CROPLANDS

OPERATORS MANUAL
QUANTUM MIST™ ORCHARD TOWER

INCORPORATING QM-420 SPRAY FANS

WWW.CROPLANDS.COM.AU

STOP

BEFORE COMMENCING operation, **ENSURE** you read & understand this manual, its contents, and any additional information supplied.

HT-OMORCHARD-A

INTRODUCTION | GENERAL MANAGER'S WELCOME

Sean Mulvaney
General Manager

Dear Customer

Congratulations on the purchase of your new Croplands Sprayer.

Croplands have been in the business of building sprayer equipment since 1972. For over 49 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 for 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 the back cover you will find our contact details, and locations where our staff can be reached during business hours. After hours, you can email 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.

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

Yours Sincerely

Sean Mulvaney
General Manager

Croplands has taken steps to ensure this operator's manual is as current and as accurate as possible. Due to the ever-changing markets of cropping and farming, Croplands is constantly striving to be at the forefront of innovation and technology. While the information in this manual is considered accurate at the time of writing, Croplands reserves the right to change this information without notice. Croplands will not accept liability for any inaccuracy in this publication, or changes forthwith.

CONTENTS

SECTION 1
IMPORTANT INFORMATION

ABOUT THIS MANUAL

This manual provides assembly, setting up, operating and maintenance instructions for the Croplands Quantum Mist™ 420, ORCHARD TOWER sprayers.

In addition to this manual, the sprayer will be delivered with the General Safety Manual (GP-SAFE-A) and where applicable the Controller Manual and Micro Power Pack Manual (HT-OMMICRO-A). For details not covered by the manuals, please contact Technical Support on 1300 650 724.

Some features and options 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.

This manual, HT-OMORCHARD-A, was first published in March 2021.

Check online as there may be more recent revisions of this manual. **www.croplands.com.au**

TERMINOLOGY

These terms/symbols used throughout this manual:

NOTE	This Note sign is in place to convey useful information and will help you to identify the best possible way to operate the machine.
CAUTION	This Caution sign shows the potential for incident. An incident may include damage to the machine itself, or possible injury to the operator.
WARNING	This warning sign shows the potential for risk or injury and highlights the need for steps to be taken to protect ones safety.
DANGER	This Danger sign will be used in areas where the highest risk is present. Always read the information on these signs and ensure you are taking steps to prevent risk or injury.

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.

DANGER

Probability of death or serious injury if an accident occurs

BEFORE OPERATING YOUR SPRAYER

Before attempting to use your sprayer, make sure you read all Operator Manuals for this sprayer including but not limited to:

This Operator's Manual, **and all other supplied manuals** for items such as Micro Power Pack, Pumps, PTO etc.

And properly understand:

- All Safety Issues.
- Assembly & Installation instructions.
- Calibration of the sprayer.
- Sprayer Operation.
- Sprayer Maintenance.

SECTION 1
IMPORTANT INFORMATION

WARRANTY POLICY

Each sprayer will be delivered with a Warranty & Pre-Delivery Booklet which includes:

- the Sprayer's unique serial number,
- the Sprayer's specification sheet,
- a pre-delivery checklist and
- outlines the Croplands Warranty policy.

Always contact your Croplands Dealer first and foremost for warranty matters.

NOTE

For full conditions of warranty and warranty policy, please see the Warranty & Pre-Delivery booklet provided with this sprayer.

SECTION 2
SAFETY

SAFETY FIRST

Please read and understand all supplied manuals, guides and safety decals before operating this sprayer. This includes the **Croplands Operators Safety Manual** – as pictured here.

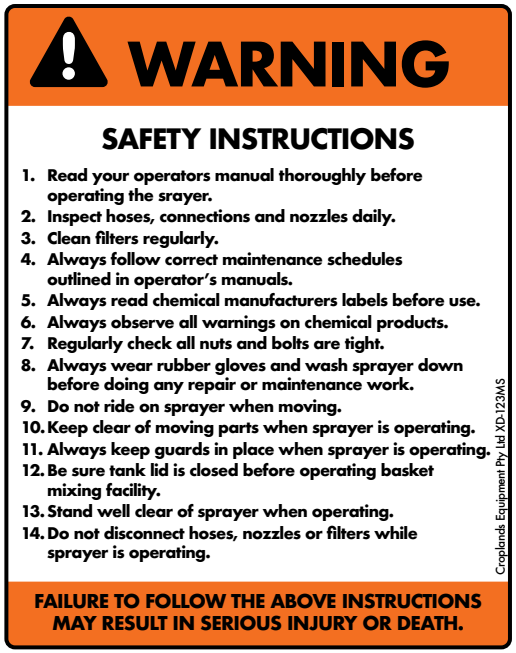
This manual is available on the Croplands Web site, or for printed versions contact Croplands customer support and ask for part number GP-SAFE-A (or later version if available).

SECTION 2
SAFETY

SAFETY SIGNS AND DECALS

All signs and decals for sprayer safety and operation must be maintained in good order and replaced if damaged or missing.
Most Croplands labels have a part number printed on the decal to aid identification and replacement.

Some examples are shown below.



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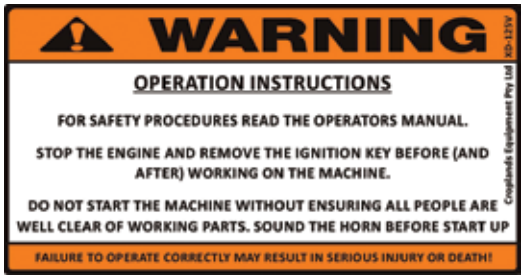

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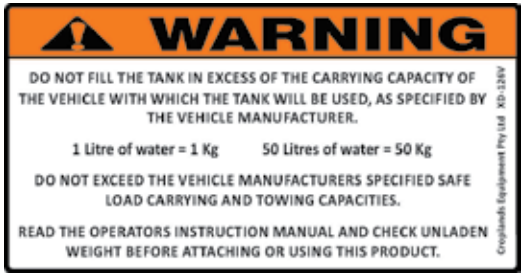
Part No: XD- 122V



Part No: XD - 126V

Part No: XD-194

Part No: XD - 127V

Part No: XD - 195

SECTION 3
PRODUCT IDENTIFICATION, SHIPPING & SPECIFICATION

PRODUCT IDENTIFICATION

Always use the serial number of the Sprayer 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.

The serial numbers of all controllers, pumps etc should also be recorded for future reference.

Photo 1

SHIPPING INFORMATION

All provided tie down points (and more) should be used to help secure the sprayer for transporting.

Note serial number plate in the attached image.

Photo 2

WEIGHTS & DIMENSIONS

The Croplands ORCHARD TOWER Sprayer is only available in 2000 slimline, 2000 XL and 3000 XL versions, all feature the hydraulically driven QM-420 spray fans mounted in fan frames. Micro Power Pack is optional.

The below is a general guide to standard model empty weights. For more detailed information consult the Croplands Customer Service team.

2000 Lt XL model, 8 fans	=	tba
2000 Lt Slimline model, 8 fans	=	tba
3000 Lt XL model, 8 fans	=	tba

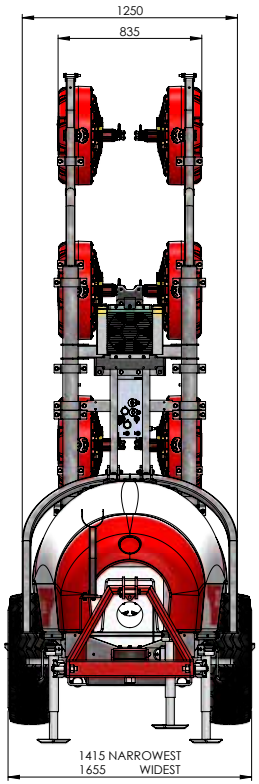
Add 190 kg +/- 10 kg for the standard Micro Power Pack (MPP).

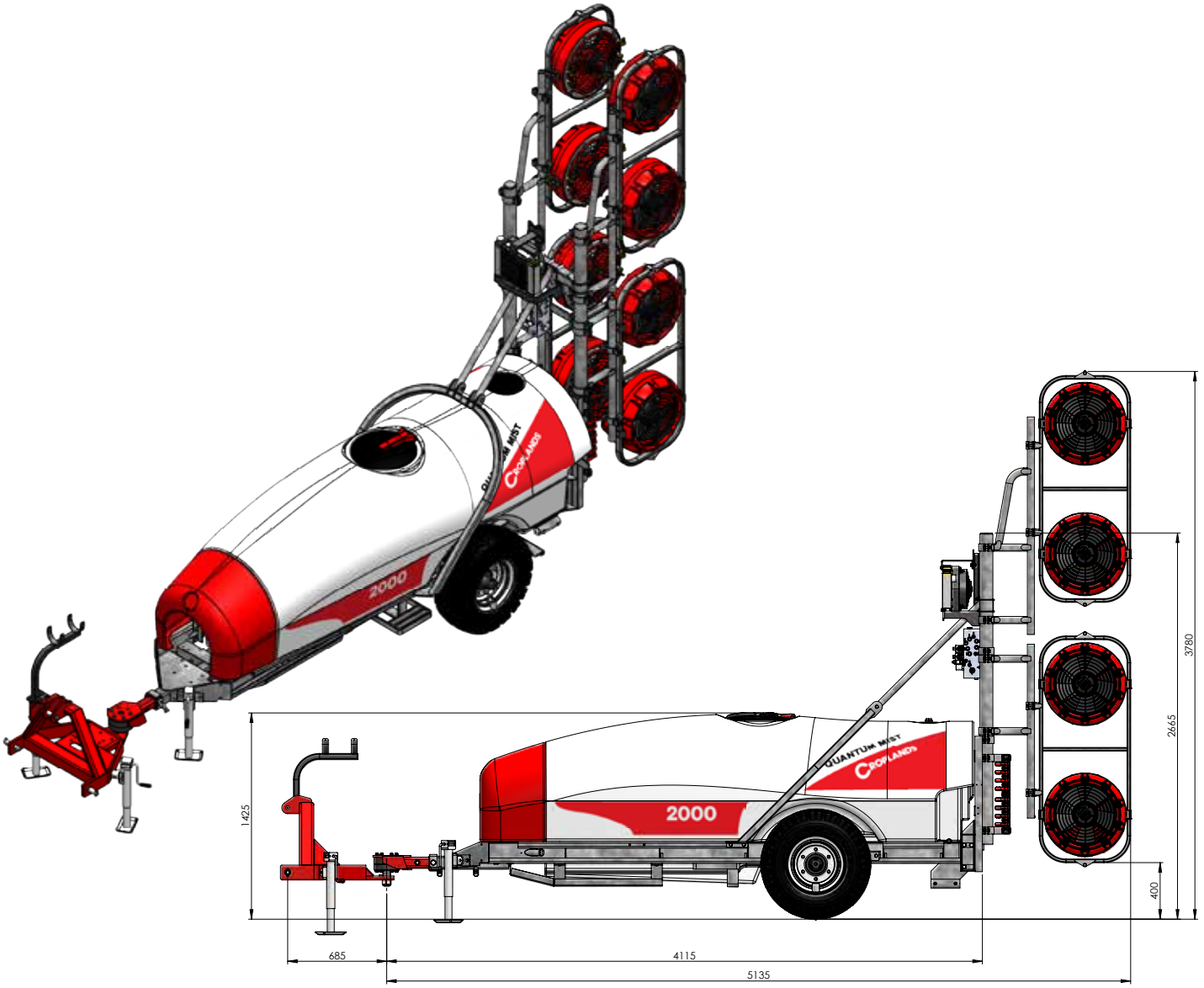
See next page for dimensions.

SECTION 3

PRODUCT IDENTIFICATION, SHIPPING & SPECIFICATION

DIMENSIONS





SECTION 3
PRODUCT IDENTIFICATION, SHIPPING & SPECIFICATION

GENERAL SPECIFICATION

The Orchard Tower Sprayer is Croplands latest row crop sprayer range to feature the patent pending QM-420 spray fans with dual spray rings. The sprayers are available with optional Micro Power Pack.

The Quantum Mist™ system uses a combination of individual hydraulically driven spray fans with 5-blade fans to give the maximum possible spray coverage in grapes and dwarf tree crops.

The sprayers are available with a wide selection of options for tanks sizes and controllers.

For more detailed specification, see Section 4, Product Features / Familiarisation

Controls

A wide variety of controllers are available. Basic manual controls, standard electric controls & auto-rate controllers. A separate manual will provided for your Spray controller option.

Tank Sizes

2000 and 3000 litre tank options are available and are constructed of impact-resistant polyethylene and UV stabilized. Each unit is available with a separate flushing tank with additional separate or integrated fresh water tank and a calibrated sight tube for filling level indication.

All main tanks drain completely via a large drain valve and sump.

Chemical Handling

Quick fill system and chemical suction probe standard on all models.

Filtration

Lid-strainers & chemical mixing baskets are standard on all models.

Large suction filter and self-cleaning pressure filter fitted.

Pumps

All Orchard Tower Sprayers are fitted with an Annovi Reverberi positive displacement diaphragm pumps with a capacity of 185 to 194 L/min - depending on the sprayer model.

A heavy-duty PTO shaft is supplied to drive the pump. This will be supplied to suit the drawbar fitted.

Hydraulic-driven pumps (in lieu of PTO) are installed when a Micro Power Pack is fitted to the sprayer.

Agitation

The agitation system is driven by the pump via twin supa-flow venturis tank agitators & bypass agitation.

Hydraulic System

Standard hydraulic oil supply is from the tractor hydraulics for fan operation, boom operations and optional pump operation.

Optional (and highly recommended) is the Micro Power Pack for fan drive hydraulics.

The "standard" fan drive oil system uses a soft start/fan speed control manifold (with test ports for pressure and return) mounted at the front of the sprayer which then feeds a distribution block at the rear of the sprayer with separate hose circuits to the hydraulic driven fans.

The optional WindComp fan function uses a single manifold block which incorporates all the above functions in the one block at the rear of the sprayer.

All models are fitted with a hydraulic oil radiator with thermostat switching of an electric fan cooler.

Micro Power Pack

Optional on all models, the Micro Power Pack is a compact, self contained, independent oil supply incorporated into a 3 point linkage, self-steering drawbar. Driven by the tractor PTO shaft, the Micro Power Pack is available in a variety of pump configurations depending on Sprayer model specifications. See the separate manual for this product.

Nozzles

Each QM-420 spray fan comes with 2 spray rings with 5 nozzles per ring, for a total of 10 nozzles per fan. The nozzles are used in a 3 tier system, with low, medium, and high settings which are manually adjustable from the ground.

Standard nozzles are ALBUZ 80-degree ceramic hollow cone nozzles (brown and yellow). Alternative size nozzles may be selected at the time of order (e.g. yellow and orange).

The feed to all spray rings is fitted with a "non-drip" diaphragm check valve with an integral stop cock.

SECTION 3
PRODUCT IDENTIFICATION, SHIPPING & SPECIFICATION

Spray rate capability for the Quantum Mist™ Orchard Tower Sprayer ranges from 150 to 2000 L/ha.

Tower & Fan Frame

Rugged heavy-duty steel booms support the galvanised "fan frames".

The Fan Frames (and Fan Frame "stand-off's) can be manually adjusted to vary fan heights and aim point of the fan.

The spray fans are well protected within the galvanized fan frames. The fans can be moved vertically and / or angle adjusted up or down to ensure optimum spray coverage.

Chassis

Hot-dipped galvanised full-length heavy-duty chassis with a choice of fixed or self-tracking drawbar, slide-out step & jockey stand.

The Slimline 2000 model uses extra heavy duty sump guard to aid with balance.

Axle & Suspension

Width adjustable single axle is the only option on the 2000 Lt Slimline model.

Fixed single axle is standard on the XL models.

Walking beam tandem axle is optional on both XL models.

Wheels & Tyres

Standard wheels and tyres are:

2000 Slim	10.0/75 x 15.3" 10 ply tubeless tyres, steel rims
2000 XL	11.5/80 x 15.3" 12 ply tubeless tyres, steel rims
3000 XL	31 X 13.5 - 15" flotation tubeless tyres, steel rims

Speed Sensors

Proximity sensors are used for Fan speed, Pump speed, and Wheel (travel) speed.

Self-Steer Drawbar

3-point hitch, self-steer drawbar is fitted as standard on all trailed Orchard Tower sprayers.

Tractor required

Power required at the PTO on flat terrain:

- 2000 Lt - 40 HP
- 3000 Lt - 65 HP

If not using a Micro Power Pack, hydraulic oil requirement is around 55 litres per minute at pressures up to a maximum of 2,750 psi.

Category 2 or 3 linkage connections required.

Options (not applicable to all models)

- HV4000 auto rate controller
- Bravo 180 auto rate controller
- WindComp (variable fan speed to left and right). This also includes the Opus A3 controller and dual fan speed sensors
- Fan rpm sensors
- Visio Multi-function display
- Atlas 100 GPS speed sensor
- 13.0 x 55 x 16" flotation tyres are available in lieu of standard. For the 2000 models only.
- Micro Power Pack
- Bio oil (for Micro Power Pack)
- Light kit
- Electric brakes
- Different nozzles, Albuz 60-degree nozzles can be used in lieu of 80-degree.

Sprayer specifications are subject to change without prior notification.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

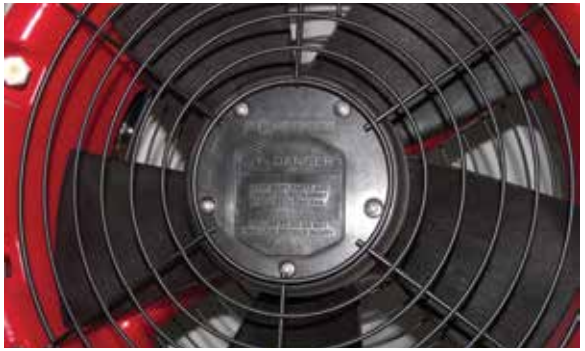
SECTION 4
PRODUCT FEATURES / FAMILIARISATION

QUANTUM MIST™ QM-420 SPRAY FAN

Standard on all ORCHARD TOWER Sprayers is the extremely efficient 420 mm diameter "QM-420" fan and the "Fan Frame" mounting system.

Fan / Cap / Cover

The robust 5 bladed fan also features a separate moulded front cap designed to prevent the build-up of detritus so common in other fans, and the same cap, with the "knockout" removed, is used at the rear to further streamline the airflow.



Drive Body

The drive body differs from the "original" and very reliable QM-380 drive body in that it has a further 4 tapped holes to accept the rear cover. Note the rear cover (which is the same moulding as the front cap, with a knock out for the hydraulic motor) has positions for 5 screws, but only 4 screws are used. The "5th screw" position aligns with a casting cutaway for either a speed sensor or case drain connection (see photo above and next column).

Cowl Orientation / Speed Sensor / Case drain

The cowling should always be mounted with the cutaway for speed sensor or case drain facing downwards (to enable drainage). The case drain is there for the unlikely event of blowing oil seals in the hydraulic motor.

Sprayers fitted with the optional Wind Compensation feature will use two speed sensors (left and right).

Note the rear guard needs to be removed to fit or access the speed sensor. Replace the guard once done.

Dual Spray Rings

The fan also features twin spray rings, with 5 nozzles per ring. This allows unprecedented control over spray coverage rates and droplet spectrums.

As supplied "standard", it's set up as a 3-tier system. The inner / smaller diameter spray ring is fitted with a smaller (brown) nozzle, and the outer / larger diameter spray ring is fitted with a larger (yellow) nozzles.

- Inner spray ring only is **Tier 1** / lowest volume rate.
- Outer spray ring only is **Tier 2** / medium volume rate.
- Both spray rings together are **Tier 3** / for high volume rate.

There are many other ways to use the dual ring system such as using one of the rings for special purpose nozzles.

See page X ?? for more information on Tiered plumbing.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

Hydraulic Drive

All QM-420 fans are driven by hydraulic motors built to a special heavy-duty specification and with case drain port. Most QM-420 models are fitted with 6.5 cc hydraulic motors. In some instances (as required by the ORCHARD TOWER sprayer), 9.8 cc motors are used.

Guards

The QM-420 must never be used without the front and rear guards installed.

Operational limits

The nominated maximum operating speed of the fan is 3,000 rpm. Normal delivered maximum operating speed of 2,500 rpm. Exceptions apply.

DANGER, Stay well away from rotating fans.
Whilst the front (downwind) side may appear to be the more dangerous side, it's the back of the fan that holds greater danger as it can suddenly suck body parts or objects in.

Fan Frame Mounting

Each spray fan is mounted via dual M12 brass inserts moulded into each side of the cowling.

The normal spray fan mounting method is via special stainless-steel clamps into the "Fan Frame".

The bracket is reversible and can be used to adjust fan positioning (see more page 44 ??).

Leaf Guard

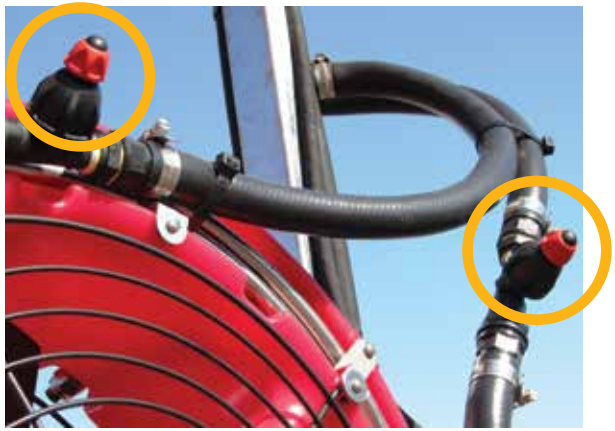
A moulded leaf guard is fitted as standard to all bottom fans.

Check Valve/stop cock/drain

The feed to each spray ring is fitted with a "non-drip" diaphragm check valve with an integral stop cock which allows individual spray rings to be manually shut off as required.

