

**CROPLANDS**

# Cropliner

## HS2000 Model



# Parts & Operator's Manual

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# Foreword

## About This Manual

This manual provides assembly, setting up, operating and maintenance instructions for the Croplands Cropliner HS2000 sprayer.

Some features explained in this manual may not be installed on your sprayer.

Please pass on this manual with the sprayer at the time of resale for usage by the new owner.

## Terminology

These terms/symbols used throughout this manual:

- **NOTE** - to convey useful operating information.
- **CAUTION** - to highlight potential injury or machinery damage.
- **WARNING** - to stress potential dangers and the importance of personal safety.

### NOTE

*Refers to important and useful information which should not be overlooked.*



### CAUTION

*Highlights hazards, unsafe/unwise practices which could cause injury, damage to property, machinery or loss of crop yield if instructions are not followed.*

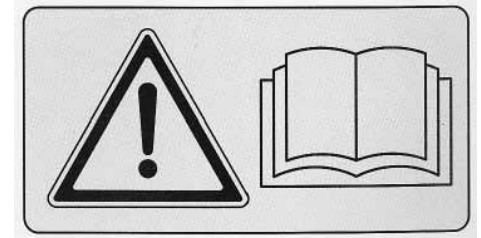


### WARNING

*Indicates the strong possibility of severe personal injury or damage to machinery if instructions are not followed.*

## Before Operating Your Sprayer

- 1 Before attempting to use your sprayer, make sure you **read the Operator's Manual** and properly understand:
  - All Safety Issues.
  - Assembly & Installation instructions.
  - Calibration of the sprayer.
  - Sprayer Operation.
  - Sprayer Maintenance.
- 2 Read and follow instructions on chemical manufacturers' labels.
- 3 Always wear applicable protective clothing.



*Read and understand this Operators' Manual before operating the sprayer.*



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*Brendan Deck, General Manager of Croplands*

Congratulations on the purchase of your new Croplands sprayer.

Croplands have been in the business of building and selling spraying equipment since 1972. For over 30 years we have been supplying sprayers to farmers, contractors, growers and all our customers involved in growing crops and in the control of pests and diseases.

Croplands is a wholly owned subsidiary of Nufarm Ltd, the largest supplier of crop protection chemicals in Australasia, and one of the fastest growing global suppliers world-wide.

At Croplands, we pride ourselves on our commitment to supplying machinery that is at the forefront of the industry's needs. We believe we can back up our products and through constant research and development, bring to you the best equipment you can find.

We welcome any feedback from you about our equipment.

On this page you will find our contact details, and locations where our staff can be reached during business hours.

After hours, you can e-mail us and expect a reply the following morning.

Please read this manual in its entirety before you operate your sprayer. This will ensure you have a trouble-free start up.

In this manual you will find the parts listings you need should you have any breakdowns in the future.

Bear in mind that over time, some parts may become obsolete or be replaced with better options. You can contact us for alternative options if this is the case.

We trust you will get years of good use from your Croplands Sprayer.

Yours sincerely

Brendan Deck  
General Manager

Contact details:

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2000 litre Cropliner with 920SV fan.

The 2000 litre poly-tank Cropliner is more than just a better airblast sprayer. It is a business investment that can provide a powerful insurance for protecting your crops.

Precision made, high performance fans give large volume, medium speed air for better distribution and more effective spray coverage than low volume, high speed air technology.

Stainless steel fan housings on the 820/920 fans with a choice of stainless steel air straightening vanes give greater strength and more power efficient air output for superior accuracy.

With durable brass non-drip, roll-over nozzles, you have total control of spray rates and spray direction to maximise spray penetration and coverage whilst minimising wastage.

## Cropliner Specifications

### Tank

Impact resistant polyethylene tanks with UV stabilised white finish.

Calibrated sight gauge, flip-open filling lid with large basket strainer, separate chemical pre-mixer & 1¼" drain valve.

Models available:

- 2000 litre main tank
- 80 litre flushing tank

Separate 10 litre fresh water tank for safety & hygiene.

### Fan Options

- **820/920mm SV fan:** Stainless steel shroud and straightening vanes.  
10 nozzles per side, 2 speed oil-bath gearbox, adjustable pitch blades.

### Nozzles

Brass swing-over nozzle bodies, automatic shut-off type. All units supplied with one set of nozzle tips.

### Pump

A & R oil-backed diaphragm type with chemical resistant diaphragms, and brass heads and manifolds.

### Drive

Heavy duty PTO driveshaft with covers and quick-release pins.

### Agitation

Supa-flo agitation.

### Filtration

Lid strainer, large suction filter, nozzle filters. Brass pressure filters optional.

### Chassis

Hot-dipped galvanised, full-length with jockey wheel, adjustable drawbar, adjustable axle height and width, 6 stud heavy duty wheel hubs, bumper bar, step and wheel-scraper.

### Controls

Remote mounting manual tap controller with individual L/R shut-off, simultaneous shut-off, full bypass, pressure adjustment and glycerine-filled gauge.

### Wheels

Steel rims, 10.0/75 x 15.3 tubeless tyres.

### Power Required

920mm SV fan: min. 37kW (50hp) at PTO.

820mm SV fan: min. 34kW (45hp) at PTO.

### Dimensions

2000 litre – 4.8m L x 1.2m W x 1.45m H

Linear Tower model - add 0.8m to H.

### Options

- Constant velocity, wide angle PTO shaft.
- Two brass pressure filters.
- Electric L/R Braglia shut-off valves with switch box.
- Electric L/R Braglia shut-offs with pressure control.
- MT3405 fully automatic controller with Braglia valves.
- HV4000 Auto-rate controller with Braglia valves.
- Flowtrak spray monitor.
- Single sided Volute (920mm fans only).
- Double nozzle blocks.
- Chemical suction probe.
- Self-steering drawbar.
- TX ceramic nozzles

*Machine specifications are subject to change without prior notification.*

# Your Sprayer's Specifications

## Important Information

**IMPORTANT!** Tick the fitted options for your sprayer on this page for future reference.

### Cropliner Options:

**Tank:** *Tick Your Sprayer's Options ( ✓ )*

- 2000 ..... ☐

#### Wheels & tyres:

- 11.5/80 x15.3 ..... ☐

#### Hitch Assembly:

- Standard fixed drawbar..... ☐
- Self-steering c/w bearing block &  
CV driveshaft ..... ☐

#### Fan:

- 820SV ..... ☐
- 920SV ..... ☐

**Pump:** *Tick Your Sprayer's Options ( ✓ )*

- ARBHS 140 ..... ☐
- ARBHS 160 ..... ☐
- ARBHS 200 ..... ☐

#### Controls:

- Manual tap controls ..... ☐
- Electric left/right in-cab controls ..... ☐
- Electric L/R c/w pressure adjust in-cab ... ☐
- Auto-rate controller ..... ☐

#### Nozzles:

- Disc and Cores ..... ☐
- Teejet TX Ceramic ..... ☐
- Albuz Ceramic ..... ☐

**General:** *Tick Your Sprayer's Options ( ✓ )*

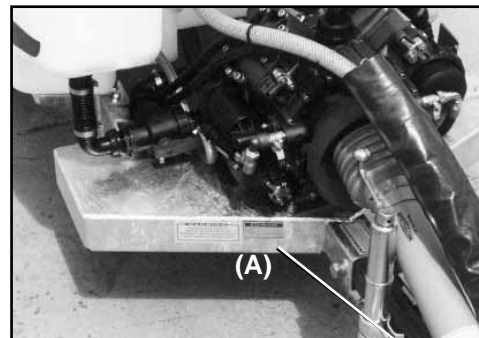
- Chemical suction probe ..... ☐
- Quick fill system ..... ☐
- Pressure filters fitted ..... ☐
- CV-Wide-angle shaft ..... ☐

**Your Product Code:** .....

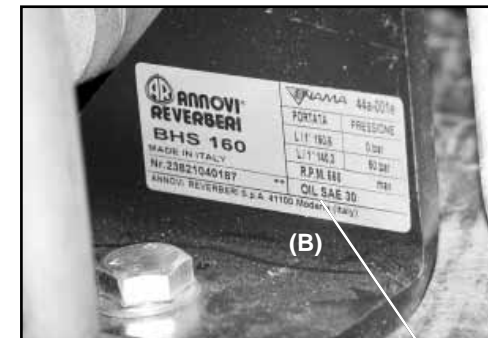
**Your Serial Number:** .....



2000 litre Cropliner with 920SV fan.



Cropliner Serial Number



AR Pump Serial Number

## Shipping Information

The following shipping information is provided but variations can occur without prior notification.

### Approx Weight

Model	Dry Weight
2000 litre	640 kg

### Maximum Towing Speed

Do not exceed 30 kph when towing on roads.

### Dimensions

Model	W x L x H
2000 litre	1.2m x 4.8m x 1.45m

## Product Identification

Always use the serial number of the Cropliner when requesting service information or when ordering parts.

Early or later models (identification made by serial number) may use different parts, or it may be necessary to use a different procedure for specific service operations.

## Cropliner Serial Number Plate

The Cropliner Serial Number Plate is located on the main frame at the front of the frame near the drawbar (A).

This plate shows name of manufacturer, serial number, product code and date of manufacture.

## Pump Serial Number Plate

The Pump Serial Number Plate is located on the pump (B).

This plate shows name of manufacturer, serial number, type of pump, year of manufacture, maximum flow rate and maximum working pressure of the pump.

### NOTE

Length is measured c/w drawbar & rear bumper in the forward position.



### Warranty Policy

Croplands Equipment Pty Ltd (trading as Croplands) warrants to its authorised Dealer, who in turn, warrants to the original purchaser (Owner) that each new Croplands' sprayer, part or accessory will be free from proven defects in material and workmanship for twelve (12) months after delivery to the first Owner according to the conditions outlined.

This warranty does not cover damages resulting from abuse, accidents, alterations, normal wear or failure to maintain or use the Croplands product with due care.

During the warranty period, the authorised Croplands Dealer shall repair or replace, at Croplands option, without charge for parts and labour any part of the Croplands product which fails because of defects in material or workmanship. The Owner must provide the authorised Dealer with prompt written notice of the defect (within 14 days of its occurrence), and allow reasonable time for replacement or repair.

Croplands (at its option) may request failed parts to be returned to the factory. Any travel time of a service technician and/or transportation of the Croplands product to the authorised servicing Dealer for warranty work are the responsibility of the Owner.

**This warranty is in lieu of all other warranties (except those of title), expressed or implied, and there are no warranties of merchantability or fitness for a particular purpose.**

**In no event shall the authorised selling Dealer or Croplands be liable for downtime expenses, loss of chemicals, loss of machine use or other incidental, consequential or special damages.**

### Conditions of Warranty

1. The warranty is not transferable.
2. The Warranty Registration Form must be returned to Croplands by the Owner Operator within 14 days of taking delivery of the unit.  
Only when warranty registration is completed and returned, can Croplands fulfill all warranty obligations.
3. **Components and conditions not covered by warranty are:**

**Abuse** Failure resulting from neglect, such as improper operation, lack of required maintenance or continued use of a sprayer after the discovery of a defect which results in greater damage to the unit.

**Environmental Conditions and Application** Deteriorated or failed components such as: diaphragms, O-rings, hoses, seals, electrical wiring and connections damaged by corrosive chemicals, dirt and sand, excessive heat or moisture. Owners should ensure the type and strength of chemicals used in the sprayer are compatible with the design of the unit.

Warranty determination for these types of failures will be made by Croplands only after inspection of failed components. In most instances these will incur inspection charges and cost of replacement parts.

**Normal Wear** Normal wear and consumable items such as: oils and lubricants, diaphragms, filter elements, flow meters, clutches, fan belts, drive belts, pivot pins, paint, light bulbs and nozzles are considered to be normal wear items and are not warranted.

#### Maintenance

Component failure caused by not performing scheduled maintenance service such as: oils, grease, failure to clean tanks, pumps, filters, spray lines, nozzles or any other blocked components. Not tightening or replacing loose or missing bolts, nuts, fittings, shields and covers.

#### Damage

Damages or machine failure caused by carelessness or accidental damage, improper operation, inappropriate transportation or storage of the sprayer or attachment.

#### Power Source

Failures due to faulty or inadequate electrical sources of power. Owners who use their own 12 volt power source must make sure that it is suitable for operating the spraying equipment.

#### Alterations

Any unauthorised alteration, modification, attachments or unauthorised repairs to the Croplands sprayer or attachments. Written approval must be obtained from Croplands for any such items to maintain warranty.

#### Removal & Installation

The time taken to remove and re-install a warranted part or component into other brands of sprayers will not be covered by Croplands warranty. Only parts and labour directly attributable to the repair of the Croplands unit is covered.

#### Clean-up Time

Croplands does not pay for cleaning the sprayer, parts, accessories or work area before or after the warranty repair. Clean-up time is affected primarily by the application or conditions in which the sprayer is operated and maintained. Since clean-up time can be so variable, cleaning time should be considered a customer expense.

#### Transportation

Warranty does not cover transportation or insurance costs for sprayers or other equipment needing repair or replacement of warranted components. Nor does it cover any freight or insurance costs in obtaining new parts or returning old parts to Croplands for inspection purposes.

#### Costs

Warranty does not cover time required to diagnose a warranty problem. Diagnostic time is affected greatly by the training and expertise of the technician employed to do the job. With proper training of service personnel, diagnostic time should be at a minimum.

#### Diagnostic Time

Croplands expects that Dealers will assign a well trained and proficient technician to handle any warranty repairs. Since Croplands is not in control of either of these responsibilities, we elect not to cover diagnostic time.

#### Non-Genuine Parts

Use of parts other than Croplands parts for repair of warranted parts will automatically negate any warranty. Warranted components must be replaced with genuine Croplands repair parts.

#### Unauthorised Repairs

Repairs by an unauthorised agent will automatically forfeit any warranty. Warranty repairs must be carried out by an authorised Croplands Dealer only.

The Pre-Delivery Check List **must be completed by the Dealer & signed by both the Dealer and the Owner**, and the white copy returned by the Dealer to Croplands.

Tick each box to affirm completion ✓

#### 1 Operator's Manuals Supplied:

- Cropliner Operators Manual ..... ☐
- MT3405 (if applicable) ..... ☐
- HV4000 (if applicable) ..... ☐
- Flowtrak Manual (if applicable) ..... ☐

#### 2 Trailer

- Undamaged ..... ☐
- Hitch height adjusted ..... ☐
- Hitch Jack lubricated ..... ☐
- Self-tracking drawbar (if fitted) ..... ☐

#### 3 Wheels & Hubs:

- Greased ..... ☐
- Bearings adjusted ..... ☐
- Split pin and dust caps in place ..... ☐
- Wheel nuts tight & threads greased ..... ☐
- Check tyre pressure (350 kPa [50psi]) ..... ☐

#### 4 Tank

- Undamaged ..... ☐
- Agitator adjusted correctly ..... ☐
- Check main lid opens and seals shut correctly ..... ☐
- Chemical mixing basket in place ..... ☐

#### 5 Check All Tank Fittings Are Sealed

- Suction line ..... ☐
- Drain outlet ..... ☐
- By-pass line ..... ☐
- Mixing basket line ..... ☐
- Agitators ..... ☐

Tick each box to affirm completion ✓

#### 6 Power Drive

##### (a) PTO

- Check quick release pins operate easily and lock into place ..... ☐
- Check universal joints work correctly ..... ☐
- Adjust PTO length to suit tractor ..... ☐
- Grease telescopic sliding shaft ..... ☐
- Grease universal joints ..... ☐
- Check safety shields are in place ..... ☐

##### (b) Pump to Fan PTO

- Check universal joint bolts are locked into place ..... ☐
- Universal joints greased ..... ☐

#### 7 Pump

- Check mountings ..... ☐
- Check oil level ..... ☐
- Check air chamber pressure - 10-20% of operating pressure ..... ☐
- Check operation ..... ☐

#### 8 Suction Lines

- Undamaged ..... ☐
- Hoses - no kinks or restrictions ..... ☐
- All joins sealed (no air leaks) ..... ☐
- Filter clean & sealed ..... ☐
- Tighten all hose clamps ..... ☐

#### 9 Pressure Lines

- Undamaged ..... ☐
- Hoses - no kinks or restrictions ..... ☐
- All hoses sealed (no leakages) ..... ☐
- Filter clean & sealed ..... ☐
- Tighten all hose clamps ..... ☐

Tick each box to affirm completion ✓

#### 10 Nozzles

- Undamaged ..... ☐
- Nozzle filters clean ..... ☐
- Nozzles correct type throughout ..... ☐
- Nozzle caps sealed (no leakages) ..... ☐
- Non-drip diaphragms working ..... ☐

#### 11 Agitation

- Check agitator works correctly ..... ☐
- Check hoses are properly sealed ..... ☐
- Tighten all hose clamps ..... ☐

#### 12 Manual Controls

- Check installation ..... ☐
- Fully check controls operation ..... ☐

#### 13 Auto Spray-Rate Controller/Flowtrack

- Check installation ..... ☐
- Check battery connection ..... ☐
- Calibrate controller ..... ☐
- Fully check controller operation ..... ☐

#### 14 Fresh Water Tank

- Undamaged ..... ☐
- Check fittings ..... ☐
- Check operation ..... ☐

#### 15 Main Control & Drain Valves

- Check there are no leaks ..... ☐
- Check all valves open & close easily ..... ☐

#### 16 Fan

- Undamaged ..... ☐
- Bolts tight ..... ☐
- Fan guard fitted securely ..... ☐
- Fan guard clear of debris ..... ☐
- Nozzle fitted correctly ..... ☐
- Nozzles adjusted to suit application ..... ☐
- Oil level (gearbox) correct ..... ☐
- Check gear selector ..... ☐

Tick each box to affirm completion ✓

#### 17 Decals

- Check all decals are in place ..... ☐

Tick appropriate box ✓

#### OWNER:

Farmer ☐ Contractor ☐

Owner's Name: (Print)

Address: .....

Postcode: .....

Phone: .....

Mobile: .....

Email: .....

Signature of Owner

Date: .....

#### DEALER:

Dealership Name: (Print)

Address: .....

Postcode: .....

Signature of Dealer Representative

Date: .....



Warranty Registration: The Owner acknowledges that the Owner has read & understood all terms & conditions of the Croplands' warranty policy contained in this manual. The warranty policy will commence upon installation.  
This Warranty Registration **must be completed & signed by both the Owner & the Dealer**, & the white copy returned by the Dealer to Croplands.

Implement Type: .....

Model: .....

Size: .....

Product Code: .....

Serial No: .....

Purchase Date: .....

Pre-Delivery Completion Date: .....

**IMPORTANT:**

By executing this Warranty Registration:

**1 The Owner:**

- (a) Agrees that the Owner will read the Operator's Manual before using the Sprayer; will follow all procedures in the operator's manual for the use of the Sprayer, and will exercise due care in the use of the Sprayer;
- (b) Agrees that Croplands' liability for any loss or damage suffered by the Owner in connection with the Owner's use of the Sprayer is limited to the cost of repair or replacement of the Sprayer;
- (c) Agrees that the Owner will bear any loss the Owner suffers as a consequence of any failure by the Owner to comply with 1.1 above;
- (d) Acknowledges that the owner is trained and is fully responsible for the safe and correct operation of the Sprayer; and
- (e) Agrees that the Owner will fully train any person who might be required to operate the Sprayer as to how to operate the Sprayer in a safe and proper manner.

**2 The Dealer** undertakes that the Dealership has met the obligations of Sprayer pre-delivery, installation, service and warranty start up.

**OWNER:**

Owner's Name: (Print)

Address: .....

..... Postcode: .....

Phone: ..... Mobile: .....

Email: .....

Signature of Owner:

Date: .....

**DEALER:**

Dealership Name: (Print)

Address: .....

..... Postcode: .....

Phone: ..... Mobile: .....

Email: .....

Signature of Dealer Representative:

Date: .....

**Owner's Machinery Register:** *(This information will assist us in providing first class back-up and parts service)*

- 1 Type of purchaser (please tick): ☐ Owner/Farmer ☐ Share Farmer ☐ Contractor
- 2 Major activities (please number in order of importance):
 

<input type="checkbox"/> Sheep	<input type="checkbox"/> Nuts	<input type="checkbox"/> Nurseries	<input type="checkbox"/> Vineyards
<input type="checkbox"/> Beef	<input type="checkbox"/> Vegetables	<input type="checkbox"/> Fruit Trees	<input type="checkbox"/> Council/Govt
<input type="checkbox"/> Cereal Grain	<input type="checkbox"/> Flowers	<input type="checkbox"/> Parks & Lanes	<input type="checkbox"/> Other
<input type="checkbox"/> Cotton	<input type="checkbox"/> Dairy	<input type="checkbox"/> Sugar Cane	<input type="checkbox"/> .....
- 3 What is the size of your holding (hectares)? .....
- 4 What are your reasons for purchasing the Croplands Sprayer? .....
- 5 What other Croplands' machinery do you currently use?
 

Serial No.	Implement Type	Size	Age	Comments
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....



<b>Safety</b>	<b>2.2</b>
<b>Hook-up</b>	<b>2.9</b>
<b>Unhitching</b>	<b>2.14</b>
<b>Pre-Operation Check</b>	<b>2.15</b>

## Safety is the Operator's Responsibility

The Cropliner features precision made, high performance fans which give large volume, medium speed air for better distribution and more effective spray coverage.

Stainless steel fans with optional stainless steel air straightening vanes give greater strength and more power efficient air output for superior accuracy.

The Cropliner is capable of spraying a wide range of crop protection products and the operator must be aware of the hazards associated with the Cropliner's operation.

The dealer explains the capabilities and application parameters of the Cropliner.

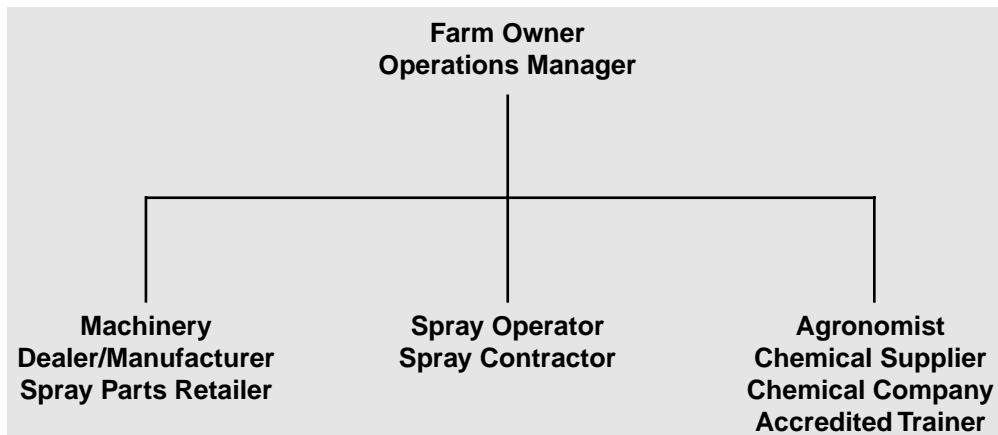
The dealer demonstrates the safe operation of the Cropliner according to Croplands instruction material, which are also available to operator.

The dealer can also identify unsafe modifications or use of unapproved attachments.

The following publication provides information on the safe use and maintenance of the Cropliner and attachments:

- The Operator's Manual delivered with the Cropliner gives operating information, as well as routine maintenance and service procedures. It is a part of the Cropliner and must stay with the machine when it is sold.
- Replacement Operator's Manuals can be ordered from your Croplands dealer, Cropliner Part No: HT-QMPOM00804.
- The Cropliner has machine signs (decals) which instruct on the safe operation and care. The signs and their locations are shown in the Operator's Manual.

Replacement signs are available from your Croplands dealer (as shown on pages 2.5).



## Safe Operation Needs a Qualified Operator

### A Qualified Operator Must Do the Following:

#### 1 Understand the Written Instructions, Rules & Regulations

- The written instructions from Croplands are included in the Cropliner Operation & Maintenance Manual and on machine decals.
- Check the rules and regulations at your location. The rules may include any Federal and State safety requirements for the chemical applicator.

#### 2 Have Training with Actual Operation

- Operator training must consist of a demonstration & verbal instruction. This training is given by your dealer before the Quantum Mist is delivered.
- The new operator must start in an area without bystanders and use all the controls until they can operate the Cropliner safely all conditions of the work area.

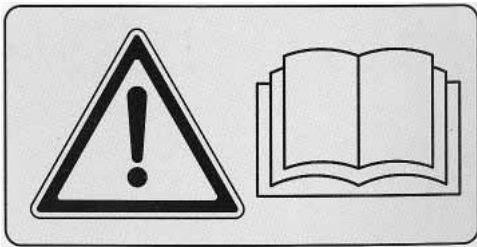
#### 3 Know The Work Conditions

- The operator must know any prohibited uses or work areas. They need to know about excessive slopes and rough terrain.
- Wear protective clothing as recommended by the chemical manufacturer. Always wear safety goggles when maintaining or servicing Cropliner.
- For an operator to be qualified, they must not use drugs or alcoholic drinks which impair alertness or coordination while working.

An operator who is taking prescription drugs must get medical advice to determine if they can safely operate a machine.

#### NOTE

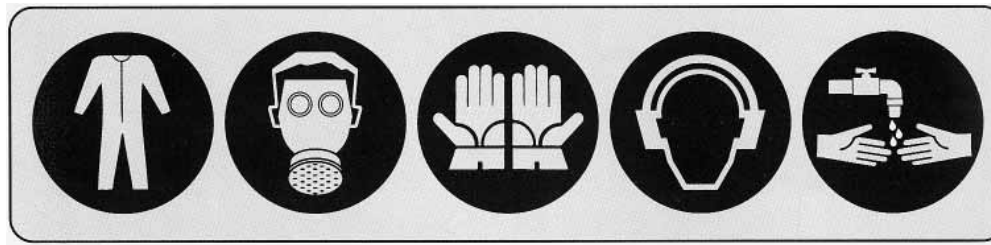
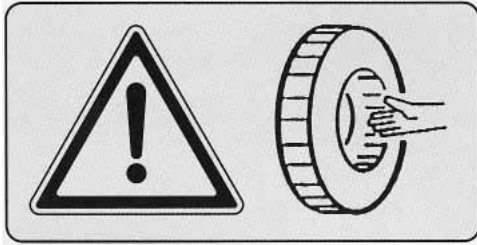
*There are accredited training programmes for spray application in each state. We recommend all operators have accredited training.*



## Rules for Safe Cropliner Operation

- Always read your sprayer operator's manual thoroughly before operating. Accidents occur every year because of careless use of farm chemicals and farm machinery. You can avoid these hazards by observing these safety instructions.
- Dispose of all chemical containers as per instructions on label. Failure to do so could result in contaminating the environment with chemicals.
- Inspect hose and hose connections daily. Always wear rubber gloves when tightening connections. Damaged, loose or worn hoses could result in operator being exposed to toxic chemicals which could result in serious illness or faulty sprayer operation.
- Always use the proper application rate. To assure proper application rate calibrate sprayer correctly. The wrong application rate of a crop protection formulation that is too high may expose the operator and the environment to danger.
- Follow the chemical manufacturer's precautions before cleaning the sprayer. Exposure to chemicals could result in serious illness or death.
- Always wear gloves and wash the machine before doing any disassembly repair work. Chemical residues on the machine parts could contaminate operator or service personnel causing serious illness.
- Always relieve system pressure before doing any work on the machine. Failure to do so could cause operator to be exposed to high pressure spray of chemical resulting in serious injury or machine damage.
- Always be sure all guards are properly installed on machine before operating. Failure to do so could result in entanglement in moving parts resulting in serious injury to operator.
- Always keep PTO guard in place when sprayer is operating. Failure to do this might result in entanglement.
- Be sure to disconnect the battery before attempting welding repairs.
- Always wear relatively tight and belted clothing to avoid entanglement in moving parts. Failure to do so could result in serious injury.
- Always stay out from under the sprayer unless it is resting on the ground or supported on solid blocks. Hydraulics or jacks could fail letting the sprayer fall. This could result in pinning or crushing of personnel.
- Check the entire sprayer, prior to each use, for any loose bolts or mechanical connections. These precautions can prevent injury to personnel and damage to equipment.
- Only inflate tyres to rated pressures. Over inflating causes tyres to burst resulting in serious injury.
- Use only genuine Croplands parts for any necessary replacement. Special alloy steels are used in many parts which are important to the equipment design. Home made parts may look the same but might be dangerous in operation.
- Do not ride on machine when in motion. This is an unsafe practice and can lead to serious injury should the rider fall from the machine.
- Always replace warning decals when damaged and make certain operator understands proper safety practices.
- Always stand well clear of sprayer when operating. The sprayer is capable of spraying chemicals 20-30 metres from the sprayer which may be hazardous to humans.
- Do not disconnect any hoses nozzles or filters while sprayer is operating. Disconnecting components while under pressure will result in uncontrolled spray discharge which may be hazardous to humans.
- Always clean the Cropliner and disconnect the battery before doing any welding repairs. Cover rubber hoses, and all other flammable parts. Keep a fire extinguisher near the Cropliner when welding. Have good ventilation when grinding or welding painted parts. Wear dust mask when grinding painted parts. Toxic dust or gas can be produced.





Make sure all safety decals are clear and in place. Replace them if damaged



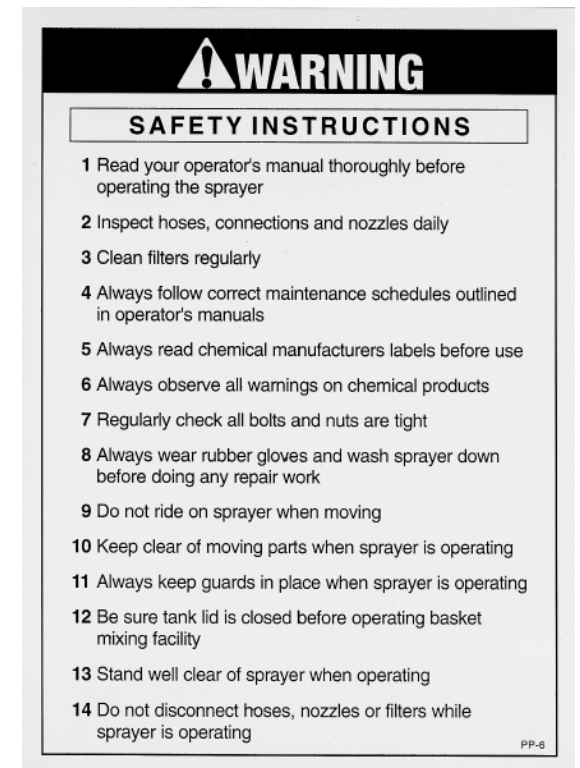
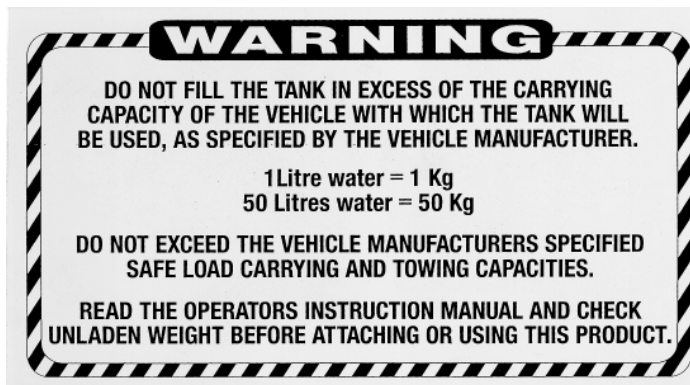
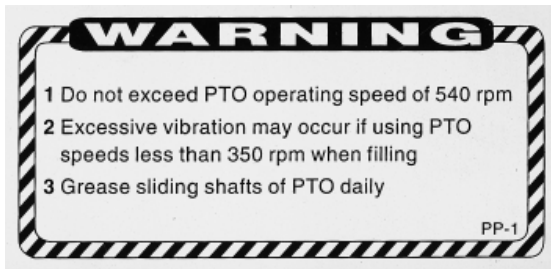
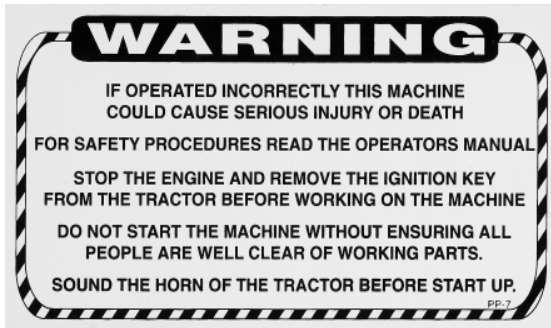
## Danger of PTO entanglement.

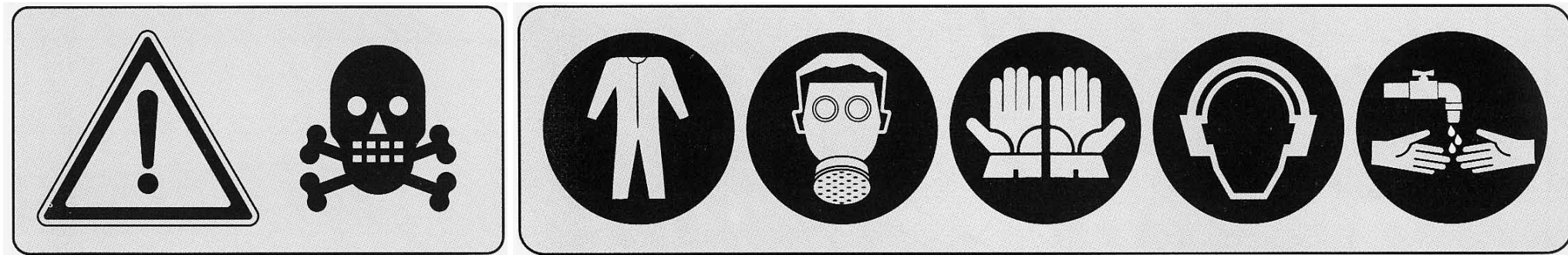
This is a common injury in farming. Ensure PTO covers are always in place.

## Rules for Safe Use of Chemicals

- Always read the label before using chemicals. Follow instructions from chemical manufacturer on how to select, use and handle each chemical. Note protection information each time before opening the container.
- Always observe all warnings on chemical products. Failure to do so could result in operator or others being exposed to toxic chemicals which could result in serious illness. Remember chemical manufacturers go to much research and expense to develop labels for your protection.
- Be sure you recognise the categories of toxicity and their key words.
- Verbal warnings must be given if written warnings cannot be understood by workers.
- Do not spill chemicals on skin or clothing. If chemicals are spilled, remove contaminated clothing immediately and wash skin (and clothing) thoroughly with soap and water.  
  
