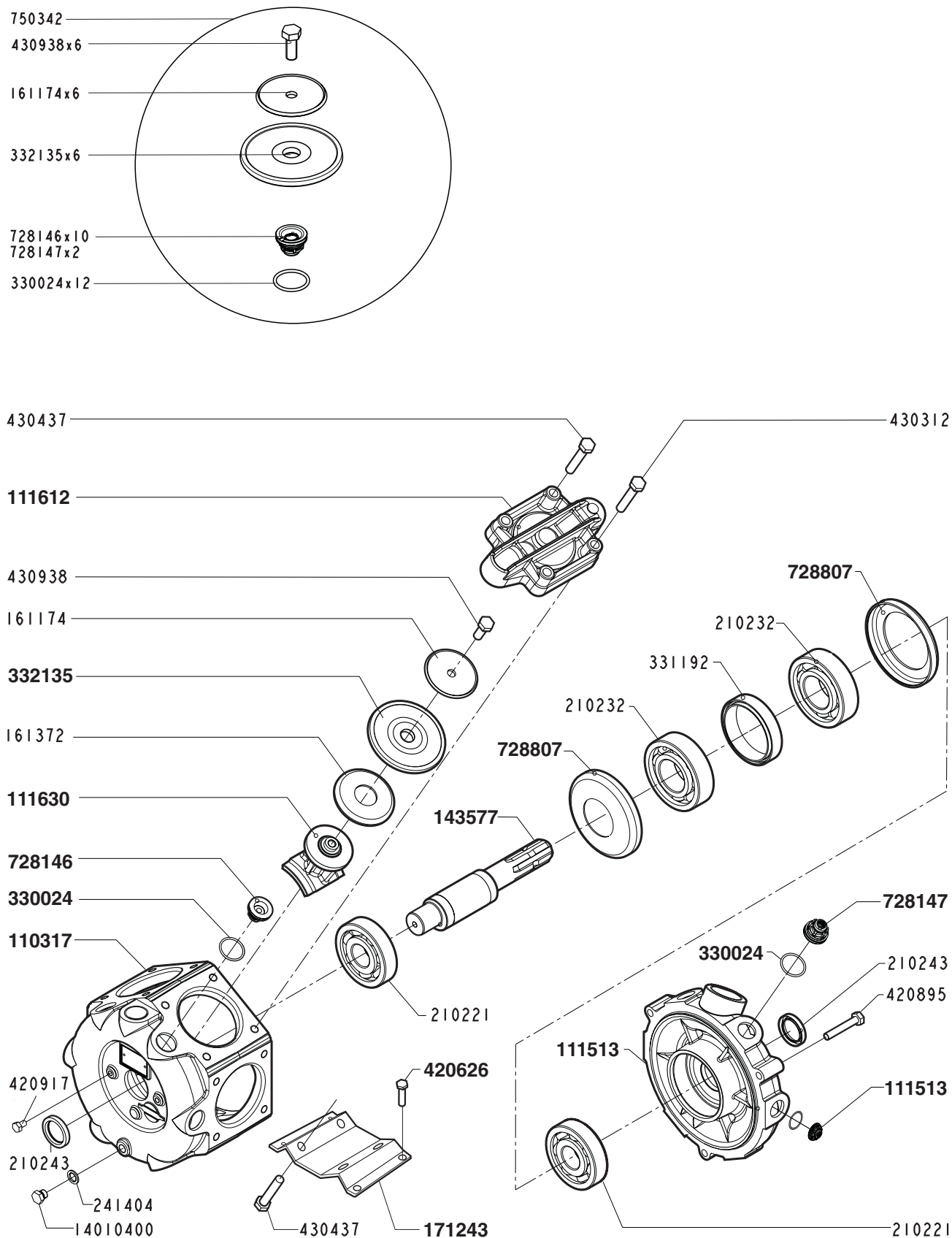
Granni Pot venturi manifold



8 - Spare parts

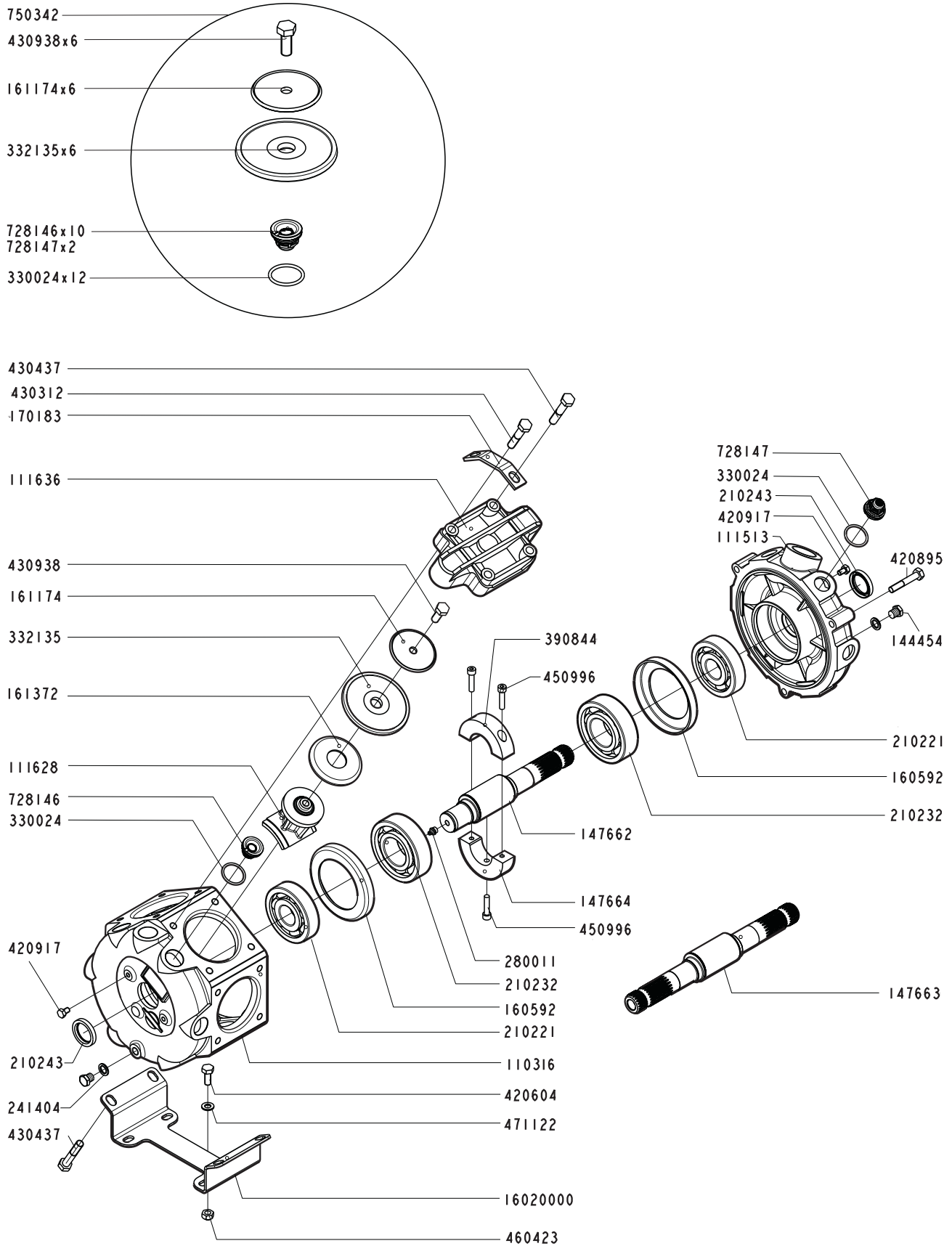
Pumps