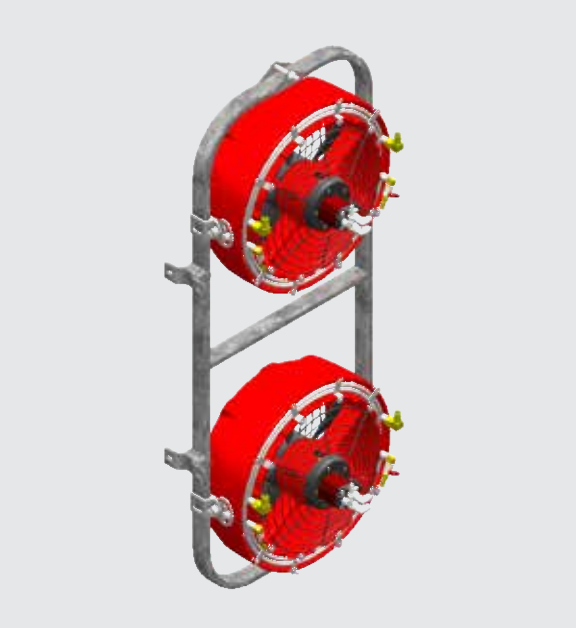
Screw the red cap **in for stop**, out for normal diaphragm "non-drip".

Each spray ring has a draining/flush tap on the exit.



SECTION 4
PRODUCT FEATURES / FAMILIARISATION

FAN FRAMES & TOWERS



Fan Frames

Mounting the spray fans into the fan frames has many advantages, including the ability to specify the exact positioning of fan heights and angles. The fans remain well protected and fixed until a change is required.

Up to 2 fans can be installed in each fan frame – with the lower fan also using a leaf guard.

More about setting up and operating the fans (and booms) in Section 5.

Tower Fans

Orchard Tower Sprayers connect the rear fan frames to the main tower via a pair of "standoff" brackets and saddle clamps.

The standoff brackets can be moved in both height and rotation by loosening the saddle clamps at and rotate the required width – retighten.

Then adjust the fan frames alignment to spray to the required direction (normally square to the canopy).

HYDRAULIC SYSTEMS

Hydraulic Identification

All Croplands Hort hydraulic hose circuits are identified as per per fig x. Some exceptions apply for special builds.

There are 2 different fan hydraulic systems available.

(A) Pressure hoses to have **two colour bands**

(B) Return lines to have **one colour band**

Hydraylic hose identification

BLUE	**RIGHT FOLD**
RED	**LEFT FOLD OR ELEC/HYD**
YELLOW	**FANS**
WHITE	**PRODUCT PUMP**
GREEN	**AXLE/SPARE**

There are 2 different fan hydraulic systems available.

(a) The **"Classic"**/standard conventional hydraulic system as used on Quantum Mist™ sprayers for many years, with several improvements, and ...

(b) The **"A3 WindComp"** system, a modified version of the Croplands "Fusion" hydraulic system and is specific to the WindComp feature.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

In both cases, the general fan motor plumbing is the same. The fan hydraulic motors are plumbed in series of 4 fans per circuit on the left and 4 fans per circuit on the right. As well as pressure in and out, each motor is plumbed with a case drain, also plumbed in series. Oil returns from the fans go via the distribution block, then onto the oil cooler (if fitted), and finally back to the tank (be it the tractor or power pack).

The CLASSIC/Standard hydraulic system

The "classic" fan drive hydraulic oil system uses a soft start/fan speed control manifold mounted at the front of the sprayer which then feeds a distribution block at the rear of the sprayer where the oil flow splits to separate hose circuits to drive the fans.

Fan speed is controlled via a manual control valve at the soft-start manifold or via an electric control valve as a function of the HV4000 or Bravo 180 controllers.

The A3 WindComp hydraulic system

WindComp (wind compensation/wind offset) is a feature made possible by a new hydraulic system. The fans facing left or right sides can be run independently of each other, at different speeds. This is ideal for combating cross winds or spraying in exposed/challenging conditions.

The optional A3 "WindComp" system uses a single manifold/distribution block mounted at the rear of the sprayer which incorporates all the fan functions.

Note **the laws of physics still apply**, if the maximum speed of the sprayer is 2,800 rpm on all fans, it's not possible to increase one side to 3,000 and leave the other at 2,800.

The WindComp feature is controlled by the A3 controller separate from any other controller functions.

The spray functions are independent of the WindComp system.

Note the spray functions are independent of the WindComp system.

Oil Supply

There are three main options to supply hydraulic oil.

1. The **preferred option** is for oil supply via the PTO driven, single pump, Micro Power Pack (see separate manual), with the AR product (spray) pump driven via a separate tractor remote. This is the simplest most reliable and maximum performance setup. Pump size needs to be matched to fan requirements. The Orchard Tower sprayer uses a 48cc pump
2. As above but using a dual pump, with the smaller pump driving the AR product (spray) pump. In some cases, this will limit maximum fan performance. The Orchard Tower sprayer using a dual pump Micro Power Pack requires a 48/24cc pump. Note the dual pump system will be discontinued in 2021.
3. Oil supply from Tractor hydraulics only. This is the most economical system. It requires a tractor with sufficient oil flow (and pressure). Whilst a flow of 60 Lpm at 2,750 psi is sufficient, it's highly recommended the tractor have ample capacity in reserve ... say 75 Lpm or more.

REGISTERED
CROPLANDS
MICRO POWER PACK
DESIGN

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

Micro Power Pack

The Croplands Micro Power Pack is a compact, PTO driven, oil supply system to drive a hydraulic circuit(s) of up to 145 litres per minute (Lpm) of oil supply at pressures up to 200 bar (2,900 psi).

SAFETY Alert; Always be aware of the PTO shaft.

Mounted to a Heavy-duty 3 point linkage self-steer drawbar, with heavy-duty gearbox and pump. A wide variety of pump sizes are available. The 48cc pump used for the Orchard Tower sprayer is rated to a maximum of 80 Lpm which is ample for Orchard Sprayer.

An automatic low oil level cut out, reduces the impact of any oil leaks - can be limited to just a few litres.

There is a separate manual for the Micro Power Pack, HT-OMMICRO-A, first published in November 2020.

Oil Cooler

All Orchard Sprayers are fitted with a hydraulic oil radiator with thermostat switching of an electric fan cooler.

The fan is thermostat controlled, switching in at around 50 degrees C.

The fan is powered via the controller loom, CHLOOM/AC

SPRAY PUMP & SELF-STEER LINKAGE

AR Pump

Orchard Tower Sprayers are fitted with an Annovi Reverberi positive displacement diaphragm pumps with a capacity range of 185 ~ 195 L/min - depending on the sprayer model.

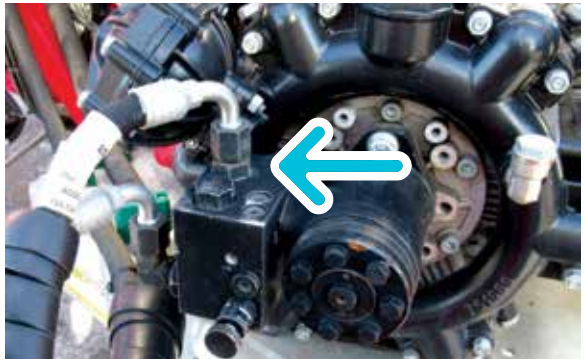
The pump can be driven by a PTO shaft or hydraulic motor.

When a Micro Power Pack is fitted to the sprayer, the AR pump must be driven by a hydraulic motor.

There are 2 options for driving this motor/AR pump.

1. Via the tractor remotes or alternatively
2. Via a secondary (dual) pump as a part of the Micro Power Pack. This option discontinued from 2021.

Note the use of a separate manifold used to set and control the pump speed (blue arrow).



In sprayer models without a Micro Power Pack the AR pump is mounted to a 3 point linkage self-steer drawbar and driven by a Heavy-duty PTO shaft. See photo next page.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

SAFETY Alert; Always be aware of the PTO shaft.

SPRAY CONTROLLERS & CONNECTION

Quantum Mist™ 420 sprayers come equipped with a variety of spray controllers ranging from the basic manual system to auto rate controller plus WindComp.

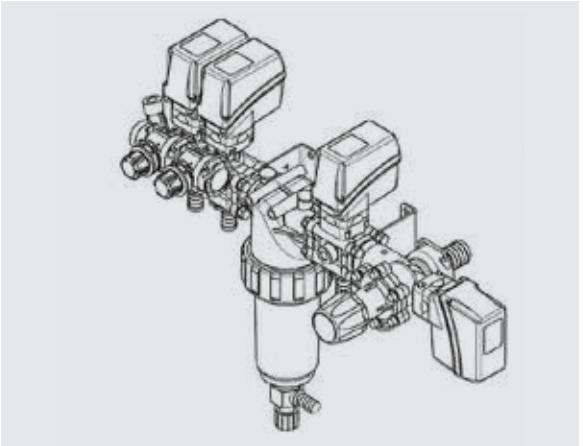
All sections (either manual or electrically controlled) are plumbed to a bank of manual section taps at the rear of the sprayer to enable manual selection of Tier 1, 2, or 3 spraying per section.

ARUCM-5

Manual controller (unusual choice). This unit has 5 sections - commonly just 4 are used. Manual pressure adjustment and a single dump lever.

HT-ARAG2

Basic electric left/right proportional shut-off with switch box and pressure adjustment.



SECTION 4
PRODUCT FEATURES / FAMILIARISATION

Bravo 180

An auto spray rate controller with up to 4 section control for the professional operator requiring GPS integration and data transfer via USB. Up to four-section control of motor valves or solenoids. Pre-set row width and application rates for simple, on-the-go adjustment. Multiple screen selections, programmable audio, and visual alarms, and up to 10 individual operating histories to keep the operator informed. L/ha or L/100m capability.

Optional fan speed control and tank level indicator.

HV4000

Croplands most popular auto spray rate controller with up to 4 section control for the professional operator, providing up to four-section control of motor valves or solenoids. Pre-set row width and application rates for simple, on-the-go adjustment. Multiple screen selections, programmable audio, and visual alarms, and up to 10 individual operating histories to keep the operator informed. L/ha or L/100m capability.

Optional fan speed control.

A3 WindComp

WindComp controller for fan operations only. See earlier section re the fan hydraulic system. The A3 is not a spray rate controller, hence is usually supplied additionally to the Bravo or HV4000.

Looms & Connections

Sprayers using the UCM controller have no need for loom connections.

Sprayers using the HT-ARAG2 come supplied with appropriate electrical looms.

Sprayers fitted with auto rate controllers, HV4000 and Bravo180 are fitted with a variety of looms and connections depending on the spray options chosen.

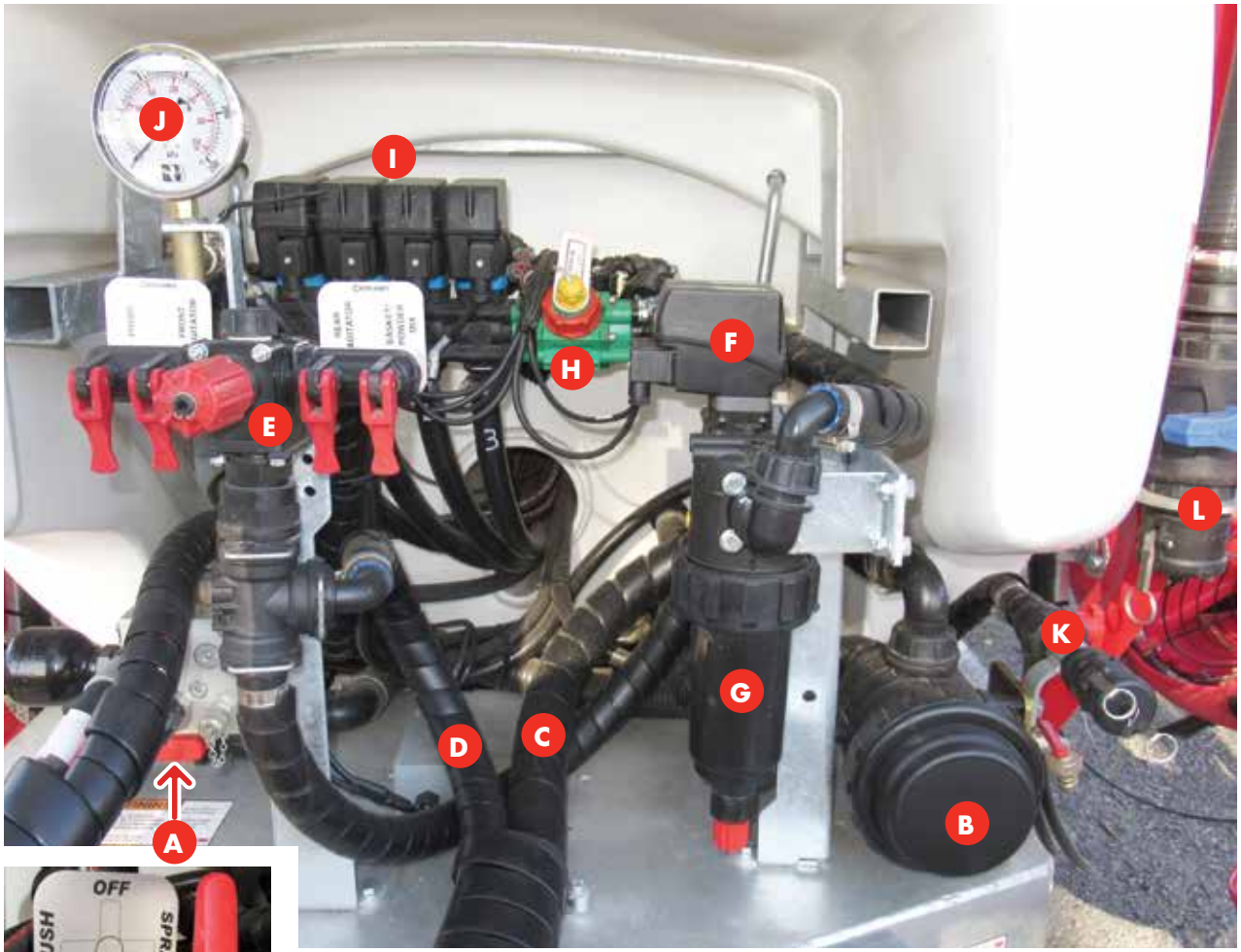
- Main Power loom, MT90LOOM/PWR
- Main Sprayer loom, MT90LOOM/1D

Connecting to the main loom and controller can be ....

- Section valve loom MT90LOOM/1C2T (for 2 Section), or ....
- Section valve loom MT90LOOM/1C4T (for 4 Sections)
- Oil cooler (power)
- WindComp controller (power).
- Micro Power Pack (oil level switch/dump)
- Product (AR) Pump speed
- Speed sensor, Proximity or GPS
- Spray Dump
- Flow Meter
- Fan speed control
- Fan speed sensor (2 required for WindComp)
- Hydraulic (Fan) pressure (only when using WindComp)

See schematics diagrams and controller manuals for more detail.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION



LIQUID SYSTEM OVERVIEW

"Front End" Spray Controls. XL tank model shown.

The Liquid flow is .....

A. **Tank selection** valve (shown to the right in the off position)

B. From the selection valve to the **suction filter**

C. The **Suction** hose going **to the pump** (in this example the pump (not shown) is mounted on the self-steer drawbar).

D. **Pressure** hose coming **from the pump** to the ...

E. **Pressure manifold.** This includes the **master pressure** adjustment (red knob) and flick switches to activate the **probe**, front & rear **agitators** and the **basket**/powder mix

F. A **Dump** valve and (7 seconds) **proportional servo valve** (closest to camera) & then ...

G. **Pressure filter,** onto the ...

H. **Flow meter**

I. **Section valves** – in this example are 4 sections. From here to the manual section taps are the rear

J. **Pressure gauge.** The pressure is taken from the end of the section valve assembly.

K. **Suction probe** connection.

L. **Remote fill** connection.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

TANKS & SUCTION PLUMBING

All models feature three tanks, Main (chemical), (freshwater) Flushing, and (freshwater) Handwash for easy operation, cleaning, and operator safety.

All Main tanks are equipped with large lid and basket filter. Plumbed to the filter basket is a Basket/Powder Mix function activated via a tap from the pressure manifold.

All Flushing and Handwash tank lids should be clearly labelled as WATER ONLY. Replacement labels are available under the code XD-127V.

All XL sprayers have the Handwash tap positioned near the main filter **(see orange arrow).** Slimline 2000 version has the tap at the back of the sprayer near the section valves.

Filling the Main tank can be via the basket or separate/ remote fill Camlock. The 3000XL uses a ball valve plus camlock **(see blue arrow).**

The freshwater Flushing tank on the 3000 model is a separate tank that fits below the main tank and is filled via a fill tube accessed from inside the Handwash tank at the rear of the sprayer **(see red arrow).**

The 2000 XL model's Fill Camlock is on top of the tank **(see the purple arrow, photo 1).**

The 2000 XL model features separate flushing and handwash tanks integrated into the design of the main tank **(circled).**

Photo 1

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

The 2000 Slimline model's main tank Fill Camlock is located on top of the tank, see fig below.

The 2000 Slimline has an optional 80 Litre Flush tank located underneath the main tank, at the rear of the sprayer. Fill point at the rear of the sprayer.

For the 2000 Slimline models without a Flush tank (which is standard), flushing is via a cam-lock connection to an external water source - see below.

Main Tank Drain

All trailed models have a Main tank drain positioned near the step on the left-hand side **(blue circle).**

Please dispose of any chemical in a safe and environmentally responsible manner.

Tank Selection Valve - XL models

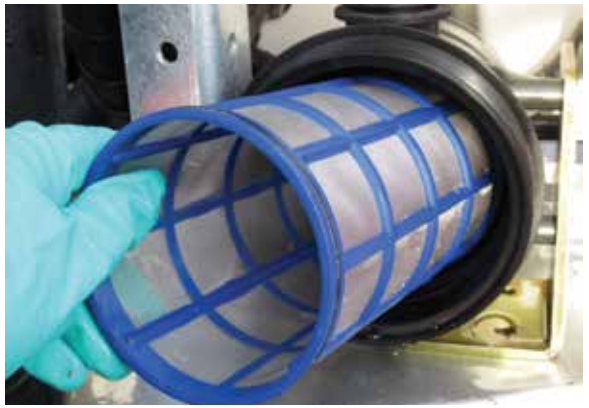
The tank selection valve has 3 x positions.

SPRAY - In this position, the pump will draw liquid from the main chemical/product tank.

FLUSH - In this position the pump will draw freshwater from the auxiliary flush tank.

OFF - In this position, ALL liquid is isolated from the pump. It is only recommended to use this position when the pump is not operating i.e. Cleaning out the suction filter.

Main Suction Filter



From the main filter, the liquid goes to the suctions side of the AR pump. The main suction filter should be checked and cleaned on a regular basis.

Before opening the filter body, ensure the pump is not running and the Tank Selection Valve is in the OFF position.

To be safe, always assume there is chemical present and take the appropriate safety measures.

Always wear gloves.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

Sight Gauges

All XL main tanks are fitted with both a front (RH side) and side (LH Side) sight gauges. Inside of each clear sight hose is a white float that can be read against the tank markings to display the approximate volume remaining in the tank.

Slimline 2000 tank (bottom photo) has the one sight gauge down the left hand side.

Photo 1

Photo 2

PUMP & PRESSURE PLUMBING

On the pressure output side of the AR pump flow goes to ....

Pressure Manifold where the maximum required pressure is set (central red knob), and 4 flick tap valves for ...

- Probe
- Front Agitator
- Rear Agitator
- Basket/Powder Mix
  - Servo Dump & Filter manifold which includes
  - Dump valve (fast-acting – identified by blue band/not visible in photo above)
  - Pressure regulating valve (slow-acting (7 seconds) – identified by a grey band (visible below 2b)
  - Pressure filter

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

And then onto the flow meter and the spray sections valves (2 sections in the example of photo on previous page).

The pressure gauge is mounted either at the front of the Micro Power Pack (see 4b), or on the RH side of the sprayer (see below) if not using a Micro Power Pack.

Photo 3

The section valves feed manual spray ring taps at the rear of the sprayer. Note photo 4 is from a Slimline 2000 Lt model whereby the four section valves (5) are mounted at the rear of the sprayer instead of the front.

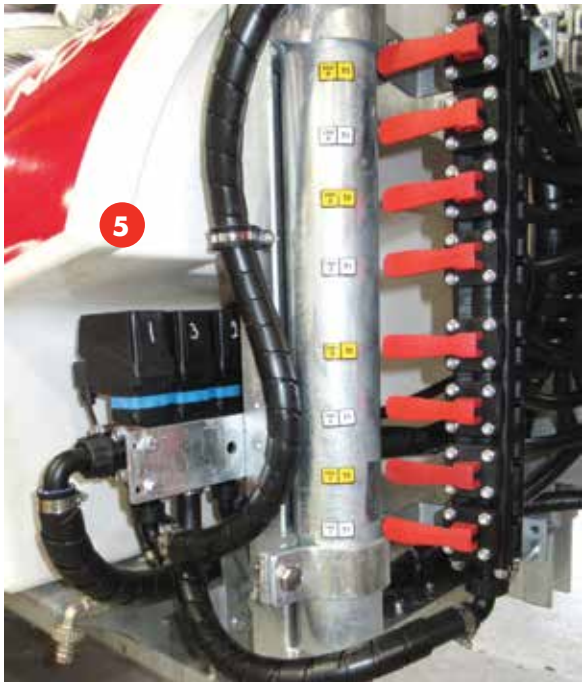


Photo 4

Flow Meter

All Orchard Tower Sprayers fitted with an auto rate controller are also are fitted with a flow meter. As a part of the initial factory testing/calibration, a value (pulses per litre) will have been recorded and written on the body of the meter (shown here in blue) or the back of the serial number tag.

Go to Section 5 for more information on how to operate these functions.

SECTION CONTROLS

All Orchard Tower Sprayers are plumbed into spray sections, dependant on the sprayer model and spray controller (see pages 32-37), and plumbing schematic in Section 10.