Wash hands and face with soap and water and change clothing after spraying. Wash clothing each day before reuse.
- The spray tank and system should be emptied of chemical mixture and flushed with clean water before servicing the spray system or spraying components. Clean the Cropliner of all chemical residue before servicing.
- Avoid inhaling chemicals. When directed on the label, wear protective clothing, face shield or goggles.
- Never smoke while spraying or handling chemicals.
- Cover food and water containers when spraying around livestock or pet areas.
- If symptoms of illness occurs during or shortly after spraying, call a physician or go to a hospital immediately.
- Follow label directions and advice to keep residues on edible portions of plants within the limits permitted by law.
- Keep chemicals out of the reach of children, pets and unauthorised personnel. Store them outside of the home, away from food and feed and lock them in a secure area.
- Keep bystanders away from spray drift.
- Always store chemicals in original containers and keep them tightly closed. Never keep them in anything but the original containers.  
  
Read labels for hazards about chemical reaction with certain types of metals.

## Decals - Please order replacements if required





## Safety must be an Integral Part of Chemical Farming Operations

- **Not Just an After Thought!**

## The Hazard

All agricultural chemicals or pesticides, as they are commonly called, are biologically active. When handled incorrectly or carelessly, they can be dangerous to all living organisms such as humans, birds, fish, bees, domestic animals and plants.

## Method of Pesticide Entry

- ☞ **Oral** - Direct by drinking, splashing into mouth, eating and smoking with contaminated hands, eating sprayed produce, cleaning nozzles with mouth.
- ☞ **Inhalation** - Nose, mouth, but predominately the lungs.
- ☞ **Dermal** - Absorption through the skin. Increased when skin is broken or perspiring.

## Rate of Absorption

While pesticides are absorbed more completely orally and by inhalation, greater exposure and more poisonings occur through skin (dermal) contact.

## Hazard and Chance of Poisoning

The hazard and chance of poisoning is much higher when handling pesticides in concentrate form than in the dilute form.

## Safe Handling

Know your Pesticides:

- ☞ **STOP!!** Read the label
- ☞ Is it the right pesticide?
- ☞ What is its poisons schedule or toxicity?
- ☞ What safety precautions are required?
- ☞ What is its persistence and withholding period?
- ☞ What is its mode of action?
- ☞ Will it be a hazard to neighbouring crops and people?

- ☞ What protective clothing and equipment is needed?
- ☞ Know the correct first aid/safety in case of poisoning.
- ☞ Seek medical advice if health is affected by chemicals.

## Mixing the Product

- ☞ Reduce or eliminate operator contact by using closed loading systems, auto fillers, wettable powder mixtures or wettable dispersible granules.
- ☞ Use the right protective clothing when handling the concentrate. The user is at greatest risk when handling chemical in concentrate form.
- ☞ Open bags carefully. Cut to open, do not tear.
- ☞ Do not stir chemicals with hands or arms.
- ☞ Choose the mixing site carefully & the fate of the probable residues.
- ☞ Do not mix more spray solution than is needed and avoid needless disposal of unwanted chemicals.

## Plan your Spray Route

- ☞ Observe weather conditions, especially wind direction & speed.
- ☞ Try to travel across wind and into untreated crop.
- ☞ Prevent double or over spraying.
- ☞ Prevent or minimise drift onto other crops, workers, etc.

## Disposal of Unwanted Pesticides and Containers

- ☞ Calibrate correctly to ensure you do not have a large quantity of unwanted spray left over.
- ☞ Rinse empty containers and pour residue into the spray tank.
- ☞ Dispose of containers in the correct manner and where provided, use pesticide drum disposal schemes.



1, 3, 5 litre measuring jugs & 25 litre mixing bucket.



Kasco helmet, Breathable spray suit & gloves.

*Croplands Breathable Spray Suits are especially designed and ideally suited to our climatic conditions. They provide greater protection than ordinary fabric and disposable overalls.*



Respirator, Breathable spray suit & gloves.

## Decontamination

- ☞ Change out of protective clothing and shower as soon as possible after spraying.
- ☞ Wash before eating, drinking or smoking.
- ☞ Provide clean water at filling site and on sprayer in case of field contamination.
- ☞ Wash and clean respirators regularly.

## Keep Sprayers and Safety Equipment in Good Working Condition

- ☞ Replace hoses and fittings when they leak.
- ☞ Clean sprayer regularly.
- ☞ Replace respirator filters regularly.
- ☞ Do not use worn, faulty or contaminated safety equipment.

## Storage

- ☞ Store pesticides in a locked, well ventilated store.
- ☞ Do not pour pesticides into other containers, especially not drink containers.

## Pesticide Free Tractor Cabs

- ☞ Ensure the cab filter is adequate for the pesticide used.
- ☞ Be careful not to contaminate the cabin environment.
- ☞ Cabin filters alone are not adequate when the operator is required to leave the cab to refill the sprayer. Safety equipment used outside the cab should not be stored in the cab.

## Protective Safety Equipment

The amount and type of protective clothing and equipment is determined by the type of chemicals, degree and duration of exposure, weather conditions and application equipment used.

Read and follow the direction on the label.

Over protection can be uncomfortable and unnecessary.

A respirator left hanging around your neck is useless.

## Measuring

- ☞ Croplands' calibrated, easypour 1, 3 and 5 litre measuring jugs and 25 litre chemical mixing bucket are practical, easy to clean, U.V. resistant and chemical resistant.

## Clothing

- ☞ Cover as much of the body as possible, especially the neck, chest and forearms. Use washable fabric overalls, disposable overalls or preferably waterproof clothing especially when coming in contact with large quantities of pesticides. Wear the trouser legs outside the boots.

## Gloves and Boots

- ☞ Never use leather or cloth materials because they absorb pesticides and provide a constant source of contamination. Gloves should be un-lined for this reason.

Croplands Nitrile Chemical Handling Gloves are recommended.



*Safety goggles for eye protection.*

## Head & Face

- Hard hats, washable hats, goggles, spray helmets and face shields are important when handling concentrates.

Croplands Spray Goggles feature sealed, anti-fog, double lens goggles for practical, comfortable eye protection. Croplands Kasco Spray Hood is fully approved by D.I.R.

## Respirators

- Choose the correct type and have the correct cartridge fitted. Replace cartridges regularly and write the date on each cartridge. Ensure there is an adequate fit to the face.

Croplands' respirators are recommended for most spraying applications.



*Respirator.*

## Operator Safety

When handling pesticides, always use elbow-length gloves, long clothes and above all, a respirator.

If you and your clothing become contaminated with spray, DO NOT WORK ON.

Stop work, remove clothing and wash affected areas thoroughly with soap and water. Put fresh clothing on before starting again.

Ensure that contaminated clothing is washed thoroughly before being used again.

Don't guess when choosing protective equipment. Feel free to call Croplands and make use of our safety database for comprehensive information on safety, handling and storage exposure levels, symptoms, health effects, first aid and personal protection.



*Sample of Agrichemical Manual.*

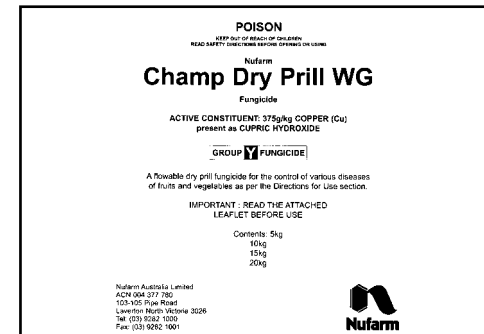
## Spraying Precautions

Agricultural chemicals applied under unfavourable weather conditions or from poorly adjusted and operated equipment can cause damage due to run-off and/or drift problems.

Crops and pastures are more susceptible to spray drift of herbicides while people, stock and water supplies are generally more susceptible to insecticide drift.

Pollution, crop damage and the potential health hazards are something agriculture can ill afford. It is simply not acceptable, socially or environmentally.

Additionally, pesticide which drifts or runs off the target reduces the efficiency of the pesticide on the target. Spray failures are a waste of money and effort.



*Read the Chemical Label*

- Be SURE** the equipment is functioning correctly. Check that nozzles are in good condition. Check all other aspects of machine operation are correct.
- Be SURE** pesticides are mixed thoroughly and according to the label.
- Be SURE** the recommended registered pesticide is used for the job at hand.
- Be SURE** pesticides are applied at recommended rates.
- Be SURE** only target plants are sprayed.
- Be SURE** to follow the safety precautions on the label.

### NOTE

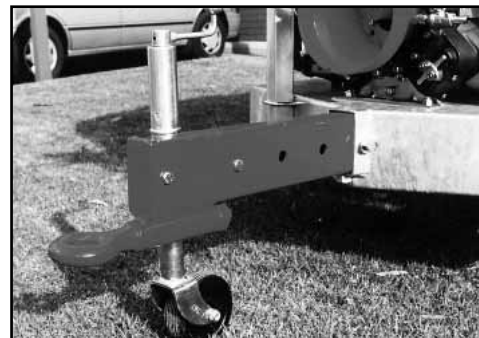
*A full agri-chemical manual is available in Australia and New Zealand. Talk to your local Agronomist for more information.*



2000 litre Cropliner with 920SV fan.



Connect the PTO shaft to the Cropliner™.



Hitch fitted in the lower position.



Loosen the bolts and locking nuts that hold the hitch.

## Assembly Instructions

The Cropliner is supplied fully assembled with the following components requiring some assembly after shipping from the factory:

- 1 Connect the Cropliner and PTO shaft to the tractor (see pages 2.9-2.13).
- 2 Fit the spray controller to the tractor:
  - Manual Controls.
  - Electric Controller.
  - Auto-rate Controller (if ordered).
  - Flowtrak Monitor (if ordered).
- 3 Axle Adjustment may be altered to suit your terrain and wheel tracks.

Connect the Cropliner to the tractor.



## 1 Connect the Cropliner to the Tractor

The Cropliner must be connected to a suitable tractor, making sure the drawbar and PTO shaft are fitted according to the instructions that follow:

- 1 Align drawbars of tractor and Cropliner, then insert & lock the drawbar pin in position ensuring it cannot come out while transporting or operating.  
Lift up and/or remove the hitch jack for sprayer operation.
- 2 Check the Cropliner is level fore and aft. The sprayer should be slightly lower at the front. If not make the necessary adjustments to tractor and/or sprayer drawbars and axle to achieve level position (see pages 2.10 - 2.11).

### NOTE

When connected to your tractor drawbar, the Cropliner should be level or slope slightly downwards at the front.

## Hitch Adjustment

The Cropliner standard hitch can be adjusted for height and length to match your tractor drawbar.

### 1 Height Adjustment

To adjust the height of the Cropliner hitch:

- a) Make sure the Cropliner cannot roll.  
Support the front of the frame and remove the hitch jack.

Hitch fitted in the upper position.

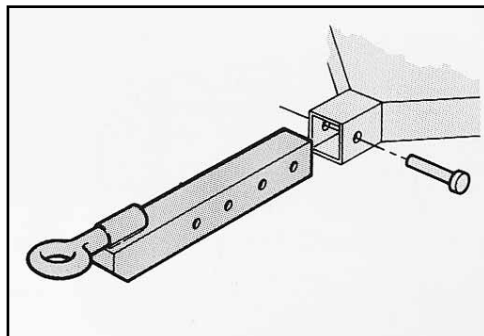


- b) Loosen the locking nut and bolt under the Cropliner hitch.
- c) Remove the nut and then the bolt that goes through the hitch.
- d) Slide the hitch out of the Cropliner frame, turn it the other way up and then slide it back into the frame.
- e) Replace the bolt through the hitch and then the locking nut.
- f) Retighten bolt and the locking nut under the Cropliner hitch.
- g) Refit the hitch jack.

### NOTE

When connected to your tractor drawbar, the drawbar pin connecting the tractor and Cropliner™ should be centred between the two universal joints of a PTO shaft (see illustration on page 2.12), except where a constant velocity drive shaft is being used.

Where a constant velocity drive shaft is used, the towing pivot point should be as close as possible to the constant velocity joint of the driveshaft (see the illustration on page 2.13).

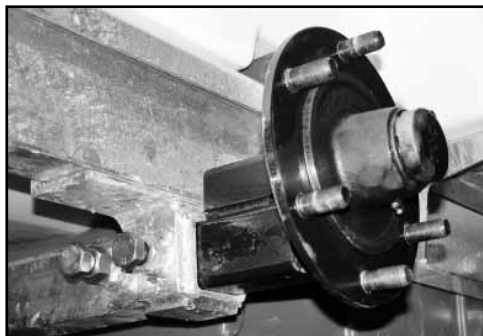


Select the hole position to set hitch length.

## 2 Length Adjustment

To adjust the length of the Cropliner hitch:

- Make sure the Cropliner cannot roll.  
Support the front of the frame and remove the hitch jack.
- Loosen the locking nut and bolt under the Cropliner hitch.
- Remove the nut and then the bolt that goes through the hitch.
- Slide the hitch in out of the Cropliner frame to the length required.
- Replace the bolt through the hitch and then the locking nut.
- Retighten bolt and the locking nut under the Cropliner hitch.



Axle adjusted in.

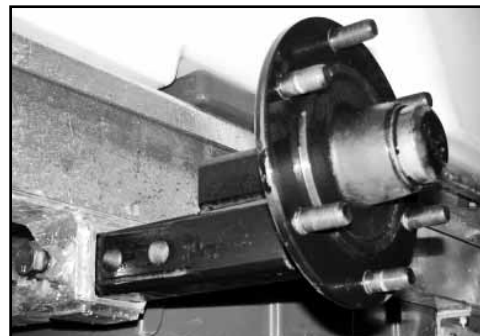
## Axle Width Adjustment

The axle width of the Cropliner can be adjusted to suit your wheel tracks requirements.

To adjust axle width:

- Make sure the Cropliner cannot roll and jack one wheel off the ground.
- Loosen the locking nuts and bolts on the underside of the axle.

Loosen and retighten the bolts & locking nuts that hold the axle.



Axle adjusted out.

- Adjust the axle in or out to suit your needs.
- Retighten the bolts and locking nuts on the underside of the axle.
- Repeat the process for the second wheel.

## Self-Tracking Drawbar

If your Cropliner is fitted with a self-tracking drawbar, ensure the pivot points are greased regularly (every spray-round).

To adjust the self-tracking drawbar length, follow the steps as instructed for "Length Adjustment" (shown left) for the standard drawbar hitch.

The self-tracking drawbar pivots as close as possible to the pump. A bearing block is fitted in front of the pump to provide support to the CV shaft.

Ensure the CV joint is connected to the **pump-end** of the self-tracking drawbar.

See your dealer about cutting the PTO to the correct length.

For more instruction on the self-tracking drawbar, see page 2.13.





Connect the Cropliner™ to the tractor.

## 2 Fit the PTO Shaft

The PTO shaft is fitted and fully tested at the factory but has been disconnected and packed for transit.

The Cropliner™ may be ordered with a standard or wide angle PTO shaft, or a swivel drawbar.

Follow the instructions below to fit the standard or wide angle PTO shaft onto the Cropliner™ after transit:

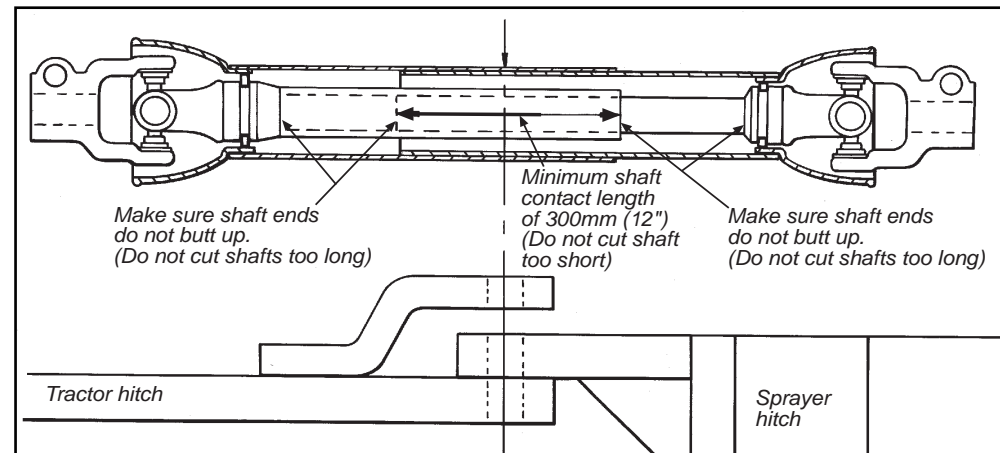
- 1 Remove the PTO shaft which is strapped to the Cropliner™ frame.

- 2 Check the PTO shaft has not been damaged in transit.
- 3 Grease the universal joints and telescoping shafts.
- 4 Measure and fit the PTO to the Cropliner ensuring the locking pin is correctly located.

Make sure you read and understand "Important factors for fitting the PTO shaft" on the next page.

**Cutting the PTO shaft to length requires knowledge of this procedure. If you have not carried out this procedure before, ensure your dealer carries out this important step.**

- 5 Before operating the drive shaft, be sure that all safety guards are in place.



On Standard PTO shafts, the drawbar pin connecting the tractor & Cropliner should be centred between the two universal joints of the PTO shaft. For wide angle (constant velocity) shafts, see page 2.13 for alternative settings.

## Important Factors when Fitting the PTO Shaft

The following three factors must be correct to avoid pump damage and maximise PTO operating life:

- 1 When travelling straight ahead, the point at which the sprayer drawbar pin is joined to the tractor should be halfway between the universal joints of a **Standard PTO shaft**, as illustrated.

The tractor is then able to make maximum turns with minimal bending of the universals.

- 2 When the tractor is towing the sprayer straight ahead, the two telescopic sections of the power take-off shaft are at maximum extension.

When turning or crossing an inversion, the telescopic shaft sections close up.

### NOTE

Full instructions are given on the following pages to ensure the PTO is set-up correctly **BEFORE** use.

If you are inexperienced in the procedures, this step should be carried out by your dealer.

### NOTE

Incorrect hitching of PTO shaft will result in excessive pump vibration and damage to the pump.

### NOTE

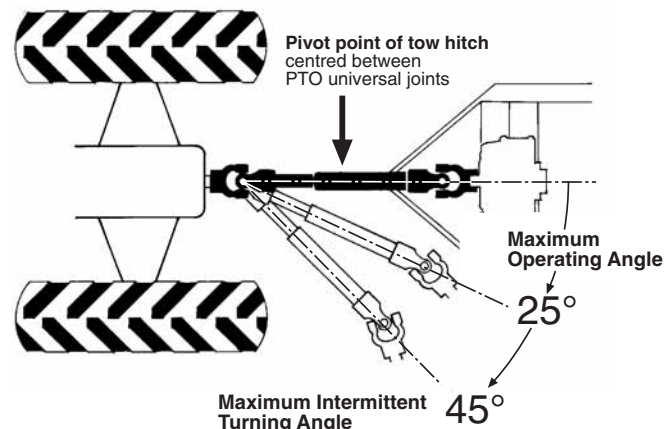
**IMPORTANT:** Do not allow more than 10% difference in the two halves of drawbar length. If more than 10% difference occurs, a wide angle shaft must be used.

### CAUTION

Ensure that the drive shaft is the correct length to avoid any "butt up" damage to the pump.



## Standard PTO



- 3 The height difference between the tractor PTO spline and the PTO spline of Cropliner should not be more than 100mm.

This ensures PTO joint angles are approx equal and do not exceed limits. If greater than 100mm, a wide angle (constant velocity) PTO should be used.

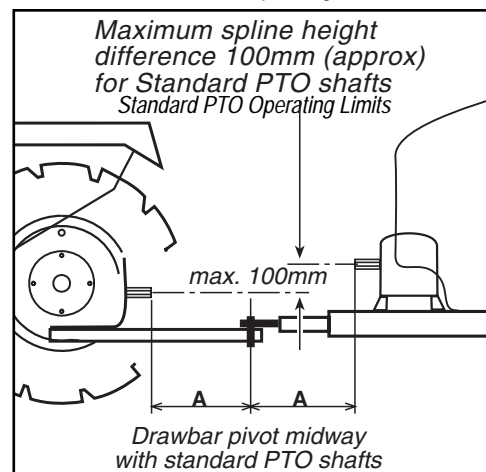
See Hitch height adjustment instructions on page 2.9.

## Heed the Operating Limits of the Standard PTO Shaft

The standard Cropliner is fitted with a STANDARD PTO shaft.

The maximum intermittent turning angles of the Standard PTO shaft is only recommended where should not exceed 45° turning angle of the PTO.

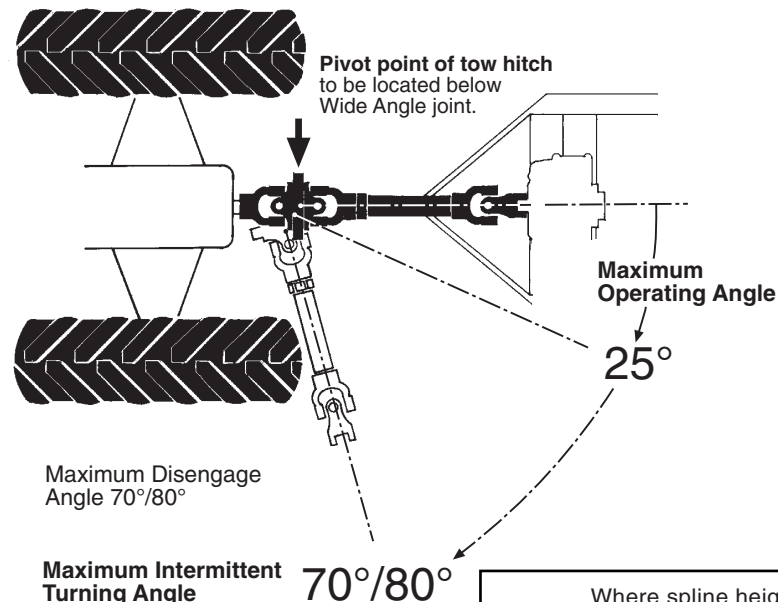
Standard PTO Operating Limits



### CAUTION

Pump warranty is not valid for damage caused by incorrect PTO shaft mounting.

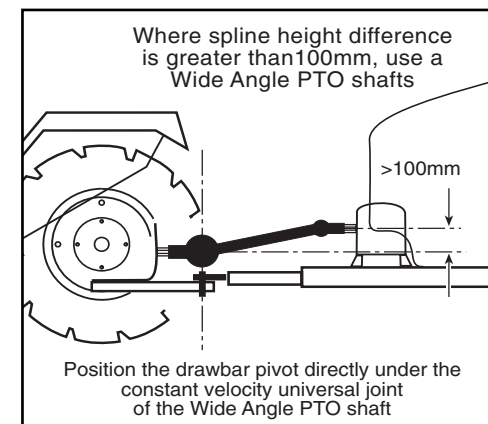
## Optional Wide Angle (Constant Velocity) PTO



## Optional Wide Angle PTO

The wide angle (constant velocity) PTO or swivel drawbar must be used where tight turning requires greater than 45° turning angle of the PTO shaft.

Where height variance between the tractor output spline and Cropliner™ input shaft is greater than 100mm, a wide angle (constant velocity) PTO must be used.



### WARNING

Always operate the PTO fitted to your Cropliner™ within the specified limits. Follow the information on pages 2.12 - 2.13.

Failure to operate the PTO as instructed can result in serious damage to the pump, PTO and any components connected to the drive train of the tractor and Cropliner. Incorrect operating will void warranty claims.

## Optional Self-Tracking Drawbar

The self-tracking drawbar can be used where tight turning requires greater than 45°.

It is also suitable for ensuring the sprayer wheels track on the same lines as those of the tractor to make row exit & entry easier.

Follow the instructions below to connect the self-tracking drawbar to the tractor:

- 1 Connect the tractor linkage arms to the self-tracking drawbar linkage pins Cat 1 & fit the holding clips.



*Failure to lock linkage arms may cause damage or injury.*

- 2 Fit locking bars to lock the tractor linkage arms into position.

**Important:** Locking bars must be fitted to tractor linkage arms to prevent the sprayer tipping up and causing damage or injury.

- 3 Fit the PTO shaft to the tractor and to the sprayer pump.

Ensure the PTO shaft is cut to the correct length.

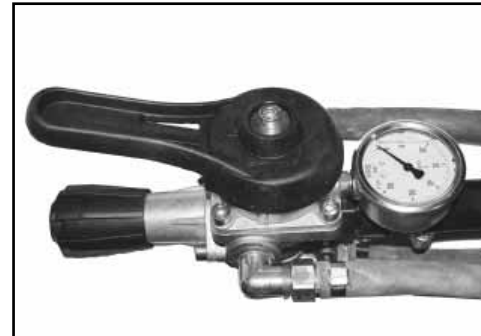
- 4 Grease the bearings of the bearing block in front of the pump.
- 5 Ensure the CV joint is on the **pump-end** next to the bearing block.



### WARNING

*Locking bars must be fitted to tractor linkage arms to prevent the sprayer tipping up and causing damage or injury.*

*Failure to lock the tractor linkage arms may cause damage or injury.*



*M170 controller.*

## 4 Fit the Controller to the Tractor

Follow the appropriate instructions to fit the controller to the tractor.

### M170 Controller (if ordered)

When ordered, the M170 controller has been fitted and fully tested at the factory and packed for transit.

Follow the instructions below to assemble the unit after transit:

- 1 Unpack the M170 controller from the Cropliner.
- 2 Uncoil the hose & controller and fit the controller onto the tractor in a convenient and safe location for the operator.
- 3 Follow instructions to test, calibrate and operate the controller.



*Electric controller.*

## Electric Controller (if ordered)

When ordered, the electric controller has been fitted and fully tested at the factory but has been disconnected and packed for transit.

Follow the instructions below to fit the unit after transit:

- 1 Unpack the electric controller from the Cropliner.
- 2 Connect the electric controller couplings together, and fit the controller console onto the tractor in a convenient & safe location for the operator.
- 3 Follow the electric controller instructions to connect the unit power connections to the tractor battery.
- 4 Follow instructions to test, calibrate and operate the controller.



MT3405 Controller.



HV4000 Auto-Rate Controller.s



Flowtrak monitor.



Attach & adjust hitch jack before removing drawbar pin.

### MT3405 Controller (if ordered)

When ordered, the Auto Rate Controller has been fitted and fully tested at the factory but has been disconnected and packed for transit.

Follow the instructions below to fit the unit after transit:

- 1 Unpack the MT3405 Controller from the Cropliner.
- 2 Connect the MT3405 Controller couplings together, and fit the controller console onto the tractor in a convenient and safe location for the operator.
- 3 Locate the MT3405 Controller operators manual and follow the instructions to connect the unit power connections to the tractor battery.
- 4 Follow the instructions in the MT3405 Controller operators manual to test, calibrate and operate the controller.

### HV4000 Auto-Rate Controller (if ordered)

When ordered, the HV4000 Controller has been fitted and fully tested at the factory but has been disconnected and packed for transit.

Follow the instructions below to fit the unit after transit:

- 1 Unpack the HV4000 Controller from the Cropliner.
- 2 Connect the HV4000 Controller couplings together, and fit the controller console onto the tractor in a convenient and safe location for the operator.
- 3 Locate the Auto-Rate Controller operators manual and follow the instructions to connect the unit power connections to the tractor battery.
- 4 Follow the instructions in the HV4000 Controller operators manual to test, calibrate and operate the controller.

### Flowtrak Monitor (if ordered)

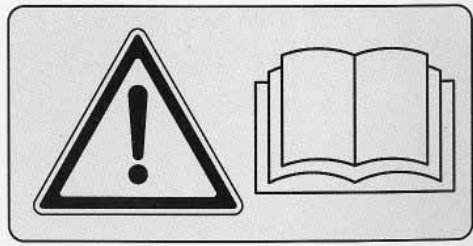
When ordered, the Flowtrak monitor has been fitted and fully tested at the factory but has been disconnected and packed for transit.

Follow the instructions below to fit the unit after transit:

- 1 Unpack the Flowtrak monitor from the Cropliner.
- 2 Connect the Flowtrak monitor couplings together, and fit the monitor console onto the tractor in a convenient and safe location for the operator.
- 3 Follow the Flowtrak monitor instructions to connect the unit power connections to the tractor battery.
- 4 Follow instructions to test, calibrate and operate the monitor.

## Unhitching the Cropliner from the Tractor

- 1 Locate sprayer on level ground and block the wheels so that sprayer does not roll when drawbar pin is removed.
- 2 Disconnect PTO shaft, manual controls or spray controllers from the tractor.
- 3 Attach and adjust the hitch jack and then remove the drawbar pin.
- 4 Put caps (supplied) on the loom plugs if you have the MT3405 or HV4000 Controller fitted.



*Read Operators' Manuals before operating machine.*

## Pre-Operation Checklist

- 1 Before attempting to use this machine, Read Operator's Manuals thoroughly.
- 2 Read and follow instructions on chemical manufacturers labels.
- 3 Always wear applicable protective clothing.
- 4 Check that all maintenance procedures have been followed.
- 5 Check all plumbing and fittings to ensure they are tight, not damaged or leaking.
- 6 Check PTO shaft is correctly set up.
- 7 Grease the PTO shaft if necessary.



*Check pump oil level.*

- 8 Check diaphragm pump oil level.
- 9 Check air pressure in the diaphragm pump air chamber is 210 - 280 kPa (30-40 psi). As a general guideline it should be 10% - 20% of operating pressure.

*Check the pump air chamber pressure.*



*Check suction filter is clean.*

- 10 Check that the suction and pressure filters are clean.

**Clean the suction and pressure filters out after initial use, and nozzles if necessary.**



*For filling, use the main lid with the basket filter in place.*

## Check the Operation of the Cropliner

To check the operation of the Cropliner, there are three sections to consider:

- 1 The fan pitch setting.
- 2 The fan gear selection.
- 3 Spray Rate Controls (4 options)

Check the full operation of the sprayer with the controller fitted.

For all pre-operation checks, ensure you have sufficient clean water in the sprayer, and the pump suction valve is open for sourcing liquid from the main tank.

### NOTE

**IMPORTANT:** Clean the suction filter out after initial use.

*Whilst all precautions are taken during assembly, it is possible to get filings in the tank and lines. These will accumulate in the suction filter during first use.*



Two speed 920SV fan with air straightening vanes.



Fan with variable pitch blades, clutch & gearbox.

1 Fan Pitch Setting

Cropliner fans incorporate variable pitch blades which can adjusted to suit various application requirements.

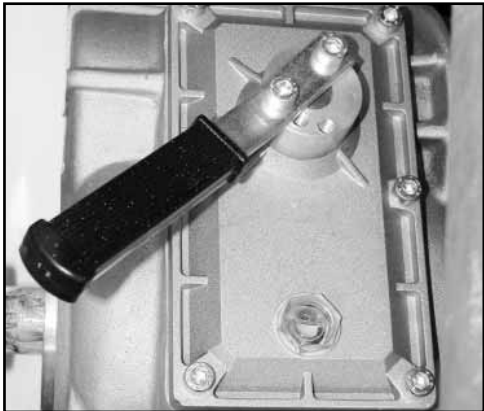
The selected pitch settings of the blades on a fan determine fan performance or air output (see chart below).

Each blade can be set at 25, 35 or 45 degrees.

To adjust the blade pitch setting follow the these instructions:

- 1 Remove fan safety grill.
- 2 Remove fan clutch cover.
- 3 Individually for each fan blade:
  - a) Remove the fan pitch holding bolt.
  - b) Select new fan pitch setting.
  - c) Replace the fan pitch holding bolt.*Refer to the Caution below.*
- 4 Replace fan clutch cover.
- 5 Replace fan safety grill.

SV Fan Output & Power Specifications (includes pump)					
Fan Dia. mm	Nozzles	Gear	Blade Pitch	Air Output M3/Sec	Approx.Power required KW (HP)
820SV	20	1st	25°		28 (38)
			35°		31 (41)
			45°		35 (47)
		2nd	25°	10.5	31 (42)
			35°	12.7	37 (50)
			45°	14.7	44 (59)
920SV	20	1st	25°		33 (44)
			35°		37 (50)
			45°		43 (57)
		2nd	25°	14.0	37 (50)
			35°	16.9	43 (58)
			45°	19.2	48 (64)



HIGH gear selected on 2 speed, 820 & 920 fans.

2 Fan Gear Selection

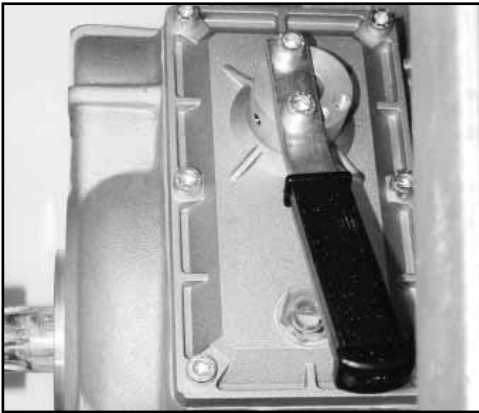
Fan gearboxes allow high and low gear selection and neutral position.

Select and engage the position required for the spray application.

Refer to the fan output chart on the left for information regarding gear selection and air outputs.



**Important:** The fan is a balanced assembly. Therefore you must ensure the fan blades are always placed in the same hub position, and the same pitch setting is used throughout.

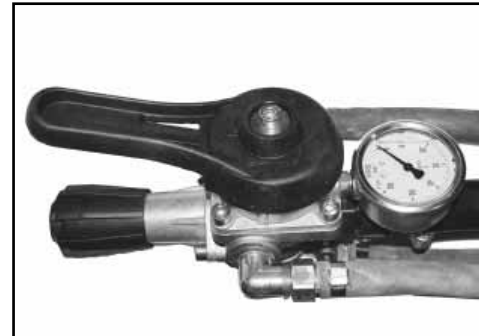


*LOW gear selected on 2 speed, 820 & 920 fans.*

## 3 Check Sprayer & Controller Operation

Check the full operation of the sprayer according to the controller supplied.

Separate operating instructions follow for each controller:



*M170 controller.*

## M170 Controller

The Cropliner is fitted standard with a M170 controller.

To operate the Cropliner fitted with the M170 controller:

- 1 Connect Cropliner to tractor - connecting hitch, PTO and controller.
- 2 Fill appropriate quantity of clean water into spray tank.
- 4 Check the agitator valve[s] (located on pump) is/are open.
- 5 Check the suction valve (located at the front of the tank) is open.
- 6 Check the fan gearbox is engaged.

- 7 Place sprayer controls in start up position by placing the M170 control lever in "By Pass" position.

- 8 Engage PTO and bring pump speed up to 540 RPM.

All pumped liquid is now being passed through the controller back into the tank. The system is not pressurised and tank agitators are not working.

- 9 Pressurise the system and operate the tank agitators by placing the M170 control lever in "C" (closed) position.

- 10 Adjust pressure to desired operating pressure by adjusting the pressure control knob of the controller.