363 Pump, 540rpm



Pumps

363 Pump, 1000rpm



Hydraulics

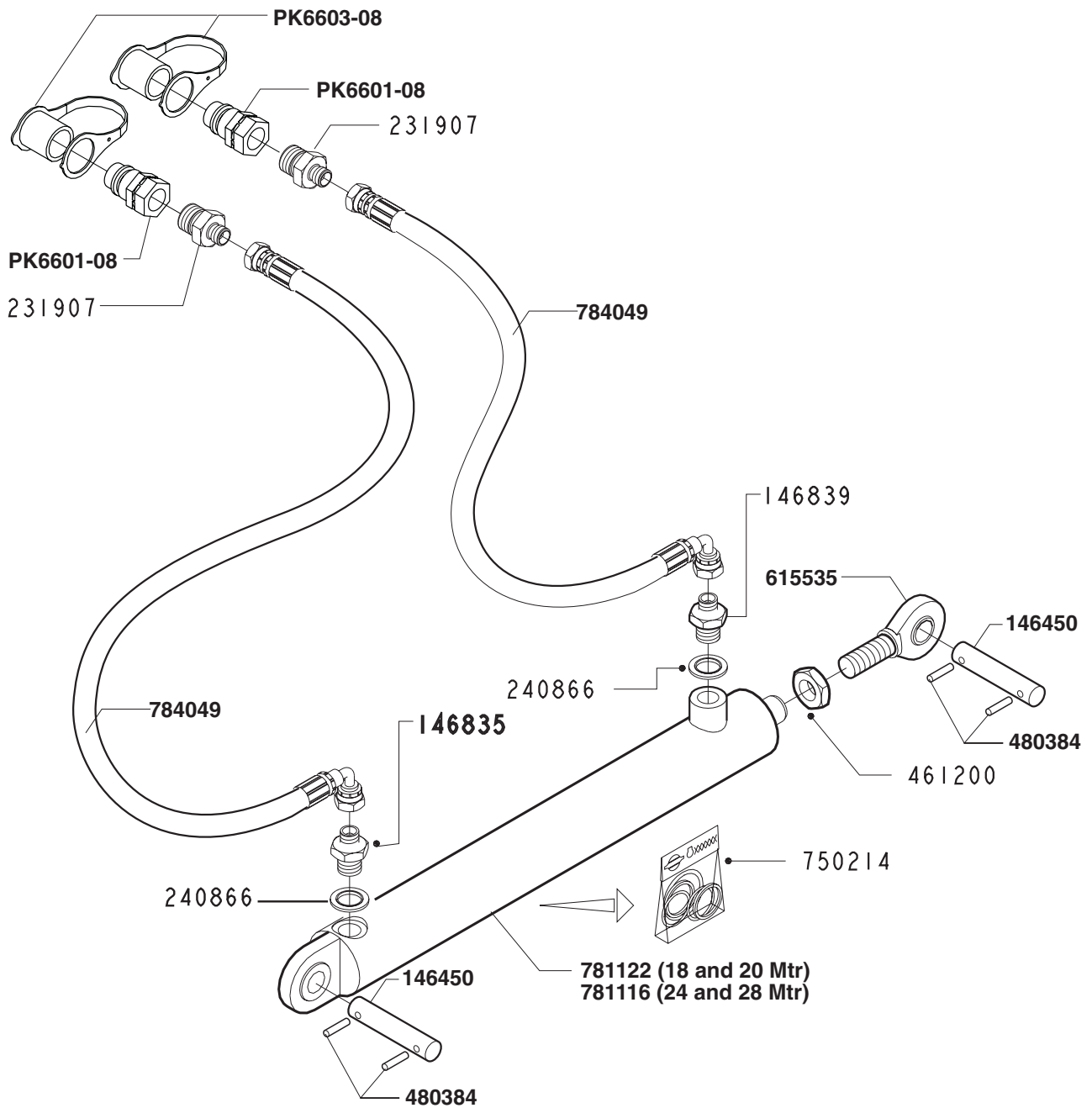
Standard hydraulics