- When the sprayer is plumbed as 2 sections,
  1. left (section 1)
  2. right (section 2)
- When plumbed as 4 sections, and the sections mirror the switching of the HV4000 controller.
  - Section 1 is Left 1, bottom left
  - Section 2 is Right 1, bottom right
  - Section 3 is Left 2, top left
  - Section 4 is Right 2, top right

To operate the sprayer the appropriate sections must be turned on, and the required spray ring (s) also turned on.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

TIERED SPRAYING

Dual spray rings make it possible to achieve a greater application rate spectrum, more consistent spray pressures, reduces nozzle changes & helps eliminates off-target spray drift via 3 Tier spraying.

- Tier1/Low rates = Inner rings ON & Outer rings OFF.
- Tier 2/Medium rates = Inner rings OFF & Outer rings ON.
- Tier 3/High rates = Inner & Outer rings ON.

Note; Orchard Tower Sprayers are using the convention of:

- The smaller/inside spray ring uses the smaller nozzles.
- The larger/outer spray ring uses the bigger nozzles.

Note both rings use the same diameter stainless steel tube, it's the circumference of the ring that's smaller or larger.

Operators can change nozzles to suits their requirements – it might be the same nozzle on every spray ring, or it might be a specialist nozzle on either of the spray rings. The choices are never-ending.

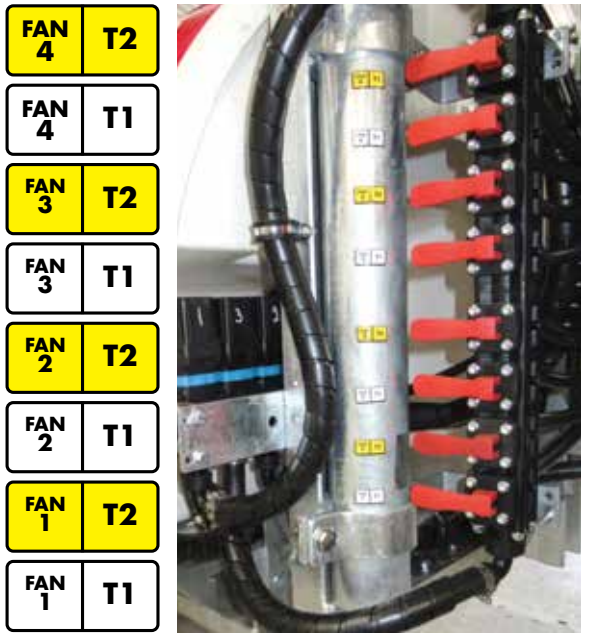
The photo shows inlet (top) and outlet (tap at the bottom) of the outer/larger diameter spray ring. The inner spray ring has similar connections on the opposite side of the cowl.

Each spray ring can also be turned on or off via a manual (red/flick tap) valve located at the rear of the sprayer. Each tap will be labelled T1 or T2.

Photo x shows with all taps in the off position.

CHASSIS ETC

Hot-dipped galvanised full-length heavy-duty chassis with optional axle types, 3-point hitch self-tracking drawbar, slide-out step & jockey stand.



TIER 1	TIER 2	TIER 3
INNER SPRAY RING	OUTER SPRAY RING	BOTH SPRAY RINGS

3-point hitch self-tracking Drawbar

All trailed Orchard Tower Sprayers come fitted with a 3-point hitch self-tracking drawbar using type Cat II & III hitch for the lower arms and Cat II for the top link.

The drawbar connection to the sprayer is supplied at its longest length. If required it can be shortened by 1 hole/110mm spacing.

SECTION 4
PRODUCT FEATURES / FAMILIARISATION

Jockey stand(s)

All trailed Orchard Tower Sprayers come fitted with an extendable Jockey Stand suitable for storage of the sprayer. There will be a total of 3 jockey stands provided – two are used on the 3-point linkage self-steer drawbar and one on the sprayer. All 3 can be seen in photo below.

Step

The step, as pictured is in the stored position. For access to the tank lids/fill Camlock (2000XL model) etc, the step must be moved and secured into the extended position.

Axle, Wheels & Tyres

The Slimline 2000 Lt sprayers are fitted with a single fixed axle as standard.

Walking beam tandem axle is fitted as standard on all XL tank models

For further identification of the axle, wheel, and tyre types see the Sprayer Specification Sheet that's included with every sprayer's Warranty & Pre-Delivery Booklet.

Wheel Speed Sensor

All Orchard Tower sprayers (and optioned with an Auto-rate controller) are fitted with a Speed Sensor – normally via a proximity sensor installed on the right-hand side, rear wheel. The sensor needs to be 5mm from the target, which in this case is the head of the wheel studs in the hub. The sensor is reading cm per pulse.

A GPS speed sensor (Atlas 100) can be fitted as an alternative option.

Pump Speed sensor

When required (hydraulically driven pump), the same sensor is used for the spray pump speed. The sensor is reading 1 pulse per revolution.

Sprayer specifications are subject to change without prior notification.

SECTION 5
PRE-OPERATION

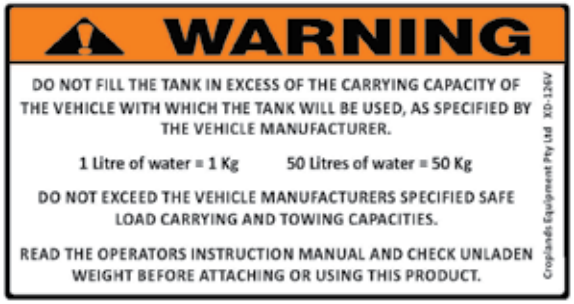
SECTION 5
PRE-OPERATION

From arrival on farm, hook up and prepare the sprayer for operation.

SAFETY FIRST

Before progressing further,

- Read and understand the Safety Manual (part no. GP-SAFE-A) supplied with this sprayer.
- Read and understand this manual to better familiarise yourself with the sprayer.
- Ensure the tractor to be used to tow this sprayer is suitable to handle the loads. If in doubt consult the tractor dealer/manual.



HOOK UP

If not using a Micro Power Pack, ensure the tractor to be used has sufficient hydraulic oil flow at the required pressures (max 2,750 psi) to handle the tasks required. If in doubt consult the tractor dealer/manual.

The Orchard Tower Sprayer has been fully tested before leaving the Croplands factory. Some components will require further assembly after shipping from the factory/dealer;

1. Adjust and fit the 2 or 3 point linkage, self-steer drawbar to the tractor
2. Connect the PTO shaft to the tractor and sprayer
3. Fit the hydraulic hoses to the tractor (if applicable)
4. Fit the controller (if applicable) and all other relevant connections to the tractor

The Orchard Tower Sprayer must be connected to a suitable tractor, making sure the drawbar and PTO shaft are fitted according to the supplied instructions.

Always park the sprayer in a horizontal position and on firm, level ground.

(1) Drawbar Length

All trailed Orchard Tower Sprayers are fitted standard with a self-tracking drawbar. The drawbar is supplied at it's longest length. If required it can be shortened by 1 hole/110mm spacing.

(2) Self-Steering Linkage Drawbars

The 3 point linkage, self-tracking drawbar is supplied in one of several versions ...

- as a part of the Micro Power Pack assembly or
- (if not fitted with Micro Power Pack), with the product pump (see photo below).

SECTION 5
PRE-OPERATION

Follow the instructions below to connect the linkage selftracking drawbar to the tractor:

- Ensure the sprayer chassis is horizontal (it may be up to approximately 3 degrees lower at the front).
- Connect the tractor linkage arms to the self-tracking drawbar linkage pins & fit the locking pin clips.
- (Micro Power Pack) Adjust the top/3rd link arm to ensure the Micro Power Pack's oil tank is sitting vertically in normal operating height.
- Ensure tractor sway bars are adjusted & locked into position.

Once the sprayer is connected to the tractor always ensure the stands are removed or folded to the horizontal before moving.

(3) Fit the PTO Shaft

A new Standard length PTO shaft is supplied with the sprayer. In most cases this will require cutting to a shorter length - specific to the tractor & sprayer dimensions.

Due to the wide variation in tractors, the sprayer is factory tested with a PTO shaft cut to a length that suits the factory tractors and a new/uncut PTO is supplied with the sprayer.

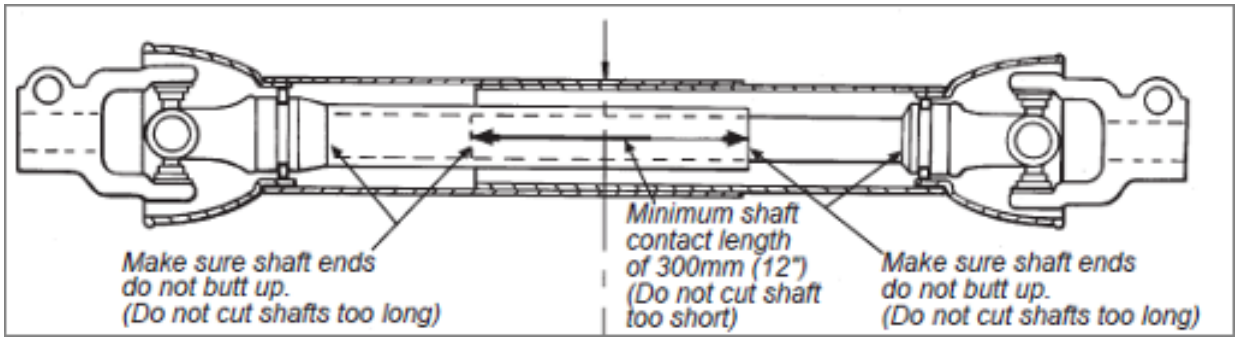
Follow the instructions below to fit the PTO shaft onto the Quantum Mist™ after transit. Note for new installations, the dealer will oversee the fitting of the new shaft. Also, refer to the PTO user manual that is supplied with every new PTO shaft.

- Remove the PTO shaft which is usually delivered strapped to the Quantum Mist™ frame.
- Check the PTO shaft has not been damaged in transit.
- Grease the universal joins, telescoping shafts & safety cover bushes.
- Measure and fit the PTO to the Quantum Mist™ ensuring the locking pin is correctly located.

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.

- Before operating the drive shaft, be sure that all safety guards are in place & safety chains are securely fitted (refer to PTO Manual).
- Do not exceed the maximum RPM of the pump or gearbox (540 RPM).

SECTION 5
PRE-OPERATION



(4) Connect the Hydraulic Hoses to the Tractor

It's important to correctly set-up the hydraulic supply for the tractor. Your dealer can carry out this step to ensure no damage or warranty issues will result from the incorrect set-up. A small charge may be incurred for this procedure.

The number of connections to tractor remotes will vary with the model and options chosen.

- Hydraulics are required to drive the spray fans on all ORCHARD TOWER sprayers, either via tractor remotes or via Micro Power Pack.
- For some models, depending on options chosen, tractor remotes are required to operate the hydraulically driven spray pump.

Note all Croplands sprayers use banded, colour coded hydraulic hoses. The pressure line is always 2 bands and the return line is identified by a single band.

Oil supply (and return) to fans is identified as **YELLOW.**

Oil supply to the product pump is always **WHITE** (as per photo below).

For models without a Micro Power Pack, oil supply to the fans (via the control block) requires a pressure line connection (normally ½") to tractor remote, and a (normally ¾") return, **DIRECT BACK-TO-TANK.**

- Decide on the best supply remote on your tractor to use for oil supply for the fan system. It's recommended to use a detentable rear remote with flow control.
- Plug the ½" oil supply line coupling to your selected remote and ensure the hydraulic line does not foul your PTO or any working parts at the rear of the tractor. Allow sufficient slack in the hydraulic line for turning
- Hook up the ¾" return line to the tractor (direct back to tank). As with the pressure line, ensure there is sufficient slack & no interference with tractor working parts. NEVER connect the return line to the conventional return port

NOTE; Supplied with each unit (when required) is a ¾" fitting for the tractor's return to tank port, as shown and circled in orange. This is to ensure there is no back-pressure on the oil return from the Quantum Mist™ sprayer. Ask your dealer to fit the ¾" female return coupler direct back-to-tank.

SECTION 5
PRE-OPERATION

NEVER connect the (fan) return line to the conventional return port, MUST always be connected to the "direct back to tank" port. **ALWAYS double-check that the return line is properly connected before engaging hydraulics.** Failure to comply with this instruction can lead to catastrophic hydraulic failure.

For models using a hydraulically driven spray pump, (and not using a dual pump Micro Power Pack), connect the ½" pressure and return line hoses to the same set of tractor remote couplings.

Best practice is to set the pump rpm manifold to maximum (circled in blue) and adjust the tractor oil flow to give the pump speed required.

Pump speed is displayed on the HV4000 Controller (if speed sensor is fitted). DO NOT exceed 540 rpm.

SECTION 5
PRE-OPERATION

HOOK-UP HV4000 AUTO RATE CONTROLLER

If ordered. Install/connect the HV4000 auto rate controller on a ORCHARD TOWER sprayer.

The controller has been fitted and adjusted at the factory but has been disconnected and packed for transit, along with the required power/connection looms and RAM mount.

Connect the main loom. Find a suitable position external of the cab for the 24 pin plug connection. It's recommended that the connection be orientated as per photo, with the cable entry on the bottom side (to help prevent water ingress).

Normally this connection is positioned behind and external of the cab/somewhere near the hydraulic remotes. Route the loom into the cab and find the best position for the controller with the remaining length of the the harness.

Fit the controller/console into the tractor cab in a convenient & safe location for the operator.

Ensure the wiring cannot interfere with the PTO shaft or any tractor functions

The connection loom features ....

A. Connection to the HV4000 controller

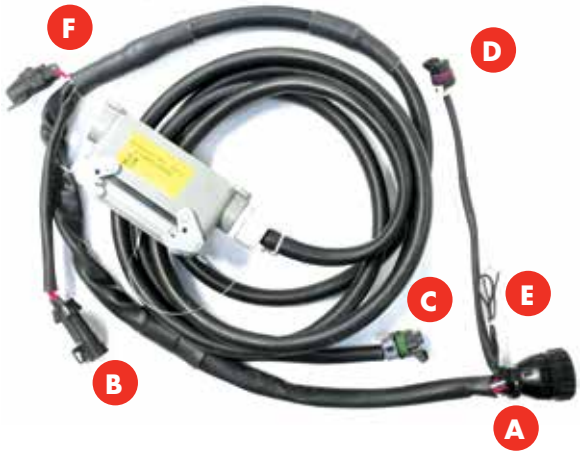
B. Power connection

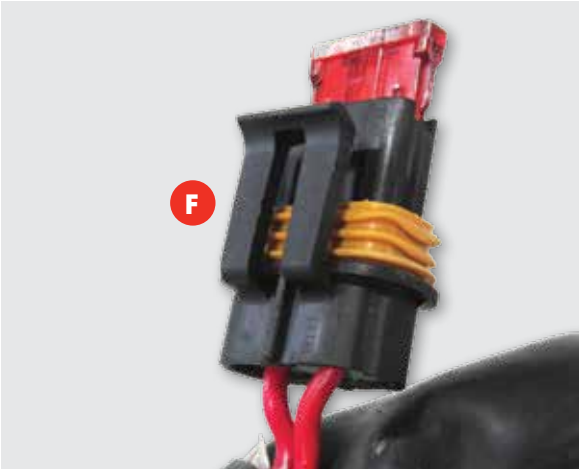
C. Micro Power pack or spray pump speed – using in conjunction with another connection loom

D. Speed - GPS (or can be any speed via pulse).

E. Earthing lead – not generally used

F. Fuse, 10 amps





SECTION 5
PRE-OPERATION

Photo 1

A. Connection to the HV4000 console via Con port 2. Refer to photo 1. Be careful to correctly align the pins before tightening.

photo 2

B. Power connection requires a connection to the power loom (supplied). Refer to photo 2.

It's highly recommended the power loom(s) are hard-wired at the battery rather than hooking up to cab connections. Only qualified persons should assemble/disassemble or service electrical components. The fuse is 10 amps.

C. The "green" 5 pin connector is used when the sprayer is fitted with a Micro Power Pack or spray pump speed and requires an extra loom (HV40LOOM/2A). Connect to CON 1and CON 2 as shown in photo 3.

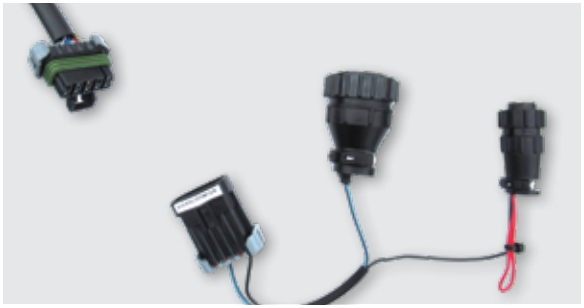
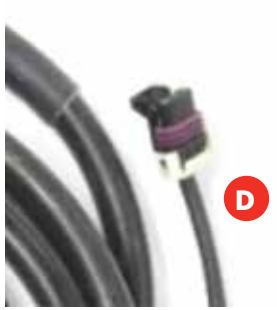


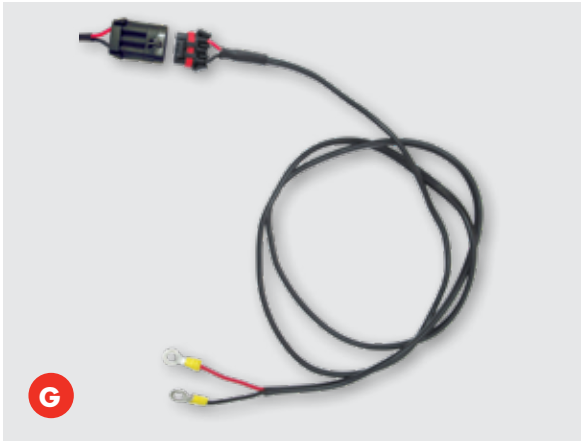
photo 3

D. The "purple" 3 pin connector is used when GPS speed or an extra speed-related connection (pump speed etc) is required.



Supplied with each HV4000 is a "RAM" Mount. This will normally be fitted by the tractor dealer as a part of the installation process.

G. In addition to the main loom, is a power lead for the oil cooler fan. Usually, this is connected to a power source in the cab.



SECTION 5
PRE-OPERATION

HOOK-UP WINDCOMP

Most ORCHARD TOWER sprayers equipped with the WindComp feature will also use the above HV4000 auto rate controller PLUS in addition the OPUS A3 controller (ref photo 3), for control of all fan speed functions. Note the fan speed function on the HV4000 is not activated.

photo 3

Photo 4 shows the rear of the A3 controller, with loom connected and hardware suitable for RAM mounting.

photo 4

Ensure the wiring cannot interfere with the PTO shaft or any tractor functions

From the sprayer the primary connections are for the main connector (for HV4000), power for the oil cooler fan, and Deutz connector for the A3 controller.

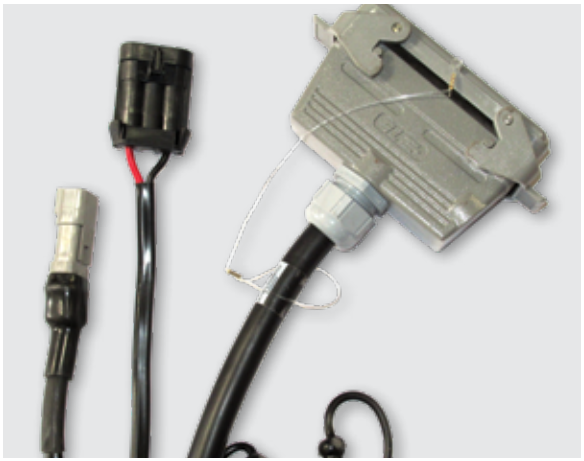


photo 5

Photo 5 shows these 3 connections for a single row sprayer – note a multiple row sprayer with multiple boom functions plus power pack will have many more connections.

The main connecting loom between controller and sprayer has the following connections ...

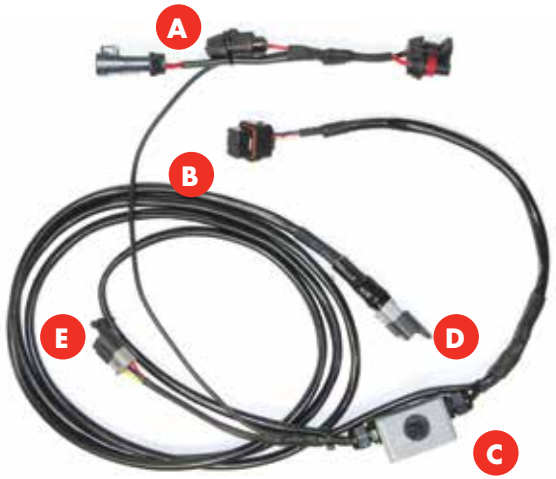
a) Power connecting. When using the HV4000 controller this section plugs (T's) into the HV4000/Power loom.

b) Main connector to the A3 controller.

c) Switch on/off.

d) Connection to sprayer side loom.

e) This connector is used in the factory to load or update software.



SECTION 5
PRE-OPERATION

HOOK-UP BRAVO 180

Connecting the Bravo 180 is similar to the HV4000 at the sprayer end – with different connections at the cab and controller.

It's highly recommended the power loom(s) are hard-wired at the battery rather than hooking up to cab connections. Only qualified persons should assemble/disassemble or service electrical components. The fuse is 10 amps.

Ensure the wiring cannot interfere with the PTO shaft or any tractor functions.

HOOK-UP MICRO POWER PACK

If fitted, the Micro Power pack will already be connected to the sprayer side. Connection to HV4000 is described on pages 32 & 33.

When operating a HV4000 system - a low oil level in the pot will trigger the fans to stop and an oil level alert will show on the controller screen.

When operating a Bravo 180 system - a low oil level in the pot will trigger the fans to stop and low fan speed alarm will show on the controller screen.

When operating the sprayer without either the HV4000 or the Bravo 180 – a standalone on/off/alert loom and control box (CHLOOM-MICROCAB) are used.