*NEUTRAL selected on 2 speed, 820 & 920 fans.*



## WARNING

**Important:** Do not have pesticides in the spray tank when checking the sprayer.

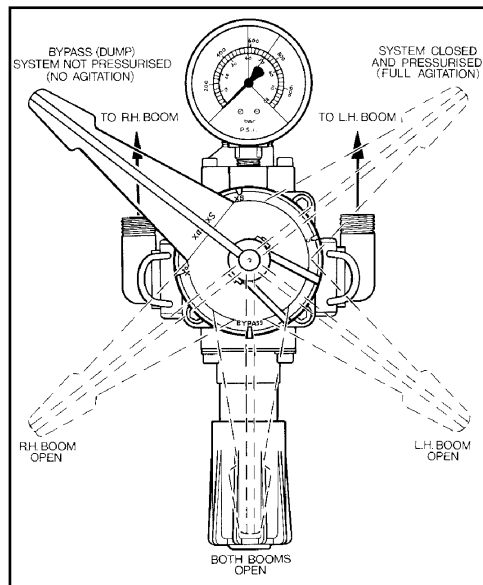


Illustration of the M170 controller functions.



The pump suction valve OPEN to the main spray tank.



Agitator valve (located on pump) in OPEN position.



Electric controller.

11 Check the agitator valve (located on pump) is open and adjust the agitator operating pressure. Check that the agitator(s) is/are working.

12 Turn spray booms ON and OFF to check that they are operational:

- To operate both booms - place the lever in forward "Sx - Dx" position.
- To operate LH boom only - place the lever in left "Sx" position.
- To operate RH boom only - place the lever in right "Dx" position.
- To turn booms off - place the lever back into "C" (closed) position.

13 While water is being pumped through both booms check for any leakages or blockages throughout the sprayer.

Check hoses, connections, valves, filters, boom fittings etc. Also check nozzles are operating correctly and that roll-overs are aligned and work correctly. Rectify any problems.

Always ensure the sprayer controls are turned off and PTO disengaged when making any repairs or adjustments. Making adjustments while sprayer is operating can lead to serious injury.

14 With both nozzle banks (also referred to as "booms") operating, check operating pressure and make the appropriate adjustment.

15 Switch nozzles ON and OFF several times and check that non-drip diaphragms are working.

16 On completion of checking the sprayer turn boom controls OFF by putting the M170 control lever in "By Pass" position.

17 Disengage PTO after controls are turned off.

Check the tank agitators.



## NOTE

Ensure the tank agitators are ON and operating during the pre-operation check.

## Electric Controller (if fitted)

When fitted, the electric controller gives in-cab switch control of left and right booms, pressure adjustment, and pressure dump.

To operate the unit:

- 1 Connect Cropliner to tractor (see instructions pages 12-18) connecting the hitch, PTO & controller.
- 2 Ensure correct nozzles are fitted
- 3 Fill appropriate quantity of clean water into spray tank. Always fill the tank through the main lid with the basket filter in place.

## WARNING

**Important:** Do not have pesticides in the spray tank when checking the sprayer.



*The pump suction valve OPEN to the main spray tank.*



*Agitator valve (located on pump) in OPEN position.*



*Check the tank agitators.*



*Check nozzles & non-drip diaphragms are working.*

3 Check the pump suction valve (located at the front of the sprayer) is open for sourcing liquid from the main tank.

4 Check the fan gearbox is engaged.

5 Place sprayer controls in start up position by placing the master switch in OFF position.

6 Engage PTO and bring the PTO speed up to 540 RPM.

All pumped liquid is now being passed through the dump valve back into the tank. The system is not pressurised and tank agitators are not working.

7 Pressurise the system and operate the tank agitator by placing the master switch in ON position and boom switches OFF

8 If your electric controller has an electric pressure adjustment switch, hold it in the "+" position and bring bypass pressure up.

9 Check the agitator valve (located on pump) is open and adjust the agitator operating pressure.

10 Check the tank agitator is working.  
Adjust if necessary.

11 Turn spray booms ON and OFF to check that they are operational:

- To operate both booms - place the left and right boom switches into ON position.
- To operate the LH boom only - place the LH boom switch ON (whilst leaving the RH switch OFF).
- To operate the RH boom only - place the RH boom switch ON (whilst leaving the LH switch OFF).
- To turn both booms off - place both boom switches in OFF position.

12 While water is being pumped through both booms check for any leakages or blockages throughout the sprayer.

Check all hoses, connections, valves, filters, boom fittings etc. Check the nozzles are operating correctly.

Rectify any problems.

13 With both booms operating check operating pressure and make appropriate adjustment with the manual PRV on the pump.

14 Switch booms ON and OFF several times and check that the non-drip diaphragms are working.

15 On completion of checking the sprayer turn controls off by placing the master switch and boom switches in OFF position.

16 Disengage PTO after the electric controls are turned off.

## NOTE

*Ensure the tank agitators are ON and operating during the pre-operation check.*



## WARNING

*Always ensure the sprayer controls are turned off and PTO disengaged when making any repairs or adjustments.*

*Making adjustments while sprayer is operating can lead to serious injury.*





MT3405 controller.



The pump suction valve OPEN to the main spray tank.



Agitator valve (located on pump) in OPEN position.



Check the tank agitators.

## MT3405 Controller (if fitted)

When fitted, this automatic controller takes control of all aspects of spray application rates.

Set the rates you want and the controller ensures constant application rate - irrespective of undulating terrain, engine speed, ground speed and variations in nozzle wear.

To operate the unit:

- 1 Connect Cropliner to tractor (see instructions pages 2.11 - 2.14) connecting the hitch, PTO and controller.
- 2 Fill appropriate quantity of clean water into spray tank. Always fill the tank through the main lid with the basket filter in place.

- 3 Check the pump suction valve (located at the front of the sprayer) is open for sourcing liquid from the main tank.
- 4 Check the fan gearbox is engaged.
- 5 Follow instruction in the MT3405 Controller Instruction Manual - to calibrate and operate the controller.
- 6 Place sprayer controls in start up position by placing the master switch in OFF position with power switch ON.

All pumped liquid is now being passed through the dump valve back into the tank. The system is not pressurised and tank agitators are not working.

- 8 Pressurise the system and operate the tank agitator by turning the booms ON.
- 9 Using the MAN/AUTO key on the controller panel, select MAN (this will be shown on the LCD screen), using the "+" key adjust pressure to desired operating pressure by closing the electrical regulating valve (servo), and then adjusting the manual pressure relief valve to maximum working pressure.
- 10 Check the agitator valve(s) (located on pump) is/are open and adjust the agitator operating pressure.
- 11 Check the tank agitator(s) is/are working.
- 12 Turn spray booms ON and OFF to check that they are operating correctly for LEFT and RIGHT.

- 13 While water is being pumped through both booms check for any leakages or blockages throughout the sprayer.

Check all hoses, connections, valves, filters, boom fittings etc. Check the nozzles are operating correctly. Rectify any problems.

- 14 With both booms operating check operating pressure and make appropriate adjustment.
- 15 Switch booms ON and OFF several times and check that the non-drip diaphragms are working.
- 16 On completion of checking the sprayer turn controls off by placing the master switch and boom switches in OFF position.
- 17 Disengage PTO after the MT3405 controls are turned off.

### WARNING

Do not have pesticides in the spraytank when checking the sprayer.

### NOTE

The maximum spraying pressure will vary with different nozzles.

We recommend you re-adjust your maximum pressure if you change your nozzle selection.

### NOTE

For full instructions on the set-up & use the MT3405 controller, refer to the separate MT3405 Manual.



*HV4000 controller.*

## HV4000 Controller (if fitted)

When fitted, this automatic controller takes control of all aspects of spray application rates.

Set the rates you want and the controller ensures constant application rate - irrespective of undulating terrain, engine speed, ground speed and variations in nozzle wear.

To operate the unit:

- 1 Connect Cropliner to tractor (see instructions pages 2.11 - 2.14) connecting the hitch, PTO and controller.
- 2 Fill appropriate quantity of clean water into spray tank. Always fill the tank through the main lid with the basket filter in place.



*The pump suction valve OPEN to the main spray tank.*

- 3 Check the pump suction valve (located at the front of the sprayer) is open for sourcing liquid from the main tank.
- 4 Check the fan gearbox is engaged.
- 5 Follow instruction in the HV4000 Controller Instruction Manual - to calibrate and operate the controller.
- 6 Place sprayer controls in start up position by placing the master switch in OFF position with power switch ON.
- 7 Engage PTO and bring the PTO speed up to 540 RPM.

All pumped liquid is now being passed through the dump valve back into the tank. The system is not pressurised and tank agitators are not working.



*Agitator valve (located on pump) in OPEN position.*

- 8 Pressurise the system and operate the tank agitator by turning the booms on.
- 9 Using the MAN/AUTO key on the controller panel, select MANUAL (this will be shown on the LCD screen), using the "▲" key adjust pressure to desired operating pressure by closing the electrical regulating valve (servo), and then adjusting the manual pressure relief valve to maximum working pressure.
- 10 Check the agitator valve(s) (located on pump) is/are open and adjust the agitator operating pressure.
- 11 Check the tank agitator(s) is/are working.
- 12 Turn spray booms ON and OFF to check that they are operating correctly for LEFT and RIGHT.



*Check the tank agitators.*

- 13 While water is being pumped through both booms check for any leakages or blockages throughout the sprayer.  
  
Check all hoses, connections, valves, filters, boom fittings etc. Check the nozzles are operating correctly. Rectify any problems.
- 14 With both booms operating check operating pressure and make appropriate adjustment.
- 15 Switch booms ON and OFF several times and check that the non-drip diaphragms are working.
- 16 On completion of checking the sprayer turn controls off by placing the master switch and boom switches in OFF position.
- 17 Disengage PTO after the HV4000 controls are turned off.



## WARNING

*Do not have pesticides in the spraytank when checking the sprayer.*

## NOTE

*The maximum spraying pressure will vary with different nozzles.*

*We recommend you re-adjust your maximum pressure if you change your nozzle selection.*

## NOTE

*For full instructions on the set-up & use the HV4000 controller, refer to the separate HV4000 Manual.*

## General Notes on Auto-rate Controllers

### Function of Auto-rate Spray Controllers.

If your Cropliner is fitted with either an MT3405 or HV4000 controller, you will have available to you a lot of additional functions & features.

An auto-rate controller, regardless of manufacturer, uses on-the-go inputs to determine the spray rate being applied at that moment in time.

It is designed to adjust an electric bypass valve (known hereon as the “Servo” valve) to either return excess flow to the tank, or force more liquid out the nozzles & therefore onto the canopy you are spraying.

The servo valve, along with the inputs of flow & speed, are the components most likely to give problems if they are not working correctly. To identify where a problem exists with a controller, performing a pre-field check by operating the controller in manual mode will often provide the answer.

### Inputs

The auto-rate controller requires a speed input from a wheel sensor, and a flow input from a flowmeter. Using this information, along with row width data, the controller can display the actual flow rate in litres per 100 metres or in litres per hectare, depending on your choice of application monitoring.

### Functions

If the speed of the tractor changes, the controller senses the change & sends power to the servo valve to either open or close the servo valve. If the tractor slows down, the servo will open to allow more flow to return to the tank, thereby reducing the flow to the nozzles.

Liquid will always take the easiest path, and as the servo bypass line is unrestricted to the tank, the liquid will bypass rather than flow out of the nozzles.

Conversely, if the tractor speeds up, the servo will close and force a lift in pressure, ensuring the liquid must pass through the nozzles, which in turn ensures the spray rate to the canopy is maintained.

The flowmeter sends information to the controller at the same time as the speed input, ensuring that when the correct flow to match the determined spray rate is reached, the servo “locks on” to that position and maintains the required rate.

### Common faults

If the controller does not receive the flow input, speed input, or if the servo cannot function, the controller cannot reach it's programmed spray rate or shuts down altogether. These three faults are the most common cause of problems.

Another problem that can occur is when the nozzles installed on the sprayer cannot work within the parameters you have asked the controller to work within.

Simply put, if the nozzles are too small or too large to attain your pre-set spray rate, the controller cannot deliver or bypass sufficient liquid to function.

### Pre-field check

By testing the controller in manual mode, we can determine if it is (a) correctly set up so it will perform properly in auto mode, and (b) find out where a problem exists if the controller is not functioning correctly.

The MT3405 & HV4000 can both be set to MANUAL (or MAN) mode by pressing the appropriate key on the console. (refer to the controller manual to identify key functions).

Once in MANUAL mode, the sprayer can be operated standing still, and the operator can take control of the servo valve.

In Manual mode, with the PTO running & liquid spraying out of the nozzles, the "+" & "-" keys (or ▲ & ▼ keys) will manually open and close the servo.

By performing this function, the operator can observe the pressure on the sprayer gauge, and the flow on the console readout to see if this matches the desired pressure & flow to achieve the desired spray rate.

This test also determines if the servo is working correctly, and if the flowmeter is registering the correct liquid output or if there is in fact no flow showing (indicating a faulty sensor or flowmeter). This step is important for troubleshooting.

By increasing the flow & pressure with the "+" & "-" keys (or ▲ & ▼ keys), the operator can also check that the manual regulating/pressure relief valve is set in the right position to allow correct flow for the system.

If the manual PRV (pressure regulating valve) is not set right, the pressure or flow your nozzles require may not get to the desired level if the PRV is allowing too much liquid to bypass.

Likewise, if the PRV is adjusted too tightly, the servo may not be able to bypass enough liquid when fully open, resulting in over-application.

By opening and closing the servo in manual mode with the "+" & "-" keys (or ▲ & ▼ keys), the range of pressure & flow can be checked.

As a rule of thumb, you should close the servo fully (hold the "+" or ▲ key until maximum pressure/flow is reached).

If this is not what you require to achieve your upper level, then adjust the PRV by turning it clockwise. If the upper level is too high in pressure or flow, turn the PRV anti-clockwise until your upper limit of pressure or flow is reached.

Then press the "-" or ▼ key to check the controller can reach an acceptable low level of flow/pressure - this will ensure in auto mode that the servo can bypass adequate liquid when the tractor slows right down.

Lastly, check the speed input by simply driving the unit along and ensuring a speed input is being logged by the controller.

**If the controller works in Manual-mode, it should operate perfectly in Auto-mode provided calibration data is correct and a speed input is being received.**

*These notes are a general explanation of the system functions of the MT3405 &/or HV4000.*

*For more detailed information, consult your operators manual for the controller, or your service agent or dealer.*

#### NOTE

*Additional copies of the Spray Controller manual can be downloaded in a PDF file format from the Internet.*

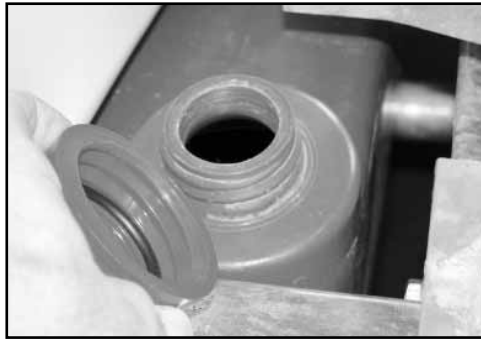
*For the micro-trak MT3405 controller, log onto [www.micro-trak.com](http://www.micro-trak.com) and follow the menu.*



<b>Filling</b>	<b>3.2</b>
<b>Filters</b>	<b>3.3</b>
<b>Mixing</b>	<b>3.4</b>
<b>Calculation Formula</b>	<b>3.5</b>
<b>Proceed to Spray</b>	<b>3.6</b>
<b>Cleaning</b>	<b>3.7</b>



*Open the lid & fill main tank using the basket filter.*



*Remove the lid shown to fill the flushing tank.*



*Remove the lid shown to fill the fresh water tank.*



*CLOSE the pump suction valve before filter cleaning.*

## Filling the Sprayer

The Cropliner features three tanks for easy operation, cleaning and safety.

### 1 Main Tank

When filling the main tank, open the spray tank lid and fill the tank with the basket filter in place.

Use fresh water (preferably rainwater), free of suspended organic matter or clay. Some chemicals are de-activated when they contact these materials.

Ensure sufficient water quantity to allow correct product blending.

### 2 Flushing Tank

Use fresh water (preferably fresh water) in the flushing tank. Unscrew the lid (shown above) and fill before spraying.

Replace the lid after filling.

### 3 Fresh Water Tank

Use only rainwater in the fresh water tank. Unscrew the lid and fill before spraying.

Replace the lid after filling.

## Filters

Filters will ensure that no solids enter the system to block or damage pump or nozzles.

- 1 Always ensure the basket filter is in place when filling the main tank.
- 2 All filters should be cleaned regularly, or after each spraying period.

If the filter screen is damaged, replace with a new screen.



*Thoroughly clean the suction filter and reassemble.*

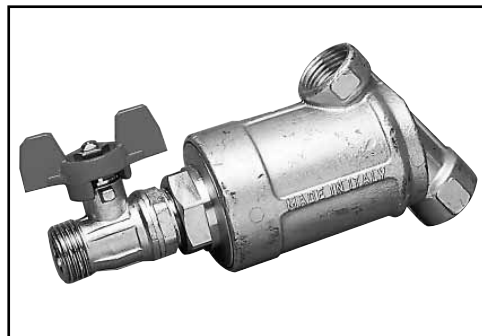
## Cleaning the Suction Filter

The suction filter should be cleaned regularly or after each spray tank has been emptied.

To clean the filter:

- 1 Completely stop all sprayer functions.
- 2 Place the pump suction valve in the closed position to shut off liquid from the main tank.
- 3 Remove the outer filter screw and bowl, and then remove the filter and thoroughly clean it.

Check the condition of O-Ring before reassembling the filter.



*Clean pressure line filter regularly (if fitted).*

## Cleaning the Pressure Filter

The pressure line filter should be cleaned regularly to avoid nozzle blockages.

To clean the pressure filters:

- 1 With the sprayer operating OPEN the valve at the bottom of the filter for and short period and CLOSE the valve.
- 2 Cleaning the filter should especially be done when flushing the sprayer with fresh water.



*Agitator valve in ON position.*

## Agitation

When chemical is added to the tank, the pump and agitator(s) must be operating at all times to ensure chemical does not settle in the tank.

Check to see that tank agitators are correctly adjusted.

If agitation causes too much foaming in the tank, turn off the agitator.

If chemical settles, through pump break down or other reasons, start up the sprayer after the fault has been rectified, then let the mixture in the tank agitate for a length of time to ensure thorough mixing of the chemical.

### NOTE

*Be careful not to damage or deform the mesh or gasket while cleaning and refitting the filters and nozzle caps.*

### NOTE

*The Cropliner 2000HS has two agitators - one in the front and one in the rear of the tank. Each agitator has separate shut-off tap.*





*Mixing basket (& suction probe) valve CLOSED.*



*The pump suction valve OPEN to the main spray tank.*



*Agitator valve (located on pump) in OPEN position.*



*Mixing basket valve OPEN (suction probe valve closed).*

## Mixing Basket

A separate chemical mixing basket is provided in the main tank to allow the operator to add and mix chemicals to the main tank while it is filling. This will save down time in spraying operations.

To operate the mixing basket:

- 1 Fill the main tank with the appropriate amount of water.

- 2 Measure the chemical required for the tank mix and place the chemical (liquid, powder or granules) into the mixing basket & close the mixer lid
- 3 Check the pump suction valve (located at the front of the sprayer) is open for sourcing liquid from the main tank.

- 4 Open agitator valves.
5. Open the mixing basket valve.
- 6 Place sprayer controls in start up position by placing the master switch in OFF position (for electric/Auto-Rate controls).
- 7 Engage PTO and bring the PTO speed up to 540 RPM.

- 8 Pressurise the system and operate the tank agitator by placing the master switch in ON position.

For the M170 manual control, see the diagram and instructions for pressurising the system on page 2.18.

- 9 Allow the chemical to mix into the tank and close the mixing basket valve.
- 10 Keep the PTO engaged and the agitators operating while chemical is in the tank.

*The mixing basket assists adding chemicals to the tank.*



### CAUTION

*Always follow chemical label safety instructions.*

*When handling chemicals always wear protective clothing ie. gloves, face mask, spray suit.*

*Should chemical come in contact with skin immediately rinse off with water.*



Accurately calculate the amount of chemical required.



25 litre measuring bucket.

## Calculate Water & Chemical Quantities

Before spraying it is necessary to calculate the exact quantities of water and chemical needed to spray the required area of orchard or vines.

a) For chemical rates expressed in litres or kg per hectare (land area), use the formula:

**Chemicals required (kg)**

=

**Tank Volume (l) x Recommended Chemical Rate (kg/ha) ÷ Spray Application Rate (l/ha)**

eg.  $[2000 \times 2\text{kg}] \div 2000$   
= 2kg

b) For volume of mixture required to spray a selected area, use the following formula:

**Total Spray Volume Required (litres)**

=

**Area (ha) x Spray Application Rate (l/ha)**

eg.  $3\text{ha} \times 2000$   
= 6000 litres

**Area Covered (ha)**

=

**Tank Volume (litres) ÷ Spray Application Rate (l/ha)**

eg.  $2000 \div 2000$   
= 1ha

c) For chemical rates expressed in litres or kg per 100 litres of water (water volume), use the formula:

**Chemicals Required (kg)**

=

**Tank Volume (litres) x Recommended Chemical Rate (kg/100l) ÷ 100**

eg.  $[2000 \times 0.1] \div 100$   
= 2kg

### NOTE

Examples of chemical quantities in these formula are for typical dilute application in tree crops.

### NOTE

**Important:** Be sure to mix only enough spray mixture to cover the area required. Avoid wastage and problems of needless chemical disposal.



2000 litre Cropliner.

## Proceed to Spray

Once the chemical mixture is in the tank, proceed to spray:

- 1 Adjust the pressure to correct operating pressure by adjusting pressure (up or down) according to instructions of the controller fitted (Refer to pages 2.18 -2.19).
- 2 Turn spray booms ON and OFF as required to spray according to the instructions of the controller fitted (Refer to pages 2.18 - 2.21).

## Operating Pointers

While spraying, continually ensure that:

- 1 Engine and PTO speed are correct.
- 2 Correct operating pressure is being maintained.
- 3 Ground speed is correct and constant.
- 4 Cropliner nozzle angles are correctly aimed toward the targeted foliage.
- 5 Ground speed is correct. Avoid going slower than the selected speed where possible because over application will occur.

Conversely, avoid going faster than the selected speed because under application will occur.

### NOTE

*An Auto-Rate controller will automatically compensate for speed fluctuation within the range of the nozzles selected.*



Swing-over nozzle on OFF position.

## Swing-Over Nozzles

Fit and adjust swing-over nozzles according to your calibration and spraying requirements.

The non-drip swing-over nozzles have three positional settings when ON.



Optional double nozzles used on alternate outlets.

### NOTE

*The non-drip valve must be pointing in the direction of liquid flow.*

**WARNING**

*Always wear protective gloves when cleaning filters containing toxic chemicals.*

## Flushing the Cropliner

The Cropliner is equipped with a flushing tank for cleaning the sprayer when changing chemicals, and at the end of the day.

To flush the Cropliner:

- 1 Ensure the site for flushing and cleaning the Cropliner meets with environmental and statutory regulations.
- 2 Open tank drain valve (valve located at the base of the tank) to drain remaining spray mixture from the tank.



*Tank drain valve OPEN.*

- 3 Open the pump suction valve to the flushing tank.
- 4 Open the mixing basket valve.
- 5 Check that agitator valves are open.
- 6 Place sprayer controls in start up position according to the instructions of the controller fitted (see pages 2.18 - 2.21).
- 7 Engage PTO and bring the PTO speed up to 540 RPM.  
All pumped liquid is now being passed through the dump valve back into the tank. The system is not pressurised and tank agitators are not working.
- 8 Pressurise the system and operate the tank agitators.

*The pump suction valve OPEN to the flushing tank.*



*Remove & clean the filter element & components.*

- 9 Adjust pressure to desired operating pressure.
- 10 Turn the spray booms ON.

Fresh water now flushes through the suction line, suction filter, pump, agitator(s), pressure lines, nozzles and mixing basket.

All water comes into the tank from the flushing tank. Water remaining in the tank drains out of the tank through the drain outlet.

- 11 On completion of flushing, shut down all controls and disengage the PTO and hydraulic fan drive.
- 12 Remove and clean the suction filter and screen, and reassemble.



*The pump suction valve OPEN to the main spray tank.*

- 13 Adjust all valves back to operating (non-flushing) mode.
  - a) Close mixing basket valve.
  - b) Close tank drain valve.
  - c) Open pump suction valve to the main tank.
  - d) Open the agitator valves.
- 14 Wash/hose down the outside of the sprayer.

**NOTE**

*Ensure the drained mixture is disposed of as required by law. Read chemical instructions.*

**NOTE**

*Be careful not to damage or deform the mesh or O-ring while cleaning and refitting the filters.*

**NOTE**

*Sulphur & Copper compounds lead to rapid deterioration of metal and polyethylene surfaces on you sprayer.*

*It is strongly recommended that you use an exterior cleaner such as FARM MATE after every spray.*

*FARM MATE is available from your Spray Shop.*



*Pump suction valve OPEN for liquid from the main tank.*



*Agitator & mixing basket valves OPEN.*



*Remove & clean suction filter screen and reassemble.*



*Fresh water tap for personal safety.*

## Using Tank and Equipment Cleaners

If a cleaning agent is required (refer to chemical label), first completely flush the Cropliner with water as outlined in Steps 1 - 14 on page 3.8, then:

- 1 Fill the spray tank with fresh water.
- 2 Add cleaning agent into the mixer basket (use according to instructions).
- 3 Open the pump suction valve to the main tank.
- 4 Open mixing basket valve.
- 5 Open the agitator valves.
- 6 Place sprayer controls in start up position according to the instructions of the controller fitted (see pages 2.18 - 2.21).

- 7 Engage PTO and bring the PTO speed up to 540 RPM.  
All pumped liquid is now being passed through the dump valve back into the tank. The system is not pressurised and tank agitators are not working.
- 8 Pressurise the system and operate the tank agitators.
- 9 Adjust pressure to desired operating pressure.
- 10 Turn the spray booms ON to put cleaner through the spray lines and nozzles.
- 11 If you require the cleaning agent to soak or stand for a period, turn the spray booms OFF and completely shut down the sprayer for a period.

- 12 When soaking is completed, start the machine following steps to flush the tank and spray lines (see page 3.7).
- 9 Stop flushing by switching booms off, turning controls off, disengaging the PTO.
- 10 Open spray tank drain valve and allow cleaning mixture to drain from the tank.
- 11 Completely flush the sprayer with fresh water as outlined on page 3.7.

## Fresh Water Tank

The Cropliner incorporates a fresh water tank for personal safety when operating the unit in the field.

### NOTE

*Ensure the drained mixture is disposed of as required by law. Read chemical instructions.*

<b>Calibration Procedure</b>	<b>4.2</b>
<b>Disc &amp; Core Chart</b>	<b>4.8</b>
<b>TX Ceramic Nozzle Chart</b>	<b>4.10</b>
<b>Calibration Work Sheet</b>	<b>4.11</b>



*Proper calibration considers all spraying variables.*

Applying the correct amount of chemical to a crop is only possible if:

- the sprayer is calibrated correctly.
- the sprayer is operated correctly.
- the sprayer is maintained correctly.

The variables of spray application (distance, time, working width, liquid and chemical volumes) must be measured and controlled accurately to ensure chemicals are applied at the correct rate.

If fitted, an automatic spray controller measures and controls the variables of speed and flow rate to give constant application.

However proper nozzle selection, checking calibration of nozzles, speed and flow rate as well as correct mixing of chemicals must be done to ensure the accuracy and performance of the sprayer and its controller.

Accurate calibration is essential to ensure uniform application of the recommended dose of chemical to the target.

Proper calibration involves setting up the sprayer (nozzle selection, pressure, speed), calculating chemical and water rates and measuring the performance of the sprayer itself. Only then can you be totally confident in applying chemical correctly.

## Fully Automatic Spray Controller (Optional)

The fully automatic spray controller maintains the application rate (set by the operator) when operated in Auto position.

The controller monitors speed of travel (speed sensor) and flow rate (flow meter) and automatically adjusts flow rate (via a servo valve) to maintain correct application rate irrespective of speed variations within the limits of the nozzles used.

## IMPORTANT:

- 1 It should be remembered that the spray controller does not eliminate the necessity to measure and check the accuracy of nozzle spray patterns and outputs. These must be checked regularly to ensure correct and uniform application rates because nozzles wear with use.
- 2 Flow meters used by the controller also needs to be checked and calibrated on a regular basis.

On the following page, you will see how to maintain and check your Rapid-check flowmeter. It is recommended you do this regularly during the spraying season.

See the Controller Operator's Manual for detailed information and calibrating procedures specific to you spray controller.



*Rapid Check Flowmeter (optional).*

## Calibration Procedure

For accurate spray rate application, follow this calibration procedure:

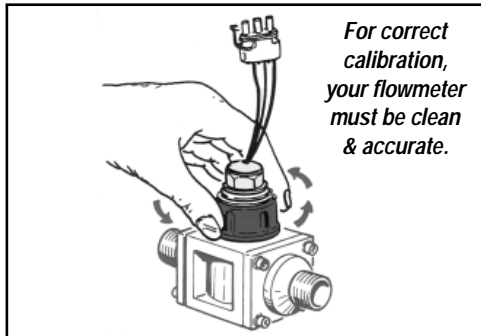
### Step 1

### Ensure Equipment Is In Good Working Order.

Tank, pump, boom, filters and nozzles must be clean, free of leakages and functioning properly.

Follow the pre-operation checklist, maintenance and operating instructions in this manual.

Install, calibrate and operate the spray controller according to the spray controller Installation/Operators Manual.



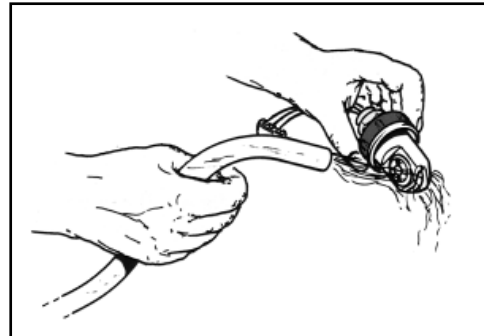
*For correct calibration, your flowmeter must be clean & accurate.*

*Unscrew the the Rapid Check assembly.*

## Daily Check & Maintenance of Flowmeter (optional)

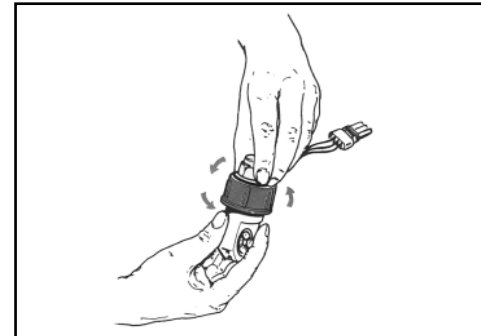
This is to be performed every day after work is finished:

- 1 Unscrew the assembly that holds the Rapid Check unit in the body.
- 2 Remove the Rapid Check unit from the body.



*Wash any impurities out of the removable turbine unit.*

- 3 Use clean water to wash any impurities out of the removable turbine unit.
- 4 Use compressed air to verify that the turbine unit rotates freely (maximum air pressure 1 BAR [15 psi]).

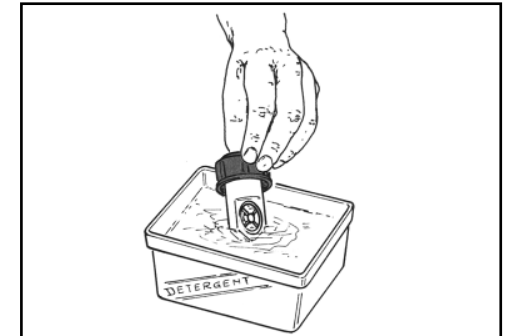


*Unscrew the sensor.*

## Every 50 Hours

Carry out the following procedure after every 50 hours of operation:

- 1 Unscrew the sensor.
- 2 Separate the sensor from the Rapid Check unit.



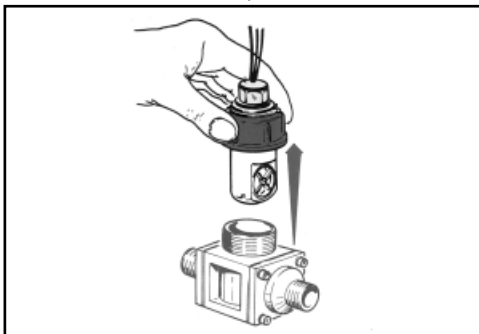
*Place the Rapid Check unit in a detergent bath.*

- 3 Place the Rapid Check unit in a detergent bath for a few hours.
- 4 Remove the Rapid Check unit from detergent bath.

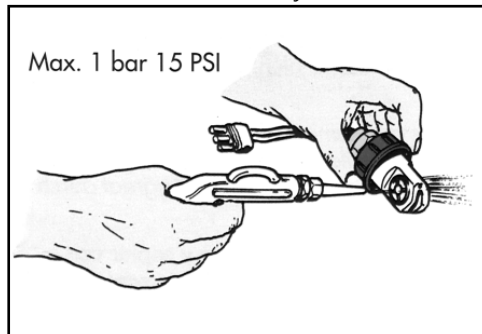
Use compressed air to verify that the turbine unit rotates freely (maximum air pressure 1 BAR [15 psi]).

If necessary, replace the Rapid Check unit with a new one.

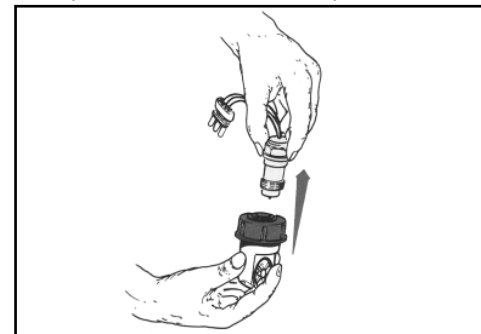
*Remove the Rapid Check unit.*



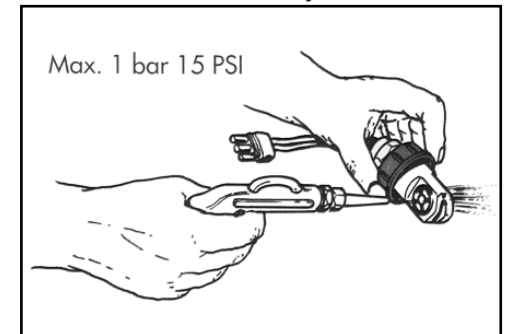
*Use compressed air to check that the turbine unit rotates freely.*



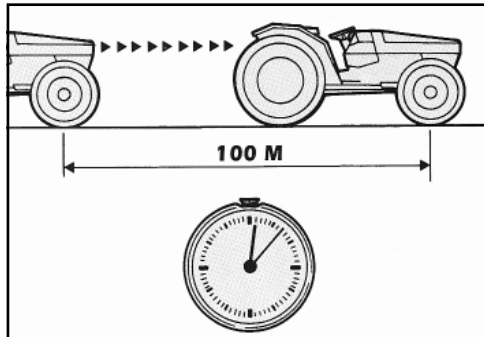
*Separate the sensor from the Rapid Check unit.*



*Use compressed air to check that the turbine unit rotates freely.*







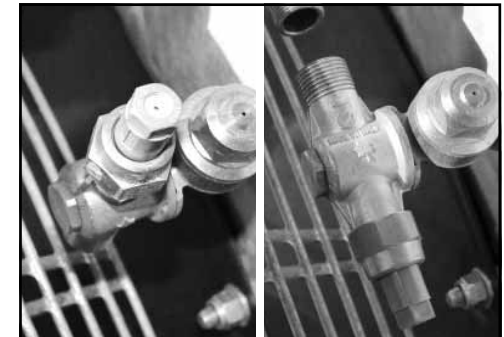
Determine actual speed of travel.