8 - Spare parts

Hydraulics

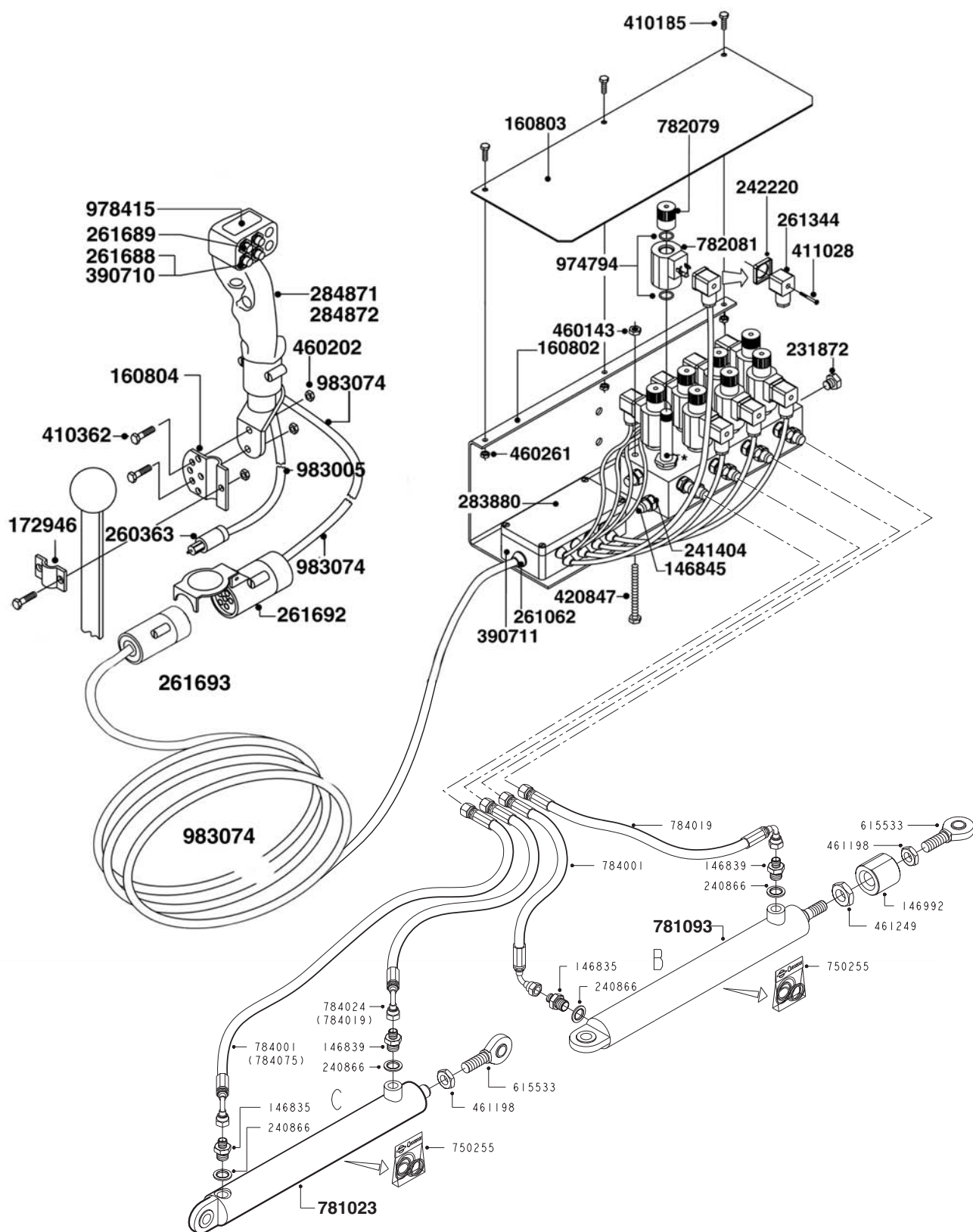
Optional tilt cylinder and hose kit



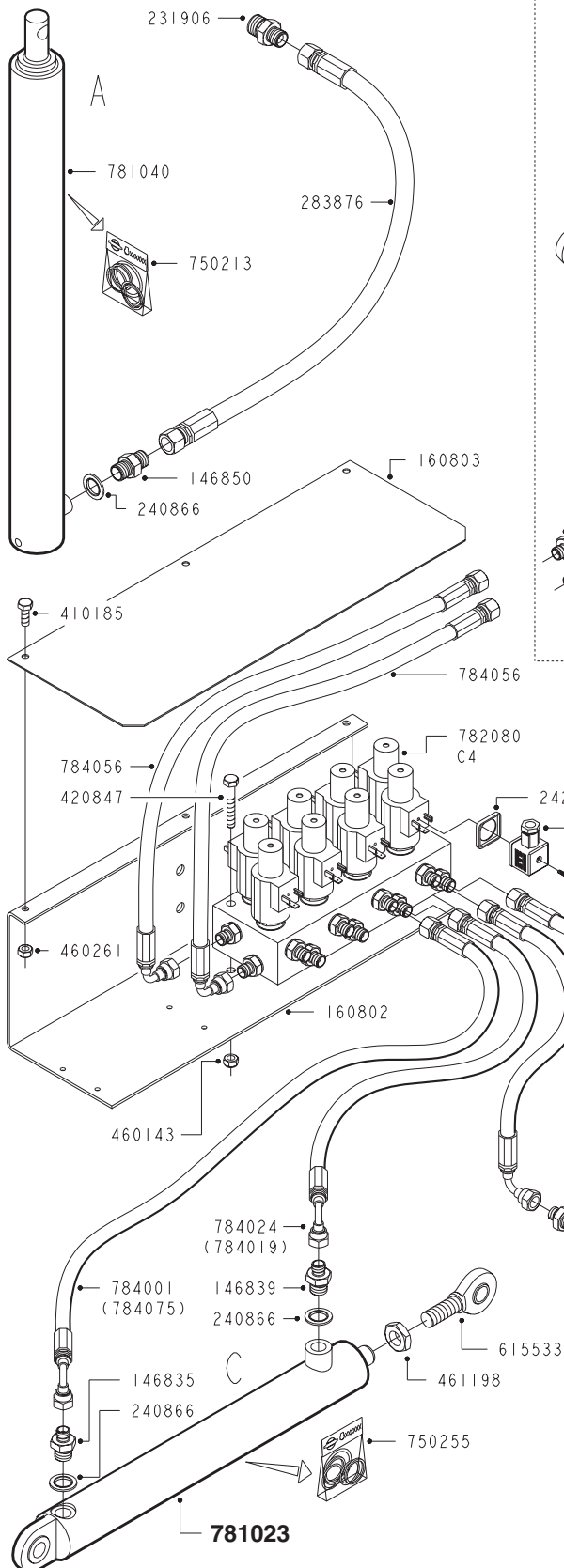