SECTION 5
PRE-OPERATION

CONFIRMING BOOM FUNCTIONALITY

With the hook up completed, the functions need to be tested before using the sprayer with chemicals.

Add some freshwater to all the tanks. Also, note the checklist at the end of this chapter on page 40.

Power up the tractor and engage the hydraulic system (via tractor remotes or PTO driven Micro Power Pack) - no need for full power at this stage – if using the PTO, set to 350rpm.

The below descriptions reference 2 set-ups.

- MANUAL controls/simplest functionality.
- CONTROLLER, Auto rate controller (HV4000) and / or WindComp.

FANS

The fan system features a built-in 5 ~ 7 second "soft start/ soft stop" system to protect the fans against excessive loads on start-up. The maximum allowed speed is 3,000 rpm although most Orchard Tower models will have maximum speed of slightly over 2,800 rpm.

MANUAL; For the initial start-up use low tractor rpm (for tractor supplied hydraulics) or low PTO speed (for Micro Power Pack) and gradually increase speed as required. Use the tractor remotes to activate the fan hydraulic circuit.

Adjust the fan speed via the manual speed control valve (ref photo X), normally situated on the back face of the hydraulic soft start block.

From the factory, this valve will have been set at 2,500 rpm. Turn out for lower rpm and in for higher speeds.

Check for full range of functionality and set for the intended use. Once rpm is set, engage the locking nut.

CONTROLLER – HV4000; The fans will not operate until the HV4000 controller is turned on and the fan speed function is activated. See page 47 of the HV4000 manual .... Continue to press the DISPLAY button until Fan speed shows. Use the arrow keys to adjust the fan speed.

For the initial start-up use low tractor rpm (for tractor supplied hydraulics) or low PTO speed (for Micro Power Pack) and gradually increase speed as required. Engage the tractor remotes (or PTO) to activate the fan hydraulic circuit.

Adjust the fan speed via the HV4000 controller. Check for a full range of functionality.

CONTROLLER – BRAVO 180; The fans will not operate until the BRAVO 180 controller is turned on and the fan speed function is activated.

See supplied (with the controller) information sheet.

For the initial start-up use low tractor rpm (for tractor supplied hydraulics) or low PTO speed (for Micro Power Pack) and gradually increase speed as required. Engage the tractor remotes (or PTO) to activate the fan hydraulic circuit.

Adjust the fan speed via the BRAVO180 controller. Check for a full range of functionality.

SECTION 5
PRE-OPERATION

CONTROLLER – WindComp; The WindComp fan speed system operates independently of all other (rate) controllers. There is a power on/off switch for the system located on the wiring loom near the controller.

For the initial start-up use low tractor rpm (for tractor supplied hydraulics) or low PTO speed (for Micro Power Pack) and gradually increase speed as required. Engage the tractor remotes (or PTO) to activate the fan hydraulic circuit.

Adjust the fan speed via the A3 WindComp controller. Check for a full range of functionality.

Activating/Deactivating Fans: Press the button next to <Fan On/Off> to turn the fans On/Off. A red light next to <Fan On/Off> will be lit when the fans are activated.

Setting Fan Speed with no WindComp: When <Wind Comp %> is set to 0 (as shown above) adjusting <Fan Speed %> will adjust the fan speed for both the LH & RH facing fans and they will adjust evenly.

Turn the rotary dial until the yellow box is above <Fan Speed %>. Press the rotary dial in and the box will turn green.

When the box is green the rotary dial can be turned to set a number between 0 & 100 with 100 being full fan speed.

It's best to adjust this number while the fans are activated as you will see the fan speeds change while turning the dial. Once the required fan speed is displayed, press the rotary dial in to set the speed. The box will turn yellow again.

Selecting WindComp Direction: On the screen, there will be an arrow pointing to <Left Wind> or <Right Wind> even if no WindComp is activated.

The wind comp direction can be changed by pressing the button next to the direction without the arrow. The direction with the arrow indicates which facing fans are going into the wind and will have the higher fan rpm if wind comp is activated.

Setting Wind Comp: Turn the rotary dial until the yellow box is above <Wind Comp %>.

Press the rotary dial in and the box will turn green. When the box is green the rotary dial can be turned to set a number between 0 & 100 with 100 being the largest difference is fan speed between the LH & RH facing fans. It's best to adjust this number while the fans are activated as you will see the fan speeds change while turning the dial.

Once the required fan speeds have been achieved, press the rotary dial in to set. The box will turn back to yellow. When <Fan Speed %> is set to 100 the wind comp will only decrease the fan speed for the side going with the wind. When <Fan Speed %> is set lower than100 you will get an increase in fan speed to the side going into the wind and a decrease in fan speed to the side going with the wind.

Note: The fan speed will never increase more than 100%

SECTION 5
PRE-OPERATION

SET-UP SPRAY PRESSURE

Croplands recommends to set the maximum system pressure to be 10% above the chosen spray pressure which is normally an extra 0.5 - 0.8 bar.

If fitted with rate controller, the auto rate controller will make automatic pressure adjustments to control rate.

The pressure is set via the **central red knob** of the manual Pressure Regulator Valve (see photo 1).

The regulator will need to be adjusted from time to time as spray rates will vary throughout the year.

WARNING; To set and forget at a high pressure will put undue stress/wear and tear on the system. Maximum recommended pressure is 12 bar but 5 ~ 8 bar is the normal recommendation.

Photo 1

To set for the first time:

- Ensure that the nozzles fitted on the sprayer are applicable to your desired rate & recommended operating pressure.
- Wind the pressure control knob anticlockwise to ensure the sprayer starts up with limited pressure
- Ensure the tank valve is in the SPRAY position
- Start the tractor & ensure the electric control box or auto rate controller (if fitted) is turned ON.
- Start the pump by engaging the Tractor remote (Micro Power Pack version) or PTO. Set to operate at your required rpm, usually between 430 and 540 rpm
- Engage both Front and Rear Agitators
- Note: The fans do not have to be engaged during this process
- Activate spraying via the fitted (be it manual or auto rate) controller, with the required spray rates and with all relevant sections/fan Tier taps open. Wait 10 seconds for the system to settle, then ....
- Slowly wind the pressure control knob clockwise until your chosen operating pressure is reached, and add a further 10% surplus pressure.
- Example - If the application rate is 500 L/ha and with your row width/nozzles & spraying speed the rate is achieved at 7 bar, you would set the maximum system pressure to 7.7 bar

Once done, leave the manifold setting "as is" until a change of operating pressure is required.

SET-UP THE FAN POSITIONS

It is recommended that the setting up of the Quantum Mist ORCHARD TOWER Sprayer fan positioning should be done in conjunction with a qualified specialist. (Croplands dealer, Croplands Representative, Agronomist or Spray manager).

The optimum set-up will vary significantly from orchard to orchard & stage of canopy growth.

Row Width Adjustment

For ease of use, it's suggested to take all measurements from the centre line of the fan frame.

1. Fan frames are mounted to the sprayer's tower via a pair of "standoff" brackets. Adjust (rotate) the brackets in and out to set the required width between the left and right fan frames or required width from the canopy.
2. Reset the fan frame orientation to be in line with the direction of travel or another designated angle.

The positioning of the fan frames can impact fan performance ...

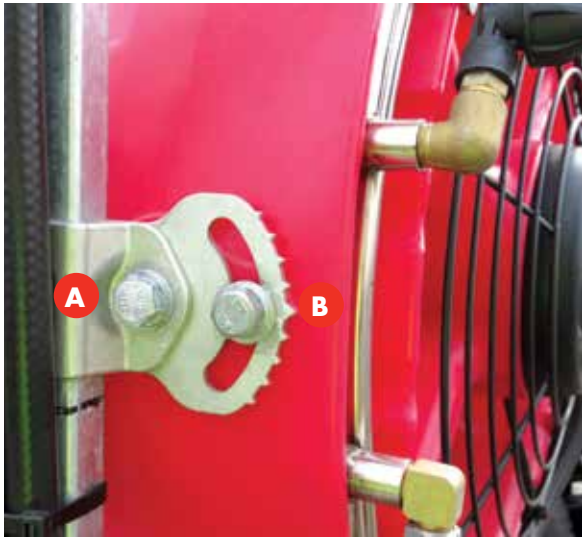
- 900mm between fan frames is considered the ideal starting point as it's well protected behind the sprayer, wide enough to have excellent fan "air" and generally an ideal distance to the canopy.
- Less than 800mm between fan frames may see some loss of overall fan effectiveness.
- Fans too close to the canopy may leave gaps in the coverage (depending on fan spacing).

3. Position the fans within the frames ...

SET-UP THE SPRAY FANS

The following fan positioning adjustments are available in order to maximise spray efficacy.

- Moving fans up and down within the frame to best position spray in relation to the canopy. Adjustment via loosening the fan clamps at position A.
- Angling fans up (common with bottom fans) straight ahead or down (common with top fans).Adjustment via loosening the fan clamps at position B.
- Rotating the fan frame to point the fans forwards (direction of travel) or to point backwards. This adjustment is made at the "standoff" see p.82 (item 15).
- The fan (fan frame) distance from the canopy is adjustable via the "standoff" positioning.



Fan Clamp - Reversed

Fan Clamp

Note the stainless-steel fan mounting clamps have "teeth" set at every 10 degrees, and the gap between is 5 degrees. Total movement of 45 degrees up and down, either side of centre (larger "tooth").

Both M12 bolts on both sides need to be loosened to enable adjustment of the fan position or angle. The cowling inserts are brass.

The "normal" fan position is with a minor portion of the fan sitting forward of the frame (hence better protected), as shown in the middle fan.

However,, the fan frame clamps can be installed "backwards" which will offset the fan 130mm closer to the canopy. This is an option for top and/or bottom fans (as shown next column with a 3 fan setup for vineyards) - the top and bottom fans are using reversed clamps, which are usually angled downwards or upwards.

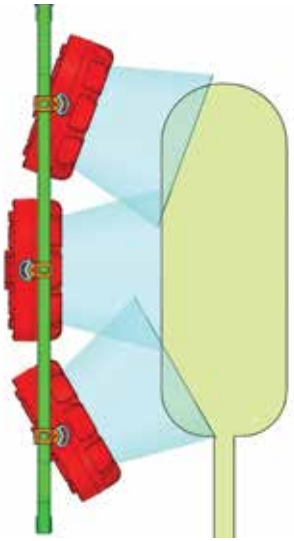
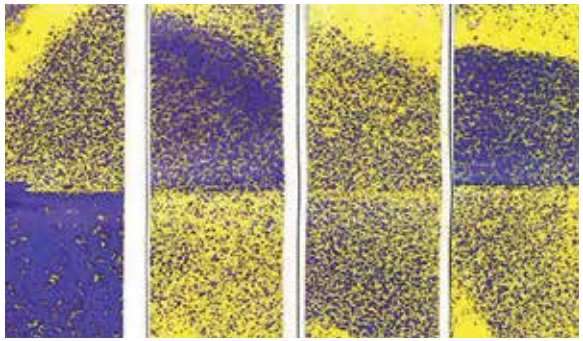


Photo 1

The chosen set-up will vary depending upon local conditions and spray requirements.

Water sensitive papers are a great way to check spray efficacy and are available from Croplands.

A repeatable recipe for spraying can be built by combining the fan frame and fan position settings with the spray data.



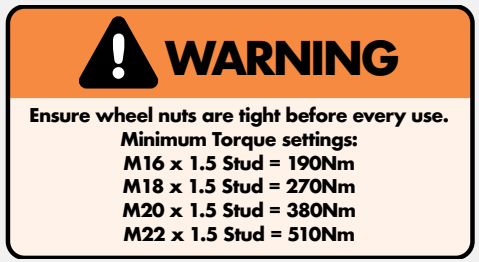
SECTION 5
PRE-OPERATION

PRE-OPERATION CHECKLIST

Before operating the sprayer, please check the following items.

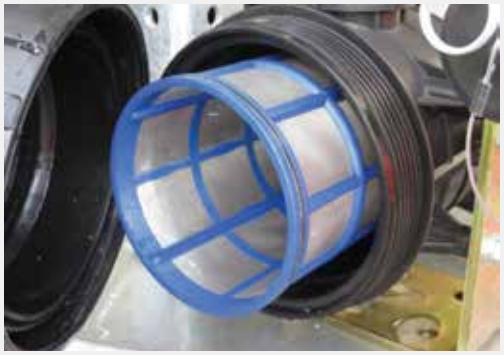
- ☐ All chemical & safety guides have been read, understood and acted upon.
- ☐ Operator is familiar with all control functions.
- ☐ Secure sprayer connected to the tractor – jockey wheels stowed away.
- ☐ Wheel nuts (M18) checked for correct torque.

- ☐ Check tyre pressures are even from side to side. All tyres will have maximum rating listed on the tyre sidewall. From the factory, sprayers are delivered with 40 ~ 50 psi in each wheel (will vary from model to model).

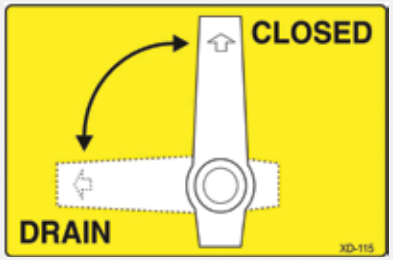


- ☐ PTO connected, and safety guards correctly installed.
- ☐ Spray controller correctly connected and operational.
- ☐ Confirm the correct oil level in the Micro Power Pack (or tractor if no MPP).

- ☐ Check pump(s) oil levels.
- ☐ Confirm the spray pump operation.
- ☐ Manual pressure regulator is set.
- ☐ Check for wear and tear on all chemical and hydraulic hoses and wiring looms.
- ☐ Ensure fill, suction and pressure filters are clean. Be safety aware as some spillage is likely.



- ☐ Check that nothing is loose or damaged.
- ☐ Check the alignment of all booms & fans.
- ☐ Check that all tanks and spray lines are clean and empty, and the drain taps are closed.



SECTION 6
SPRAY OPERATIONS

SECTION 6
SPRAY OPERATIONS

The pre-operation and familiarisation tasks must be completed before commencing spray-operations.

Also, refer to the familiarisation section, pages 12-26.

SAFETY FIRST

Before progressing further,

- Read and understand the Safety Manual (part no. GP-SAFE-A) supplied with this sprayer.
- Read and understand this manual to better understand the sprayer.

FILTERS

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

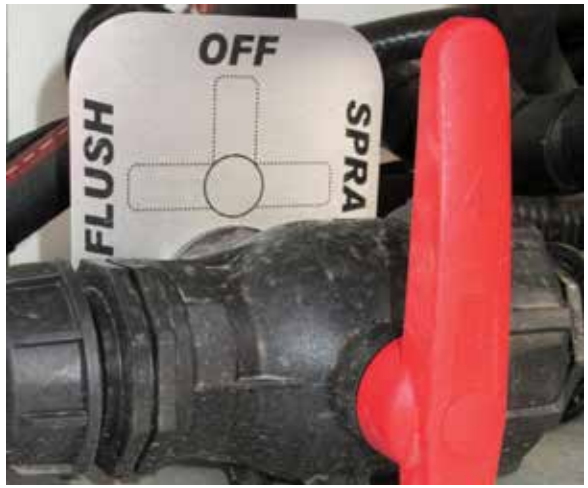
- Always ensure the basket filter is in place when filling the main tank.
- All filters should be cleaned regularly, or after each spraying period. Wear protective clothing.
- If the filter screen is damaged, replace it with a new screen.

Cleaning the suction filter

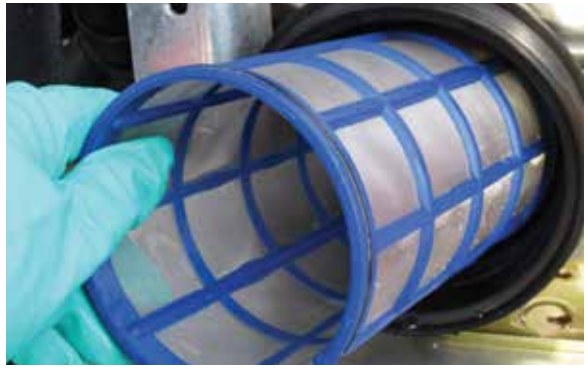
The suction filter should be cleaned regularly or after each spray tank has been emptied.

To clean the filter:

- **Always wear gloves**
- Completely stop all sprayer functions.



- Place the Tank Selection Valve in the closed position to shut OFF liquid from the main tank.
- Some spillage is likely, therefore perform this operation in an appropriate place, and with safety clothing.
- 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.
- Remember to turn the ball valve back to SPRAY or FLUSH when finished.

Cleaning the Pressure Filter

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

To clean the pressure line filter:

- **Always wear gloves**
- Completely stop all sprayer functions.
- Some spillage is possible, therefore perform this operation in an appropriate place, and with safety clothing.
- Open the valve at the bottom of the filter to ensure all pressure is removed from the filter.
- Remove the outer filter bowl, and then remove the filter and thoroughly clean it before re-assembly.
- Make sure the valve, at the bottom of the filter, is closed before continuing.

SECTION 6
SPRAY OPERATIONS

FILLING THE SPRAYER

Use freshwater (preferably rainwater), free of suspended organic matter or clay as some chemicals are de-activated when they contact these materials. Ensure sufficient water quantity to allow correct product blending.

Main Tank

When filling the main tank (freshwater only), open the spray tank lid and fill the tank with the basket filter in place. Clean the basket and replace the lid after filling.

Or ...

Fill via the separate Camlock fill (freshwater or chemical premix). Connect to the water source before opening the ball valve. Shown here in the off position.

Flushing Tank

Use FRESHWATER ONLY (preferably rainwater) in the flushing tank. Unscrew the lid and fill before spraying.

Replace the lid after filling. 2000L model shown.

Hand-wash Tank

Fill the hand-wash tank with FRESHWATER ONLY from a source remote to any chemical source. Replace the lid after filling.

Always maintain the correct caution label at the fill point.

For more information on the tank positions across the range see Section 4, page 21.

SECTION 6
SPRAY OPERATIONS

SETTING SPRAYER PRESSURE

The regulator will need to be adjusted from time to time – early season with low spray application rates versus peak season with higher spray rates will require this regulator to be adjusted (see Set-up on page 41).

WARNING; To set and forget at a high pressure will put undue stress/wear and tear on the system. Maximum recommended pressure is 12 bar but 5 ~ 8 bar is the normal recommendation.

AGITATION

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

- Start the tractor.
- Start the pump by engaging the Tractor remote (Micro Power Pack version) or PTO. Set to operate at your required rpm, usually between 450 and 540 rpm
- Flick taps need to be in the UP position. Shown here are both in the off position.
- Check to see that tank agitators are working via the tank lid .... To do this use the step provided (2000L model) or use a suitable platform to access the lid. Refer to page 31.
- If agitation causes too much foaming in the tank, turn off the front agitator, or introduce an anti-foaming additive.
- If chemical settles, due to a 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.

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.

SECTION 6
SPRAY OPERATIONS

To operate the mixing basket:

- Fill the main tank with the appropriate amount of water
- **Always wear gloves**
- Measure the chemical required for the tank mix and place the chemical (liquid, powder or granules) into the mixing basket & close the mixer lid. This process is best done in several smaller batches of chemical.
- Check the Tank Selection valve (located at the front of the sprayer) is open to SPRAY.
- Start the Tractor
- Make sure the electric or auto rate controller is NOT in Spray mode
- Start the pump by engaging the Tractor remote (Micro Power Pack version) or PTO. Set to operate at your required rpm, usually between 450 and 540 rpm
- Open (flick UP) both AGITATOR valves.
- Open (flick up) the mixing basket valve **(make sure the lid is closed)**
- Allow sufficient time for the chemical to mix into the tank. The actual time will vary depending upon the product used
- **Close the mixing basket valve** before next opening the lid.

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.

SECTION 6
SPRAY OPERATIONS

CHEMICAL PROBE

An alternative to the mixing basket (which is best used for powders and granules) is the chemical suction probe. Designed to suck liquid chemical, via a venturi system, straight from a drum or chemical containers and into the main tank.

- **Always wear gloves**
- Connect the probe to the sprayer as pictured making sure the ball valve (as circled) is in the off position
- Prepare the chemical source. **Be especially vigilant of chemical safety.**
- Start the Tractor
- Make sure the controller is NOT in Spray mode.
- Start the pump by engaging the Tractor remote (Micro Power Pack version) or PTO. Set to operate at your required rpm, usually between 450 and 540 rpm. Higher rpm will give better suction.
- Open (flick UP) the PROBE valve
- Place / hold the probe's tube into the chemical source (usually a drum of chemical).
- To suck chemical from the drum to tank, turn on the probe connection ball valve (circled in **yellow**, shown in the off position). Use the ball valve to control the suction. Turn to off when finished.
- Flush with / suck from a clean water source when finished.

Note the Slimline 2000 model's probe is permanently plumbed to the system and housed below the red "bonnet". It uses an ON/OFF tap at the probe "handle".

SECTION 6
SPRAY OPERATIONS

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.

For **CHEMICAL required** expressed in litres or kg per hectare (land area), use the following formula:

Chemicals required (Litres) =

Tank Volume (L) x Recommended Chemical Rate (L/ha)

Spray Application Rate (L/ha)

eg. $\frac{1500 \times 5 \div 400}{= 18.75 \text{ litres}}$

For **tank VOLUME OF MIXTURE required** to spray the selected area,use the following formula:

Tank Volume Required (Litres) =

Area (ha) x Spray Application Rate (L/ha)

eg. $\frac{18.75 \times 400}{= 1500 \text{ litres}}$

For **AREA COVERED (ha),**

= Tank Volume (litres) + Spray Application Rate (l/ha)

eg. $\frac{1500 \div 400}{= 3.75 \text{ litres}}$

For **CHEMICAL RATES** expressed in Litres or kg per 100 litres of water (water volume), use the following formula:

Chemicals Required (Litres) =

Tank Volume (Litres) x Recommended Chemical Rate (L/100 litres)

100

eg. $\frac{1500 \times 3 \div 100}{= 45 \text{ litres}}$

NOTE

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

PROCEED TO SPRAY

Once the pre-operation checklist on page x been completed, and chemical mixture is in the tank, proceed to spray:

- Anyone operating this sprayer must be conversant with the Croplands Safety manual.