Determine spraying volume required.



Buyers Guide - courtesy of TeeJet.



Nozzles can be turned ON (left) or OFF (right).

## Step 2 Determine Actual Speed of Travel

It is essential to use actual speed of travel when calibrating application rates.

- Half fill the sprayer tank with water and mark out a test strip of 100 metres (simulating spraying conditions).
- Set the sprayer operating and record the time taken to travel 100 metres at your required spraying speed.
- Calculate the actual speed of travel using the formula:

$$\text{km/hr} = \frac{\text{Distance (m)} \times 3.6}{\text{Time (sec)}}$$

$$\text{Distance (m)} \times 3.6 \div \text{Time (sec)}$$

$$\text{eg. } 100 \times 3.6 \div 100$$

$$= 3.6 \text{ km/hr}$$

An alternative formula is:

$$\text{km/hr} = \frac{\text{Metres travelled in 1 minute}}{16.7}$$

$$\text{Metres travelled in 1 minute} \div 16.7$$

## Step 3 Determine Spraying Volume Required

It is essential to determine the **liquid volume per hectare** required to effectively spray a crop without overspraying or underspraying.

The term "litres per hectare" must be related to foliage and not just to land area.

The amount of liquid needed to effectively spray any given crop will vary greatly with:

- The type of crop,
- Row spacing,
- Width of canopy,
- Height of canopy.
- Stage of growth,
- Density of foliage,
- Type of leaf surface,
- Type of fruit (single or bunched)
- Type of sprayer used.

## Step 4 Determine Sprayer Configuration

Once the volume of required spray volume per hectare is established, the next step in calibrating your sprayer is to determine:

- The **number of row(s)** to be sprayed in one pass, and
- The **total number of nozzles** to be used on the sprayer.

Both these factors can vary with the type of sprayer used and other factors mentioned under step 3 on the left.

### Example 1

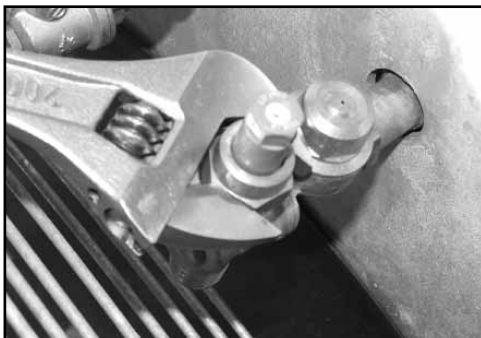
A Cropliner to spray apples, 4 metres high - spraying both sides, each with 8 nozzles (total nozzles 16) to spray one row per pass.

### NOTE

*Always use Actual Speed of Travel for speed in the calibration formula.*

### NOTE

*Use your own experience or a registered rate calibration consultant to determine effective application rates in litres per hectare.*



Select and fit nozzles.

## Step 5

### Determine Spray Output for Each Side of Sprayer

Knowing actual travel speed, application rate required, number of rows to be sprayed in one pass and total number of nozzles to be used, we can determine the nozzles required for the sprayer. Use the formula below:

**Litres/Minute/Side**

=

**Spray Volume (Litres/Ha) x Speed  
(Km/hr) ÷ 1200 x Row Spacing (m) x  
Number of Rows in One Pass**

#### Example 1

$960 \text{ (l/ha)} \times 6 \text{ km/hr} \div 1200 \times 3\text{m (row spacing)} \times 1 \text{ (rows/pass)}$   
= 19.2 litres/minute/side

## Step 6

### Select & Design Nozzle Layout

- a) **Select the number of nozzles** to be used on one side of the sprayer (in the effective air stream) for the planned crop.

Depending on size and shape of crop/trees it may be necessary to turn some outer nozzles off.

#### Example 1

Use 8 nozzles and shut 2 off.

- b) **Divide the nozzles used** into:

- 1/3 (outer upper and lower areas)
- 2/3 (bulk 1/2 - 2/3 of the tree) & calculate the litres per minute required for each nozzle

#### Example 1

19.2 litres/min/side required within:

- **The Outer Tree Area (1/3rd)**

$19.2 \div 3 \text{ (1/3rd)} = 6.4 \text{ litres}$   
allocated to three nozzle positions  
2, 3 & 9 (1/3 to outer areas)

$6.4 \div 3 \text{ nozzles} = 2.13 \text{ litres/min/}$   
nozzle (average).

- **The Bulk of Tree Area (2/3rd)**

$6.4 \times 2 \text{ (2/3rd)} = 12.8 \text{ litres}$   
allocated to five nozzle positions  
4, 5, 6, 7 & 8 (2/3 to bulk of the tree)

$12.8 \div 5 \text{ nozzles} = 2.56 \text{ litres/min/}$   
nozzle (average)..

- c) **Now select appropriate nozzles** using:

- Calibration work sheet on page 4.13.

It is suggested that a photocopy of the blank worksheet be used for each calibration, and keep them for future reference.

- Nozzle charts on pages 4.8 - 4.10.

Find and allocate the operating pressure and nozzle or disc/swirl plate (core) combinations which fulfill the required discharge rate for the nozzle layout and droplet size required.

Calibration example shown next page.

### CAUTION

*Do not use a worn nozzles to set the pressure setting and nozzle rates, otherwise inaccurate calibration will occur.*

### NOTE

*The flow rate of each nozzle is dependent on the nozzle size and operating pressure.*

### NOTE

*Remember when selecting nozzle outputs that higher pressures and wider spray angles usually give finer droplet sizes than lower pressures and narrower spray angles.*

### WARNING

*Do not use mixed pesticides for testing. Use only clean water.  
Use of pesticides when testing is hazardous to your health.*

## Calibration of Example 1

### Actual Travel Speed

$$100\text{m} \times 3.6 \div 60 (\text{sec}) = 6.0 \text{ km/hr}$$

$$\text{Row spacing} = 4 \text{ metres}$$

$$\text{Volume of spray/ha} = 960 \text{ litres/ha}$$

### Spray Output per Side =

$$\text{Spray Volume (l/ha)} \times \text{Speed (km/hr)} \div 1200 \\ \times \text{Row Spacing (m)} \times \text{Number of Rows/Pass}$$

$$960 \times 6 \div 1200 \times 4 \times 1$$

$$= 19.2 \text{ litres/minute/side}$$

$$1/3 \text{ Spray Volume} = 6.4 \text{ litres/minute}$$

$$\text{Average/nozzle} = 2.13 \text{ litres/nozzle/minute}$$

$$2/3 \text{ Spray Volume} = 12.8 \text{ litres/minute}$$

$$\text{Average/nozzle} = 2.56 \text{ litres/nozzle/minute}$$

$$\text{Pump Pressure} = 1380 \text{ kPa}$$

### Nozzle Diagram

	Nozzle	*Discharge	*Disc No	*Core No	*Spray Angle
Top Area 1/6th volume (2.08 l/min)	1	0	Off	Off	n/a
	2	2.08	D2	56	17
	3	2.65	D3	46	22
Bulk of Tree Foliage (15.3 l/min)	4	2.35	D4	25	82
	5	2.65	D3	46	22
	6	2.65	D3	46	22
	7	2.35	D4	25	82
Lower Area 1/6th volume (2.08 l/min)	8	2.65	D3	46	22
	9	2.08	D2	56	17
	10	0	Off	Off	n/a
Total		19.46	per side		

\*Read these from your spray nozzle discharge charts for selected pump pressure.

### DISCLAIMER:

Because of the many variable factors involved Fernz Croplands cannot be held responsible for any down grading or loss of crop resulting from the use of any information in this manual.

## Step 7

### Fit & Test Selected Nozzles

Now, the most important calibration is to test for the **actual litres per hectare** achieved through your sprayer.

Use the following method to fit and test the selected nozzles:

- Fit selected nozzles one side of the sprayer.
- Fill your spray tank to overflowing & set the specified pump pressure and operate the sprayer for a short period to make sure all lines are full and nozzles fitted are working properly (no blockages or leaks).
- Stop the sprayer and top up the tank with water to overflowing again.



### CAUTION

Do not use a worn nozzles to set the pressure setting and nozzle rates, otherwise inaccurate calibration will occur.



Measure how much water is required to refill the tank.

- Operate the sprayer in the stationary position at the required pressure for approximately one minute.

- Measure how much water is required to refill the tank to the brim.

Now, divide the volume measured by the time taken (minutes).

$$\text{Output/min/side (l/min)} = \text{Output (litres)} \div \text{Time (minutes)}$$

### Example 1

$$24.2 \text{ litres} \div 1.25 \text{ minutes} = 19.36 \text{ litres/min.}$$

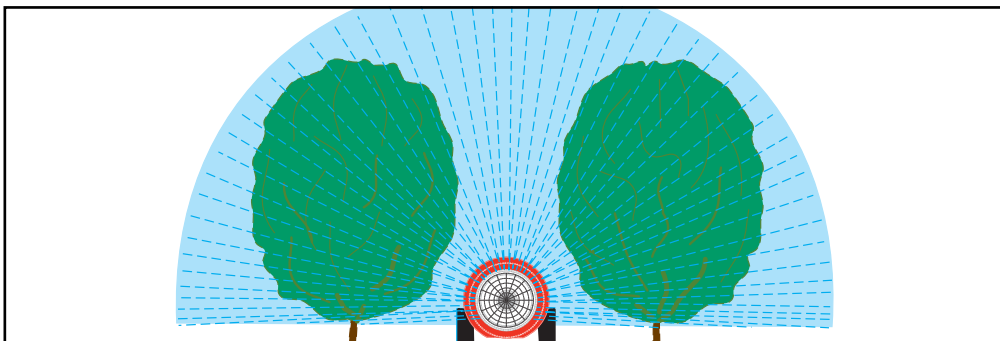
**Multiply by 2 = Output for both sides**

### Example 1

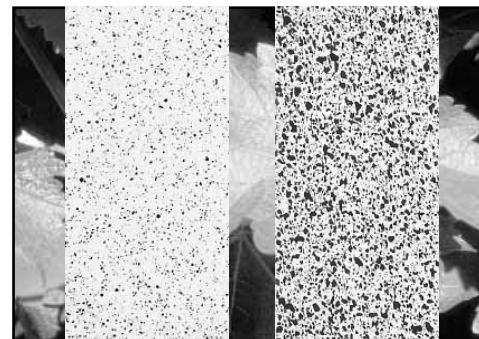
$$19.36 \times 2 = 38.72 \text{ litres/min.}$$

### NOTE

Always use Actual Speed of Travel for speed in the calibration formula.



Calculate the application rate tested. Then, if necessary, make adjustments, retest and recalculate.



Samples of water sensitive paper tests.

## Step 8

### Calculate the Actual Application Rate

Actual application rate is the objective of setting up and calibrating your sprayer.

To calculate actual application rate (litres per hectare), use the following formula:

**Application Rate (l/ha) =**

$$\frac{\text{Total Sprayer Output (l/min)} \times 600}{\text{Speed (Km/hr)} \div \text{Row Spacing (m)} \div \text{Number Rows in One Pass}}$$

#### Example 1

$$\begin{aligned} &38.72 \text{ (l/min)} \times 600 \div 6 \text{ km/hr} \div \\ &4\text{m (row spacing)} \div 1 \text{ (rows/pass)} \\ &= 968 \text{ litres/ha.} \end{aligned}$$

## Step 9

### If the Tested Rate is Unsatisfactory

If your tested application rate does not meet your requirements, your options are:

- Adjust pump pressure to increase or decrease the rate of application as required.
- Adjust the speed of travel decrease or increase application rate.
- Select a different nozzle size to decrease or increase application rate.

Repeat the necessary testing procedure and application rate calculation (steps 6 & 7) if adjustment or nozzle changes are made.

Continue adjustment and testing until the require application rate is acheived.

## Step 10

### Field Check Coverage

Operate your sprayer in the required orchard or vineyard to check the actual spray coverage achieved on foliage.

This is important because it is the only real measure you have of actual coverage and effective penetration of your sprayer.

Coverage checks can be done using:

- A fluorescent dye system - often available through chemical and spray equipment suppliers.
- Water or oil sensitive papers available through chemical and spray equipment suppliers. Ensure cards are strategically placed on both upper and lower surfaces.

It is recommended to test the unit using water only as a test run, and again when applying your chemical mixture.

## Step 11

### Record each Calibration on a Work Sheet

Record all your calibration data on the work sheets given at the end of this section.

Photocopy the work sheets to obtain the number of work sheets required.

#### NOTE

*Always use Actual Speed of Travel for speed in the above formula.*

#### NOTE

*All nozzles have a pressure and flow rate range to acheive the best results.*

*Ensure you have selected the nozzle which best suits your application to avoid any problems.*

#### NOTE

*Mix only the amount required. Avoid wastage and the problem of needless chemical disposal.*

#### NOTE

*Full instructions of controller operation are contained in your seperate Controller Manual.*

# Disc & Core Chart

# Sprayer Calibration

The core & disc sizes listed are the most commonly used in airblast spraying. For Hollow Cone Spray Patterns use cores 23, 25, 45 & 46.

For Full Cone Spray Patterns use cores 33, 35 & 56.

**Spray Outputs per nozzle in litres per minute, and Spray Angle at disc orifice - at 5 different pressures.**

Disc	Core	700 kPa (100 psi)	1040 kPa (150 psi)	1380 kPa (200 psi)	2070 kPa (300 psi)	2760 kPa (400 psi)		Disc	Core	700 kPa (100 psi)	1040 kPa (150 psi)	1380 kPa (200 psi)	2070 kPa (300 psi)	2760 kPa (400 psi)
<b>D1</b>	23	0.41 60°	0.47 63°	0.53 64°	0.62 65°	0.70 65°		<b>D2</b>	23	0.61 71°	0.72 72°	0.80 72°	0.95 72°	1.06 72°
	25	0.59 46°	0.70 49°	0.80 50°	0.97 51°	1.10 51°			25	0.95 60°	1.10 61°	1.29 61°	1.55 61°	1.74 60°
	33	0.83 36°	0.99 37°	1.14 38°	1.40 37°	1.59 37°			33	1.40 55°	1.71 55°	1.97 55°	2.39 52°	2.73 48°
	35	0.83 27°	0.99 27°	1.10 27°	1.33 27°	1.52 26°			35	1.40 47°	1.71 45°	1.93 44°	2.27 40°	2.58 38°
	45	0.72 36°	0.85 39°	0.97 40°	1.17 40°	1.33 40°			45	1.21 57°	1.44 58°	1.67 58°	2.01 58°	2.31 57°
	46	0.87 16°	1.06 17°	1.21 17°	1.48 17°	1.71 16°			46	1.59 21°	1.90 20°	2.16 19°	2.58 18°	2.96 18°
	56	0.87 16°	1.06 17°	1.21 17°	1.48 17°	1.71 16°			56	1.48 18°	1.78 18°	2.08 17°	2.54 16°	2.92 16°
<b>D1.5</b>	23	0.49 64°	0.59 66°	0.66 67°	0.80 67°	0.90 67°		<b>D3</b>	23	0.68 76°	0.80 77°	0.91 77°	1.06 77°	1.21 77°
	25	0.78 51°	0.93 54°	1.06 55°	1.25 55°	1.44 55°			25	1.10 68°	1.33 69°	1.52 69°	1.82 69°	2.08 68°
	33	1.14 45°	1.36 46°	1.55 46°	1.90 45°	2.16 43°			33	1.71 57°	2.08 57°	2.39 57°	2.88 56°	3.34 54°
	35	1.10 30°	1.29 30°	1.48 30°	1.74 30°	1.97 29°			35	1.71 52°	2.08 48°	2.35 45°	2.80 42°	3.22 40°
	45	0.95 46°	1.17 48°	1.33 49°	1.63 50°	1.86 50°			45	1.36 61°	1.67 62°	1.93 62°	2.35 62°	2.69 61°
	46	1.25 18°	1.55 18°	1.74 18°	2.12 18°	2.43 17°			46	1.93 24°	2.31 23°	2.65 22°	3.26 21°	3.75 21°
	56	1.25 16°	1.55 16°	1.78 16°	2.16 16°	2.46 15°			56	2.01 24°	2.46 24°	2.84 23°	3.49 22°	4.06 22°

Refer to charts on page 92 - 96 for more detailed information on hollow cone disc & cores.

# Section 4

# Disc & Core Chart

The core & disc sizes listed are the most commonly used in airblast spraying. For Hollow Cone Spray Patterns use cores 23, 25, 45 & 46.

For Full Cone Spray Patterns use cores 33, 35 & 56.

Spray Outputs per nozzle in litres per minute, and Spray Angle at disc orifice - at 5 different pressures.																
Disc	Core	700 kPa (100 psi)	1040 kPa (150 psi)	1380 kPa (200 psi)	2070 kPa (300 psi)	2760 kPa (400 psi)		Disc	Core	700 kPa (100 psi)	1040 kPa (150 psi)	1380 kPa (200 psi)	2070 kPa (300 psi)	2760 kPa (400 psi)		
D4	23	0.87 88°	1.06 88°	1.21 88°	1.44 88°	1.67 88°		D6	23	1.21 99°	1.49 100°	1.71 100°	2.05 99°	2.35 99°		
	25	1.71 81°	2.05 82°	2.35 82°	2.84 82°	3.26 81°			25	2.65 89°	3.22 89°	3.68 89°	4.51 88°	5.19 88°		
	33	2.27 62°	2.77 63°	3.15 63°	3.87 63°	4.43 58°				33	Not recommended					
	35	2.99 70°	3.52 68°	4.17 63°	4.93 60°	5.69 54°				35	Not recommended					
	45	2.12 73°	2.58 73°	2.96 73°	3.60 72°	4.21 72°			45	3.52 81°	4.36 80°	5.04 80°	6.22 79°	7.20 79°		
	46	3.34 33°	4.06 32°	4.66 32°	5.76 31°	6.67 31°			46	6.56 50°	8.19 49°	9.48 48°	11.60 47°	13.34 47°		
	56	3.30 30°	4.02 30°	4.66 29°	5.72 28°	6.59 28°			56	6.59 41°	8.07 40°	9.32 39°	11.45 38°	13.19 38°		
	D5	23	1.06 95°	1.29 96°	1.44 96°	1.74 95°			2.01 95°	D7	23	Not recommended				
		25	2.05 85°	2.46 85°	2.84 84°	3.41 84°			3.94 84°		25	3.07 93°	3.71 92°	4.47 92°	5.19 91°	6.03 91°
		33	Not recommended									33	Not recommended			
35		3.79 71°	4.55 69°	5.31 65°	6.44 65°	7.20 59°		35	Not recommended							
45		2.69 76°	3.26 76°	3.75 76°	4.62 75°	5.31 75°	45	4.21 87°	5.12 86°		5.95 86°	7.35 85°	8.53 85°			
46		4.74 42°	5.69 41°	6.56 41°	8.07 40°	9.36 40°	46	8.41 56°	10.35 55°		11.94 54°	14.99 53°	16.75 53°			
56		4.55 35°	5.57 35°	6.41 34°	7.88 33°	9.10 33°	56	9.10 54°	11.14 53°		12.89 52°	15.77 51°	18.23 51°			

Refer to charts on page 92 - 96 for more detailed information on hollow cone disc & cores.

TIP	BAR	LITRES PER MINUTE	CUMULATIVE VOLUME PERCENTAGE OF MICRONS *											V.M.D.	SPRAY ANGLE
			0-	0-	50-	50-	100- 150 µm	100- 200 µm	100- 300 µm	150-	300- 400 µm				
YELLOW NO 3	4	.22	7	44	37	80	40	54	56	13				107	74°
	8	.30	9	54	45	87	41	45	46	4				95	80°
	20	.45	10	80	70	90	20	20	20					87	83°
GREEN NO 4	4	.30	4	38	34	73	40	60	62	19				115	75°
	8	.41	7	48	41	85	44	45	52	7				101	80°
	20	.62	9	62	53	91	38	38	38					92	81°
RED NO 6	4	.45	2	28	26	60	34	66	72	27				132	75°
	8	.62	4	36	32	76	44	63	64	19				117	80°
	20	.93	6	44	38	94	58	58	58					106	80°
GREY NO 8	4	.60	2	20	20	43	28	58	77	32				150	75°
	8	.84	2	26	24	66	36	66	74	28				132	80°
	20	1.30	4	30	26	96	70	70	70					120	80°
BLACK NO 10	4	.75	2	16	14	40	26	66	83	30				164	76°
	8	1.00	2	23	21	52	31	65	77	34				145	80°
	20	1.60	3	24	21	76	67	74	74	7				132	79°
BROWN NO 12	4	.90	1	11	10	33	23	49	84	24	6			180	76°
	8	1.30	1	18	17	41	24	60	84	36				159	80°
	20	2.00	2	21	19	54	35	35	35	44				145	78°
ORANGE NO 18	4	1.40	1	10	9	25	18	40	82	22	8			203	77°
	8	1.90	1	10	9	33	25	53	86	28	4			180	80°
	20	3.00	2	12	10	34	26	90	90	62				164	77°
LIGHT BLUE NO 26	4	2.00	1	5	4	19	15	31	71	16	16			233	78°
	8	2.80	1	7	6	24	18	41	83	23	10			206	80°
	20	4.40	2	9	7	24	18	51	40	33				187	76°

Information gathered from Spraying Systems DATA SHEET NO 12135-168M 12135 169M 12135-170M April 14, 1993.

\*There are 1000 µm ( microns ) in 1mm.

## Step 1 Check the Sprayer is in Good Working Order

### Step 2 Determine Actual Speed of Travel

Measure and mark a straight path of 100 metres (or more) of travelling conditions similar to the orchard or vineyard you are going to spray.

Half fill the spray tank & record the time (in seconds) to travel the measured distance.

Make sure that the tractor is travelling at spraying speed when you pass the start and finish marks and ensure the the fan and pump are at operational speed.

If you have a hectare metre or automatic controller you need to check the speed calibration of the controller.

Tractor model	
Gear	
Range	
Dual power	
Engine RPM	
Speed in Km/hr	
<p><b>Kilometres per Hour</b> = <b>Distance traveled (m) x 3.6</b></p>	

## Step 3

### Determine Spraying Volume Required

It is essential to determine the liquid volume per hectare required to effectively spray a crop without overspraying or underspraying.

Use your own experience or a registered rate calibration consultant to determine effective volume in litres per hectare.

..... litres/ha

## Step 4

### Determine Sprayer Configuration

- **Number of row(s)** to be sprayed in one pass .....
- **Total number of nozzles** to be used .....

## Step 5

### Determine & Select Nozzles

Determine nozzle flow rate required:

**Litres/Minute/Side**

=

**Spray Volume (l/ha) x Speed (Km/hr) ÷ 1200 x Row Spacing (m) x Number of Rows in One Pass**

eg.

..... x ..... ÷ 1200 ÷ ..... x .....

= ..... litres/minute/side.

## Step 6

### Select & Design Nozzle Layout

**1/3 Spray Volume** = ..... litres/minute

Average/nozzle = ..... litres/nozzle/minute

**2/3 Spray Volume** = ..... litres/minute

Average/nozzle = ..... litres/nozzle/minute

**Pump Pressure** = ..... kPa

**Nozzle Diagram**      **Nozzle**    **\*Discharge**    **\*Disc No**    **\*Core No**    **\*Spray Angle**

Top Area	1				
1/6th volume	2				
( ..... l/min)	3				
	4				
<b>Bulk of Tree</b>	5				
<b>Foliage</b>	6				
( ..... l/min)	7				
	8				
Lower Area	9				
1/6th volume	10				
( ..... l/min)					
	Total	..... per side			

\*Read these from your spray nozzle discharge charts for your pump pressure.

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**Note:**  
Photocopy this work sheet to obtain the number of work sheets required.

## Step 7

### Fit & Test Selected Nozzles

The most important calibration is to test for actual litres per hectare.

Fill your spray tank to overflowing and run the sprayer for one minute, at the above operating settings, and record the total litres per minute used.

**Output/min/side (l/min)**

=

**Output (litres) ÷ Time (minutes)**

..... ÷ ..... = ..... litres/min.

## Step 8

### Calculate the Actual Application Rate

To calculate actual application rate (litres per hectare), use the following formula:

**Application Rate (l/ha)**

=

**Total Sprayer Output (l/min) x 600 ÷ Speed (Km/hr) ÷ Row Spacing (m) ÷ Number Rows in One Pass**

..... x 600 ÷ ..... ÷ ..... ÷ .....

= ..... litres/ha.



## Step 1 Check the Sprayer is in Good Working Order

### Step 2

#### Determine Actual Speed of Travel

Measure and mark a straight path of 100 metres (or more) of travelling conditions similar to the orchard or vineyard you are going to spray.

Half fill the spray tank & record the time (in seconds) to travel the measured distance.

Make sure that the tractor is travelling at spraying speed when you pass the start and finish marks and ensure the the fan and pump are at operational speed.

If you have a hectare metre or automatic controller you need to check the speed calibration of the controller.

Tractor model	
Gear	
Range	
Dual power	
Engine RPM	
Speed in Km/hr	

$$\text{Kilometres per Hour} = \frac{\text{Distance traveled (m)} \times 3.6}{\text{Time (s)}}$$

### Step 3

#### Determine Spraying Volume Required

It is essential to determine the liquid volume per hectare required to effectively spray a crop without overspraying or underspraying.

Use your own experience or a registered rate calibration consultant to determine effective volume in litres per hectare.

..... litres/ha

### Step 4

#### Determine Sprayer Configuration

- **Number of row(s)** to be sprayed in one pass .....
- **Total number of nozzles** to be used .....

### Step 5

#### Determine & Select Nozzles

Determine nozzle flow rate required:

**Litres/Minute/Side**

=

**Spray Volume (l/Ha) x Speed (Km/hr) ÷ 1200 x Row Spacing (m) x Number of Rows in One Pass**

eg.

$$\text{.....} \times \text{.....} \div 1200 \div \text{.....} \times \text{.....}$$

$$= \text{..... litres/minute/side.}$$

### Step 6

#### Select & Design Nozzle Layout

**1/3 Spray Volume** = ..... litres/minute

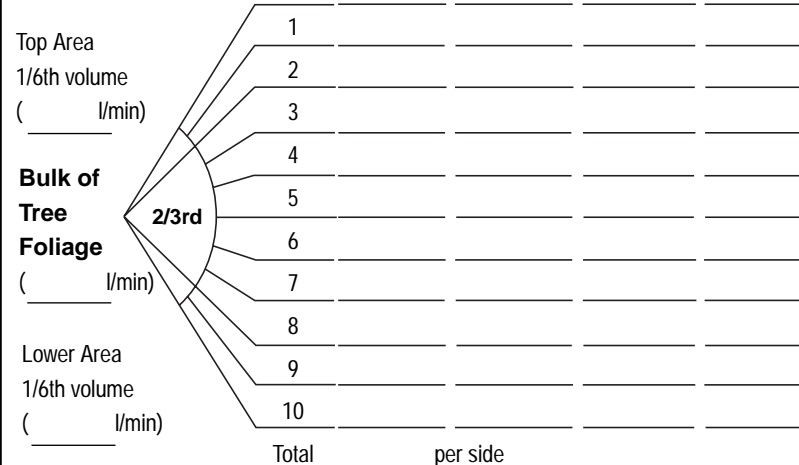
Average/nozzle = ..... litres/nozzle/minute

**2/3 Spray Volume** = ..... litres/minute

Average/nozzle = ..... litres/nozzle/minute

**Pump Pressure** = ..... kPa

**Nozzle Diagram**      **Nozzle**      **\*Discharge**      **\*Disc No**      **\*Core No**      **\*Spray Angle**



*\*Read these from your spray nozzle discharge charts for your pump pressure.*

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***Note:**  
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### Step 7

#### Fit & Test Selected Nozzles

The most important calibration is to test for actual litres per hectare.

Fill your spray tank to overflowing and run the sprayer for one minute, at the above operating settings, and record the total litres per minute used.

**Output/min/side (l/min)**

=

**Output (litres) ÷ Time (minutes)**

$$\text{.....} \div \text{.....} = \text{..... litres/min.}$$

### Step 8

#### Calculate the Actual Application Rate

To calculate actual application rate (litres per hectare), use the following formula:

**Application Rate (l/ha)**

=

**Total Sprayer Output (l/min) x 600 ÷ Speed (Km/hr) ÷ Row Spacing (m) ÷ Number Rows in One Pass**

$$\text{.....} \times 600 \div \text{.....} \div \text{.....} \div \text{.....}$$

$$= \text{..... litres/ha.}$$

**Step 1 Check the Sprayer is in Good Working Order****Step 2****Determine Actual Speed of Travel**

Measure and mark a straight path of 100 metres (or more) of travelling conditions similar to the orchard or vineyard you are going to spray.

Half fill the spray tank & record the time (in seconds) to travel the measured distance.

Make sure that the tractor is travelling at spraying speed when you pass the start and finish marks and ensure the the fan and pump are at operational speed.

If you have a hectare metre or automatic controller you need to check the speed calibration of the controller.

Tractor model	
Gear	
Range	
Dual power	
Engine RPM	
Speed in Km/hr	
<p><b>Kilometres per Hour</b> = <b>Distance traveled (m) x 3.6</b></p>	

**Step 3****Determine Spraying Volume Required**

It is essential to determine the liquid volume per hectare required to effectively spray a crop without overspraying or underspraying.

Use your own experience or a registered rate calibration consultant to determine effective volume in litres per hectare.

..... litres/ha

**Step 4****Determine Sprayer Configuration**

- **Number of row(s)** to be sprayed in one pass .....
- **Total number of nozzles** to be used .....

**Step 5****Determine & Select Nozzles**

Determine nozzle flow rate required:

**Litres/Minute/Side**

=

**Spray Volume (l/ha) x Speed (Km/hr) ÷ 1200 x Row Spacing (m) x Number of Rows in One Pass**

eg.

..... x ..... ÷ 1200 ÷ ..... x .....

= ..... litres/minute/side.

**Step 6****Select & Design Nozzle Layout**

**1/3 Spray Volume** = ..... litres/minute

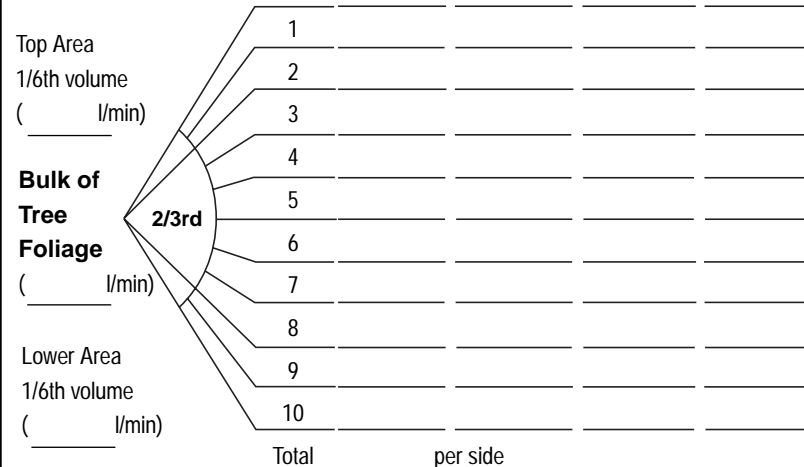
Average/nozzle = ..... litres/nozzle/minute

**2/3 Spray Volume** = ..... litres/minute

Average/nozzle = ..... litres/nozzle/minute

**Pump Pressure** = ..... kPa

**Nozzle Diagram**      **Nozzle**    **\*Discharge**    **\*Disc No**    **\*Core No**    **\*Spray Angle**



\*Read these from your spray nozzle discharge charts for your pump pressure.

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**Note:**  
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**Step 7****Fit & Test Selected Nozzles**

The most important calibration is to test for actual litres per hectare.

Fill your spray tank to overflowing and run the sprayer for one minute, at the above operating settings, and record the total litres per minute used.

**Output/min/side (l/min)**

=

**Output (litres) ÷ Time (minutes)**

..... ÷ ..... = ..... litres/min.

**Step 8****Calculate the Actual Application Rate**

To calculate actual application rate (litres per hectare), use the following formula:

**Application Rate (l/ha)**

=

**Total Sprayer Output (l/min) x 600 ÷ Speed (Km/hr) ÷ Row Spacing (m) ÷ Number Rows in One Pass**

..... x 600 ÷ ..... ÷ ..... ÷ .....

= ..... litres/ha.

## Step 1 Check the Sprayer is in Good Working Order

## Step 2 Determine Actual Speed of Travel

Measure and mark a straight path of 100 metres (or more) of travelling conditions similar to the orchard or vineyard you are going to spray.

Half fill the spray tank & record the time (in seconds) to travel the measured distance.

Make sure that the tractor is travelling at spraying speed when you pass the start and finish marks and ensure the the fan and pump are at operational speed.

If you have a hectare metre or automatic controller you need to check the speed calibration of the contoller.

Tractor model	
Gear	
Range	
Dual power	
Engine RPM	
Speed in Km/hr	

$$\text{Kilometres per Hour} = \frac{\text{Distance traveled (m)} \times 3.6}{\text{Time (s)}}$$

## Step 3

### Determine Spraying Volume Required

It is essential to determine the liquid volume per hectare required to effectively spray a crop without overspraying or underspraying.

Use your own experience or a registered rate calibration consultant to determine effective volume in litres per hectare.

..... litres/ha

## Step 4

### Determine Sprayer Configuration

- **Number of row(s)** to be sprayed in one pass .....
- **Total number of nozzles** to be used .....