8 - Spare parts

Hydraulics

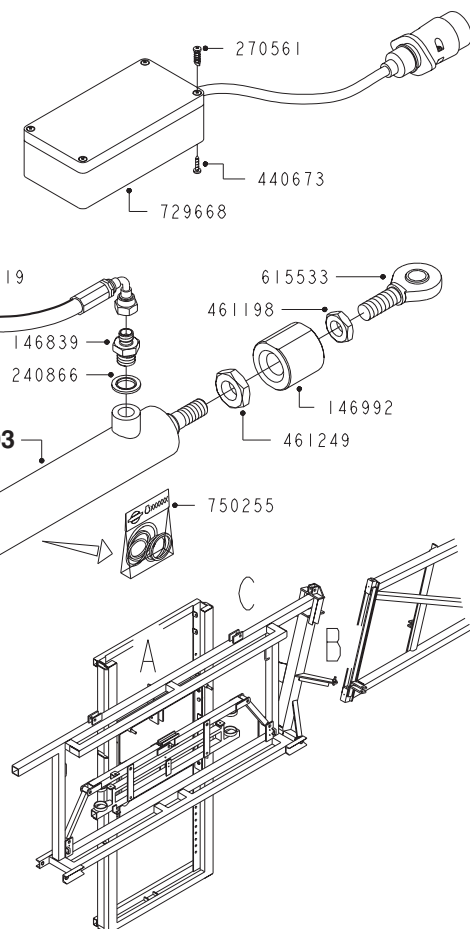
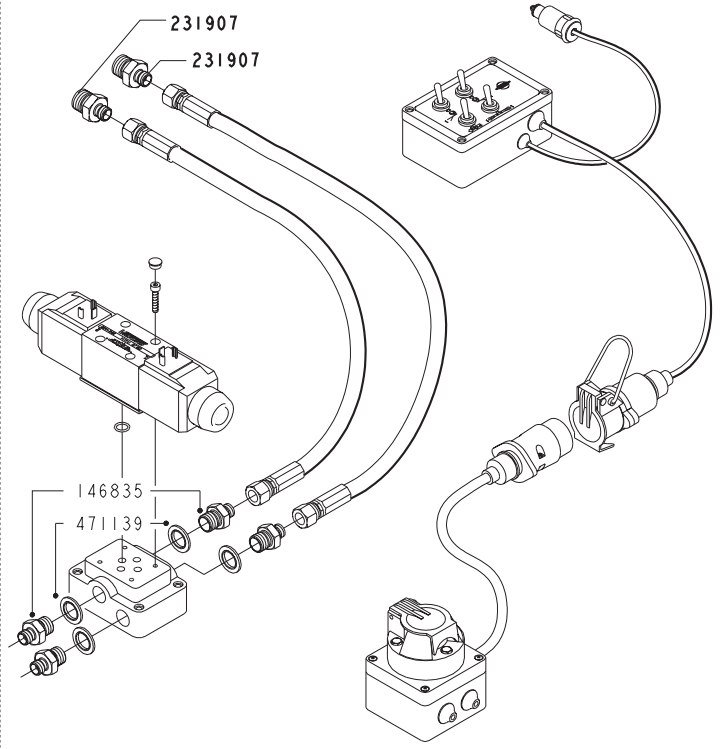
Optional Joy stick hydraulic control



Optional load sensing hydraulic system



P/No: 5904900



8 - Spare parts

Hydraulics

Cat 3 Lift tower