WARNING

SAFETY INSTRUCTIONS

1. **Read your operators manual thoroughly before operating the srayer.**
2. **Inspect hoses, connections and nozzles daily.**
3. **Clean filters regularly.**
4. **Always follow correct maintenance schedules outlined in operator's manuals.**
5. **Always read chemical manufacturers labels before use.**
6. **Always observe all warnings on chemical products.**
7. **Regularly check all nuts and bolts are tight.**
8. **Always wear rubber gloves and wash sprayer down before doing any repair or maintenance work.**
9. **Do not ride on sprayer when moving.**
10. **Keep clear of moving parts when sprayer is operating.**
11. **Always keep guards in place when sprayer is operating.**
12. **Be sure tank lid is closed before operating basket mixing facility.**
13. **Stand well clear of sprayer when operating.**
14. **Do not disconnect hoses, nozzles or filters while sprayer is operating.**

Croplands Equipment Pty Ltd XD-123MS

FAILURE TO FOLLOW THE ABOVE INSTRUCTIONS MAY RESULT IN SERIOUS INJURY OR DEATH.

- Spray operations should be done in conjunction with an agronomist/spray manager/someone skilled in the art of spraying and operating machinery.

SECTION 6
SPRAY OPERATIONS

The spray manager will have predetermined the job requirements, such as the following example ....

- The block to be sprayed, and hence row width and any special instruction on boom/fan setup
- Operating speed (often around 6 ~ 8 Kph)
- Application rate (for example 500 L/Hectare)
- The nozzles to be used/which spray rings/Tier
- Spray pressures to be used (often around 6 ~ 9 bar)
- PTO and Spray pump rpm (often between 450 & 540)

Most of these parameters should be loaded into the Auto Rate Controller (if fitted) whilst back at base/filling the sprayer.

Operating Pointers

- Always drive to the conditions taking into account the load, the terrain and the weather.

- In mixed terrain, spray the flat ground before spraying the hills.
- Before engaging any hydraulics for the first time, double check that the pressure return lines are properly connected.
- When preparing to spray in a row for the first time, stop – open the boom and check that all row widths and alignments are correct. Check that all tank lids are closed and the Tank Selection Valve is in the SPRAY position. Double-check the electric controls or auto rate controller settings (if fitted) – now ready to spray.

While spraying, continually ensure that:

- Engine and PTO speed are correct
- Recommended operating pressure is being maintained
- Ground speed is suitable, safe and constant
- Quantum Mist™ spray fans are operating correctly and aimed toward the target foliage.

FLUSHING

Quantum Mist™ sprayers are equipped with a flushing tank for cleaning the sprayer when changing chemicals and for flushing down at the end of the day.

To flush the Quantum Mist™:

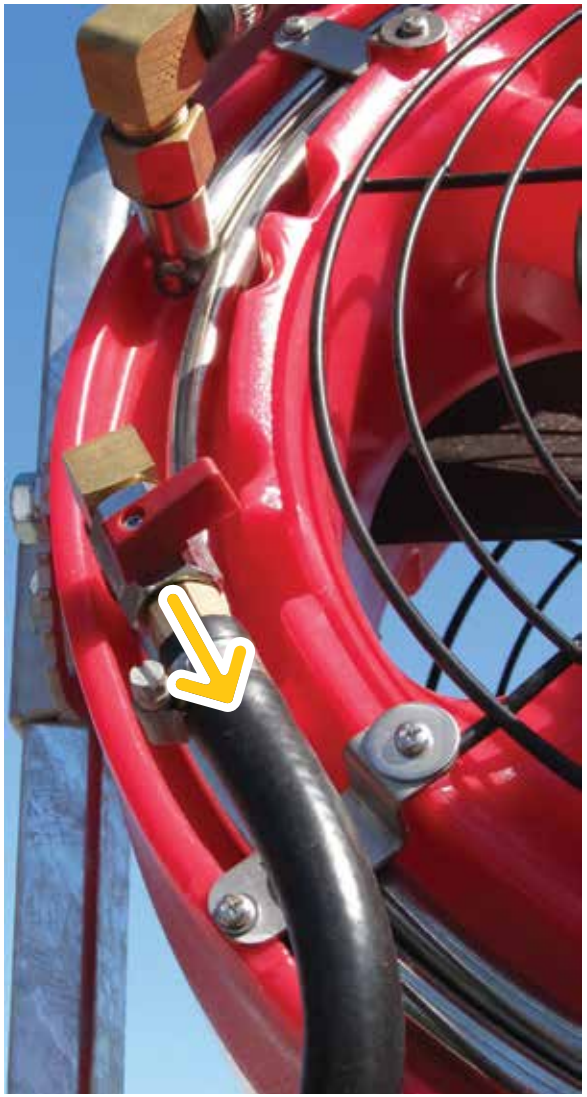
1. Ensure the site for flushing and cleaning the sprayer meets with environmental and statutory regulations

2. Open the tank Drain Valve and drain the remaining spray mixture from the tank
3. Open the Tank Selection Valve to the FLUSH position, as shown
   - Be aware that the flushing tanks may need to be refilled during the process

4. Open the mixing basket valve
5. Open the agitator valves
6. Start the Tractor

SECTION 6
SPRAY OPERATIONS

7. Make sure the controller is NOT in Spray mode. Confirm that TIER 3 is selected to enable both spray rings to be flushed.
8. Start the pump by engaging the Tractor remote (Micro Power Pack version) or PTO. Set to operate at your required rpm, usually between 450 and 540 rpm.
9. 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
10. Activate the controller SPRAY mode. This will pressurise the system and operate the tank agitators & basket rinse. If auto-rate controller, ensure system is in manual mode, then activate to SPRAY mode.
11. Adjust to normal operating pressures.
12. Turn ON all spray sections.
    a. Make sure the area around the fans is clear of bystanders.
    b. Make sure the fans are downwind of the operator.
    c. Check that all spray ring taps were activated.
13. After sufficient flushing, turn OFF the spray sections.
14. Turn on the fan Spray ring flushing taps (photo shows the closed position).
15. Turn ON all spray sections to flush the remainder of the spray ring.
16. After sufficient flushing turn OFF all spray sections. Turn off spray ring drain taps.
17. Some water will have flowed back to the main tank due to the flushing actions and drained out of the tank through the drain outlet.
18. On completion of flushing, shut down all controls and disengage the PTO/ hydraulic drive.



Turn on spray ring flushing taps

19. Check and clean all filter screens as required.
20. Adjust all valves back to operating (non-flushing) mode,
    a. Close mixing basket valve
    b. Close tank drain valve
    c. Open Tank Selection Valve to the main SPRAY tank
    d. Open the agitator valves
21. Wash/hose down the outside of the sprayer.

SECTION 6
SPRAY OPERATIONS

TANK AND EQUIPMENT CLEANING

If a cleaning agent is required (refer to the chemical label), as is often recommended when changing from one chemical group to another or as an end of season clean before storage.

Nufarm's Tank and Equipment Cleaner is a suitable cleaning agent. Note this product is available from ratified Croplands Dealers under part code L-H9704.

Below is a guide procedure, but if in doubt, follow the instructions provided with the cleaner.

1. First, completely flush the sprayer with water as outlined in the previous FLUSHING section. Then ...
2. Fill the spray tank with freshwater
3. Add cleaning agent into the mixer basket (use according to instructions)
4. Open the Tank Selection Valve to the SPRAY tank

5. Open mixing basket valve
6. Open the agitator valves
7. Start the Tractor
8. Make sure the controller / electric controls or auto rate controller is NOT in Spray mode. Ensure TIER 3 is selected to enable both spray rings to be flushed
9. Start the pump by engaging the Tractor remote (Micro Power Pack version) or PTO. Set to operate at your required rpm, usually between 450 and 540 rpm
10. Activate the controller SPRAY mode. This will pressurise the system and operate the tank agitators & basket rinse
11. Adjust to normal operating pressures.
12. Turn ON all spray sections.
    a. Make sure the area around the fans is clear of bystanders
    b. Make sure the fans are downwind of the operator
    c. Check that all spray ring taps were activated
13. After sufficient flushing, turn OFF the spray sections
14. 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 the desired period
15. When soaking is completed, start the machine following steps to flush the tank and spray lines
16. On completion of flushing, shut down all controls and disengage the PTO/ hydraulic drive
17. Open spray tank drain valve and allow cleaning mixture to drain from the tank

18. Delay the final flushing of the sprayer (again) with freshwater as outlined in the previous FLUSHING section, until just before the sprayer is next used – that might be in 1 hour or 6 months away if the sprayer is going into storage for the offseason.

SECTION 6
SPRAY OPERATIONS

Unhitching the Sprayer from the Tractor

Position the sprayer on level ground and chock the wheels so that sprayer does not roll when the sprayer (linkage arms) are disconnected.

Disconnect PTO shaft, hydraulic hoses, and electric controller looms (if applicable) from the tractor.

Attach and adjust all Jockey stands before removing the drawbar pin/detaching linkage arms.

Ensure all caps for the electrical (looms) and hydraulic hose fittings are utilised to help prevent water, dust & dirt ingress.

SECTION 7
SPRAYING INFORMATION

SECTION 7
SPRAYING INFORMATION

Spraying should be done in conjunction with an agronomist/spray manager/someone skilled in the art of spraying. The best setup might vary significantly from crop to crop, season to season, etc.

SPRAYWISE

It's highly recommended that all operators of this sprayer and spray program managers should be fully conversant with the information supplied in the **Nufarm SprayWise Horticultural Application Handbook** (refer photo) before undertaking spray operations.

The book includes chapters discussing;

- Droplet Size
- Nozzle Types
- Dilute Spraying
- Concentrate Spraying
- Coverage & Assessment
- Selecting Nozzles
- Drift
- Weather
- Adjuvants
- Formulations & Mixing Order
- Cleaning
- Calibration
- Record Keeping
- And more

This book is supplied with every ORCHARD TOWER Sprayer, and is available from Croplands dealers, under the part number: SPRAYWISEHK.

CALIBRATION

Applying the correct amount of chemical to a crop is only possible **if the sprayer is calibrated, operated, and 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.

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 chemicals correctly.

Fully Automatic Spray Controller (HV4000/ Bravo 180)

Automatic spray controllers maintain the application rate (as set by the operator) when operated in the Auto position.

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

IMPORTANT:

- 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.
- Flow meters used by the controller also needs to be checked and calibrated on a regular basis.

SECTION 7
SPRAYING INFORMATION

The following page demonstrates how to maintain and check your Rapid-check flowmeter. It is recommended this is done regularly during the spraying season.

FLOWMETER CALIBRATION

If optioned with auto-rate controller, as a part of the initial factory testing/calibration, a value (pulses per litre) will have been recorded and written on the body of the flow meter see the example on page 32.

To check/improve the resolution of the flow meter calibration use the below method after having sprayed out a reasonable volume of liquid (the more sprayed the better the resolution);

- The current flow meter calibration number in the controller = X
- Take the total volume the controller says was sprayed and divided by the actual volume sprayed = Your new flow meter calibration.
- Then manually enter this number into the controller settings.

For example;

Current flow cal number (X) = 250. Controller says we have sprayed 4400L after having put 4000L in the tank.

250 x 4400 = 1100000

1100000 / 4000 = 275 (new flow cal number)

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.

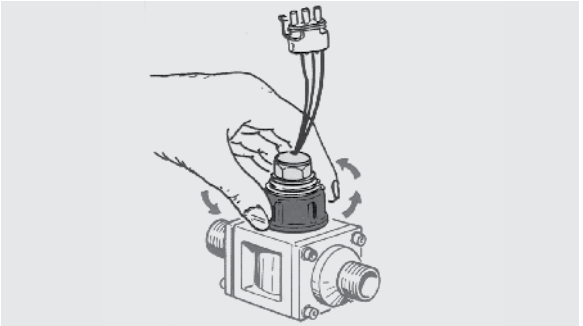
Install, calibrate and operate the spray controller according to the spray controller operators manual.

Inspections of the Flowmeter should be performed regularly.

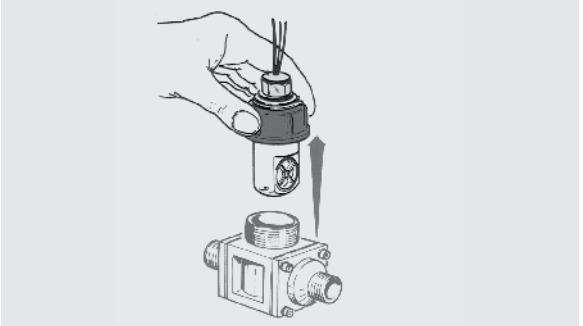
Daily Check & Maintenance of Flowmeter

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.

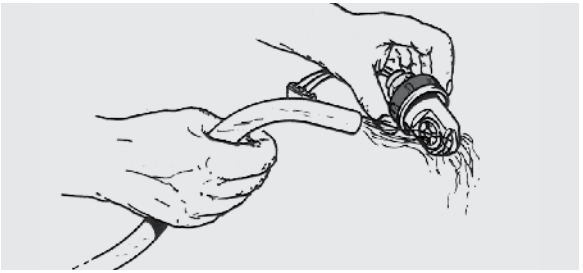


Unscrew the Rapid Check assembly



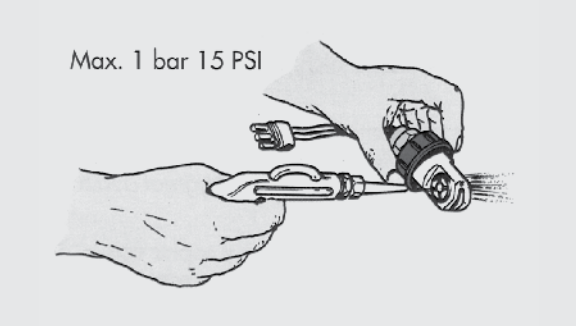
Remove the Rapid Check unit

3. Use clean water to wash any impurities out of the removable turbine unit.



Wash any impurities out of the removable turbine unit

SECTION 7
SPRAYING INFORMATION



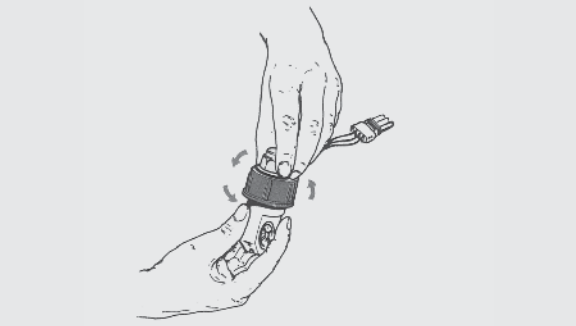
Use compressed air to check that the turbine unit rotates freely

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.

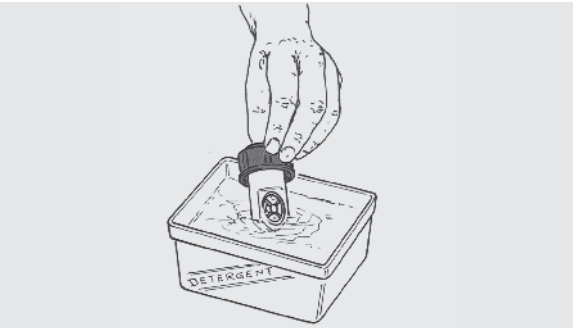


Unscrew the sensor

2. Separate the sensor from the Rapid Check unit.

Separate the sensor from the Rapid Check unit

3. Place the Rapid Check unit in a detergent bath for a few hours.

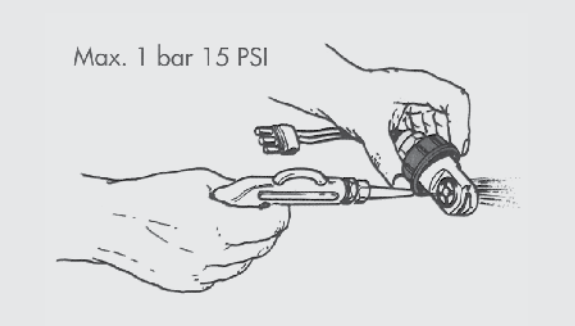


Place the Rapid Check unit in a detergent bath

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.

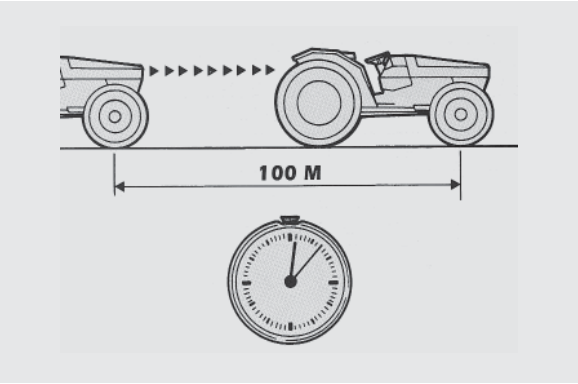


Use compressed air to check that the turbine unit rotates freely

SECTION 7
SPRAYING INFORMATION

STEP 2 - DETERMINING THE ACTUAL SPEED OF TRAVEL

If optioned with auto-rate controller, your sprayer has been factory set with a calibration number. This should be fine-tuned prior to commencement of spraying and checked by your dealer. This is done by traveling a known distance (usually 100 metres) and comparing the distance measured by the Spray Controller to the known distance. If there is a discrepancy, the Spray Controller Manual explains how to easily adjust the calibration number automatically.



To manual check the speed...

a) Half fill the sprayer tank with water and mark out a test strip of 100 metres (simulating spraying conditions).

b) Set the sprayer operating and record the time taken to travel 100 metres at your required spraying speed.

c) Calculate the actual speed of travel using the formula:

For SPEED, km/hr = using the following formula:

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

eg. 100(m) x 3.6 ÷ 48(seconds)

= 7.5km/hr travel speed

An alternative formula is:

km/hr = Metres travelled in 1 minute

STEP 3 - DETERMINE SPRAYING VOLUME REQUIRED

It is essential to determine the liquid volume per hectare required to effectively spray a crop without over spraying or under spraying.

The spray volume requirement should be determined by/in conjunction with an agronomist/spray manager/someone skilled in the art of spraying.

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 setting up the sprayer is to determine:

- The **number of row(s)** to be sprayed in one pass
- The **total number of nozzles** to be used on the sprayer. Don't forget Tier 1, Tier 2 and Tier 3 options.

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

Example

An ORCHARD TOWER Sprayer to spray vines – using 4 spray fans per side, will give a total of 8 spray fans. Each spray fan has 2 spray rings - each with 5 nozzles per ring. That gives a combined total of 40 nozzles per (8 spray rings x 5) per Tier/80 nozzles (both spray sets of rings combined) to spray two rows per pass.

The choice of nozzles (step 5 below) will influence decisions regarding the Sprayer's Tier configuration.

STEP 5 - DETERMINE THE IDEAL SPRAY PRESSURE

Before determining the correct nozzles, it's best to have an idea of the spray pressure required. As a general rule, a pressure of 5 to 10 bar is considered ideal. Setting up the sprayer around a pressure of say 7 to 8 bar will allow lower pressures (say 5 or 6 bar) to be used in early season and higher presssure (say 9 or 10 bar) for later season without having to change nozzles midseason. It will also offer some margin around travelling slower or faster than the chosen speed.

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SPRAYING INFORMATION

The advice provided above is general information only and operators should seek specialised advice from their agronomist/spray manager/someone skilled in the art of spraying.

NOTE; when determining the optimum nozzles for both spray rings (Tiers 1 & 2), all calculations should be done at the same pressure.

STEP 6 - DETERMINE & SELECT CORRECT NOZZLES

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

The calculation formulation is;

Litres/Minute/Nozzle
(Litres per minute per nozzle)

$$= \frac{\textbf{Litres/Ha x Km/hr} \div \textbf{600}}{\textbf{total number of nozzles used x row spacing (m) x number of rows in one pass}}$$

NOTE; it's easiest to make the calculations based on each individual spray ring volume and then combine both rings. Always select nozzles from the same pressure chart.

For example, using Example A from the previous pages ....

- Row spacing = 3.0m
- Number of rows = 1
- Number of nozzles = 40
- Speed = 7.5 kph
- Ideal pressure 7 ~ 8 bar
- Tier 1 target rate = 650 L/ha
- Tier 2 target rate = 1000 L/ha
- Tier 3 target rate = 1650 L/ha

Using the above formula ....

650 (target rate) x **7.5** (speed) ÷ **600** ÷ **40** (number of nozzles) x **3.0** (row spacing) x **1** (no. of rows) = **0.61** Litres per minute per nozzle.

Once the flow rate per nozzle is known select the most appropriate nozzle from a flowrate chart for the nozzle being used. Flowrate charts are available from relevant nozzle suppliers. Croplands supplies and recommends the ALBUZ ATR Hollow Cone Nozzles for the Quantum Mist™ Sprayers.

CROPLANDS

Quantum Mist ALBUZ Nozzle Selection Worksheet

Step1:
Enter data in grey boxes

Formula

Target rate (L/ha)	650	Speed (km/hr)	7.5
Row spacing (m)	3	Number of rows	1
Number of nozzles	40		
Total L/min =	24.375	L/min per nozzle	0.61

Step 2:
Select nozzles from chart

ALBUZ NOZZLE	PART NUMBER	MESH	5 Bar	6 Bar	7 Bar	8 Bar	9 Bar
WHITE	AZ-ATR-WE-80C	100	0.27	0.29	0.32	0.34	0.36
LILAC	AZ-ATR-LC-80C	50	0.36	0.39	0.42	0.45	0.48
BROWN	AZ-ATR-BN-80C	50	0.48	0.52	**0.56**	0.60	0.64
YELLOW	AZ-ATR-YW-80C	50	0.73	0.80	0.86	0.92	0.97
ORANGE	AZ-ATR-OE-80C	50	0.99	1.08	1.17	1.24	1.32
RED	AZ-ATR-RD-80C	50	1.38	1.51	1.62	1.73	1.83
GREY	AZ-ATR-GY-80C	50	1.5	1.63	1.76	1.87	1.98
GREEN	AZ-ATR-GN-80C	50	1.78	1.94	2.09	2.22	2.35
BLACK	AZ-ATR-BK-80C	50	2	2.18	2.35	2.50	2.64
BLUE	AZ-ATR-BE-80C	50	2.45	2.67	2.87	3.06	3.24

Pictured above and right are screenshots taken from a small spreadsheet program freely available from the Croplands website or Croplands Customer Service titled "ALBUZ QM Nozzle Selection Worksheet" which makes it much quicker to calculate nozzle requirements. For more nozzles see the Croplands Optima buyers guide.