## Step 5

### Determine & Select Nozzles

Determine nozzle flow rate required:

**Litres/Minute/Side**

=

**Spray Volume (l/Ha) x Speed (Km/hr) ÷ 1200 x Row Spacing (m) x Number of Rows in One Pass**

eg.

$$\text{.....} \times \text{.....} \div 1200 \div \text{.....} \times \text{.....}$$

$$= \text{..... litres/minute/side.}$$

## Step 6

### Select & Design Nozzle Layout

**1/3 Spray Volume** = ..... litres/minute  
Average/nozzle = ..... litres/nozzle/minute  
**2/3 Spray Volume** = ..... litres/minute  
Average/nozzle = ..... litres/nozzle/minute  
**Pump Pressure** = ..... kPa

*\*Read these from your spray nozzle discharge charts for your pump pressure.*

#### DISCLAIMER:

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Nozzle Diagram	Nozzle	*Discharge	*Disc No	*Core No	*Spray Angle
Top Area	1				
1/6th volume (..... l/min)	2				
	3				
	4				
<b>Bulk of Tree Foliage</b> (..... l/min)	5				
	6				
	7				
	8				
Lower Area	9				
1/6th volume (..... l/min)	10				
	Total				per side

***Note:**  
Photocopy this work sheet to obtain the number of work sheets required.*

## Step 7

### Fit & Test Selected Nozzles

The most important calibration is to test for actual litres per hectare.

Fill your spray tank to overflowing and run the sprayer for one minute, at the above operating settings, and record the total litres per minute used.

**Output/min/side (l/min)**

=

**Output (litres) ÷ Time (minutes)**

$$\text{.....} \div \text{.....} = \text{..... litres/min.}$$

## Step 8

### Calculate the Actual Application Rate

To calculate actual application rate (litres per hectare), use the following formula:

**Application Rate (l/ha)**

=

**Total Sprayer Output (l/min) x 600 ÷ Speed (Km/hr) ÷ Row Spacing (m) ÷ Number Rows in One Pass**

$$\text{.....} \times 600 \div \text{.....} \div \text{.....} \div \text{.....}$$

$$= \text{..... litres/ha.}$$

<b>Greasing &amp; Service Procedures</b>	<b>5.2</b>
<b>Diaphragm Pumps</b>	<b>5.3</b>
<b>Filters</b>	<b>5.5</b>
<b>Flowmeter Maintenance</b>	<b>5.6</b>
<b>General Maintenance</b>	<b>5.7</b>

## Greasing & Service Procedures

### Regular Checks

- 1 Clean suction line filter with each tank load.
- 2 Clean nozzles regularly.
- 3 Check tyre pressure (250kPa), and tighten wheel nuts regularly.
- 4 Check tank bolts regularly.
- 5 Check all bolts and nuts, especially the wheels and pump mounting bolts.
- 6 Grease tractor to sprayer PTO universal joints **every 4 hours**.  
Grease lightly until grease becomes firm in seals. Over greasing will break seals and allow dust and moisture to penetrate - increasing wear.
- 7 Grease PTO inner tubes **every 4 hours**.  
To lubricate the inner tube, slide PTO shaft apart, clean the telescopic tubes, grease and reassemble.
- 8 Grease the PTO covers **every 20 hours**.
- 9 Check pump air chamber pressure (210-280kPa), on a regular basis.
- 10 To ensure trouble free spraying, flush the sprayer with fresh water thoroughly each day, and before changing chemicals.  
Dispose of tank wash according to chemical manufacturers instructions.

### NOTE

*Ensure the sliding inner tubes of the PTO are greased every 4 hours, especially when doing a lot of tight turning*



*Grease the thru-shaft universals once per year.*

### Every 200 Hours

- 1 Lubricate quick release lock pins on PTO shaft.
- 2 Re-pack wheel bearings with grease.
- 3 Grease the universal joint of the PTO through-shaft once per year.



Check oil level is correct in the sight glass.



Check the pump air chamber pressure.

## Diaphragm Pump Maintenance

Annovi & Reverberi (A&R) pumps are of the piston-diaphragm type. All parts in contact with the spray liquid, which are subject to corrosion, are protected, making them ideal for spraying.

### Daily Before Starting the Pump

- 1 Check that oil is visible in sight glass (half way up) and top up if necessary with good clean motor oil 20W/30 or 20W/40.
- 2 Clean all sprayer filters. Blocked or semi blocked filters place extra stress on diaphragms.
- 3 Start with zero pressure and the pump will self prime immediately and clear air locks in suction line.

### Daily after Use

- 1 Flush pump with clean water.
- 2 Drain filters and clean. A high percentage of pump failures are due to blocked filters.



### CAUTION

*Running a diaphragm pump faster than specified will not improve performance, but will damage and wear out moving parts.*

*Warranty will be made void by speeds in excess of those indicated on the pump name plate.*

### Every 50 Hours

Check surge chamber pressure and adjust as follows:

- Air pressure 210-280kPa (30- 40 psi) [Should be 10-20% of operating pressure].

Vibration of the delivery hose usually indicates that the air pressure in the surge chamber is incorrect.

The main cause of surge chamber diaphragm fracture is low pressure in this chamber.

Surge chamber pressure can be checked with an ordinary tyre gauge.

The above pressure range is a guide to the correct pressure.

However, if difficulties recur, adjust the pressure until an even flow is obtained from the pump (no pulsing of liquid at operating RPM). The pressure is best increased with a bicycle pump, hand pump or foot pump.

### Recommended at 250 Hours or Every Season

- 1 Change oil and refill with 20W/30 oil. Attention should be made to remove trapped air behind the diaphragms by rocking from side to side as instructed. It is also good practise to run the pump for 10 minutes without pressure, and then, top up with oil before working the pump.
- 2 When changing the pump oil, check diaphragms and replace them if they are showing signs of wear. Diaphragm valves should be replaced every 400 hours regardless of wear. This is normally a pre-season maintenance procedure which can be done easily as no special tools are required. You can avoid unnecessary down time in spraying seasons by carrying out the proper maintenance.
- 3 Also check inlet and outlet valves and replace if worn. Worn valves not only reduce the output of the pump, but may reduce the life of the diaphragms.

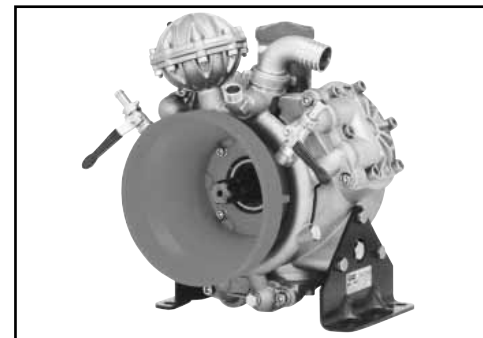
## Excessive Diaphragm Failure

If you have excessive diaphragm failure check the following points. These will cause failure of diaphragms due to added stress or chemical attack.

- 1 **Most Important** - Pump not being flushed out daily with clean water after use.
- 2 Oil level too low allowing air between piston and diaphragm.
- 3 Air leaks in suction line.
- 4 Restricted suction line.
- 5 Restriction through suction filter.
- 6 Not cleaning suction filter regularly.
- 7 Worn suction and discharge valves.
- 8 Bypass line too small to carry full capacity of pump.
- 9 In cold climates - frozen suction/ discharge lines or water remaining in the pump after flushing.
- 10 Incorrect air setting or no air in air chamber.
- 11 Agitator excessively restricting bypass from pump.
- 12 Diaphragm material construction incorrect for chemical or solution being pumped.
- 13 Chemicals containing toluene or other aggressive solvents may require viton diaphragms - particularly if the pump is not properly flushed after use.

## Pre-Season Servicing

For thorough pre-season servicing - check all aspects of the Cropliner and its operating components as outlined in the pre-delivery check list on page 1.7.



ARHBA - 140 l/min diaphragm pump.

## Pump Storage and Corrosion Protection

### 1 Warm Climates

If you operate in a warm climate with no chance of frost in the winter, you will not have any problems with frost damage.

If you are storing your sprayer between seasons, ensure your pump has been thoroughly flushed with clean water. A good idea is to run a mixture of 1% solution of summer mineral spraying oil through the pump and plumbing system. Summer spraying oil is water-soluble oil such as DC-Tron. This will coat and protect all internal pump parts. Ensure this mixture is flushed out before spraying commences in the new season.

### 2 Cold Climates

For prolonged storage, an anti-freeze mixture can be flushed through the pump. Ensure this is thoroughly flushed out prior to the commencement of spraying again.

If the pump is being stored overnight and a risk of freezing is imminent, drain all liquid from the pump and lines, including boom lines.

### NOTE

*For pump maintenance and for overhaul, Croplands has a network of service agents to carry out this work. Croplands recommends you contact your local service agent or dealer.*



*The pump suction valve CLOSED to the main tank.*

## Filter Maintenance

Clean filters ensure that no solids enter the spraying system to block or damage pump or nozzles.

All filters should be cleaned regularly or after each spraying period.

### Suction Filter

The suction filter should be cleaned regularly, or after each spray tank has been emptied.

To clean the filter:

- 1 Completely stop all sprayer functions.
- 2 Place the pump suction valve in the closed position to shut off liquid from the main tank.
- 3 Remove the outer filter screw and bowl.



*Remove the outer filter screw and bowl.*

- 4 Remove the filter screen & thoroughly clean it and other components before reassembling the filter.
- 5 Carefully reassemble the filter, ensuring the screen O-Rings are in place, and then, tighten the outer filter screw so that the outer O-ring is properly sealed.

*Remove & clean the filter element & components.*

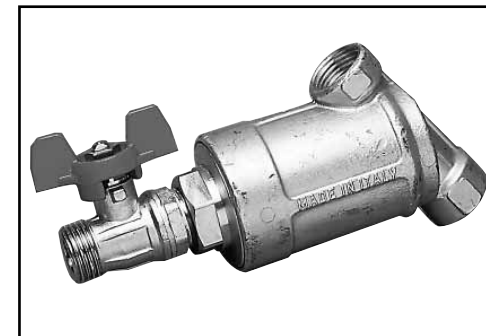


*Reassemble and tighten the outer filter screw.*

- 6 Check the filter is sealed correctly by opening the pump suction valve to access liquid from the main tank.

If leaking, further tighten the outer screw until sealed. If this does not stop the leaking, check the alignment of the O-ring and/or the condition of the O-ring. Replace if necessary.

Vaseline is the best lubricant for filter seals.



*Clean pressure line filter regularly (if fitted).*

## Pressure Filter

The pressure filter (when fitted) should be cleaned regularly to avoid nozzle blockages.

To clean the pressure filter:

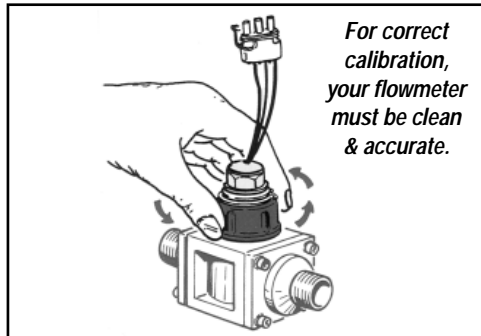
- 1 With the sprayer operating OPEN the valve at the bottom of the filter for a short period and CLOSE the valve.
- 2 Cleaning the filter should be done when flushing the sprayer with fresh water.

### NOTE

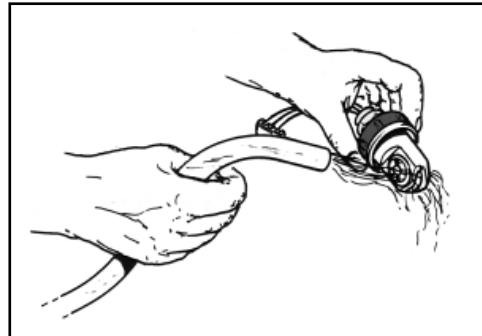
*Be careful not to damage or deform the mesh or O-ring while cleaning and refitting the suction filter.*

*If the filter screen or O-ring is damaged, replace the part.*

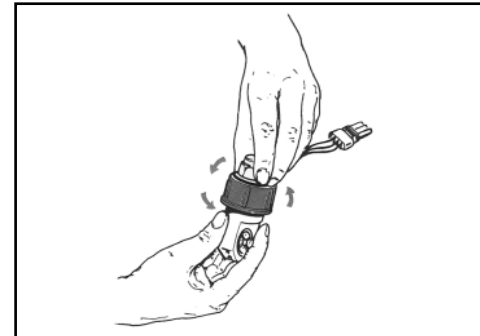




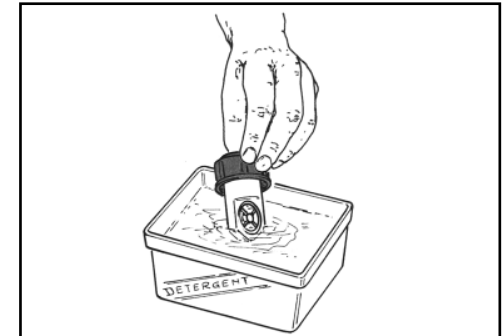
*Unscrew the the Rapid Check assembly.*



*Wash any impurities out of the removable turbine unit.*



*Unscrew the sensor.*



*Place the Rapid Check unit in a detergent bath.*

## Daily Check & Maintenance of Flowmeter (optional)

This is to be performed every day after work is finished:

- 1 Unscrew the assembly that holds the Rapid Check unit in the body.
- 2 Remove the Rapid Check unit from the body.

- 3 Use clean water to wash any impurities out of the removable turbine unit.
- 4 Use compressed air to verify that the turbine unit rotates freely (maximum air pressure 1 BAR [15 psi]).

## Every 50 Hours

Carry out the following procedure after every 50 hours of operation:

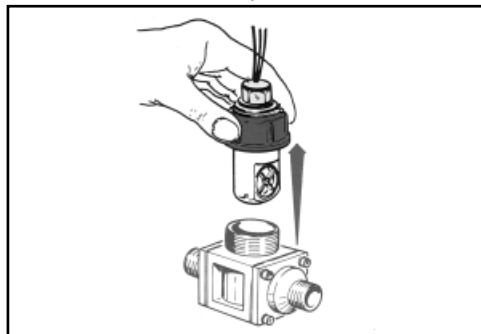
- 1 Unscrew the sensor.
- 2 Separate the sensor from the Rapid Check unit.

- 3 Place the Rapid Check unit in a detergent bath for a few hours.
- 4 Remove the Rapid Check unit from detergent bath.

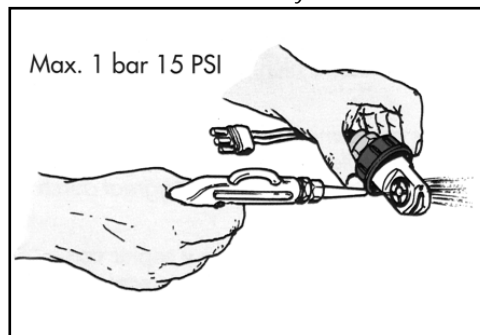
Use compressed air to verify that the turbine unit rotates freely (maximum air pressure 1 BAR [15 psi]).

If necessary, replace the Rapid Check unit with a new one.

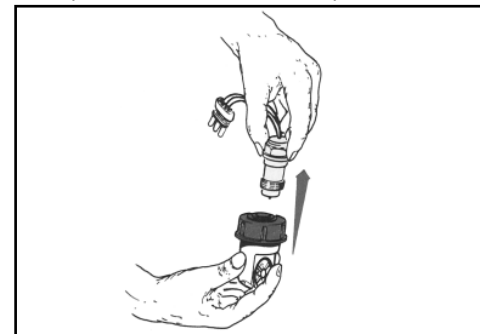
*Remove the Rapid Check unit.*



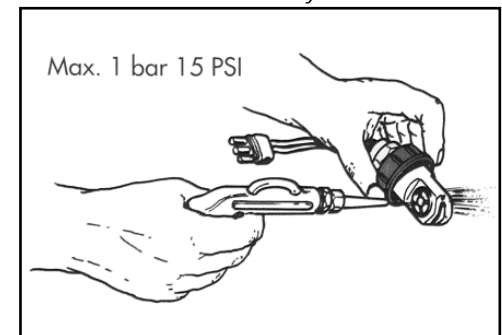
*Use compressed air to check that the turbine unit rotates freely.*



*Separate the sensor from the Rapid Check unit.*



*Use compressed air to check that the turbine unit rotates freely.*





*Bottom tank clamps (2).*

## Tank Clamps

The tank clamps located under the main tank should be kept tight so that the tank is not free to slide on the chassis.

Tank clamps should be checked when the sprayer is new and the tank and chassis are bedding-in.

Thereafter, the tank clamps should be checked regularly.

Also check the tank bolts (6 per side) under the tank. Do not over tighten.

*Check the tank bolts.*



*Remove & clean non-drip diaphragms regularly.*

## Non-Drip Diaphragms

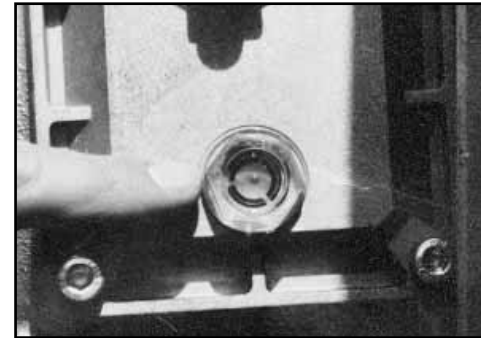
Non-drip diaphragms should be cleaned regularly to prevent dripping from nozzles.

To clean the non-drip diaphragms:

- 1 Completely stop all sprayer functions.
- 2 Unscrew and remove the diaphragm cap.
- 3 Remove and clean any sediment off the diaphragm membrane.  
Replace the diaphragm membrane if damaged.
- 4 Replace the diaphragm.
- 5 Refit the diaphragm cap and carefully tighten.

### NOTE

*Do not over tighten the diaphragm cap. Over tightening the cap may impede flow through the diaphragm.*

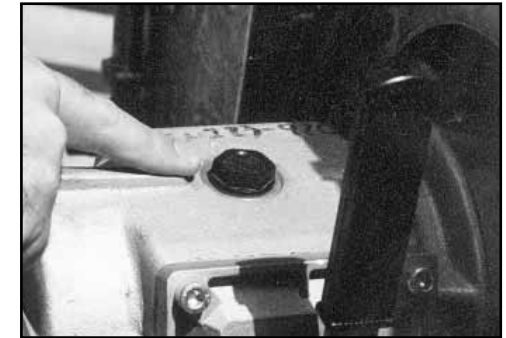


*Check gearbox oil level regularly.*

## Fan Gearbox

The oil level of the fan gearbox should be checked regularly. Top up oil level if necessary.

Drain gearbox oil every 200 hours, and refill with SAE 85/140 or SAE 91/140 oil.



*Gearbox oil filler port.*

*Gearbox oil drain plug.*





<b>Diaphragm Pump Problems</b>	<b>6.2</b>
<b>General Sprayer Problems</b>	<b>6.4</b>

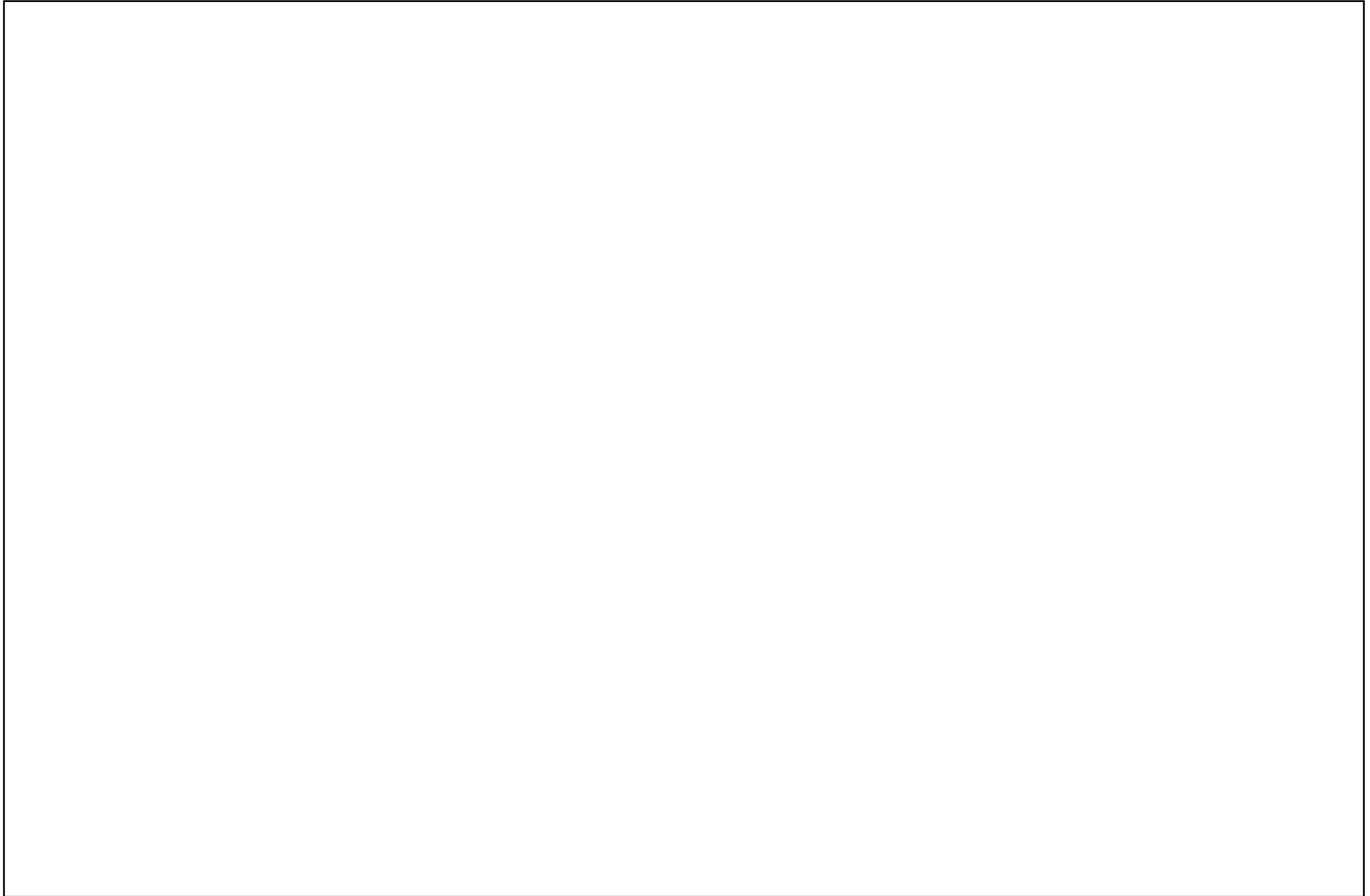
PROBLEM	PROBABLE CAUSE	REMEDY
<b>A Pump does not draw or deliver liquid. Pressure gauge fluctuates badly.</b>	<ol style="list-style-type: none"> <li>1 One or more valves are not seating properly.</li> <li>2 The pump is sucking in air through suction line.</li> <li>3 Air has not been entirely evacuated from the pump.</li> <li>4 Blocked suction filter.</li> <li>5 Damaged or worn suction valves.</li> </ol>	<ol style="list-style-type: none"> <li>1 Clean valve seating.</li> <li>2 Examine the suction hose and ensure it is firmly secured.</li> <li>3 Rotate the pump with outlet hose and taps open.</li> <li>4 Clean suction filter.</li> <li>5 Replace suction valves.</li> </ol>
<b>B Liquid flow is irregular (Also check items under A)</b>	<ol style="list-style-type: none"> <li>1 The air in the air chamber of the pump is incorrectly set.</li> <li>2 Diaphragm split.</li> <li>3 Damaged or worn valves.</li> <li>4 Foreign matter holding valves open.</li> </ol>	<ol style="list-style-type: none"> <li>1 Check pressure in air chamber of pump. Set at 210-280Kpa (30-40 psi).</li> <li>2 Replace diaphragm.</li> <li>3 Replace valves.</li> <li>4 Clean valves.</li> </ol>
<b>C Pump delivers insufficient pressure</b>	<ol style="list-style-type: none"> <li>1 Regulating valve: <ul style="list-style-type: none"> <li>• Sticking open</li> <li>• Not set for pressure.</li> <li>• Damaged or worn seat or spring.</li> </ul> </li> <li>2 Cylinder diaphragm ruptured.</li> <li>3 Pump valves blocked, worn or damaged.</li> <li>4 Spray nozzles worn, missing or exceed pump capacity.</li> </ol>	<ol style="list-style-type: none"> <li>1 Fix the regulator: <ul style="list-style-type: none"> <li>• Unstick the valves.</li> <li>• Set the pressure.</li> <li>• Replace the spring.</li> </ul> </li> <li>2 Replace diaphragms.</li> <li>3 Unblock valves and or replace.</li> <li>4 Replace spray nozzles with appropriate size.</li> </ol>
<b>D Output drops &amp; pump is noisy.</b>	<ol style="list-style-type: none"> <li>1 Oil level is too low.</li> </ol>	<ol style="list-style-type: none"> <li>1 Top up with oil to correct level (1/2 way up the sight glass).</li> </ol>

PROBLEM	PROBABLE CAUSE	REMEDY
<b>E Oil being discharged through delivery line or discoloured oil in sight glass of pump.</b>	1 One or more diaphragms split or ruptured.	1 Immediately drain oil from pump and flush to remove all spray residues from sump. Remove pump heads & fit new diaphragms.  Fill to correct level with motor oil SAE 20/50 or 30/40.
<b>SUCTION SIDE OF PUMP</b>		
<b>F Suction hose vibration.</b>	1 Air getting into suction.	1 Seal all joints securely with tape or stag. Firm up clamps. 2 Check the suction filter is sealed.
<b>G Pump valves hammering.</b>	1 Suction tap partly turned off. 2 Suction strainer(s) blocked.	1 Turn tap fully on. 2 Clean filters.
<b>H No water flow in suction hose.</b>	1 Obstruction in tank or suction line. 2 Suction tap in OFF position	1 Clean foreign material from tank & suction line. 2 Turn suction tap ON.
<b>DISCHARGE SIDE OF PUMP</b>		
<b>I Pressure gauge pointer swings violently.</b>	1 Pressure control valve spindle doesn't move easily.	1 Lubricate with light oil or C.R.C.
<b>J AR control valve leaking from spindle.</b>	1 Split diaphragm or O-rings.	1 Remove 4 body set screws, replace diaphragm and O-rings.
<b>K Pressure gauge showing correct working pressure no pressure at nozzle.</b>	1 Burst discharge line. 2 Blocked discharge filter where fitted. 3 O-ring(s) jamming flow in discharge line. 4 Ants, wasps build nests in discharge line or nozzles.	1 Replace discharge line. 2 Clean discharge filter. 3 Clean discharge line of foreign materials. 4 Clean nozzles of foreign materials with tooth brush

PROBLEM	PROBABLE CAUSE	REMEDY
<b>1 No spray when turned on.</b>	<ol style="list-style-type: none"> <li>1 Filter on the inlet side of the pump blocked.</li> <li>2 Faulty pump.</li> </ol>	<ol style="list-style-type: none"> <li>1 Dismantle, clean &amp; re-assemble.</li> <li>2 Change pump.</li> </ol>
<b>2 Sprays for short time only.</b>	<ol style="list-style-type: none"> <li>1 Air inlet to tank blocked.</li> <li>2 Filter on suction side of pump blocking or blocked.</li> </ol>	<ol style="list-style-type: none"> <li>1 Clean air vent.</li> <li>2 Dismantle, clean &amp; re-assemble the filter. If filter problem persists, clean out the tank &amp; start again.</li> </ol>
<b>3 Spray is uneven around the boom.</b>	<ol style="list-style-type: none"> <li>1 Some nozzle filters or tips are blocked.</li> <li>2 Nozzle tips worn.</li> <li>3 Different pressure along the boom.</li> </ol>	<ol style="list-style-type: none"> <li>1 Remove, clean &amp; check. Check output &amp; for streaks.</li> <li>2 Check nozzle output, replace worn nozzles.</li> <li>3 Remove a nozzle in each boom section &amp; check that flow rate is the same. If different, check for blockages.</li> </ol>
<b>4 Pressure going up - output going down.</b>	<ol style="list-style-type: none"> <li>1 Nozzle filters blocking.</li> </ol>	<ol style="list-style-type: none"> <li>1 Dismantle, clean &amp; refit. Check pressure returns to normal. Check all filters and spray mixture.</li> </ol>
<b>5 Pressure falling.</b>	<ol style="list-style-type: none"> <li>1 Filter on suction side blocked.</li> <li>2 Nozzle tips worn.</li> <li>3 Pressure gauge faulty.</li> <li>4 Pump worn.</li> </ol>	<ol style="list-style-type: none"> <li>1 Dismantle &amp; clean the filter.</li> <li>2 Check nozzle output, replace worn nozzles.</li> <li>3 Check with new pressure gauge.</li> <li>4 Repair or replace the pump.</li> </ol>
<b>6 Spray pattern narrow.</b>	<ol style="list-style-type: none"> <li>1 Pressure too low.</li> <li>2 Pressure too low &amp; spluttering.</li> </ol>	<ol style="list-style-type: none"> <li>1 Check that the correct nozzles are being used.</li> <li>2 Check that the tank is not empty. If not, there is an air leak between the pump &amp; tank or in the pump. Check plumbing &amp; repair.</li> </ol>
<b>7 Foam in the tank.</b>	<ol style="list-style-type: none"> <li>1 Too much agitation.</li> </ol>	<ol style="list-style-type: none"> <li>1 Check that the return line is at the bottom of the tank. Partly close agitation and valve</li> </ol>
<b>8 Spray pattern streaky.</b>	<ol style="list-style-type: none"> <li>1 Nozzle partly blocked.</li> </ol>	<ol style="list-style-type: none"> <li>1 Remove &amp; clean. If it continues, the nozzle is damaged. Replace with same size tip, check flow rate of replacement nozzle.</li> </ol>

<b>ARBHS140 Pump</b>	<b>7.2</b>
<b>ARBHS160/200 Pump</b>	<b>7.4</b>
<b>2000 Litre Tank &amp; Chassis</b>	<b>7.6</b>
<b>Hub Assembly</b>	<b>7.8</b>
<b>920SV Fan Assembly</b>	<b>7.10</b>
<b>820SV Fan Assembly</b>	<b>7.12</b>
<b>Main On/Off (Dump) Valve</b>	<b>7.14</b>
<b>Boom On/Off Valve</b>	<b>7.15</b>
<b>Pressure Regulating Valve</b>	<b>7.16</b>
<b>Pressure Relief Valve</b>	<b>7.17</b>
<b>Plumbing Diagram - Electric Controller HT-IE4020</b>	<b>7.18</b>
<b>Plumbing Diagram - Electric Controller HT-IE4021</b>	<b>7.19</b>
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<b>Tank Lid Assembly</b>	<b>7.29</b>
<b>Suction &amp; Pressure Filter Assembly</b>	<b>7.30</b>
<b>Useful Formulae for Calibrating Sprayers</b>	<b>7.31</b>



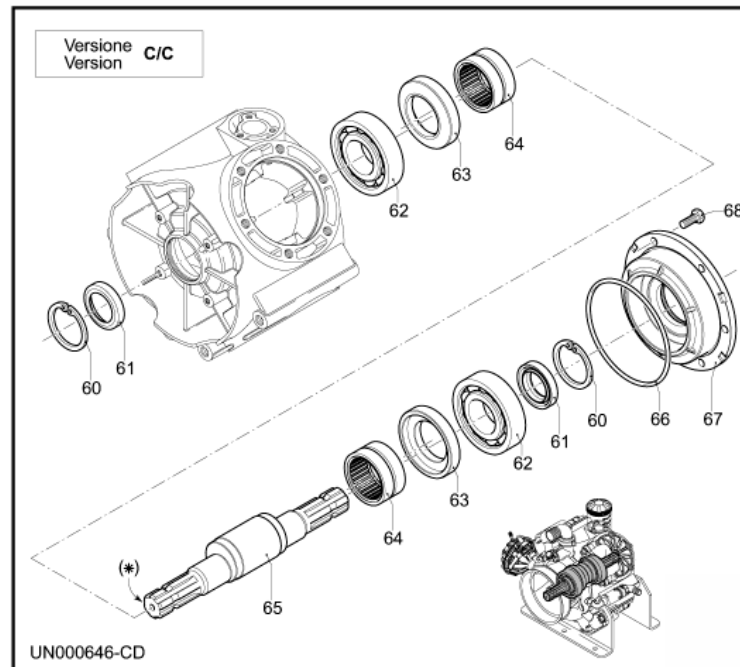
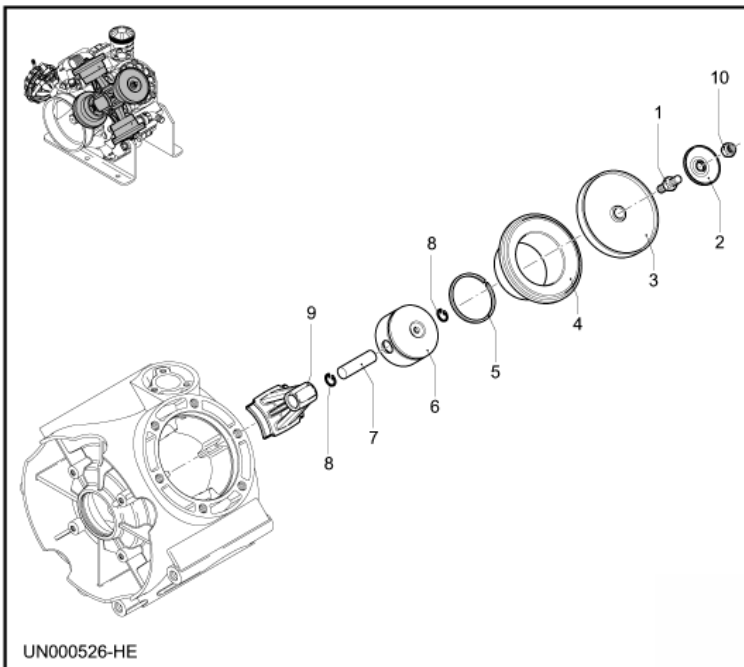
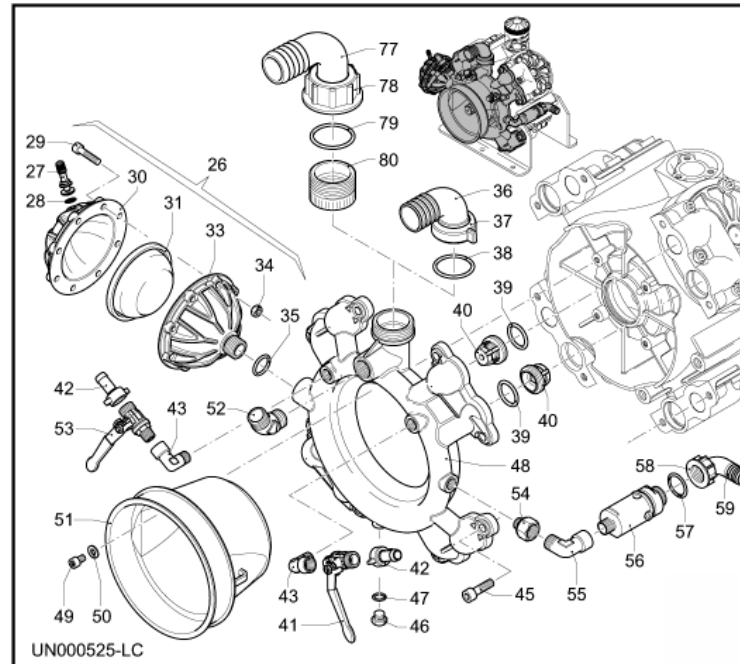
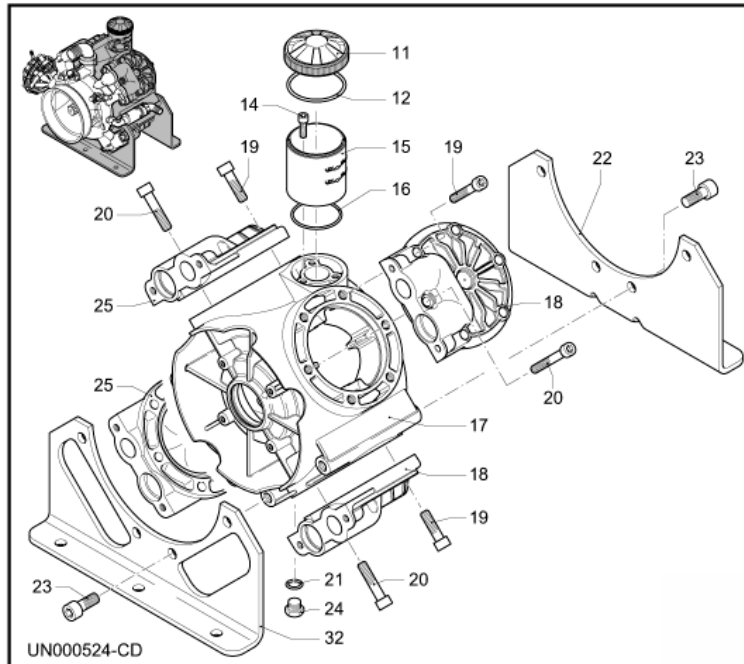


Pos	Part No	Description	Qty

Pos	Part No	Description	Qty

# ARBHS160/200 Pump

## Assembly Drawings & Parts

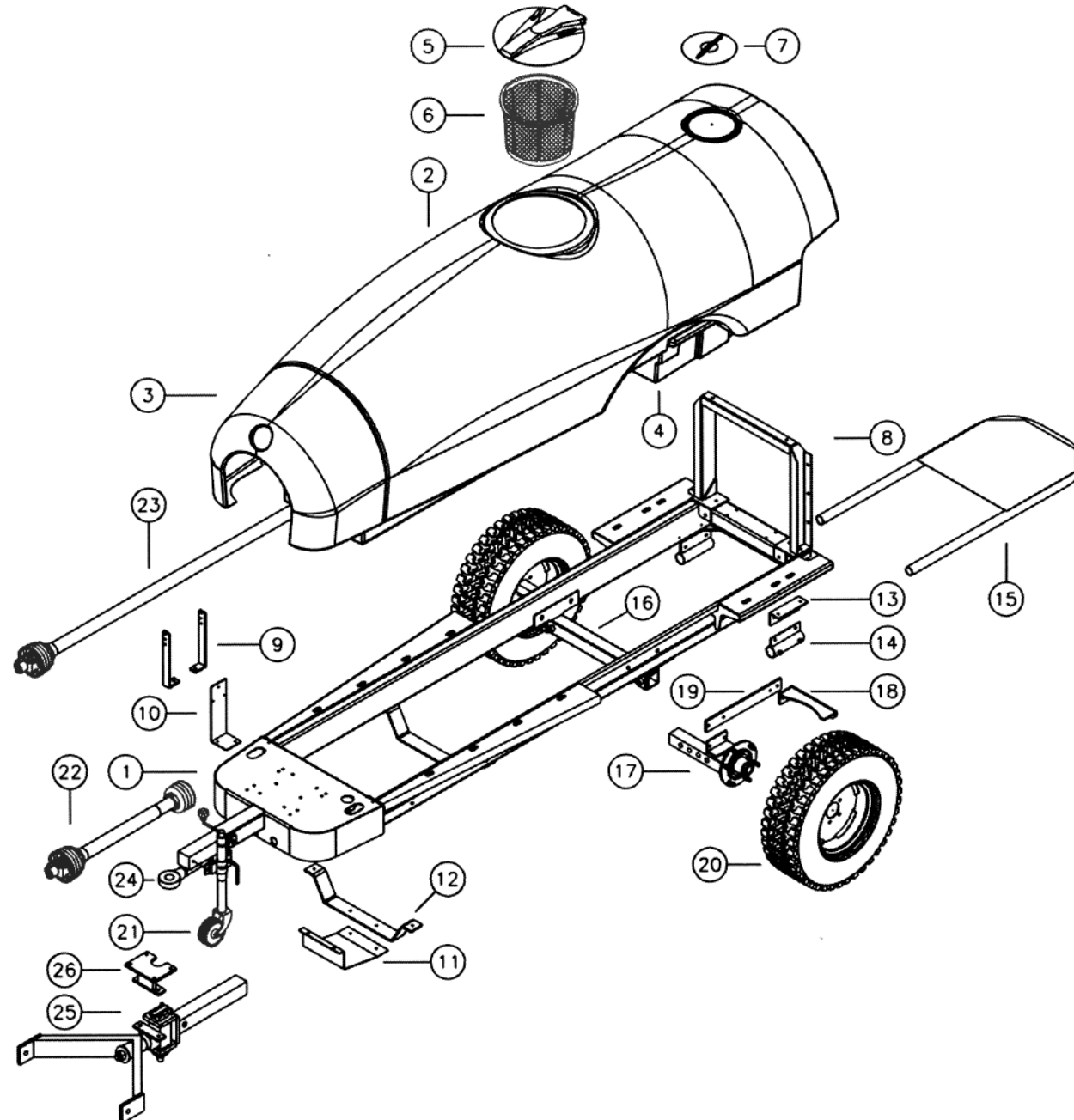


# Section 7

# ARBHS160/200 Pump

Pos	Part No	Description	Qty
1	2240100	Diaphragm pin	4
2	580090	Plate	4
3	2240080	Diaphragm Gomma	4
4	2240050	Sleeve - BHA 160	4
4	2240340	Sleeve - BHA 200	4
5	260230	Piston ring - BHA 160	4
5	2240360	Piston ring - BHA 200	4
6	2240060	Piston - BHA 160	4
6	2240350	Piston - BHA 200	4
7	260700	Piston pin - BHA 160	4
7	540070	Piston pin - BHA 200	4
8	160691	Pin ring	8
9	2380050	Connecting rod	4
10	2240110	M10 Nut	4
11	1800060	Black oil tank cap - BHA 160	1
11	750050	Red oil tank cap - BHA 200	1
12	1040060	ø 72,69x2,62 O-Ring	1
14	540290	M8x25 Bolt	3
15	2240070	Oil tank	1
16	2240270	ø 67,95x2,62 O-Ring	1
17	2380010	Pump body - BHA 160	1
17	2380011	Pump body - BHA 200	1
18	2240450	Right head	2
20	2240470	M12x70 Bolt	24
21	180101	ø 17,5x2 O-Ring	1
22	2380040	Base	1
23	2380060	M14x35 Bolt	8
24	820361	1/2" G Cap	1
25	2240451	Left head	2
26	1527	Complete air chamber	1
27	180020	Air valve	1
28	650542	Gasket	1
29	621781	M8x40 Bolt	8
30	620230	Upper air chamber	1
31	550190	Semi air chamber	1
32	2380030	Base	1
33	1520770	Lower air chamber	1
34	1520740	Threaded adapter	1
35	720030	ø 22,22x2,62 O-Ring	1
36	540550	ø 40 Elbow	1
37	540540	1" 3/4 G Ring nut	1

Pos	Part No	Description	Qty
38	250310	ø 36,14x2,62 O-Ring	1
39	680070	ø 31,5x4,25 O-Ring	8
40	759051	Complete valve	8
41	130491	3/8"-1/2" G (M) Right valve	1
43	2240260	Valve elbow	2
45	650330	M10x35 Bolt	8
46	880581	1/4" G Plug	1
47	820510	ø 10,82x1,78 O-Ring	1
48	2380070	Manifold	1
49	850250	M8x12 Bolt	4
50	390311	8,5 Washer	4
51	1500470	Cardan protection	1
52	851650	Outlet elbow	1
53	130492	3/8"-1/2" G (M) Left valve ex 30492	1
54	881461	3/8"-1/2" G (M)-(F) Threaded adapter	1
55	881560	90° 1/2" G (M)-(F) Elbow	1
56	1609002	Safety valve	1
57	880831	ø 15,54x2,62 O-Ring	1
58	550450	3/4" G Ring nut	1
59	550460	ø 18 Elbow	1
60	2240160	Circlip	2
61	2240150	Seal ring	2
62	2240140	Bearing	2
63	2240121	Con rod ring	2
64	850320	Roller bearing	2
65	2240173	"C/C" "C/C" shaft	1
66	2240290	ø 152,7x2,62 O-Ring	1
67	2240020	Flange	1
68	160670	M 10x25 Bolt	6
70	2240410	"C/F" "C/F" shaft	1
71	2240390	Con rod ring	1
72	2240400	Ring	1
73	2240380	Bearing	1
74	1800090	Seal ring	1
75	620330	Circlip	1
76	2240370	Flange	1
77	760020	ø 50 Elbow - Optional	1
78	760040	2" G Ring nut - Optional	1
79	620210	ø 40,95x2,62 O-Ring - Optional	1
80	2380080	2"-1 3/4 G (M)-(F) Threaded adapter - Optional	1
81	392190	ø 40 Hose tail - Optional	1

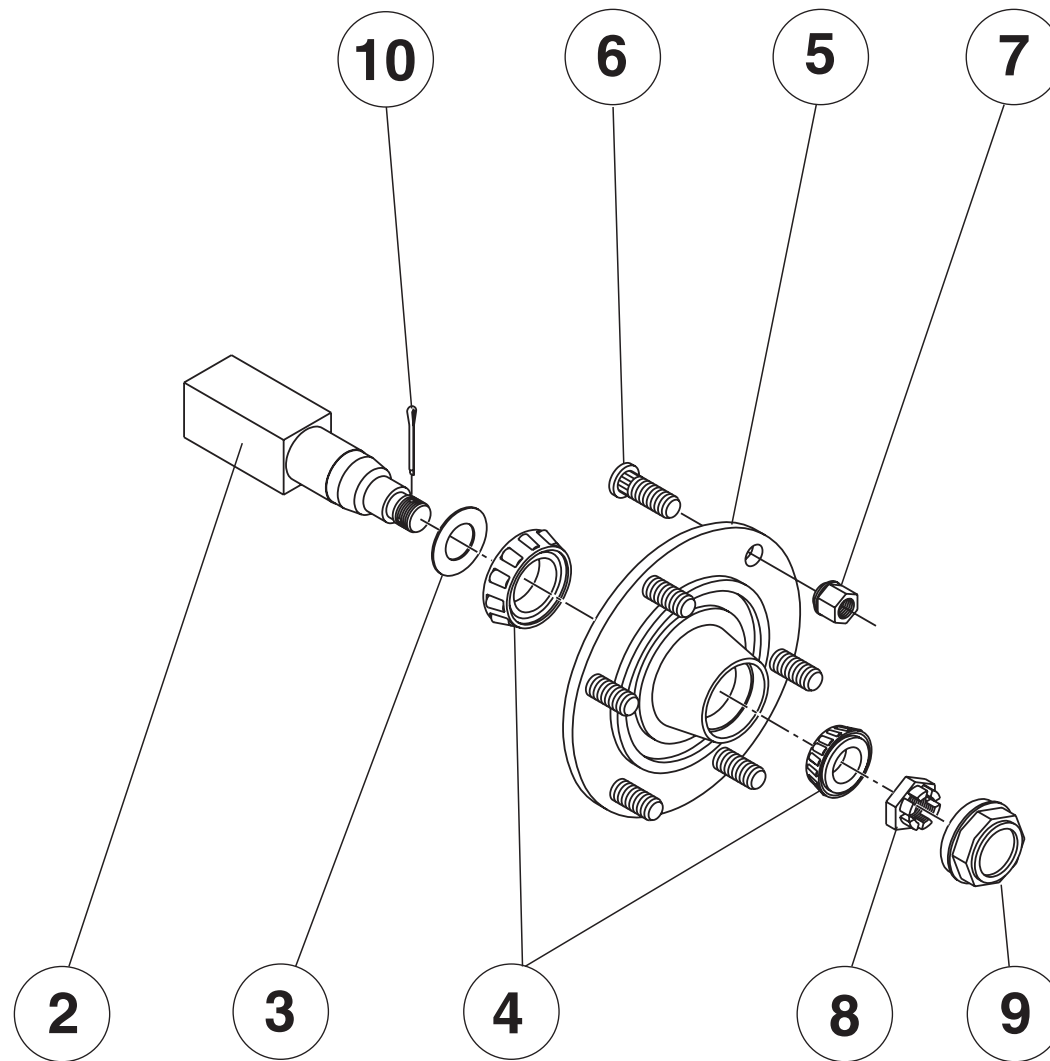


## Section 7

## 2000 litre Tank & Chassis

Pos	Part No	Description	Qty
1	HP2000ABSL	CHASSIS 2000LT	1
2	P2000SAB-RAW	TANK 2000LT	1
3	HP-800	PUMP COVER	1
4	P80AB-RAW	FLUSH TANK	1
5	A356060	HINGED LID	1
6	A3000130	FILTER BASKET, LARGE	1
7	A3522221	LID, SMALL	1
8	HP-284C	FAN & TANK BRACKET	1
9	HP-267A	VALVE BRACKET L.H. & R.H.	1PR
10	HP-405A	BRACKET, FILTER	1
11	HP-801	FRONT GUARD	1
12	HP-802	CROSS PLATE, CHASSIS	2
13	HP-806	MOUNTING ANGLE, REAR BUMPER	2
14	HP-406	BRACKET, BUMPER	2
15	HP-807	REAR BUMPER	1
16	HP-809	AXLE HOUSING	1
17	HP-808L	AXLE L.H.	1
	HP-808R	AXLE R.H.	1
18	HP-803L	MUDSCRAPER L.H.	1
	HP-803R	MUDSCRAPER R.H.	1
19	HP-803-1	ARM, MUDSCRAPER	2
20	HP-200A	TYRE AND RIM	2
21	MUJOCKEY	JOCKEY WHEEL	1
22	SH5AG	DRIVE SHAFT	1
23	SHABTT2000	THRU TANK SHAFT 2000LT	1
24	HP-400A	DRAW BAR	1

Pos	Part No	Description	Qty
25	HP-024	SWIVEL DRAW BAR	1
26	HP-024-1	PUMP MOUNT, SWIVEL DRAWBAR	1



### NOTE

*Axle assembly may be FAD brand or BPW brand.  
To identify, check the dust cap.*

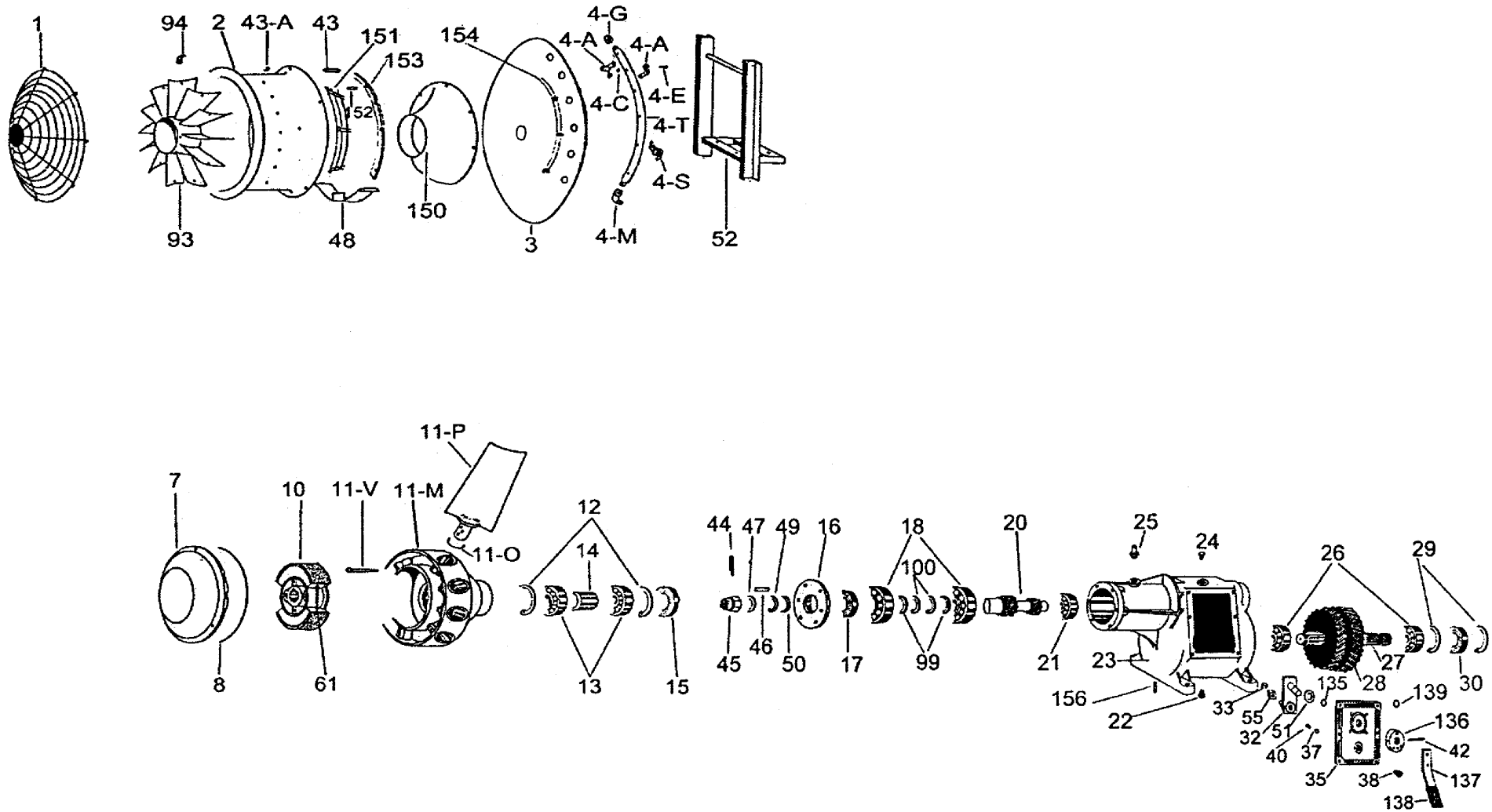
*If it has the letters "FAD" imbedded on the outside  
of the cap, it is a FAD axle assembly.*

*If it is blank on the outside of the cap, it is a  
BPW axle assembly.*

Pos	Part No	Description	Qty
		<u>FAD AXLE</u>	
2	N/A	Axle – not available as a spare part. Purchase complete axle assembly	1
3	HP-199SEAL	Seal (45 x 85 x 10)	1
4	HP-199BEARING	Bearing kit: - 30209 bearing- - 30206A bearing	1
5	N/A	Hub – not available as a spare part. Purchase complete axle assembly	1
6	HP-199STUD	Stud	6
7	BP-509NUT	Wheel Nut	6
8	HP-199CNUT	Castle Nut	1
9	HP-199CAP	Dust Cap	1
10	N/A	Split pin – not carried as a spare part (use generic split pin)	1

Pos	Part No	Description	Qty
		<u>BPW AXLE</u>	
2	N/A	Axle – not available as a spare part. Purchase complete axle assembly	1
3	HP-199SEALBPW	Seal (61.6/35 x 7)	1
4	HP-199BEARBPW	Bearing kit: - 32007 bearing - 30205 bearing	1
5	N/A	Hub – not available as a spare part. Purchase complete axle assembly	1
6	HP-199STUDBPW	Stud	6
7	BP-509NUTBPW	Wheel Nut	6
8	HP-199CNUTBPW	Castle Nut	1
9	HP-199CAPBPW	Dust Cap	1
10	N/A	Split pin – not carried as a spare part (use generic split pin)	1

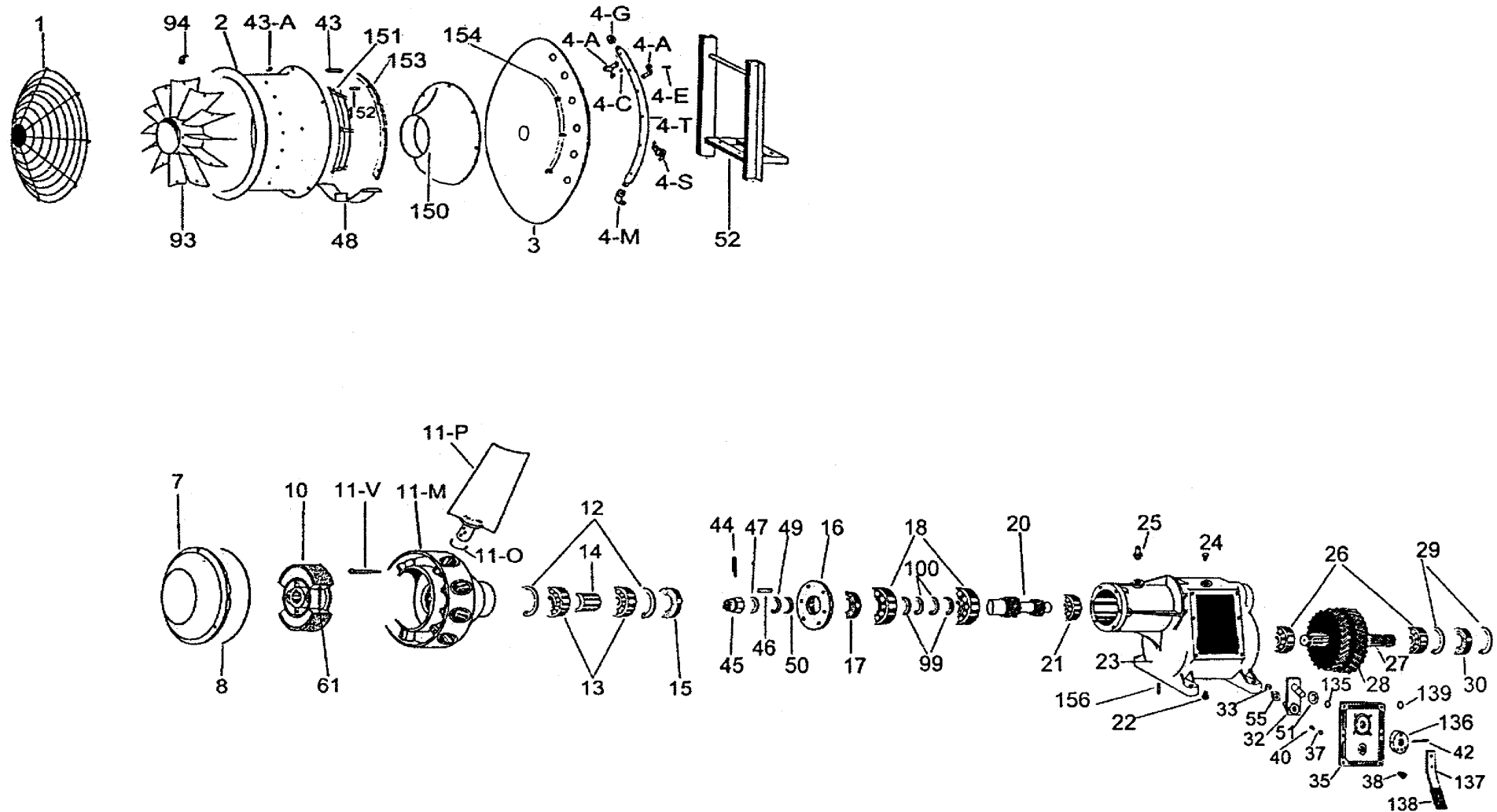




Pos	Part No	Description	Qty
1	FIENI1-920	Rear Grill	Each
2	FIENI2-920SV	Fan Conveyor	Each
3	FIENI3-920	Backplate	Each
4A	B267.612.177	Nozzle Clamp	Each
4C	Not Stocked	3030 O-ring*	N/A
4E	Not Stocked	6 x 12 bolt*	N/A
4G	TFC12	½" Gas Cap (Female)	Each
4M	Not Stocked	½" x ½" Gas Elbow*	N/A
4S	FI80000110	Galvanised Stirrup Clamp	Each
4T	FIENI4-920SV	Manifold Tube, 10-hole	Pair
43	FI20000990	Shaped Spacer	Each
43A	FI00010970	Shaped Washer	Each
48	FIENI48-920SV	Stainless Steel Deflector	Each
52	FIENI52-920	Galvanised Mount	Each
93	FIENI11-920SV	Stainless Steel Vane	Each
150	FIENI54-920	Poly Cone (no cutaway)	Each
151	FI20002000	RT/18 Safety Guard	Each
152	Not Stocked	H.50 Spacer*	N/A
153	Not Stocked	MD/01 Ring*	N/A
154	FI20002001	RT/16 Safety Guard	Each
94	FI30000170	Vane Angle Clamp	Each
	<b>FIENI11-920SV</b>	<b>Propeller Assy c/w blades, hub &amp; cover (no Clutch)</b>	
7	FIENI-16	Clutch cover	Each
8	Not Stocked	O-ring for cover	N/A
11M	FIMOZ0001	Fan Hub	Each
11P	FIENI-11-P	920 fan blade	Each
11O	Not Stocked	3137 O-ring*	N/A
11V	Not Stocked	8 x 55 Bolt*	N/A
12	Not Stocked	I 80 Circlip*	N/A
13	Not Stocked	62082RS Bearing*	N/A
14	Not Stocked	D40 Spacer*	N/A
15	Not Stocked	45 x 80 x 10 Seal*	N/A
10	FIENI10-920	Complete Clutch	Each
61	FI40000290	Clutch Spring	Each

Pos	Part No	Description	Qty
	<b>FIMOLV2G001</b>	<b>Complete Gearbox V2G 'A'</b>	
	<b>FIMOLV2G002</b>	<b>Complete Gearbox V2G 'B'</b>	
16	Not Stocked	Cover	N/A
17	FIENI-17	45x 65 x 10 Seal	Each
18	Not Stocked	6309 Bearing*	N/A
20	FI700020G	High Speed Shaft	Each
21	Not Stocked	6407 Bearing*	N/A
22	Not Stocked	12 x 16 Bolt*	N/A
23	Not Stocked	Gearbox Casing	N/A
24	Not Stocked	Oil Loading Cap	N/A
25	Not Stocked	Oil Breather	N/A
26	FIENI-26	6307 Bearing	N/A
27	FIENI-27	Input Spline Shaft	Each
28	Not Stocked	Low Gear	N/A
28	Not Stocked	High Gear	N/A
29	FIENI-29	I 80 Circlip	Each
30	Not Stocked	35 x 80 x 12 Seal*	N/A
32	Not Stocked	Secondary Lever	N/A
33	Not Stocked	E 10 Circlip*	N/A
35	Not Stocked	Rectangular Cover	N/A
37	FIENI-37	Steel Ball	Each
38	FI60000850	Oil Level	Each
40	FIENI-40	Spring	Each
42	FIENI-42	6 x 45 Tension Pin	Each
44	Not Stocked	5 x 40 Pin*	N/A
45	Not Stocked	24MB Castle Nut	N/A
46	FIENI-46	10 x 8 x 40 Small Key	N/A
47	Not Stocked	24 x 44 x 4 Washer*	N/A
49	Not Stocked	E 40 Circlip	N/A
50	Not Stocked	48 x 40 x 5/2 Ring*	N/A
51	Not Stocked	18 x 30 x 3 Washer*	N/A
55	Not Stocked	Selector Cube	N/A
99	Not Stocked	45 x 55 x 2 Ring*	N/A
100	Not Stocked	E 45 Circlip*	N/A
135	Not Stocked	2056 O-Ring*	N/A
136	Not Stocked	Lever Holder	N/A
137	FIENI41-820	Lever	N/A
138	Not Stocked	Handgrip	N/A
139	Not Stocked	117 O-Ring for Lever*	N/A
156	Not Stocked	12 x 25 Stud*	N/A

\*Note: Items marked \* can be purchased as generic items (bearings etc).



Pos	Part No	Description	Qty
1	RET0008	Rear Grill	Each
2	FIENI2-820SV	Fan Conveyor	Each
3	FIENI3-820	Backplate	Each
4A	B267.612.177	Nozzle clamp	Each
4C	Not Stocked	3030 O-Ring*	N/A
4E	Not Stocked	6 x 12 bolt*	N/A
4G	TFC12	½" Gas Cap (Female)	Each
4M	Not Stocked	½" x ½" Gas Elbow*	N/A
4S	FI80000110	Galvanised Stirrup Clamp	Each
4T	FIENI4-920SV	Manifold Tube, 9-hole	Pair
43	FI20000990	Shaped Spacer	Each
43A	FI00010970	Shaped Washer	Each
48	FIENI48-920SV	Stainless Steel Deflector	Each
52	FIENI52-920	Galvanised Mount	Each
93	FIENI10820SV	Stainless Steel Vane	Each
150	FIENI54-920	Poly Cone (no cutaway)	Each
151	Not Stocked	RT/18 Safety Guard	N/A
152	Not Stocked	H.50 Spacer*	N/A
153	Not Stocked	MD/01 Ring*	N/A
154	Not Stocked	RT/16 Safety Guard	N/A
04	FI30000170	Vane Angle Clamp	Each
	<b>FIENI11-820SV</b>	<b>Propeller Assy c/w blades, hum &amp; cover (no clutch)</b>	
7	Not Stocked	Clutch cover	N/A
8	Not Stocked	O-Ring for cover	N/A
11M	FIMOZ0001	Fan Hub	Each
11P	FIENI-11P-820	820 fan blade	Each
11O	Not Stocked	3131 O-Ring	N/A
11V	Not Stocked	8 x 55 Bolt*	N/A
12	Not Stocked	I 80 Circlip*	N/A
13	Not Stocked	62082RS Bearing*	N/A
14	Not Stocked	D40 Spacer*	N/A
15	Not Stocked	45 x 80 x 10 Seal*	N/A
10	FIENI10-920	Complete Clutch	Each
61	FI40000290	Clutch spring	Each

Pos	Part No	Description	Qty
	<b>FIV2G</b>	<b>Complete Gearbox</b>	
16	FIENI-16	Cover	Each
17	FIENI-17	45 x 65 x 10 Seal	Each
18	Not Stocked	6309 Bearing*	N/A
20	FI7000020G	High Speed Shaft	Each
21	Not Stocked	6407 Bearing*	N/A
22	Not Stocked	12 x 16 Bolt*	N/A
23	Not Stocked	Gearbox Casing	N/A
24	Not Stocked	Oil Loading Cap	N/A
25	Not Stocked	Oil Breather	N/A
26	FIENI-26	6307 Bearing	N/A
27	FIENI-27	Input Spline Shaft	Each
28	Not Stocked	Low Gear	N/A
28	Not Stocked	High Gear	N/A
29	FIENI-37	I 80 Circlip	Each
30	Not Stocked	35 x 80 x 12 Seal*	N/A
32	Not Stocked	Secondary Lever	N/A
33	Not Stocked	E 10 Circlip*	N/A
35	Not Stocked	Rectangular Cover	N/A
37	FIENI-37	Steel Ball	Each
38	FI60000850	Oil Level	Each
40	FIENI-40	Spring	Each
42	FIENI-42	6 x 45 Pin	N/A
44	Not Stocked	5 x 40 Pin*	N/A
45	Not Stocked	24 MB Castle Nut	N/A
46	FIENI-46	10 x 8 x 40 Small Key	Each
47	Not Stocked	24 x 44 x 4 Washer*	N/A
49	Not Stocked	E 40 Circlip	N/A
50	Not Stocked	48 x 40 x 5/2 Ring*	N/A
51	Not Stocked	18 x 30 x 3 Washer*	N/A
55	Not Stocked	Selector Cube	N/A
99	Not Stocked	2056 O-Ring*	N/A
100	Not Stocked	E 45 Circlip*	N/A
135	Not Stocked	2056 O-Ring*	N/A
136	Not Stocked	Lever Holder	N/A
137	FIENI41-820	Lever	Each
138	Not Stocked	Handgrip	N/A
139	Not Stocked	117 O-Ring for Lever*	N/A
156	Not Stocked	12 x 25 Stud*	N/A

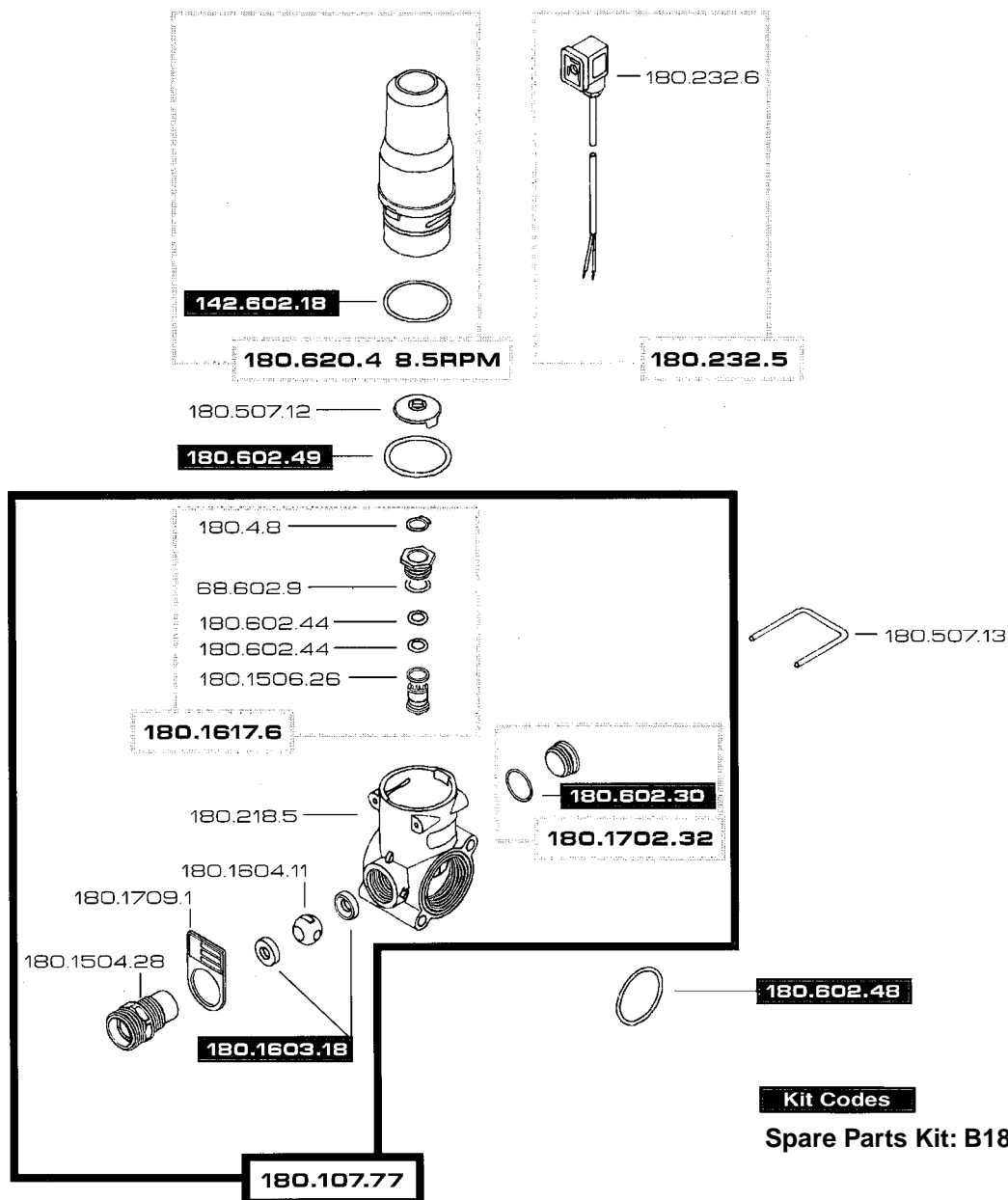
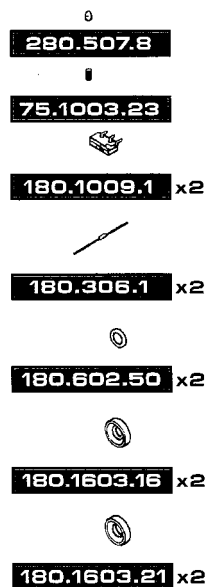
\*Note: Items marked \* can be purchased as generic items (bearings etc).