In the example above the closest / **correct nozzle** for Tier 1 is the ALBUZ Brown nozzle operating at 8 Bar.

In the sample below, the closest / **correct nozzle** for Tier 2 is the ALBUZ Yellow nozzle operating at 8 bar. Note the formula requires 0.94 L/min, and the nozzle flowchart shows 0.92 L/min. This nozzle with a marginal increase in pressure will meet our requirements.

Across the spraying season, the variables (such as rates and speeds) may often change. With a well set up system, small variations will be easily accommodated. Larger variations may require a change of nozzles.

CROPLANDS

Quantum Mist ALBUZ Nozzle Selection Worksheet

Step1:
Enter data in grey boxes

Formula

Target rate (L/ha)	650	Speed (km/hr)	7.5
Row spacing (m)	3	Number of rows	1
Number of nozzles	40		
Total L/min =	24.375	L/min per nozzle	0.61

Step 2:
Select nozzles from chart

ALBUZ NOZZLE	PART NUMBER	MESH	5 Bar	6 Bar	7 Bar	8 Bar	9 Bar
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BROWN	AZ-ATR-BN-80C	50	0.48	0.52	0.56	0.60	0.64
YELLOW	AZ-ATR-YW-80C	50	0.73	0.80	**0.86**	0.92	0.97
ORANGE	AZ-ATR-OE-80C	50	0.99	1.08	1.17	1.24	1.32
RED	AZ-ATR-RD-80C	50	1.38	1.51	1.62	1.73	1.83
GREY	AZ-ATR-GY-80C	50	1.5	1.63	1.76	1.87	1.98
GREEN	AZ-ATR-GN-80C	50	1.78	1.94	2.09	2.22	2.35
BLACK	AZ-ATR-BK-80C	50	2	2.18	2.35	2.50	2.64
BLUE	AZ-ATR-BE-80C	50	2.45	2.67	2.87	3.06	3.24

SECTION 7
SPRAYING INFORMATION

STEP 7 - FIT & TEST SELECTED NOZZLES

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 to the sprayer.
- Fill your spray tank to maximum capacity & set the specified pump pressure and operate the sprayer for a short period to make sure all lines are full and nozzles are working properly (no blockages, leaks, etc).
- Stop the sprayer and top up the tank with water to maximum capacity again.
- Operate the sprayer in the stationary position at the required pressure for not less than 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). The longer the test time the more accurate the figure.

The calculation formulation is;

Output (L/min) =

Output (litres)

+ Time (minutes)

Example 1, testing Tier 1 of our examples above.

30 litres

+ 1.25 minutes (75 seconds)

= 24 litres/min.

Which is slightly less than the target of 24.37L/min (0.61 L/min per nozzle x 40 nozzles for 1.0 min).

Example 2, testing Tier 2 of our examples above.

48.5 litres

+ 1.25 minutes (75 seconds)

= 38.8 litres/min.

Which is slightly more than the target of 37.6L/min (0.94 L/min per nozzle x 40 nozzles for 1.0 min).

- Excessive output is a sign of worn nozzles. See steps 8 & 9.
- Insufficient output is a sign of blockages. See steps 8 & 9.

STEP 8 - CALCULATE THE ACTUAL APPLICATION RATE

The 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) =

Total sprayer output (L/min) x 600 ÷ speed (Km/hr) ÷ row spacing (m) ÷ number rows in one pass

Example 1 (as per Tier 1 example)

24 (L/min) x 600
÷ 7.5km/hr ÷ 3m (row spacing)
+ 1 (rows/pass)

= 640 litres/ha (slightly less than planned)

Example 2 (as per Tier 2 example)

38.8 (L/min) x 600
÷ 7.5 km/hr ÷ 3m (row spacing)
+ 1 (rows/pass)

= 1034 litres/ha

STEP 9 - IF THE TESTED RATE IS UNSATISFACTORY

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

A) In Auto mode - if the application rate is not being achieved:

- Operating pressure will be excessive if nozzles are too small or blocked or speed is too fast.

SECTION 7
SPRAYING INFORMATION

Likewise, if your pressure filter is blocked (even partially), you may experience excessive pressure at the pump.

Make adjustments accordingly.

- Operating pressure will fall if nozzles are too large or speed is too slow. Make adjustments accordingly.

B) In Manual mode - the Controller application rate can be altered by:

- Adjusting pressure up or down to increase or decrease the rate of application (use +/- keys).
- Adjusting spraying speed up or down to decrease or increase the rate of application.
- Changing to a different nozzle capacity.

Repeat necessary testing procedures and calculation of application rate if adjustments or changes are made.

LITRES PER 100 METRES / ROW

Many Auto Rate controllers have an option for Litres per 100 metres and is occasionally the unit of preference for some spray operations. It's a simpler formula as row width is not relevant.

The calculation requires volume and distance, such as 11 litres per 100 metres (of rows). The operator only needs to follow the chemical label rate for mixing concentrate per 100 L.

Flowrate conversion charts are available in the Nufarm SprayWise Horticultural application handbook and the Croplands Optima spray range buyers guide.

Litres / Hectare conversion to Litres/100m
Table unit = L/100 m

Litres/Hectare \ Row Spacing (metres)	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.00
250	5.0	5.3	5.5	5.8	6.0	6.3	6.5	6.8	7.0	7.3	7.5	7.8	8.0	8.3	8.5	8.8	9.0	9.3	9.5	9.8	10.0
300	6.0	6.3	6.6	6.9	7.2	7.5	7.8	8.1	8.4	8.7	9.0	9.3	9.6	9.9	10.2	10.5	10.8	11.1	11.4	11.7	12.0
350	7.0	7.4	7.7	8.1	8.4	8.8	9.1	9.5	9.8	10.2	10.5	10.9	11.2	11.6	11.9	12.3	12.6	13.0	13.3	13.7	14.0
400	8.0	8.4	8.8	9.2	9.6	10.0	10.4	10.8	11.2	11.6	12.0	12.4	12.8	13.2	13.6	14.0	14.4	14.8	15.2	15.6	16.0
450	9.0	9.5	9.9	10.4	10.8	11.3	11.7	12.2	12.6	13.1	13.5	14.0	14.4	14.9	15.3	15.8	16.2	16.7	17.1	17.6	18.0
500	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5	20.0
550	11.0	11.6	12.1	12.7	13.2	13.8	14.3	14.9	15.4	16.0	16.5	17.1	17.6	18.2	18.7	19.3	19.8	20	21	21	22
600	12.0	12.6	13.2	13.8	14.4	15.0	15.6	16.2	16.8	17.4	18.0	18.6	19.2	19.8	20	21	22	22	23	23	24
650	13.0	13.7	14.3	15.0	15.6	16.3	16.9	17.6	18.2	18.9	19.5	20	21	21	22	23	23	24	25	25	26
700	14.0	14.7	15.4	16.1	16.8	17.5	18.2	18.9	19.6	20	21	22	22	23	24	25	25	26	27	27	28
750	15.0	15.8	16.5	17.3	18.0	18.8	19.5	20	21	22	23	23	24	25	26	26	27	28	29	29	30
800	16.0	16.8	17.6	18.4	19.2	20	21	22	22	23	24	25	26	26	27	28	29	30	30	31	32
850	17.0	17.9	18.7	19.6	20	21	22	23	24	25	26	26	27	28	29	30	31	31	32	33	34
900	18.0	18.9	19.8	21	22	23	23	24	25	26	27	28	29	30	31	32	32	33	34	35	36
950	19.0	20	21	22	23	24	25	26	27	28	29	29	30	31	32	33	34	35	36	37	38
1000	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1100	22	23	24	25	26	28	29	30	31	32	33	34	35	36	37	39	40	41	42	43	44
1200	24	25	26	28	29	30	31	32	34	35	36	37	38	40	41	42	43	44	46	47	48
1300	26	27	29	30	31	33	34	35	36	38	39	40	42	43	44	46	47	48	49	51	52
1400	28	29	31	32	34	35	36	38	39	41	42	43	45	46	48	49	50	52	53	55	56
1500	30	32	33	35	36	38	39	41	42	44	45	47	48	50	51	53	54	56	57	59	60

Example 1 (as per Tier 2 example)

Using the chart above

1000 Lt/ha x 3m rows

correlates to 30 litres per 100 metres of row.

STEP 10 - COVERAGE ASSESSMENT

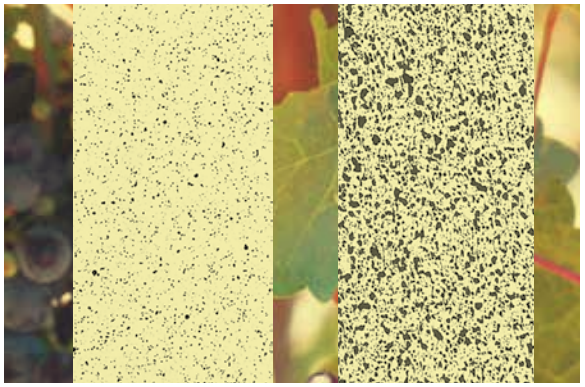
Operate your sprayer in the required orchard or vineyard to check the actual spray coverage achieved on foliage.

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:

- Water Sensitive Papers (as pictured) and available through Croplands dealers – see Croplands Optima Buyers guide for further details.
- Clay Markers as available through Croplands dealers – see Croplands Optima Buyers guide for further details.
- Fluorescent Dye system as available through Croplands dealers – see Croplands Optima Buyers guide for further details.

SECTION 7
SPRAYING INFORMATION



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

Ensure water sensitive-papers are strategically placed on both upper and lower surfaces.

Spray testing, evaluation and adjustment to the sprayer (say fan positions) or spray settings (say nozzles, pressures, and rates) should be done in conjunction with an agronomist/spray manager/someone skilled in the art of spraying. The best setup might vary significantly from crop to crop, season to season, etc.

STEP 11 - ADD THE CORRECT AMOUNT OF CHEMICAL TO THE TANK

For land area rates (Litres or kg per hectare)

Use the following formula:

Chemical required (Litres) =

Tank volume (Litres) x recommended chemical rate (L/ha) ÷ spray application rate (L/ha)

For example;

2000 (litre tank) x 2.0 (chemical rate L/ha)
÷ 50 (spray application rate L/ha)

= 80 litres of chemical

If chemical recommendation is given in water volume rates

Use the following formula:

Chemical required (Litres) =

Tank volume (Litres) x recommended chemical rate (L/ 100 litres) ÷ 100

For example;

2000 (litre tank) x 4 (chemical rate L/100 litres)
÷ 100 = 80 litres of chemical

For tank volume required,

Use the following formula:

Tank volume required (Litres) =

Area (ha) x spray application rate (L/ha)

For example;

20 (hectares) x 50 (application rate, L/ha)
= 1000 litres of spray tank capacity required

SECTION 7
SPRAYING INFORMATION

STEP 12 - RECORD ALL DATA FOR FUTURE REFERENCE

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

Photocopy the worksheets to obtain the number of worksheets required.

ALBUZ-ATR HOLLOW CANE NOZZLES

Features:

- Angle of 80° at 5 bar
- Easy dismantling for cleaning
- Hollow cone nozzle producing fine droplets
- Albuz durable pink ceramic allows precision high pressure spraying
- Polished ceramics ensure perfect sealing and precise flow rate.

Applications:

- For fungicides and insecticides
- Recommended for orchards and vineyards.

	ALBUZ NOZZLE	PART NUMBER	MESH	5 BAR	6 BAR	7 BAR	8 BAR	9 BAR	10 BAR	11 BAR	12 BAR
	WHITE	AZ-ATR-WE-80C	100	0.27	0.29	0.32	0.34	0.36	0.38	0.39	0.41
	LILAC	AZ-ATR-LC-80C	50	0.36	0.39	0.42	0.45	0.48	0.50	0.52	0.55
CURRENT STANDARD	BROWN	AZ-ATR-BN-80C	50	0.48	0.52	0.56	0.60	0.64	0.67	0.70	0.73
CURRENT STANDARD	YELLOW	AZ-ATR-YW-80C	50	0.73	0.80	0.86	0.92	0.97	1.03	1.07	1.12
	ORANGE	AZ-ATR-OE-80C	50	0.99	1.08	1.17	1.24	1.32	1.39	1.45	1.51
	RED	AZ-ATR-RD-80C	50	1.38	1.51	1.62	1.73	1.83	1.92	2.01	2.09
	GREY	AZ-ATR-GY-80C	50	1.50	1.63	1.76	1.87	1.98	2.08	2.17	2.26
	GREEN	AZ-ATR-GN-80C	50	1.78	1.94	2.09	2.22	2.35	2.47	2.58	2.69
	BLACK	AZ-ATR-BK-80C	50	2.00	2.18	2.35	2.50	2.64	2.78	2.90	3.03
	BLUE	AZ-ATR-BE-80C	50	2.45	2.67	2.87	3.06	3.24	3.40	3.56	3.71

SECTION 7
SPRAYING INFORMATION
CALIBRATION WORK SHEET

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 vine yard 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 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/h	

Kilometres per Hour = Distance traveled (m) x 3.6

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/Nozzle
=
Litres/Ha x Km/hr ÷ 600 ÷ Total Number of Nozzles Used x Row Spacing (m) x Number of Rows in One Pass

_____ x _____ ÷ 600 ÷ _____ x _____ x _____

= _____ litres/minute/nozzle

Once the flow rate per nozzle is known, select an appropriate nozzle size from the nozzle charts [see pages 4.9-4.11].

Nozzle Selection	

Step 6

Fit & Test Selected Nozzles

The most important calibration is to test for **actual litre 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 (l/min)
=
Output (litres) ÷ Time (minutes)

_____ ÷ _____ = _____ litres/min

Step 7

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

Record your data:

Farm location	
Crop to be sprayed	
Canopy width (m)	
Canopy Height (m)	
Spray Volume litres/ha	
No. Rows in one pass	
No. of nozzles used	
Litres/minute/nozzle	
Nozzle pressure	
Nozzle type	
Nozzle size &colour	
Tested Output in l/min	
Actual Litres/Hectare	

Note: If your sprayer has a flow meter fitted, you should calibrate it regularly. The calibration setting on the tag is a factory setting only and needs to be regularly checked - taking into consideration changes in density and/or viscosity of the product to be sprayed.

SECTION 7
SPRAYING INFORMATION
CALIBRATION WORK SHEET

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 vine yard 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 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/h	

Kilometres per Hour = Distance traveled (m) x 3.6

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/Nozzle
=
Litres/Ha x Km/hr ÷ 600 ÷ Total Number of Nozzles Used x Row Spacing (m) x Number of Rows in One Pass

_____ x _____ ÷ 600 ÷ _____ x _____ x _____

= _____ litres/minute/nozzle

Once the flow rate per nozzle is known, select an appropriate nozzle size from the nozzle charts [see pages 4.9-4.11].

Nozzle Selection	

Step 6

Fit & Test Selected Nozzles

The most important calibration is to test for **actual litre 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 (l/min)
=
Output (litres) ÷ Time (minutes)

_____ ÷ _____ = _____ litres/min

Step 7

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

Record your data:

Farm location	
Crop to be sprayed	
Canopy width (m)	
Canopy Height (m)	
Spray Volume litres/ha	
No. Rows in one pass	
No. of nozzles used	
Litres/minute/nozzle	
Nozzle pressure	
Nozzle type	
Nozzle size &colour	
Tested Output in l/min	
Actual Litres/Hectare	

Note: If your sprayer has a flow meter fitted, you should calibrate it regularly. The calibration setting on the tag is a factory setting only and needs to be regularly checked - taking into consideration changes in density and/or viscosity of the product to be sprayed.

SECTION 7
SPRAYING INFORMATION
CALIBRATION WORK SHEET

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 vine yard 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 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/h	

Kilometres per Hour = Distance traveled (m) x 3.6

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/Nozzle
=
Litres/Ha x Km/hr ÷ 600 ÷ Total Number of Nozzles Used x Row Spacing (m) x Number of Rows in One Pass

x ÷ 600 ÷ x x

= litres/minute/nozzle

Once the flow rate per nozzle is known, select an appropriate nozzle size from the nozzle charts [see pages 4.9-4.11].

Nozzle Selection	

Step 6

Fit & Test Selected Nozzles

The most important calibration is to test for **actual litre 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 (l/min)
=
Output (litres) ÷ Time (minutes)

÷ = litres/min

Step 7

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

Record your data:

Farm location	
Crop to be sprayed	
Canopy width (m)	
Canopy Height (m)	
Spray Volume litres/ha	
No. Rows in one pass	
No. of nozzles used	
Litres/minute/nozzle	
Nozzle pressure	
Nozzle type	
Nozzle size &colour	
Tested Output in l/min	
Actual Litres/Hectare	

Note: If your sprayer has a flow meter fitted, you should calibrate it regularly. The calibration setting on the tag is a factory setting only and needs to be regularly checked - taking into consideration changes in density and/or viscosity of the product to be sprayed.

SECTION 7
SPRAYING INFORMATION
CALIBRATION WORK SHEET

Step 1

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Make sure that the tractor is travelling at spraying speed when you pass the start and finish marks and ensure 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/h	

Kilometres per Hour = Distance traveled (m) x 3.6

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/Nozzle
=
Litres/Ha x Km/hr ÷ 600 ÷ Total Number of Nozzles Used x Row Spacing (m) x Number of Rows in One Pass

_____ x _____ ÷ 600 ÷ _____ x _____ x _____

= _____ litres/minute/nozzle

Once the flow rate per nozzle is known, select an appropriate nozzle size from the nozzle charts [see pages 4.9-4.11].

Nozzle Selection	

Step 6

Fit & Test Selected Nozzles

The most important calibration is to test for **actual litre 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 (l/min)
=
Output (litres) ÷ Time (minutes)

_____ ÷ _____ = _____ litres/min

Step 7

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

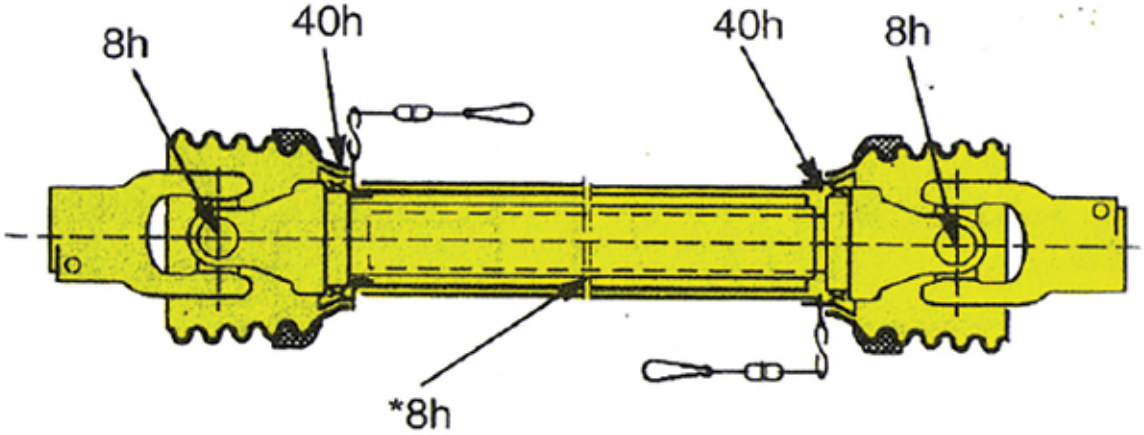
Record your data:

Farm location	
Crop to be sprayed	
Canopy width (m)	
Canopy Height (m)	
Spray Volume litres/ha	
No. Rows in one pass	
No. of nozzles used	
Litres/minute/nozzle	
Nozzle pressure	
Nozzle type	
Nozzle size &colour	
Tested Output in l/min	
Actual Litres/Hectare	

Note: If your sprayer has a flow meter fitted, you should calibrate it regularly. The calibration setting on the tag is a factory setting only and needs to be regularly checked - taking into consideration changes in density and/or viscosity of the product to be sprayed.

SECTION 8
LUBRICATION & MAINTENANCE

SECTION 8
LUBRICATION & MAINTENANCE



Grease the PTO shaft as shown. * Pull shaft apart - apply grease to the inside of the outer telescopic profile.

GREASING & SERVICE PROCEDURES

1. Clean suction line filter after completion of each tank.
2. Clean pressure line filter regularly.
3. Check tyre pressure ((350kPa / 50 psi), and check wheel nuts.
4. Clean Rapid-check flowmeter (refer to page 62), if fitted.
5. Grease tractor to sprayer PTO universal joints every 8 hours. Grease lightly until grease becomes firm in seals. Over greasing will break seals and allow dust and moisture to penetrate - increasing wear.
6. Grease PTO inner tubes every 8 hours. To lubricate the inner tube, slide PTO shaft apart, clean the telescopic tubes, grease and reassemble.
7. Grease the PTO covers every 40 hours.
8. Ensure safety covers and safety chains are in place and in good working order
9. Grease self steer drawbar every 20 hours.
10. Check pump air chamber pressure on a regular basis. As a general guideline it should be 10%-20% of operating pressure (70-100 kPa [10-15 psi]). Refer to pump manual for more information.
11. 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.
12. Grease all boom joints, height adjusting points and other grease points.

EVERY 200 HOURS

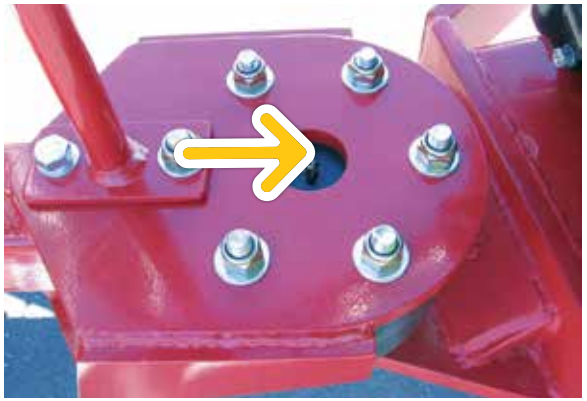
1. Lubricate quick release lock pins on PTO shaft.
2. Re-pack wheel bearings with grease.
3. Grease and check & adjust castellated nut both LH & RH of walking beam axle.
4. Grease all tank lid seals with vaseline.
5. Check to ensure agitators have not become blocked with sulphur/chemicals.
6. Inspect all hydraulic lines for wear points.
7. Check pump mounts.
8. Check fan RPM and oil pressure at test port.

GREASE POINTS

Grease all swivel drawbar grease points

1. Swivel eye on drawbar, if fitted.
2. Wheel hubs, if fitted with grease nipples.

SECTION 8
LUBRICATION & MAINTENANCE



Grease the self steer ball assembly regularly

3. PTO shaft - all crosses (knuckles), both ends and sliding tubes. Refer to page 73 for frequency.

Grease wheel hubs

AR185 - 180l/min diaphragm pump

DIAPHRAGM PUMPS

Diaphragm Pumps 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.

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.

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.

Every 50 Hours

Check surge chamber pressure and adjust as follows:

- Air pressure 70-100kPa (10-15psi) [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.

SECTION 8
LUBRICATION & MAINTENANCE

Every 250 hours or Every Season - Whichever Comes Sooner

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 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 preventative 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 Quantum Mist™ and its operating components as outlined in the pre-delivery check list.

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.

FILTERS

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.

The pump suction valve CLOSED to the main tank

Suction Filter

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

SECTION 8
LUBRICATION & MAINTENANCE

To clean the filter:

1. Completely stop all sprayer functions.
2. Place the tank selection 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.

Remove & clean the filter element & components

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.

Reassemble and tighten the outer filter screw.

6. **Open the tank selection valve** to access liquid from the main tank, then check the filter is sealed correctly.

   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.

Open & close the filter tap while system is pressurised

NOTE

Be careful not to damage or deform the mesh or O-ring while cleaning and refitting the suction filter.
If the fi lter screen or O-ring is damaged, replace the part.

In-line Pressure Filters

The in-line pressure filter should be cleaned regularly, or after each spray tank has been emptied.

To flush each filter, open and close the filter tap while system is pressurised.

The filter & bowl assembly will need to be disassembled for thorough cleaning.

CAUTION

Ensure the TANK SELECTION VALVE IS OPEN before starting the pump.
Starting the pump with the Tank Selection valve closed will seriously damage the suction valve and warranty will be made void.

For Major Servicing follow the pre-delivery Checklist that came with the sprayer.

SECTION 9
TROUBLESHOOTING

GENERAL SPRAYER PROBLEMS

PROBLEM	PROBABLE CAUSE	REMEDY
1. No spray when turned on	1. Filter on the inlet side of the pump blocked. 2. Faulty pump. 3. Control valves not working	1. Dismantle, clean & re-assemble. 2. Change pump. 3. Check all motor valves and manual Pressure Regulating Valve.
2. Sprays for short time only	1. Air inlet to tank blocked. 2. Filter on suction side of pump blocking or blocked.	1. Clean air vent. 2. Dismantle, clean & re-assemble the filter. If filter problem persists, clean out the tank & start again.
3. Spray is uneven around the spray-head	1. Blocked nozzles. 2. Nozzle tips worn. 3. Different pressure at nozzles; wrong nozzles fitted.	1. Remove, clean & check. Check output & for streaks. 2. Check nozzle output, replace worn nozzles. 3. Remove a nozzle in each section & check that flow rate is the same. If different, check for blockages.
4. Pressure going up - output going down	1. Blocked nozzles. 2. Pressure filter blocking.	1. Dismantle, clean & refit. Check pressure returns to normal. Check all filters and spray mixture. 2. Check & clean the pressure filter.
5. Pressure falling	1. Filter on suction side blocked. 2. Nozzle tips worn. 3. Pressure gauge faulty. 4. Pump worn. 5. Worn manual PRV (pressure regulating valve)	1. Dismantle & clean the filter. 2. Check nozzle output, replace worn nozzles. 3. Check with new pressure gauge. 4. Repair or replace the pump. 5. Replace PRV
6. Spray pattern narrow or faltering	1. Pressure too low. 2. Nozzles blocked or partially blocked.	1. Check that the correct nozzles are being used... check and clean.. 2. Check that the tank is not empty. If not, there is an air leak between the pump & tank or in the pump. Check plumbing & repair.
7. Foam in the tank	1. Too much agitation.	1. Switch Off one or both agitators.

SECTION 9
TROUBLESHOOTING

DIAPHRAGM PUMP PROBLEMS

PROBLEM	PROBABLE CAUSE	REMEDY
SUCTION SIDE OF PUMP		
F. Suction hose vibration... / hunting	1. Air getting into suction.	1. Check suction lines for leaks.
G. Pump valves hammering	1. Suction tap partly turned off. 2. Suction strainer(s) blocked.	1. Seal all joints securely with tape or stag. Firm up clamps. 2. Check the suction filter is sealed.
H. No water flow in suction hose	1. Suction Tank Selection Valve turned off. 2. Suction strainer(s) blocked.	1. Turn valve fully on. 2. Clean filters.
DISCHARGE SIDE OF PUMP		
I. Manual regulator valve leaking from spindle	1. Split diaphragm or O-rings.	1. Remove 4 body set screws, replace diaphragm and O-rings.
J. Pressure gauge showing correct working pres sure no pressure at nozzle	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

SECTION 9
TROUBLESHOOTING

DIAPHRAGM PUMP PROBLEMS

PROBLEM	PROBABLE CAUSE	REMEDY
A. Pump does not draw or deliver liquid. Pressure gauge fluctuates badly	1. The pump is sucking in air through suction line. 2. Air has not been entirely evacuated from the pump. 3. Blocked suction filter. 4. Damaged or worn suction valves.	1. Examine the suction hose and ensure it is firmly secured. 2. Rotate the pump with outlet hose and taps open. 3. Clean suction filter. 4. Replace suction valves.
B. Liquid flow is irregular (Also check items under A)	1. The air in the air chamber of the pump is incorrectly set. 2. Diaphragm split. 3. Damaged or worn valves. 4. Foreign matter holding valves open.	1. Check pressure in air chamber of pump. Set at 210-280Kpa (30-40 psi). 2. Replace diaphragm. 3. Replace valves. 4. Clean valves.
C. Pump delivers insufficient pressure	1. Regulating valve: • Sticking open • Not set for pressure • Damaged or worn seat or spring 2. Cylinder diaphragm ruptured. 3. Pump valves blocked, worn or damaged. 4. Spray nozzles worn, missing or exceed pump capacity.	1. Fix the regulator: • Unstick the valves • Set the pressure • Replace the spring 2. Replace diaphragms. 3. Unblock valves and or replace. 4. Replace spray nozzles with appropriate size.
D. Output drops & pump is noisy	1. Blocked suction lines or filter screen.	1. Check and clean as required.
E. Oil being discharged through delivery line or discoloured oil in sight glass of pump	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 20W/30.

SECTION 9
TROUBLESHOOTING

RATE CONTROLLER PROBLEMS

PROBLEM	PROBABLE CAUSE	REMEDY
Boom hydraulic functions not working when remote levers are used in the intended direction.	1. Hydraulic return line (with a one way check valve) is connected to the wrong side of the tractor remotes. 2. If fitted, faulty or damaged electrical system (loom / plug / coil etc).	Swap the supply and return hoses at the remotes. Clearly mark the hoses or remotes for future reference. Find the cause and replace as required
Blown hydraulic hoses, motor seals or hydraulic cooler at startup	Excessive pressure due to dead heading the hydraulic system. Usually caused by not properly connecting the return hose to tank. See page xx of this manual.	ALWAYS double check that the return line coupling is fully engaged. Make sure all staff are trained on this aspect.
Fan's won't run	1. No oil supply 2. Faulty hose connection 3. Low oil level switch in Micro Power Pack 4. Normal oil level, won't start or switch off	1. Check tractor oil levels or Micro Power Pack oil reservoir 2. Check all hydraulic supply connections 3. Check switch position - refer to Micro Power Pack manual 4. Check for (cracked) sunken float in the oil level switch
Unexpected shut down of the Micro Power Pack	Oil level too low causing unexpected shut down due to oil level changes when operating on uneven ground.	Add oil. Oil level should be as per page 11 of the Micro Power Pack manual.
Unexpected restart (after shutdown) of the Micro Power Pack	Incorrect low level oil level switch adjustment. After a low oil level level shut down, the oil can (in some circumstances) flow back into the oil reservoir and hence trigger a restart.	Slide the oil level switch to the bottom of the switch and use sufficient oil to prevent unexpected shut down. See page 11 of the Micro Power Pack manual.

SECTION 9
TROUBLESHOOTING

HYDRAULIC SYSTEM PROBLEMS

PROBLEM	PROBABLE CAUSE	REMEDY
Fan performance drop off	1. Tractor oil supply (drop off due to wear and tear) 2. Worn hydraulic motor(s) 3. Fan drive body failure / bearing issues etc	1. Check tractor oil performance (requires specialist equipment) 2. Replace hydraulic motor(s) 3. Replace the drive body

After noticing a fan performance (rpm) drop off, troubleshooting requires isolating the problem. All fans are run in series, in circuits of 2, 3 or 4 fans (see the schematics in Section 10). Using a tachometer, check the relevant fan rpm's - note there will always be minor variations (+/- 15~ 30 rpm is normal).

- If all fans are down on performance then the problem is with the greater oil supply system.
- If the problem is confined to one or more fans of a fan hydraulic circuit, the problem is most likely to be in one or more of the individual fans or fan motors. Isolating the troublesome fan can be complicated as it's not always the slow running fan that's causing the problem - it might be a fan earlier in the series.
- Firstly confirm that it's not the fan drive body at fault by checking that the fans can spin freely. This will require the hydraulic motor to be removed from the drive body or the hydraulics to be disconnected from the motor (not recommended).
    - If the fan / drive body assembly can rotate freely without the hydraulic motor attached, then the issue is with the motor or hydraulics.
    - Assuming the fault is with the motor, and it's not a blown shaft seal (which will be an obvious oil leak before getting to this stage), the fault is likely to be internal damage or wear. Internal wear will show itself as oil leaking / flowing via the case drain.
        - The case drain hose is the smaller (1/4") of the 3 hoses connecting to the back of each hydraulic motor, and are coupled in series back to the distribution manifold. To isolate the problem will require checking the case drain flow from each fan motor. Normal flow (test at lower rpm) from a case drain port is more of a dribble, whereas a worn motor will be a constant flow. This test should only be done by someone skilled in hydraulics.

Note, a worn motor can often be detected by an increase in pressure at soft start manifold's (TT) test port (5 ~20 psi at operating speed & temperature is normal) - however this won't tell you which hydraulic fan circuit is causing the problem.

SECTION 9
TROUBLESHOOTING

DUMP VALVE OPERATION

Start with the controller in "Manual" mode, the master switch in the 'Hold" position, at least one section switch in the spray position and the pump running at operating RPM. There should be minimal to no spray pressure on the gauge. Put the master switch into the "Spray" position and the gauge pressure will increase and the sections open will start spraying. Put the master switch back into the "hold" position and the gauge pressure will decrease. If this works then the dump valve is operating correctly.

If there is gauge pressure when the master switch is in the Hold" position and no gauge pressure with the master switch is in the "Spray" position then the dump valve is working backwards. There will either be a setting in the controller to reverse this or the wiring at the dump valve can be reversed.

If no change in gauge pressure happens when changing the position of the master switch then the dump valve mustn't be operating. The following pages show what voltage you should read at the dump valve to diagnose whether is it a faulty valve, wiring or controller.

Croplands use an Arag dump valve on the majority of their trailed/linkage sprayers. These come in two different styles and can be operated by 2 wire or 3 wire switching.

A8630001 & A8730001

Dump Valve Operation A8630001 & A8730001

2 Wire Operation

= Positive +12V DC

= Negative

Closed/Spray Position

Open/Dump Position

3 Wire Operation

= Positive +12V DC

= Negative

= Positive +12V DC

Closed/Spray Position

Open/Dump Position

Dump Valve Operation - A8710502

2 Wire Operation

= Positive +12V DC

= Negative

Closed/Spray Position

Open/Dump Position

3 Wire Operation

= Positive +12V DC

= Negative

= Positive +12V DC

Closed/Spray Position

Open/Dump Position

A8710502

SECTION 9
TROUBLESHOOTING

NO FLOW RATE

WHEN THE SPRAY CONTROLLER ISN'T READING FLOW, FOLLOW THESE STEPS TO DIAGNOSE THE ISSUE.

- Is the flow calibration number present/correct?

- Is the turbine/paddle spinning freely?

- Check the flow sensor for any visible signs of damage.

- Is 12 volts supplied to the flow sensor? Croplands wiring is Pin A = Signal, Pin B = Positive & Pin C = Negative.

You should read 12 volts on your multimeter between pins B & C when the controller thinks it's spraying and when possible check this with the sensor connected as some controllers lose their 12 volt supply when under load. If 12 volts is present move to the next step, if no 12 volts is present repeat the test at the next connector working back towards the tractor. Continue on until you find a bad cable or until you reach the back of the controller. Please note that Croplands MT90 series looms only power the flow meter when spraying with an MT90LOOM/6 relay box on Broadacre sprayers and a diode pack or relay box on the section valve loom on Horticultural sprayers. If the controller is not outputting 12 volts you can send it to Croplands to be repaired.

Croplands have loan controllers so you can continue spraying while your controller is being repaired.

- Enter a flow calibration of 1 pulse per litre and view the total volume screen on the controller.

The controller needs to be in "Manual" mode and have at least 1 section turned on so the sprayer would actually be spraying if the pump was engaged. Start at the cable connecting to the flow sensor. With a small jumper wire (or paper clip), bridge a connection between the Ground and Signal wires using a "bridge, no bridge" motion. Each time a bridging connection is made the total volume should increase on the controller, if this works replace the flow sensor and re-enter the correct flow calibration. If total volume does not increase, repeat at the next connector towards the controller.

Continue on until you find a bad cable or until you reach the back of the monitor. If the total volume does still not increase you can send the controller to Croplands to be repaired. Croplands have loan controllers so you can continue spraying while your controller is being repaired.

SECTION 9
TROUBLESHOOTING

NO GROUND SPEED

WHEN THE SPRAY CONTROLLER ISN'T READING GROUND SPEED, FOLLOW THESE STEPS TO DIAGNOSE THE ISSUE.

-- Is the speed calibration number present/correct?

- Is the speed sensor mounted correctly? The sensor tip should be 5mm from the pickups.

- Check the speed sensor for any visible signs of damage.

-- Is 12 volts supplied to the speed sensor? Croplands wiring is Pin A = Signal, Pin B = Positive & Pin C = Negative.

You should read 12 volts on your multimeter between pins B & C and when possible check this with the sensor connected as some controllers lose their 12 volt supply when under load. If 12 volts is present move to the next step, if no 12 volts is present repeat the test at the next connector towards the controller. Continue on until you find a bad cable or until you reach the back of the controller. If the controller is not outputting 12 volts you can send it to Croplands to be repaired. Croplands have loan controllers so you can continue spraying while your controller is being repaired.

- Enter a speed calibration of 1cm per pulse and view the screen reading distance on the controller.

The controller should be in "Manual" mode and have at least 1 section turned on so the sprayer would actually be spraying if the pump was engaged. Start at the cable connecting to the speed sensor. With a small jumper wire (or paper clip), bridge a connection between the Ground and Signal wires using a "bridge, no bridge" motion. Each time a bridging connection is made the distance should increase on the controller, if this works replace the speed sensor and re-enter the correct speed calibration. If distance does not increase, repeat at the next connector towards the controller.

Continue on until you find a bad cable or until you reach the back of the controller. If the distance does still not increase you can send the controller to Croplands to be repaired. Croplands have loan controllers so you can continue spraying while your controller is being repaired.

HOW TO TEST A UP-402 PROXIMITY SPEED SENSOR

Power the speed sensor by supplying 12 volts to the Brown positive wire and an earth to the Blue ground wire. With your multimeter set to read DC voltage connect the multimeter's red terminal to the sensors signal wire and the multimeter's black terminal to the sensors ground wire. The multimeter will read 12 volts when no metal pickup is present and when a metal pickup is detected the multimeter will read 0 volts.

SECTION 9
TROUBLESHOOTING

SERVO VALVE OPERATION

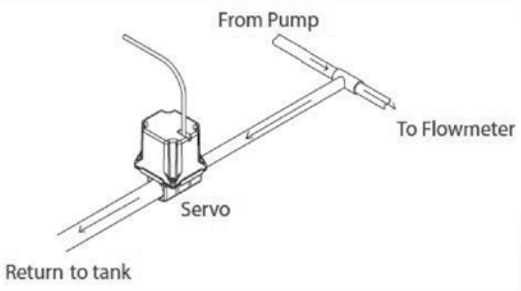
With the controller in "Manual" mode, the master switch in the 'Spray" position, all section switches turned on and the pump running at operating RPM. Press and hold the increase rate button/switch and the pressure on the gauge should increase. Press and hold the decrease rate button/switch and the pressure on the gauge should decrease. The Servo valve will take between 7-10 seconds to go for opened to closed and vise versa. If this works then the servo valve is operating correctly.

If the gauge pressure decreases while holding the increase button/switch and increases while holding the decrease button/switch then the servo valve is working backwards. There will either be a setting in the controller to change or the two wires at the servo valve can be reversed.

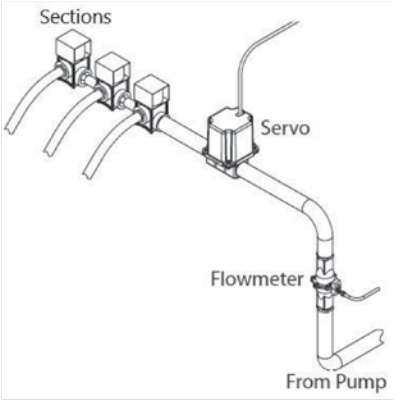
If no change in gauge pressure happens when the increase or decrease button/switch is held then the servo valve isn't operating. The next page shows what voltage you should read at the servo valve to diagnose whether is it a faulty valve, wiring or controller.

Croplands use an Arag servo valve on the majority of their trailed/linkage sprayers. These come in two different series called an 863 or 873 and can be plumbed in either an Bypass or In-line set up. The 873 series is generally fitted on centrifugal and diaphragm pumps with a flow rate of more than 250 litres per minute.

Bypass Plumbing



In-line Plumbing



Servo Valve Operation
A86300245 & A87300205

Bypass Plumbing

Increasing Pressure

0 = Positive +12V DC

0 = Negative

Decreasing Pressure

In-line Plumbing

Increasing Pressure

0 = Positive +12V DC

0 = Negative

Decreasing Pressure


2000
CROPLANDS

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

ALL PARTS INFORMATION is now listed on the Croplands website:

- Go to croplands.com.au
- Search in the Parts Information section linked to the home page.