**B180.1910.016HS**

(HS = high speed)

### NOTE

When ordering, all part numbers require the prefix "B", eg, B142.602.18



**Kit Codes**

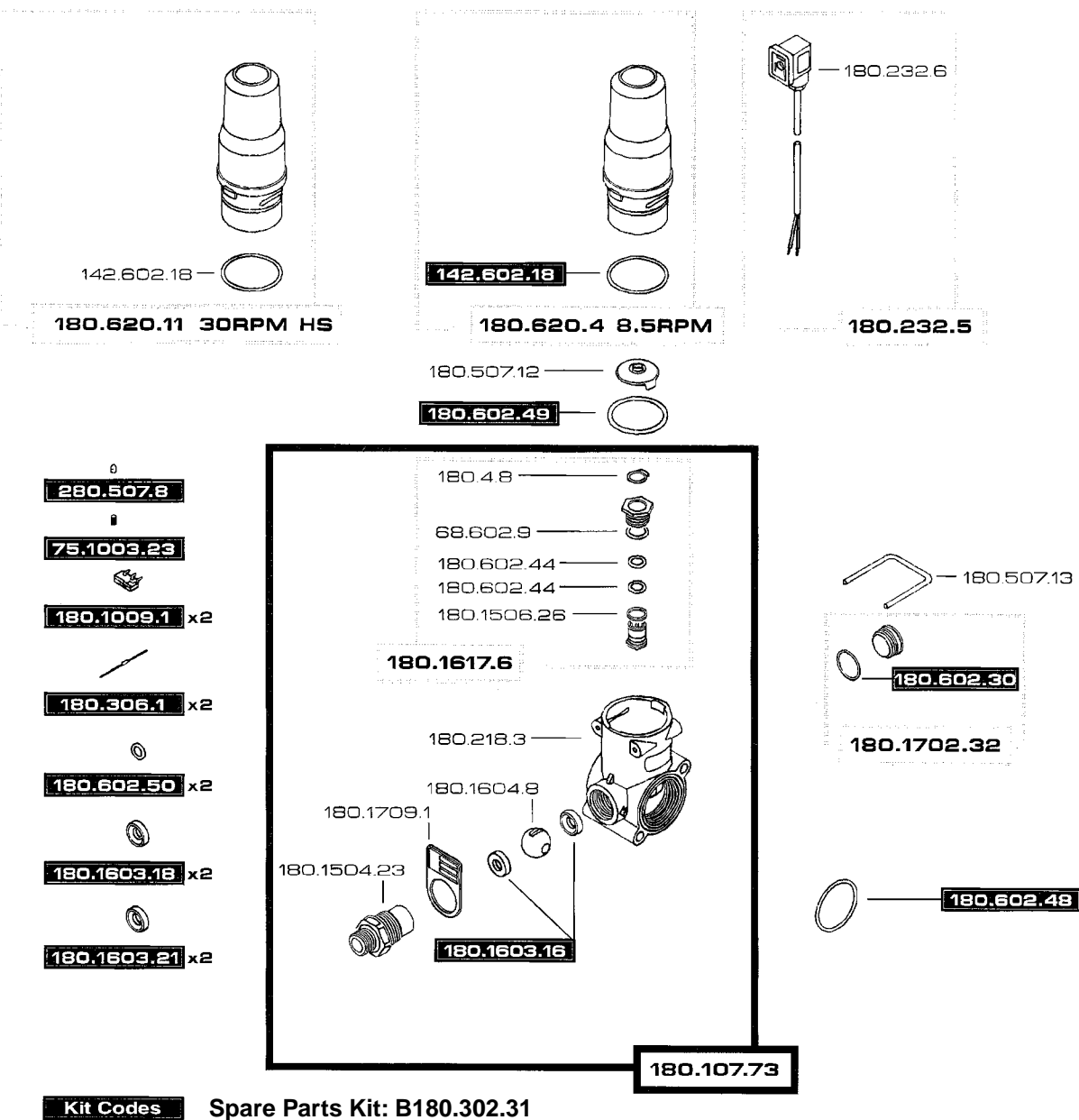
Spare Parts Kit: B180.302.31

## B180.1910.6HS

(HS = high speed)

### NOTE

When ordering, all part numbers require the prefix "B", eg, B142.602.18



### B180.1910.14 (5 sec)

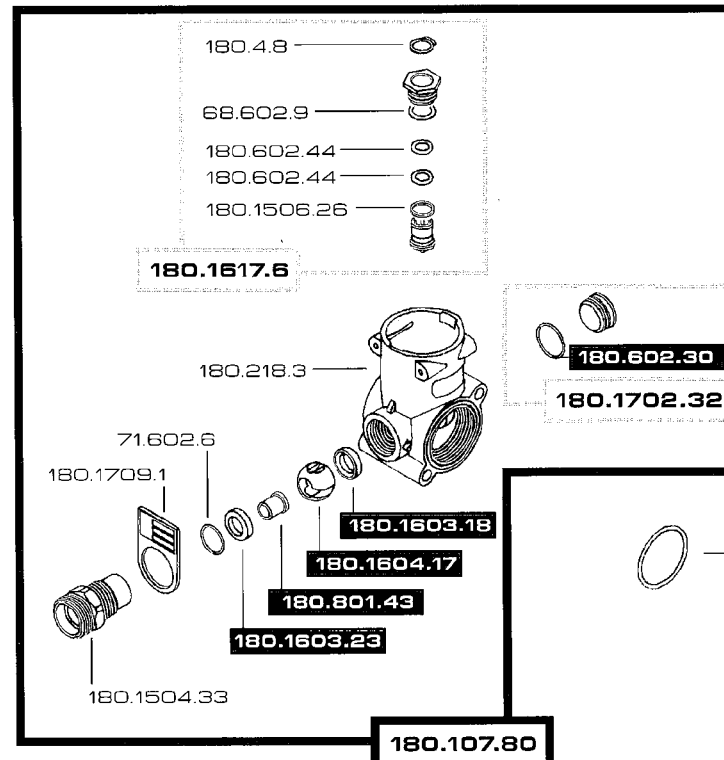
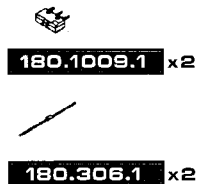
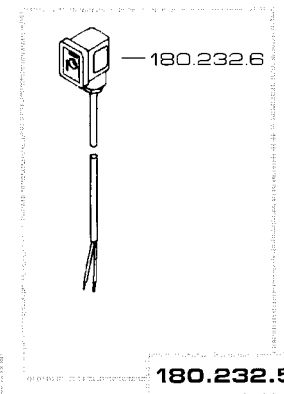
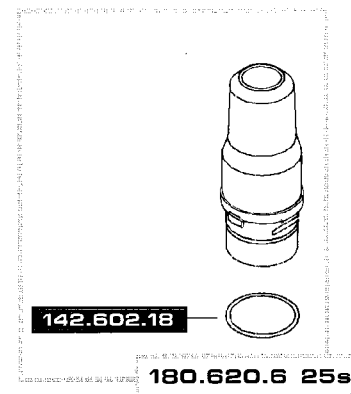
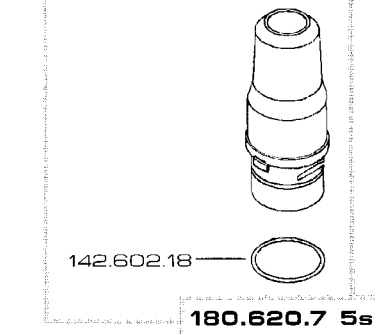
(25 seconds for basic electrical systems)

(5 seconds for automatic rate controllers)

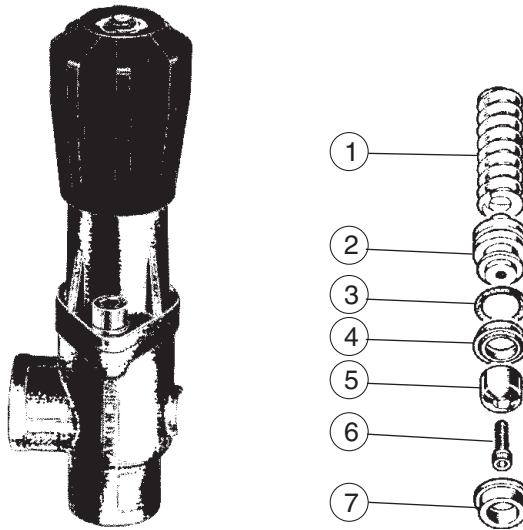
#### NOTE

*When ordering, all part numbers require the prefix "B", eg, B142.602.18*

#### Electronic control system



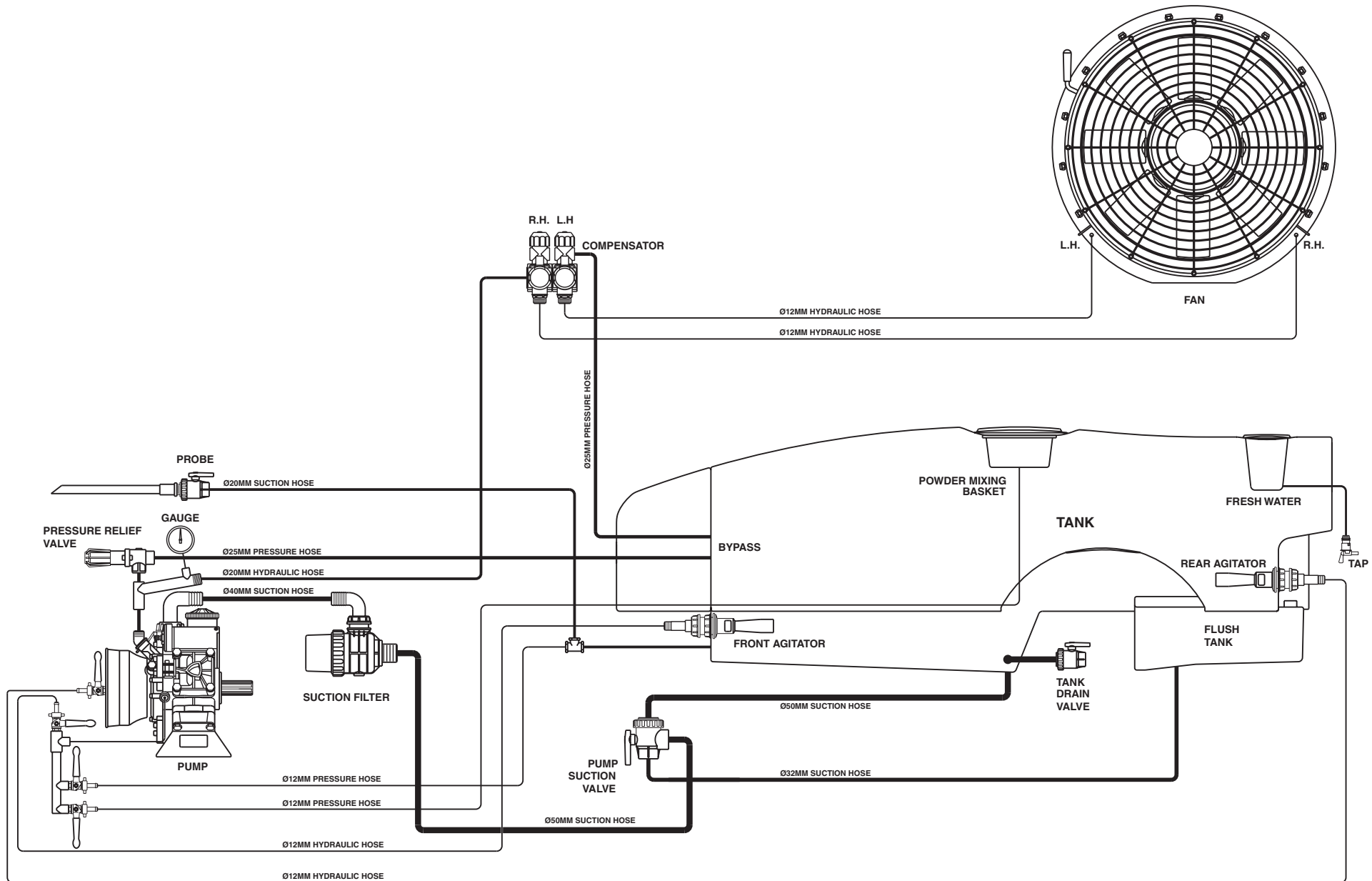
**Kit Codes**  
Spare Parts Kit: B180.302.32

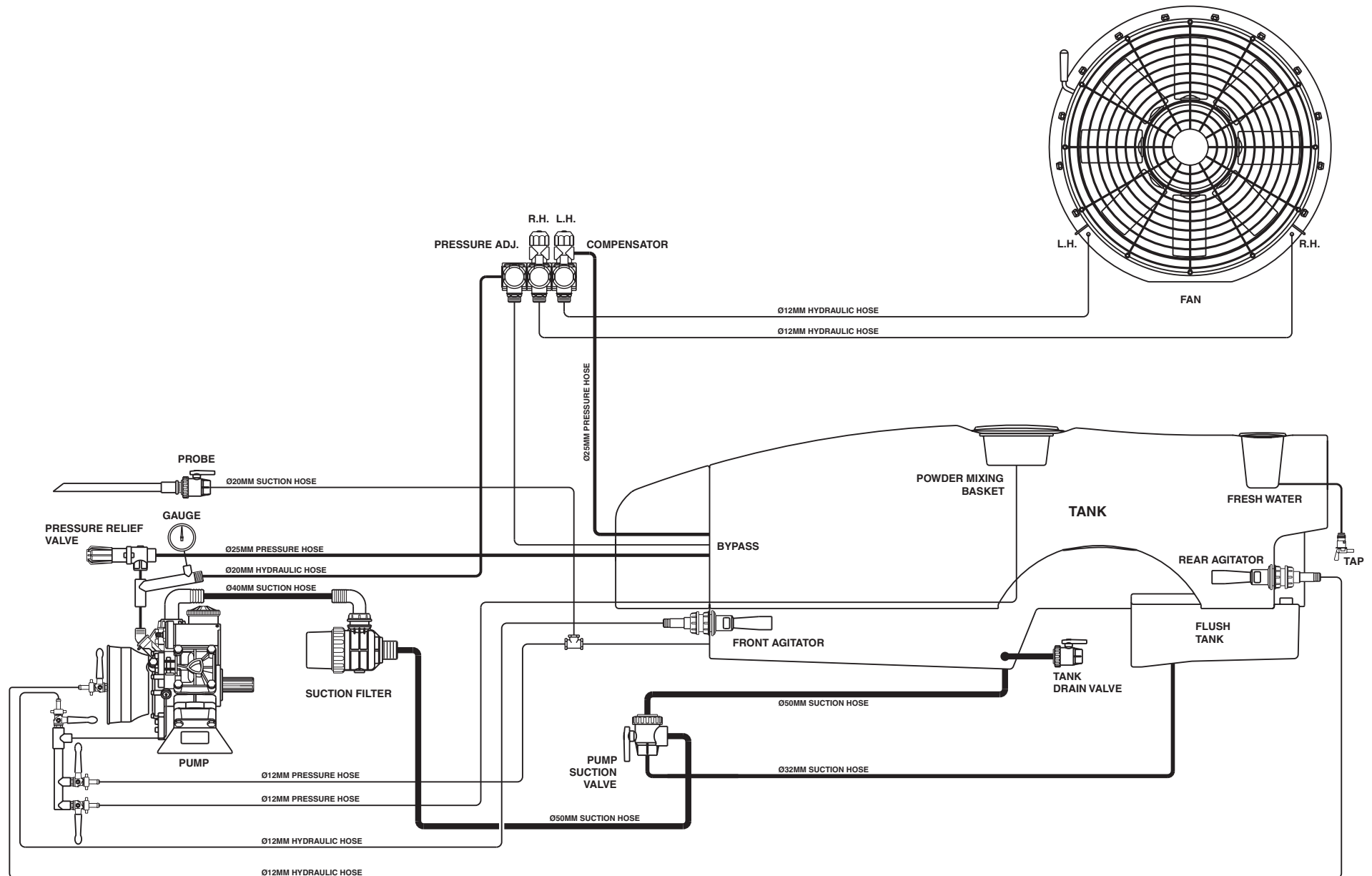
**B410.1510.2**

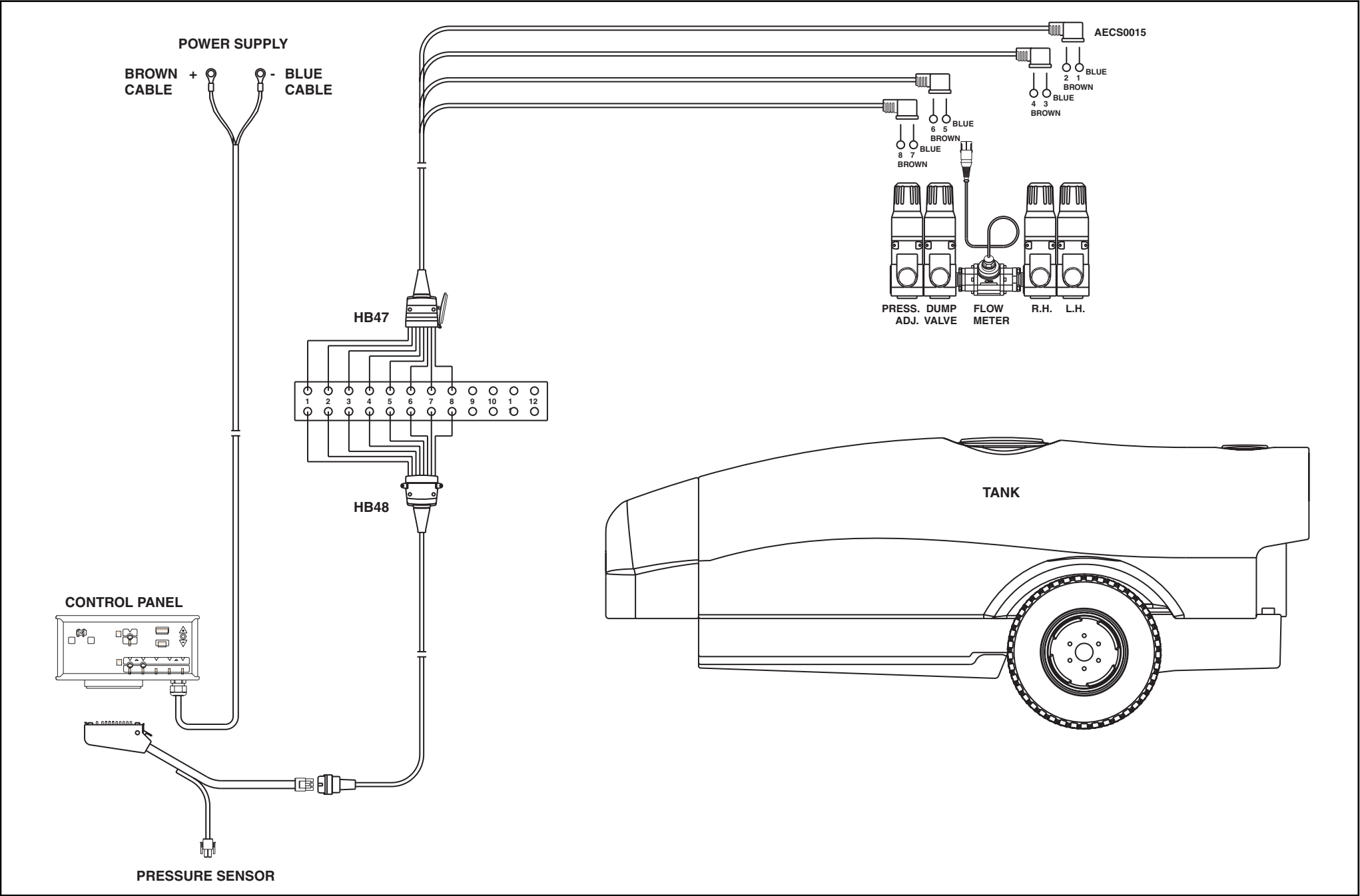
Parts List		
Pos	Part No	Qty
1	B170.1003.10	1
2	B170.1609.1	1
3	B170.602.25	1
4	B170.601.23	1
5	B170.202.7	1
6	B170.1902.17	1
7	B170.1603.1	1

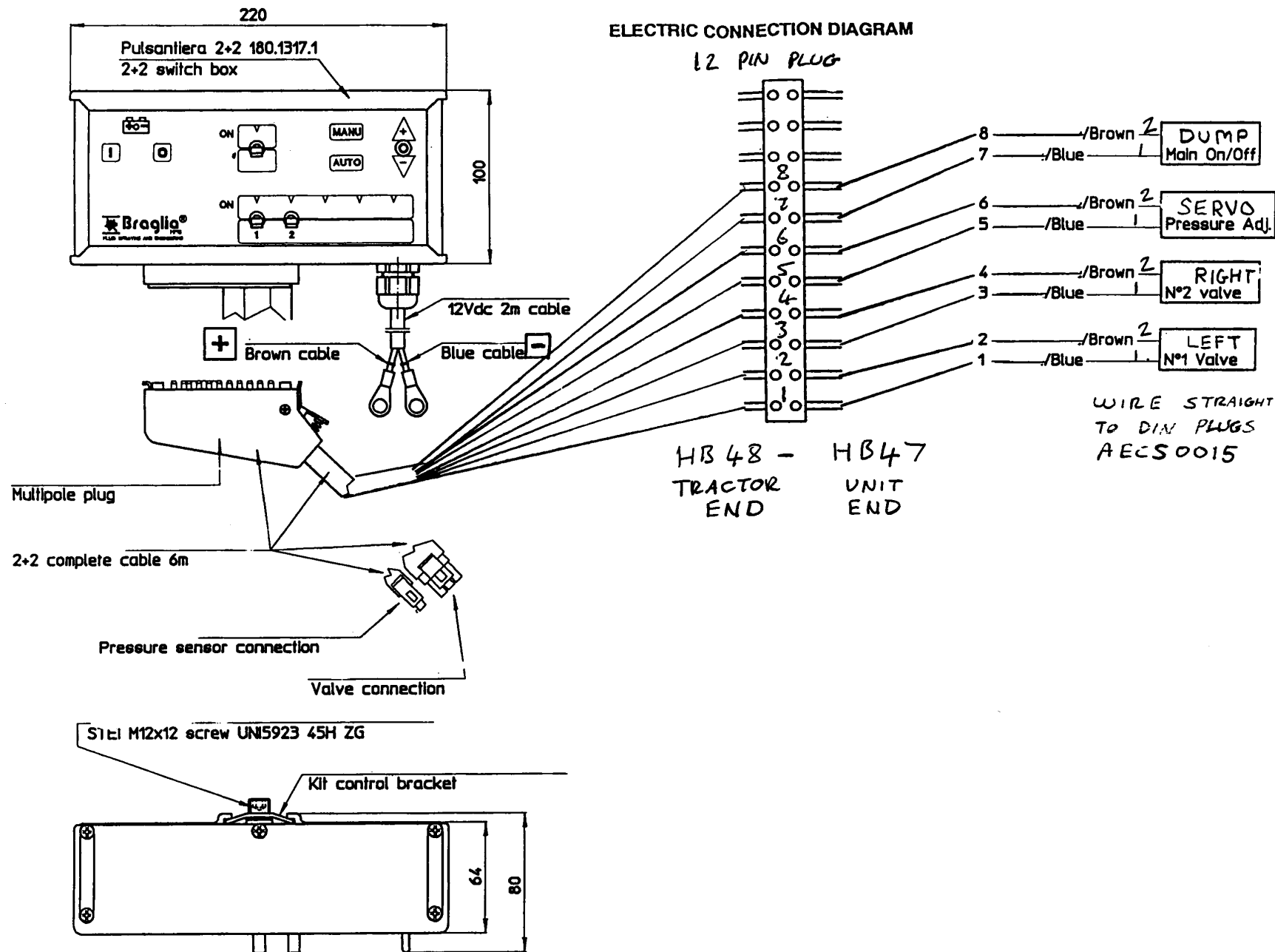


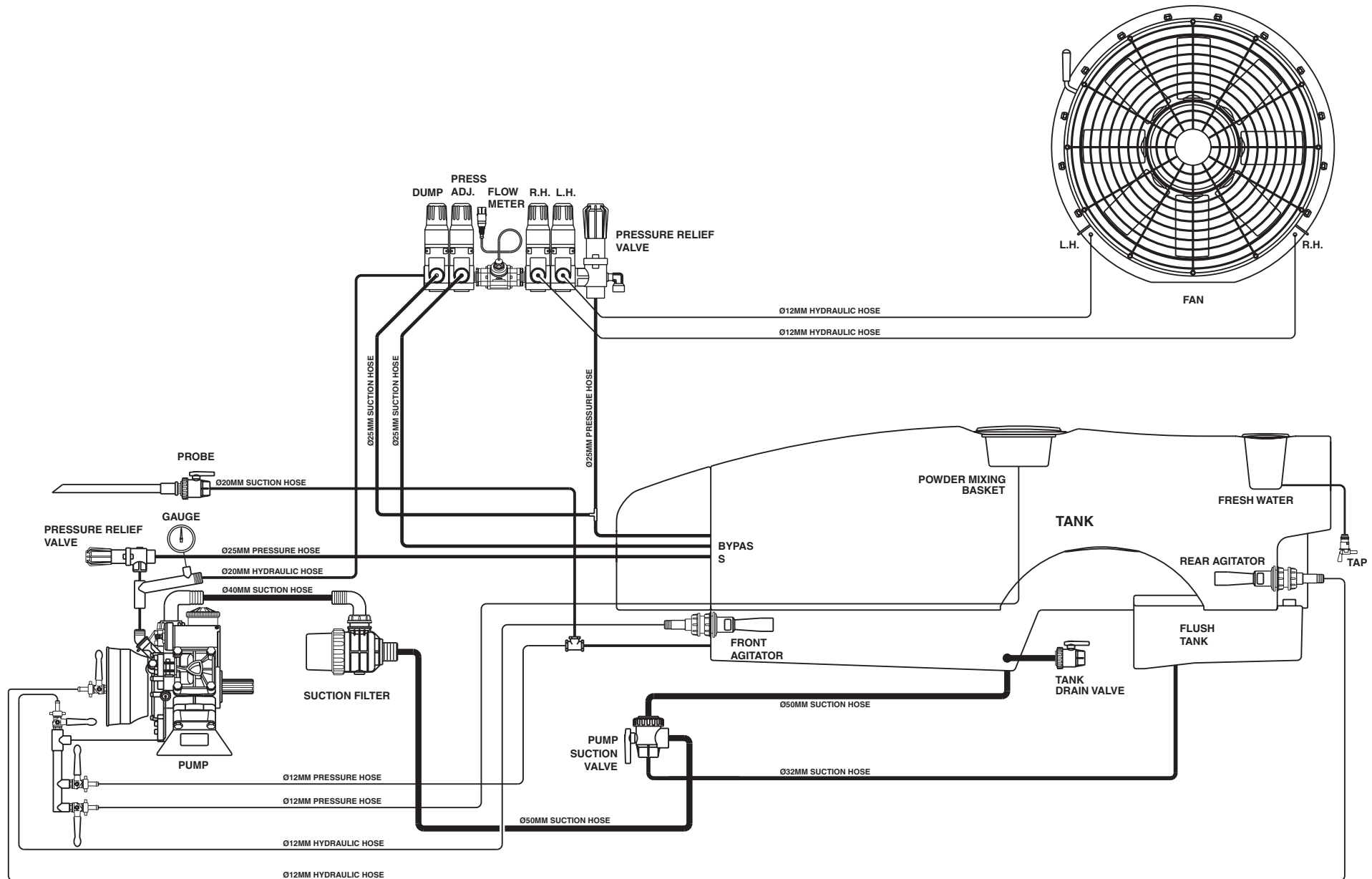
# Plumbing Diagram - E/Controller HT-IE4020 Assembly Drawings & Parts

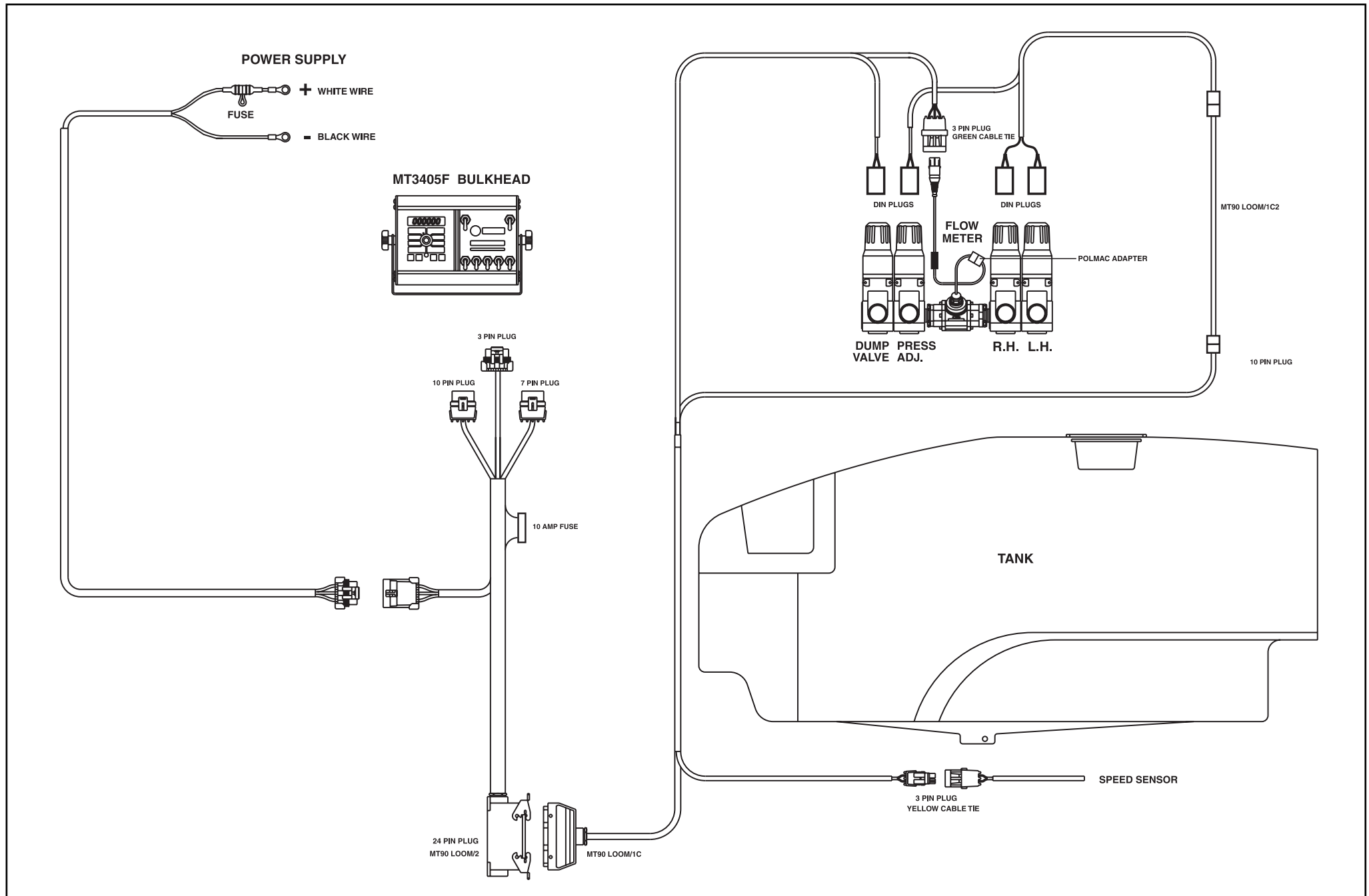




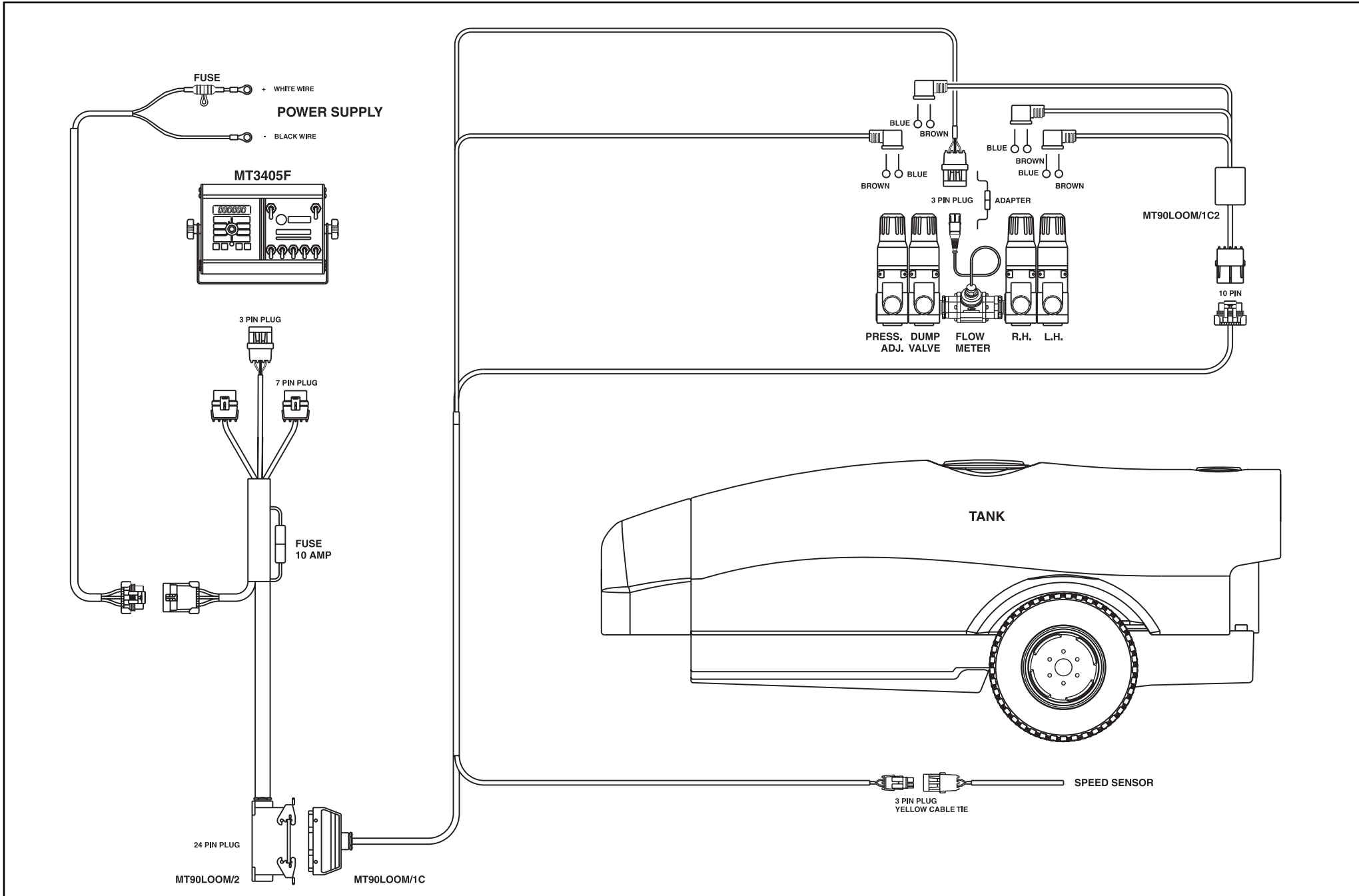


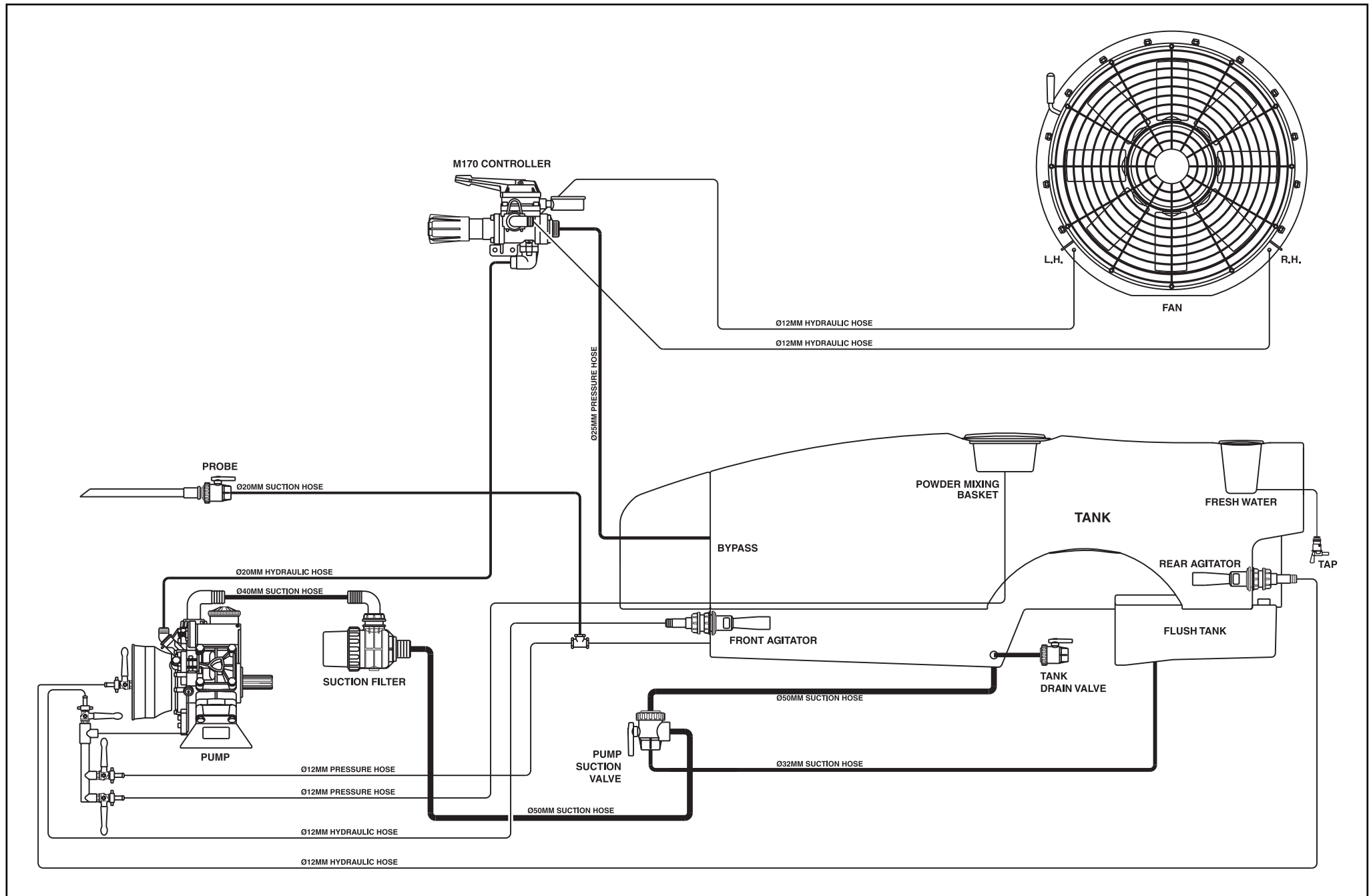




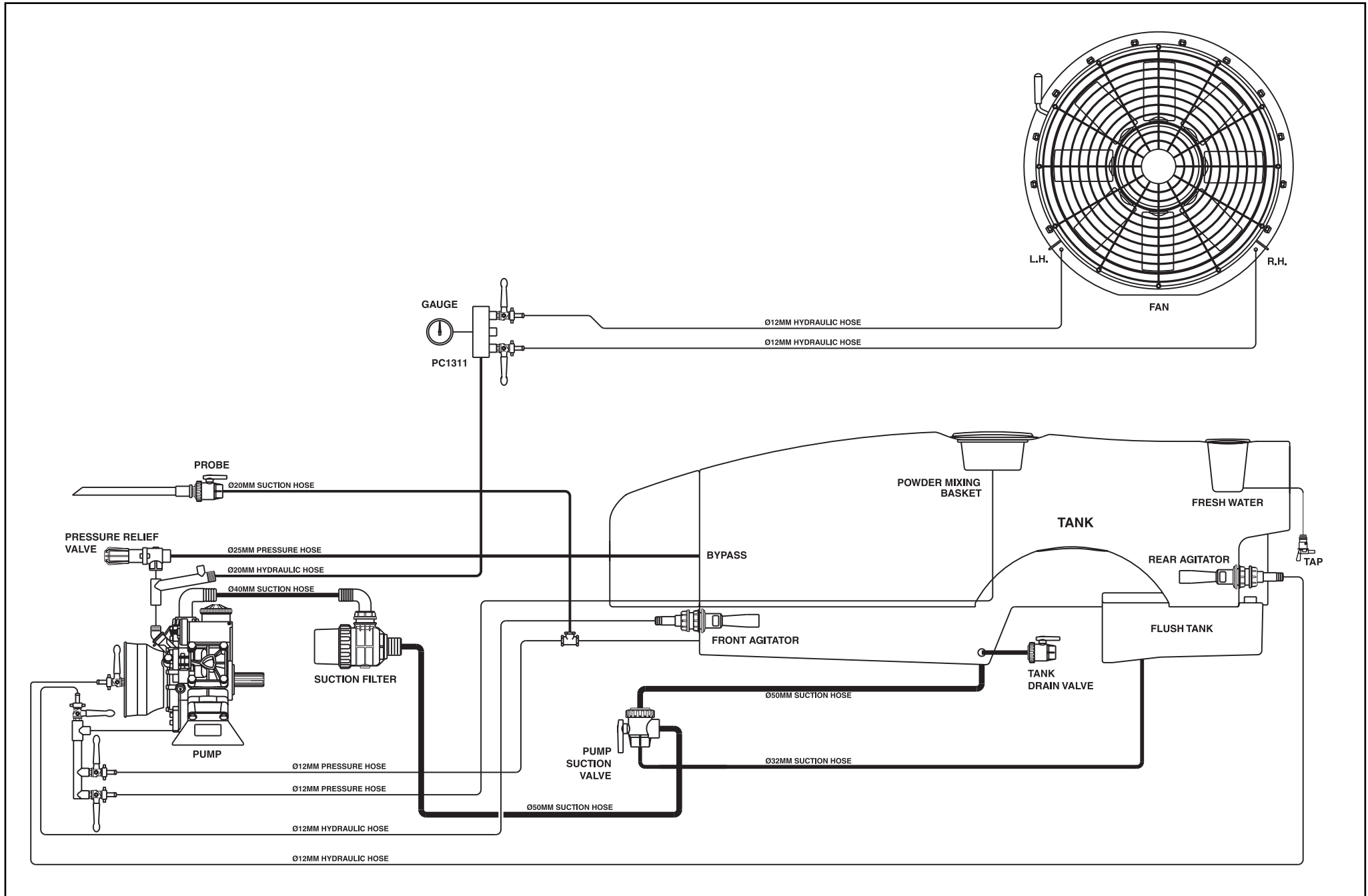


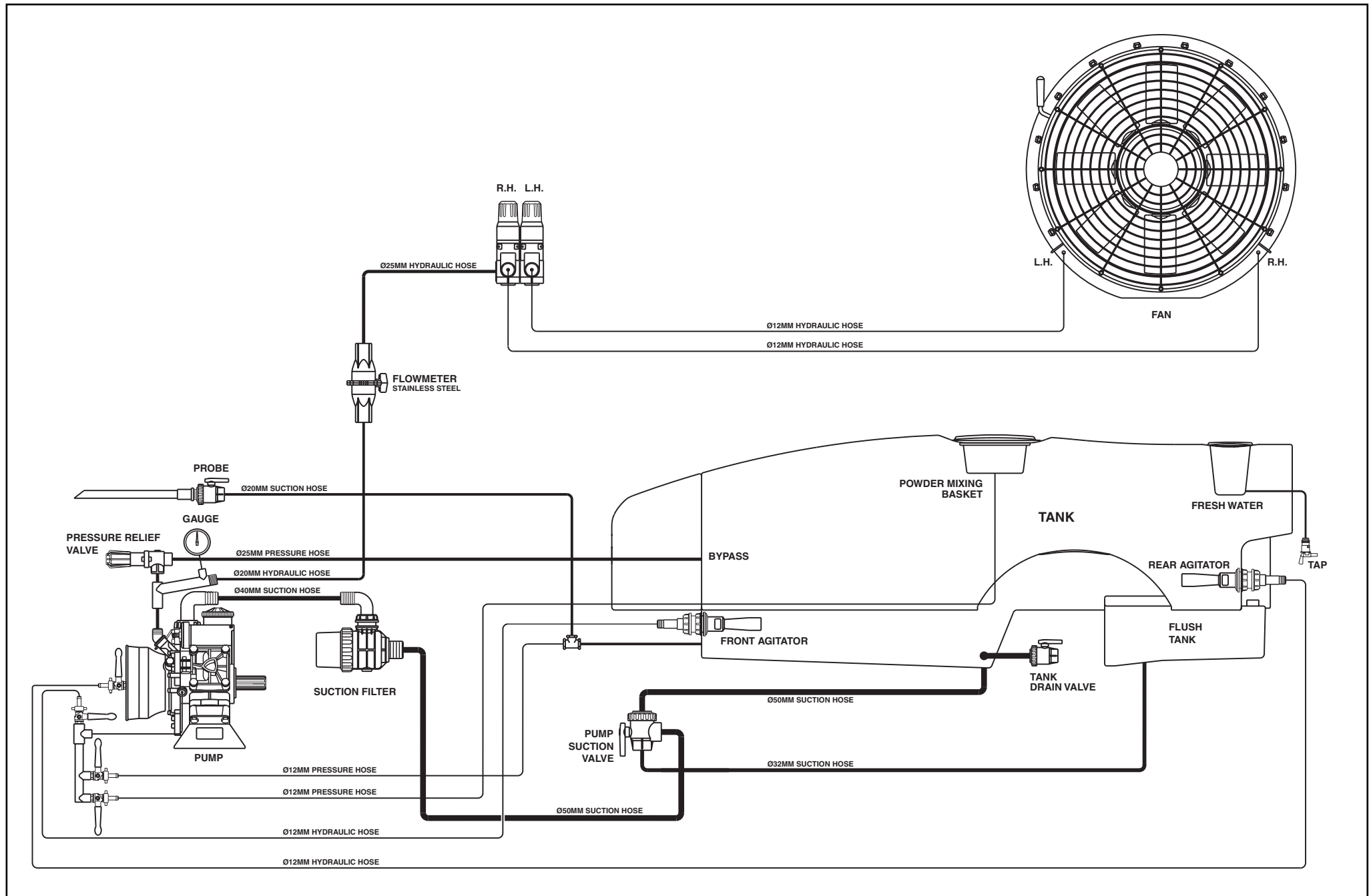
# Electrical Wiring Diagram - MT3405F/HV4000 Assembly Drawings & Parts









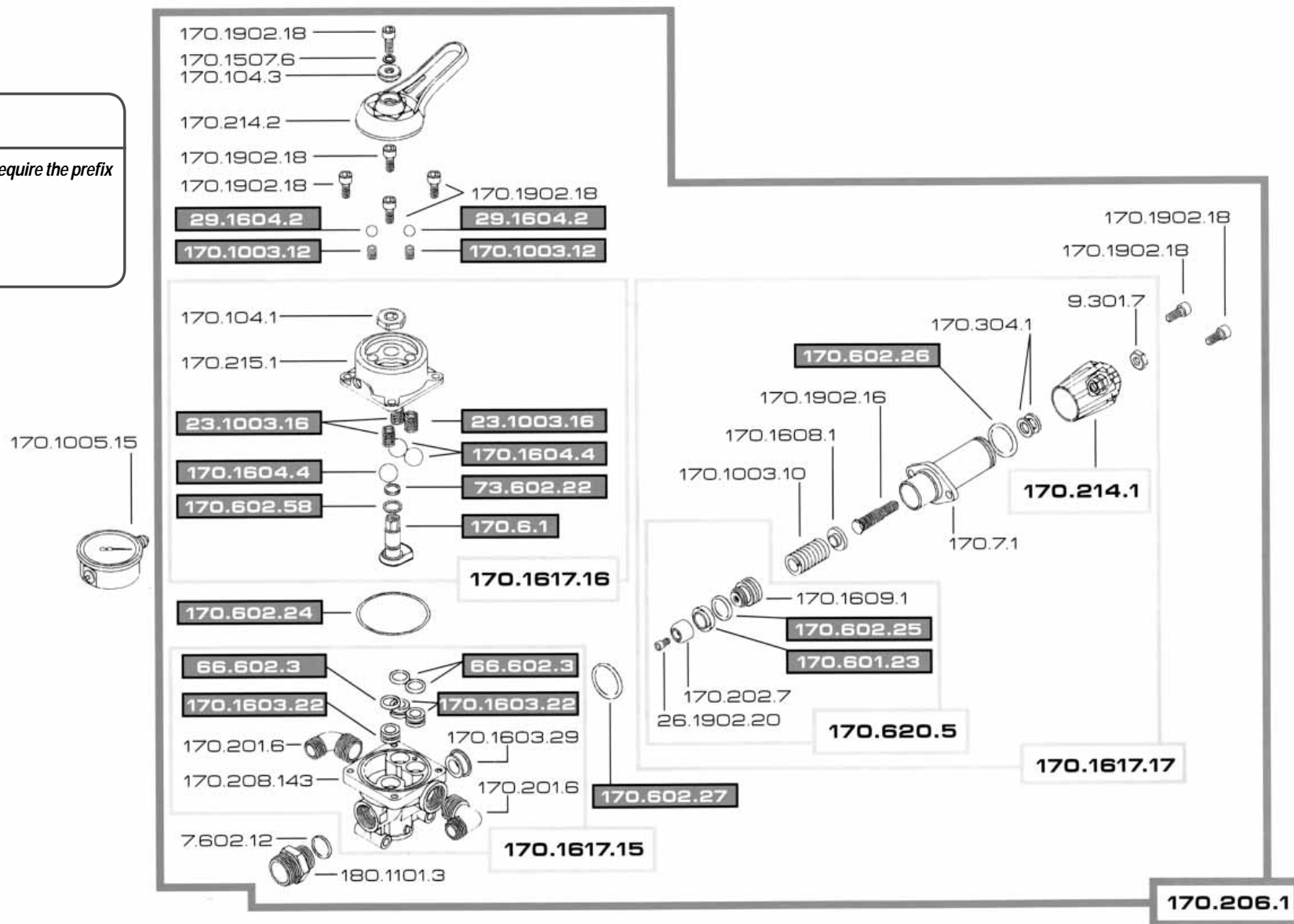


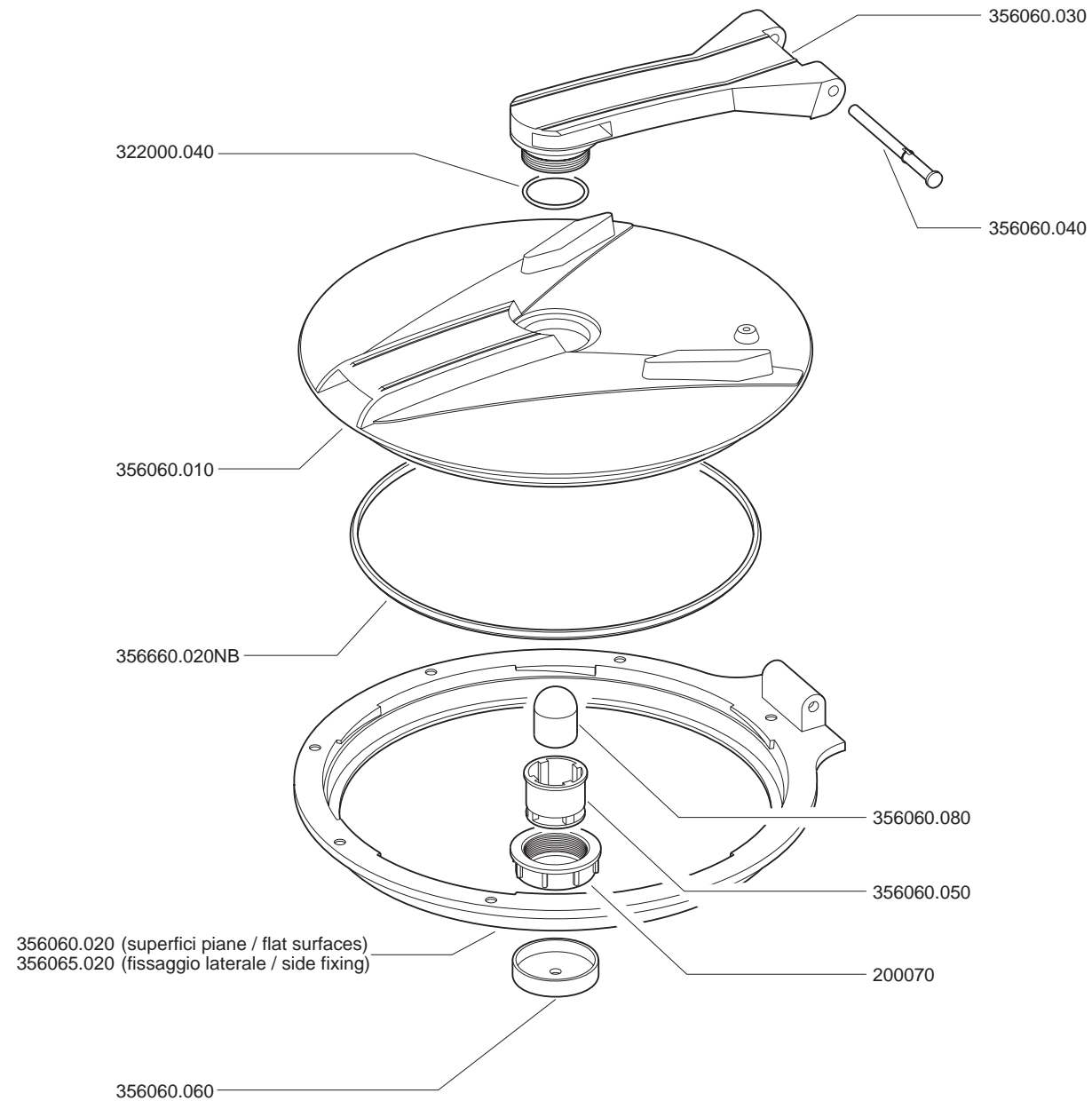
### 170 Controller

Part No. B1170.206.8

#### NOTE

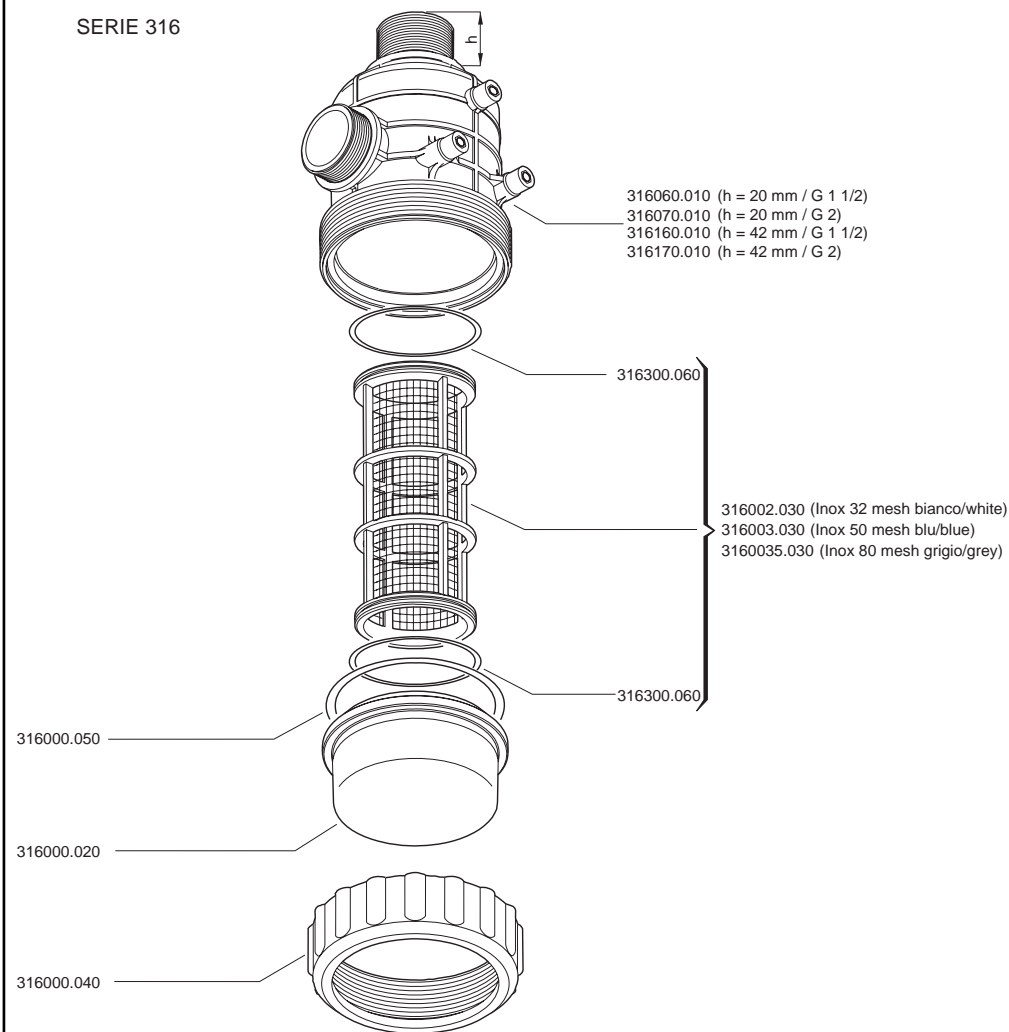
When ordering, all part numbers require the prefix "B", eg, B142.602.18



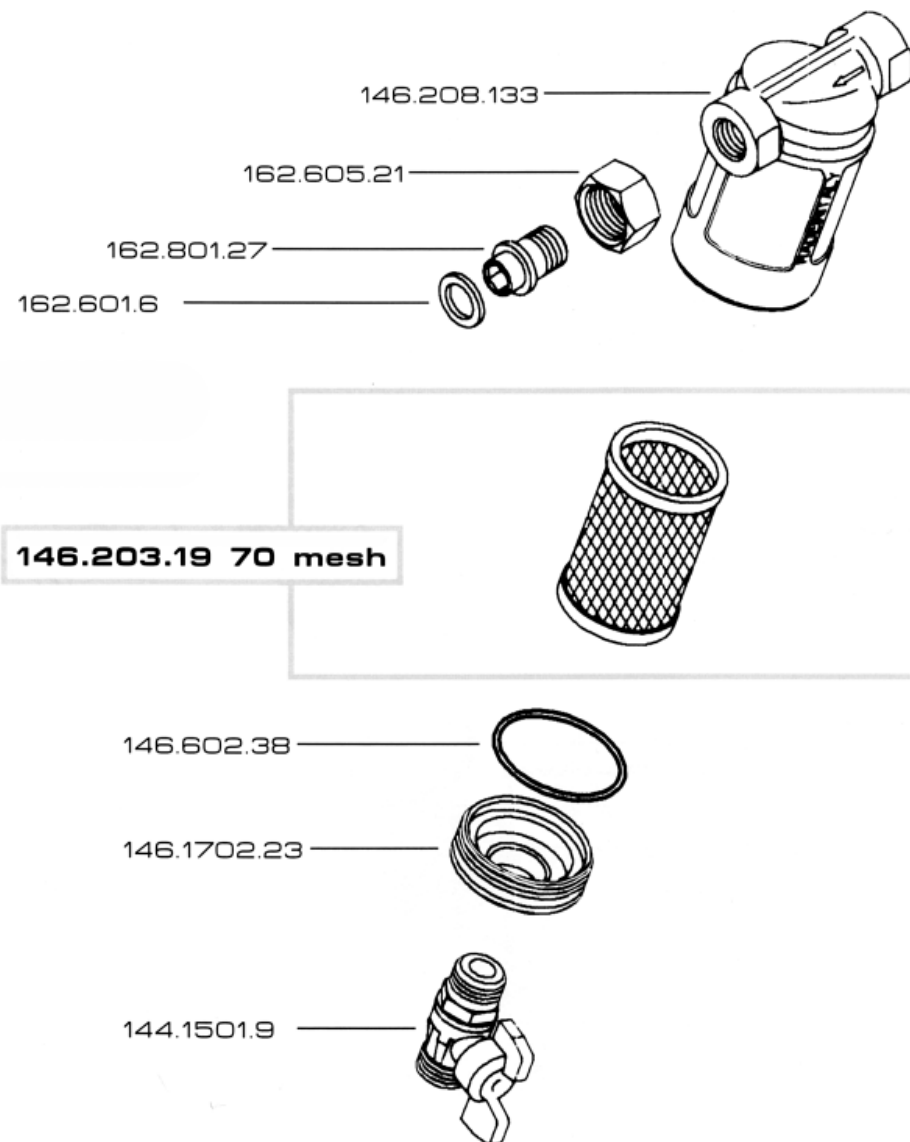


### Suction Filter - Pt No. A314563

SERIE 316



### Optional Pressure Filter - Pt No. B146.504.70



## Section 7

# Useful Formulae for Calibrating Sprayers

The following formulae may be useful when calibrating sprayers for orchard or tree applications.

### 1 Trees per Hectare

$$\begin{aligned} & \text{Trees/Ha} \\ & = \\ & 10,000 \div \text{Row Spacing (m)} \div \text{Tree Spacing (m)} \end{aligned}$$

### 2 Total Litres per Minute

$$\begin{aligned} & \text{Total Litres/Min} \\ & = \\ & \text{Row Spacing (m)} \times \text{Litres/ha} \times \text{Speed (km/hr)} \div 600 \end{aligned}$$

### 3 Tractor Speed

$$\begin{aligned} & \text{km/hr} \\ & = \\ & \text{metres travelled in one minute} \div 16.7 \\ & \text{OR} \\ & \text{mph} \\ & = \\ & \text{feet travelled in one minute} \div 88 \end{aligned}$$

### 4 Distance Travelled per Hectare

$$\begin{aligned} & \text{km/hectare} \\ & = \\ & 10,000 \div \text{Row spacing (m)} \div 1000 \end{aligned}$$

### 5 Litres per Hectare

$$\begin{aligned} & \text{Litres/Ha} \\ & = \\ & \text{Total Litres per Minute} \times 600 \div \text{Row Spacing (m)} \div \text{Speed (km/hr)} \end{aligned}$$

### 6 New Output (litres per minute)

$$\begin{aligned} & \text{New Output (l/min)} \\ & = \\ & \text{Known Output (l/min)} \times \text{New Pressure (bar)} \div \text{Known Output (bar)} \end{aligned}$$

### 7 Time to Spray One Hectare

$$\begin{aligned} & \text{Time (minutes)} \\ & = \\ & 600 \div \text{Row Planting Width (m)} \times \text{km/hr} \end{aligned}$$

### 8 Vertical Target Volume

$$\begin{aligned} & \text{Target Volume(m}^3\text{)} \\ & = \\ & \text{Land Area (ha)} \times 2 \times \text{Tree height (m)} \div \text{Row Spacing (m)} \end{aligned}$$

### 9 Calculating Trees per Hectare

$$\begin{aligned} & \text{Trees per Hectare} \\ & = \\ & 10,000 \div \text{Row Spacing (m)} \div \text{Tree Spacing (m)} \end{aligned}$$

### 10 Actual Litres/Minute per Nozzle

$$\begin{aligned} & \text{Litres/Minute per Nozzle} \\ & = \\ & \text{Total Litres per Minute} \div \text{Number of Nozzles} \end{aligned}$$

### 11 Spray Volume Required per Hectare

$$\begin{aligned} & \text{Spray Volume/Hectare (litres)} \\ & = \\ & 10 \times \text{Tree Height (m)} \times \text{Tree Width (m)} \times \text{Spray Volume Factor} \div \text{Tree Row Spacing (metres)} \end{aligned}$$

### 12 Number of Trees per Spray Tank

$$\begin{aligned} & \text{Tree Number/Spray Tank} \\ & = \\ & \text{Spray Tank Size} \times 1000 \div \text{Tree Height (m)} \div \text{Tree Width (m)} \div \text{Row Spacing (m)} \div \text{Spray Volume Factor} \end{aligned}$$

The following formulae may be useful when calibrating sprayers for vineyard applications.

## 1 Tractor Speed

$$\begin{aligned} & \text{km/hr} \\ & = \\ & \text{metres travelled in one minute} \div 16.7 \\ & \text{OR} \\ & \text{mph} \\ & = \\ & \text{feet travelled in one minute} \div 88 \end{aligned}$$

## 4 Distance Travelled per Hectare

$$\begin{aligned} & \text{km/hectare} \\ & = \\ & 10,000 \div \text{Row spacing (m)} \div 1000 \end{aligned}$$

## 5 Litres per Hectare

$$\begin{aligned} & \text{Litres /Ha} \\ & = \\ & \text{Canopy Width (m)} \times \text{Canopy Height (m)} \times 30 \times \text{Density Factor} \times 100 \\ & \div \text{Row Spacing (m)}. \end{aligned}$$

## 4 Litres per 100 Meters

$$\begin{aligned} & \text{Litres/100 Meters} \\ & = \\ & \text{Canopy Width (m)} \times \text{Canopy Height (m)} \times 30 \times \text{Density Factor} \end{aligned}$$

## 5 Litres per Hectare

$$\begin{aligned} & \text{Litres/Hectare} \\ & = \\ & \text{Litres per 100 metres} \times 100 \div \text{Row Spacing (m)} \end{aligned}$$

## 6 Litres per Minute

$$\begin{aligned} & \text{Litres/Minute} \\ & = \\ & \text{Litres per 100 metres} \times \text{Kilometres per Hour} \div 6 \\ & \text{OR} \\ & \text{Litres/Minute} \\ & = \\ & \text{Row Spacing (m)} \times \text{Litres/Hectare} \times \text{Kilometres/Hour} \div 600. \end{aligned}$$

## 7 Litres/Minute/Nozzle

$$\begin{aligned} & \text{Litres/Min/Nozzle} \\ & = \\ & \text{Litres per Minute per Row} \div \text{Number of Nozzles per Row} \end{aligned}$$

## 8 Time to Spray One Hectare

$$\begin{aligned} & \text{Time (minutes)} \\ & = \\ & 600 \div \text{Row Planting Width (m)} \times \text{km/hr} \end{aligned}$$

## 9 Actual Litres/Minute per Nozzle

$$\begin{aligned} & \text{Litres/Minute per Nozzle} \\ & = \\ & \text{Total Litres per Minute} \div \text{Number of Nozzles} \end{aligned}$$

## 10 Spray Volume Required per Hectare

$$\begin{aligned} & \text{Spray Volume/Hectare (litres)} \\ & = \\ & 10 \times \text{Tree Height (m)} \times \text{Tree Width (m)} \times \text{Spray Volume Factor} \div \text{Tree} \\ & \text{Row Spacing (metres)} \end{aligned}$$