NOTE

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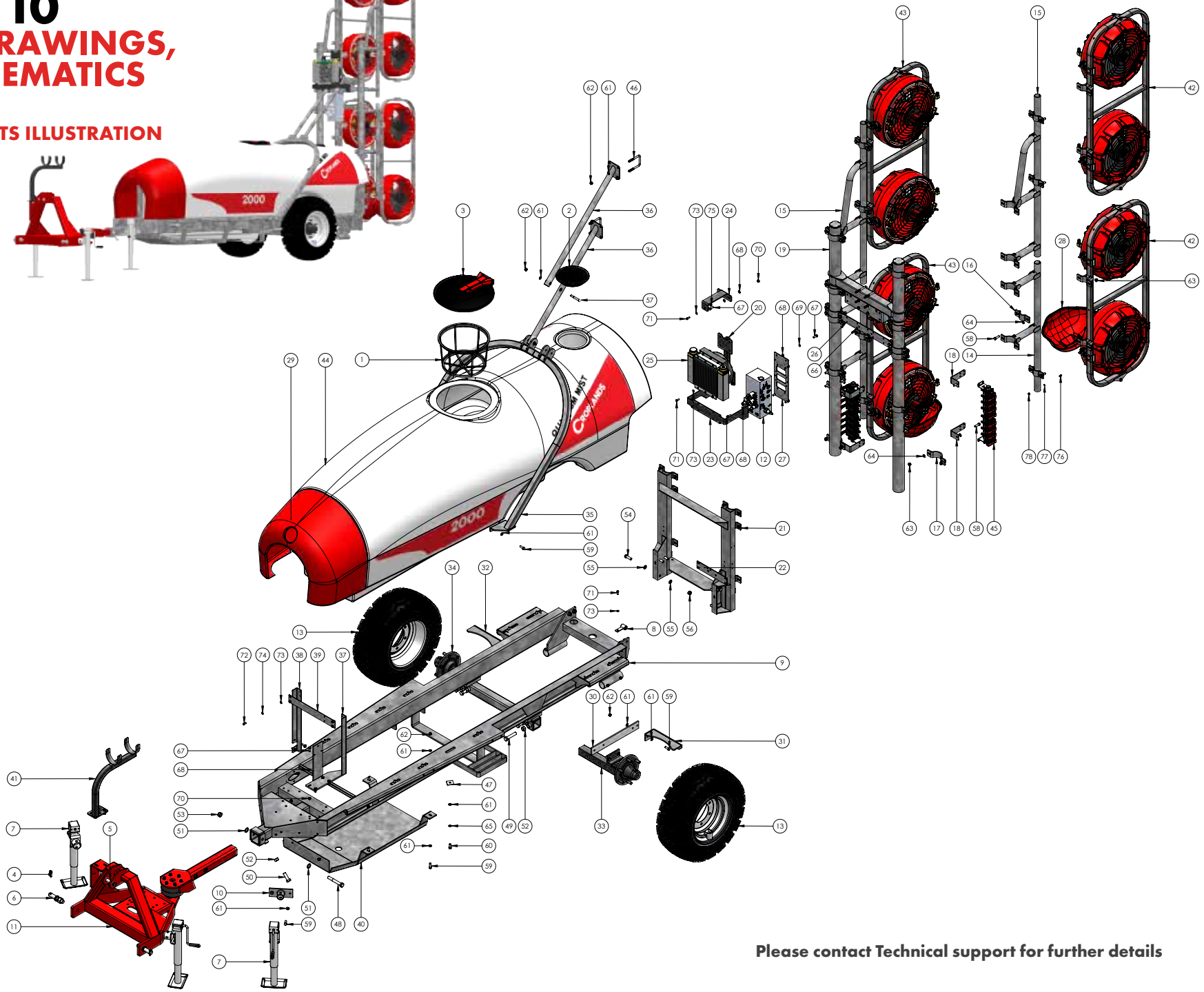
NOTE

Contact Croplands Technical Support for further information:
1300 650 724

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

2000LT ORCHARD PARTS ILLUSTRATION



Please contact Technical support for further details

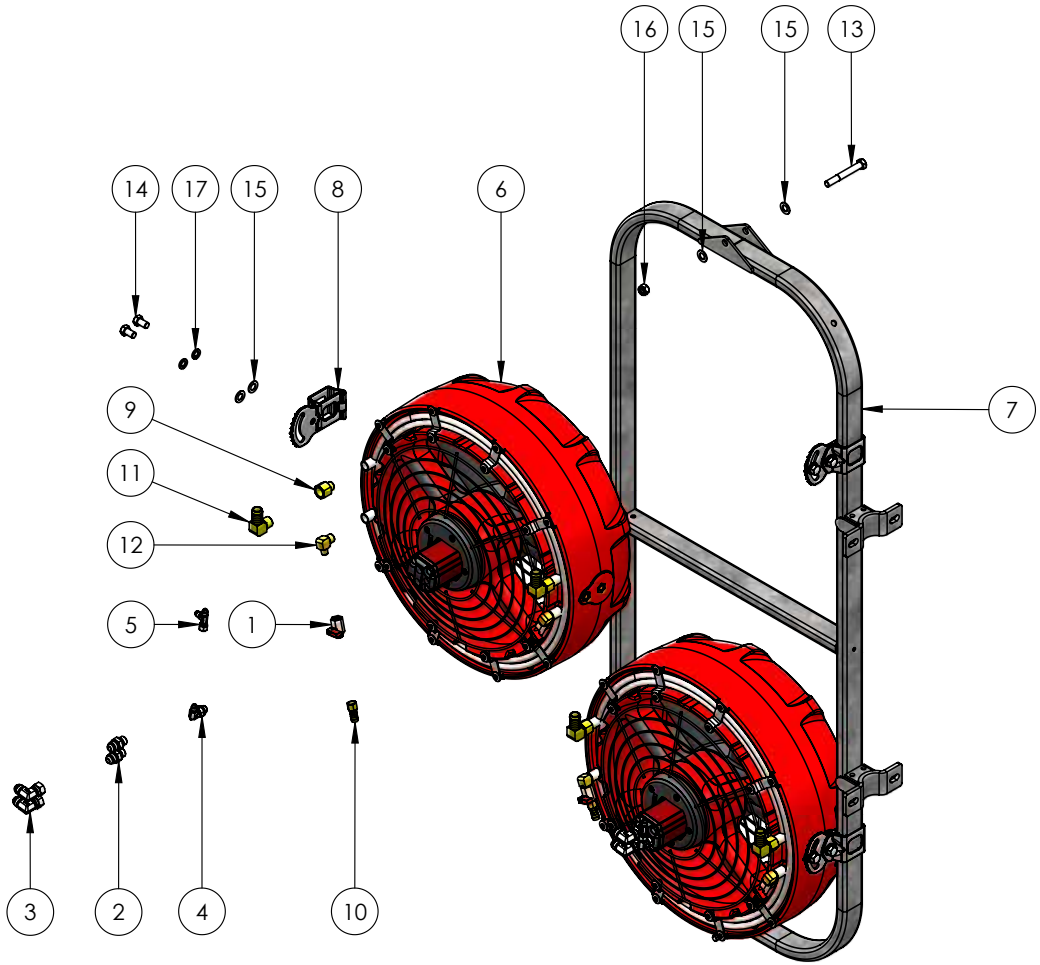
SECTION 10

ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	A300130	FILTER BASKET LARGE 254MM DEEP	1
2	A3522120	LID ONLY 255MM CLOSED	1
3	A356060	LID HINGE 455MM 180DEG	1
4	B0006	BARE LINCH PIN 7/16" DIA	3
5	B0076	TOP LINK PIN 3" X 7/16" S1040	1
6	B0102	IMPLEMENT PIN CAT 2	2
7	BP-184A	JOCKEY STAND SHORT PINTO	3
8	FM-FDSOCKET	SOCKET FOAM MARKER DROPPER	1
9	HP2000ABSL3A	CHASSIS SLIMLINE V3 HAYLITE	1
10	HP-006	SPIGOT PLATE JACK STAND	1
11	HP-024C	SELF STEER DRAWBAR 3PTL 3000/4000LT	1
12	HP-103	HYDRAULIC MANIFOLD FUSION SS	1
13	HP-200A	TYRE & WHEEL AWT 10/75-15.3	2
14	HP-274A-9C	TUBE STANDOFF ORCHARD LOWER	2
15	HP-274A-9D	TUBE STANDOFF ORCHARD UPPER	2
16	HP-274A-13G	CLAMP HALF SADDLE 45MM GALVED	8
17	HP-274A-14G	CLAMP HALF SADDLE 90MM GALV	18
18	HP-274A-14G-1	TAP MANIFOLD MOUNT BRACKET	4
19	HP-274A-15G	MAIN TOWER ASSY GALVANISED	1
20	HP-274A-15G-1	COOLER BRACKET TOP SUPPORT QM	1
21	HP-283C2	QUANTUM TOWER BRACKET HS2000 V2	1
22	HP-289	MANIFOLD BRACKET A463CCRO08A	1
23	HP-298-15A-1	BRACKET OIL COOLER	1
24	HP-298-15A-2	TOP SUPPORT BRACKET OIL COOLER	1
25	HP-298-15A	OIL COOLER 12V AIR TYPE HYDAC	1
26	HP-318-09	BRACKET SECTION VALVE MOUNT	1
27	HP-318-10A	BRACKET FUSION HYDRAULIC MANIFOLD SLIMLINE	1
28	HP-319-3-1	LEAF GUARD QM420	2
29	HP-800	PUMP COVER SLIMLINE 2000	1
30	HP-803-1	ARM MUDSCRAPER	2
31	HP-803L	HS2000 MUDSCRAPER LH	1
32	HP-803R	HS2000 MUDSCRAPER RH	1
33	HP-808AL	ADJUSTABLE STUB AXLE ASSY HS LH	1
34	HP-808AR	ADJUSTABLE STUB AXLE ASSY HS RH	1
35	HP-822A-1	TOWER SUPPORT HOOP HS2000	1
36	HP-822A-2	TOWER SUPPORT ARM HS2000	2
37	HP-823	FILTER MOUNTING BRACKET SLIMLINE	1
38	HP-825	MANIFOLD STAND SLIMLINE	1
39	HP-826	MANIFOLD PLATE SLIMLINE	1
40	HP-828A	SUMP GUARD 2000 SLIMLINE	1
41	HP-024-7A	CABLE HOLDER BRACKET SHORT	1
42	KH-5105ALA	FAN FRAME 2X420 LH 1/2" HOSE 6.5CC ORCH	2
43	KH-5105ARA	FAN FRAME 2X420 RH 1/2" HOSE 6.5CC ORCH	2
44	P2000SAB-RAW	2000LT TANK SLIMLINE AIRBLAST	1
45	KH-5120	420QM MANUAL TAP MANIFOLD 8 SECT	2
46	XBMBB75	U-BOLT 75MM X 10	4
47	50SQWASHER	50MM SQUARE WASHER	12
48	M20X140BOLT	M20 X 140 HEX HEAD BOLT HT ZP	1
49	M20X100	M20 X 100 SET SCREW HT ZP	4
50	M20X60	M20 X 60 SET SCREW HT ZP	2
51	M20FWASHER	M20 FLAT WASHER ZP	2
52	M20HNUT	M20 HALF NUT ZP	6
53	M20NNUT	M20 NYLOC NUT HT ZP	1
54	M16X50	M16 X 50 HEX HEAD SET SCREW HT ZP	6
55	M16FWASHER	M16 FLAT WASHER ZP	12
56	M16NNUT	M16 NYLOC NUT HT ZP	6
57	M12X90BOLT	M12 X 90 BOLT HT ZP	2
58	M12X40SS	M12 X 40 SET SCREW S/S HT ZP	48
59	M12X35	M12 X 35 SET SCREW HT ZP	24
60	M12X30	M12 X 30 SET SCREW HT ZP	12
61	M12FWASHER	M12 FLAT WASHER ZP	72
62	M12NNUT	M12 NYLOC NUT HT ZP	34
63	M12SSNNUT	M12 S/S NYLOC NUT	48
64	M12SSFWASHER	M12 S/S FLAT WASHER	96
65	M12SWASHER	M12 SPRING WASHER ZP	12
66	M10X35	M10 X 35 SET SCREW HT ZP	2
67	M10X30	M10 X 30 SET SCREW HT ZP	16
68	M10FWASHER	M10 FLAT WASHER ZP	30
69	M10SWASHER	M10 SPRING WASHER ZP	6
70	M10NNUT	M10 NYLOC NUT HT ZP	12
71	M8X25	M8 X 25 SET SCREW HT ZP	4
72	M8X20	M8 X 20 SET SCREW HT ZP	4
73	M8FWASHER	M8 FLAT WASHER ZP	12
74	M8SWASHER	M8 SPRING WASHER ZP	4
75	M8NNUT	M8 NYLOC NUT HT ZP	4
76	M6X16	M6 X 16 SET SCREW HT ZP	2
77	M6FWASHER	M6 FLAT WASHER ZP	4
78	M6NNUT	M6 NYLOC NUT HT ZP	2

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

KH-5105ALA
ORCHARD FAN FRAME ASSY, 2 X



NOTE

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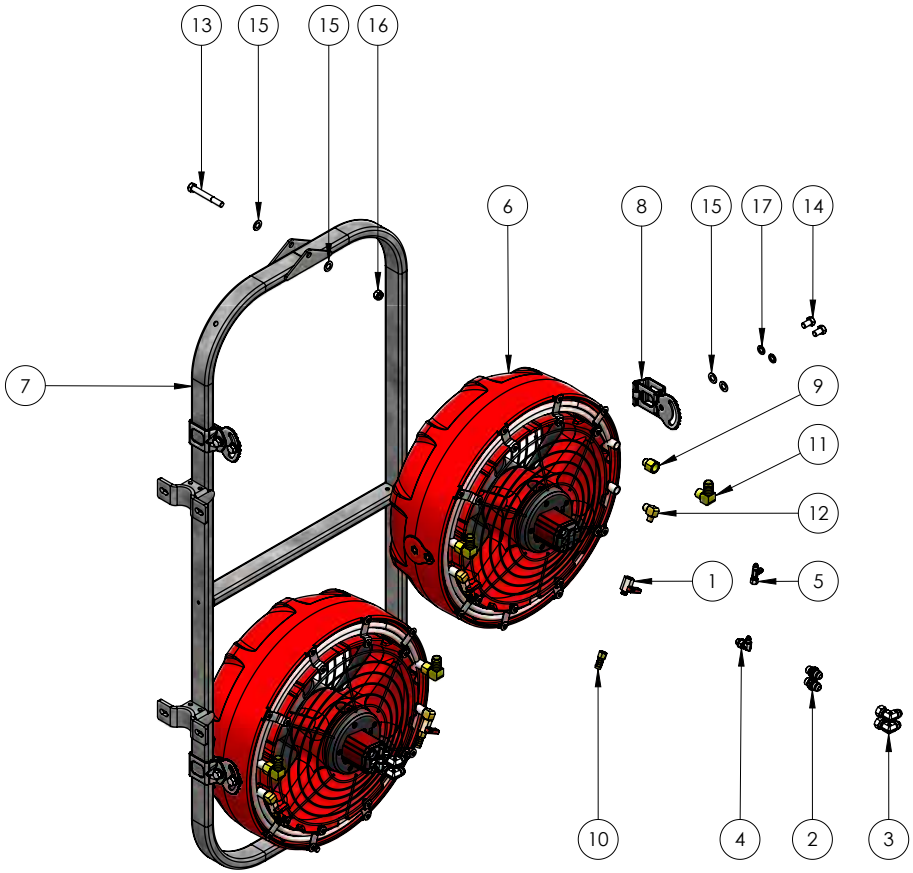
For further parts information refer to: www.croplands.com.au

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	BALL14MF2M	BALL VALVE 1/4" M/F	4
2	HP-040	NIPPLE 3/8" BSPPM X 3/4" JICM	4
3	HP-042	ELBOW 3/4" JICM X 3/4" JICFM	4
4	HP-045	ELBOW 1/4" BSPPM X 7/16" JICM	2
5	HP-089	TEE 7/16" JICM/JICM/JICFM	2
6	HP-319-31A	QM420 NO NOZZLES	2
7	HP-322-03	FAN FRAME REAR 2FAN	1
8	HP-324-420	CLAMP QM420 FRAME	4
9	TFAD1238FM	ADAPTOR 1/2" BSPF X 3/8" BSPM	4
10	TFA1412F	TAIL BRASS 1/4"BSPF X 1/2" TAIL	4
11	TFEL1234	ELBOW 1/2" BSPM X 3/4" TAIL	4
12	TFEL1438MM	ELBOW 1/4" BSPM X 3/8" BSPM	4
13	M12X90BOLT	M12 X 90 BOLT HT ZP	2
14	M12X20	M12 X 20 HEX HEAD SET SCREW HT ZP	8
15	M12FWASHER	M12 FLAT WASHER ZP	12
16	M12NNUT	M12 NYLOC NUT HT ZP	2
17	M12SWASHER	M12 SPRING WASHER ZP	8

Please contact Technical support for further details

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

KH-5105ARA



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	BALL14MF2M	BALL VALVE 1/4" M/F	4
2	HP-040	NIPPLE 3/8" BSPPM X 3/4" JICM	4
3	HP-042	ELBOW 3/4" JICM X 3/4" JICFM	4
4	HP-045	ELBOW 1/4" BSPPM X 7/16" JICM	2
5	HP-089	TEE 7/16" JICM/JICM/JICFM	2
6	HP-319-31A	QM420 NO NOZZLES	2
7	HP-322-03	FAN FRAME REAR 2FAN	1
8	HP-324-420	CLAMP QM420 FRAME	4
9	TFAD1238FM	ADAPTOR 1/2" BSPF X 3/8" BSPM	4
10	TFA1412F	TAIL BRASS 1/4"BSPF X 1/2" TAIL	4
11	TFEL1234	ELBOW 1/2" BSPM X 3/4" TAIL	4
12	TFEL1438MM	ELBOW 1/4" BSPM X 3/8" BSPM	4
13	M12X90BOLT	M12 X 90 BOLT HT ZP	2
14	M12X20	M12 X 20 HEX HEAD SET SCREW HT ZP	8
15	M12FWASHER	M12 FLAT WASHER ZP	12
16	M12NNUT	M12 NYLOC NUT HT ZP	2
17	M12SWASHER	M12 SPRING WASHER ZP	8

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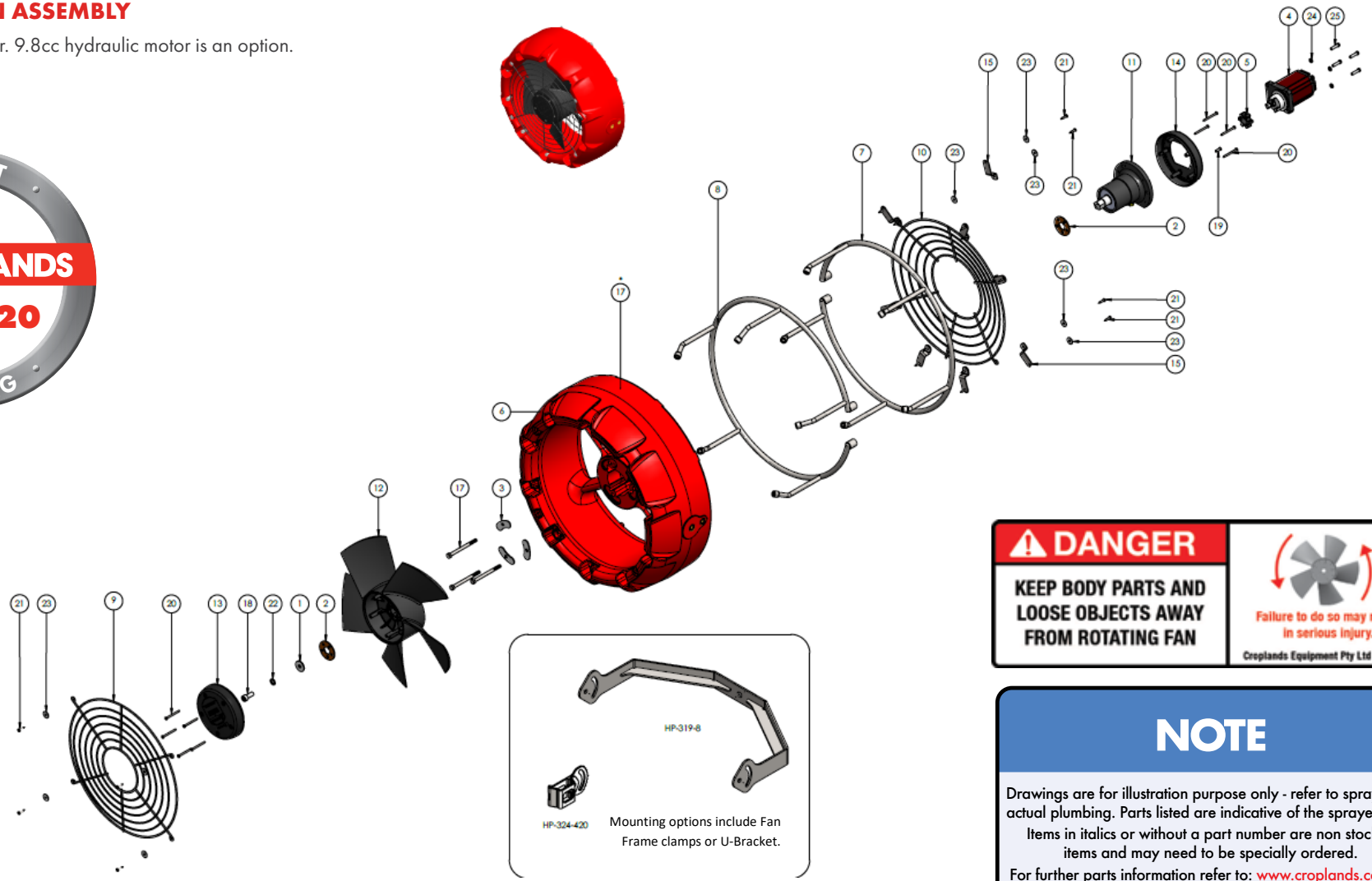
SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

HP-319-31
QM-420 SPRAY FAN ASSEMBLY

Using 6.5cc hydraulic motor. 9.8cc hydraulic motor is an option.

PATENT
CROPLANDS
QM-420
PENDING



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SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

ITEM NO.	PART NUMBER	DESCRIPTION	
1	HP-119-20	WASHER 10X30 STAINLESS STEEL	1
2	HP-119-23	HEP WASHER 5PIN X 2.4	2
3	HP-219-18	WASHER KIDNEY SHAPED S/S	3
4	HP-219M6.5CE-2	HYDRAULIC MOTOR KIT ASSEMBLY 6.5CC	1
5	HP-219-1C	COUPLING INSERT SUIT CH48	1
6	HP-319-3	COWL QM420	1
7	HP-319-5S	SPRAY RING QM420 INNER	1
8	HP-319-5L	SPRAY RING QM420 OUTER	1
9	HP-319-6	GUARD FRONT QM420	1
10	HP-319-7	GUARD REAR QM420	1
11	HP-319-9	MAIN DRIVE BODY ASSEMBLY SERIES 2 HYD	1
12	HP-319-10	FAN PROPELLER QM420	1
13	HP-319-15	COVER FRONT QM420 FAN	1
14	HP-319-15R	COVER REAR QM420 DRIVE BODY	1
15	HP-319-27	CLAMP QM420 GUARD AND RING	8
16	XD-195	LABEL FAN DANGER	1
17	*M8X100SSBOLT*	*M8 X 100 S/S BOLT*	3
18	*M10X25SHSCREW*	*M10 X 25 ALLEN HEAD SCREW HT ZP*	1
19	*M5X15SSSCREW*	*M5 X 15 S/S SCREW*	1
20	*M4X50SSSCREW*	*M4 X 50 S/S SCREW*	9
21	*M4.2X19SSSCREW*	*M4.2 X 19 S/S SCREW*	20
22	*M10SWASHER*	*M10 SPRING WASHER ZP*	1
23	*M4SSFWASHER*	*M4 FLAT WASHER S/S*	24
24	*M6SSSWASHER*	*M6 SPRING WASHER SS*	4
25	*M6X25SSSCREW*	*M6 X 25 HEX HEAD S/S SCREW*	4

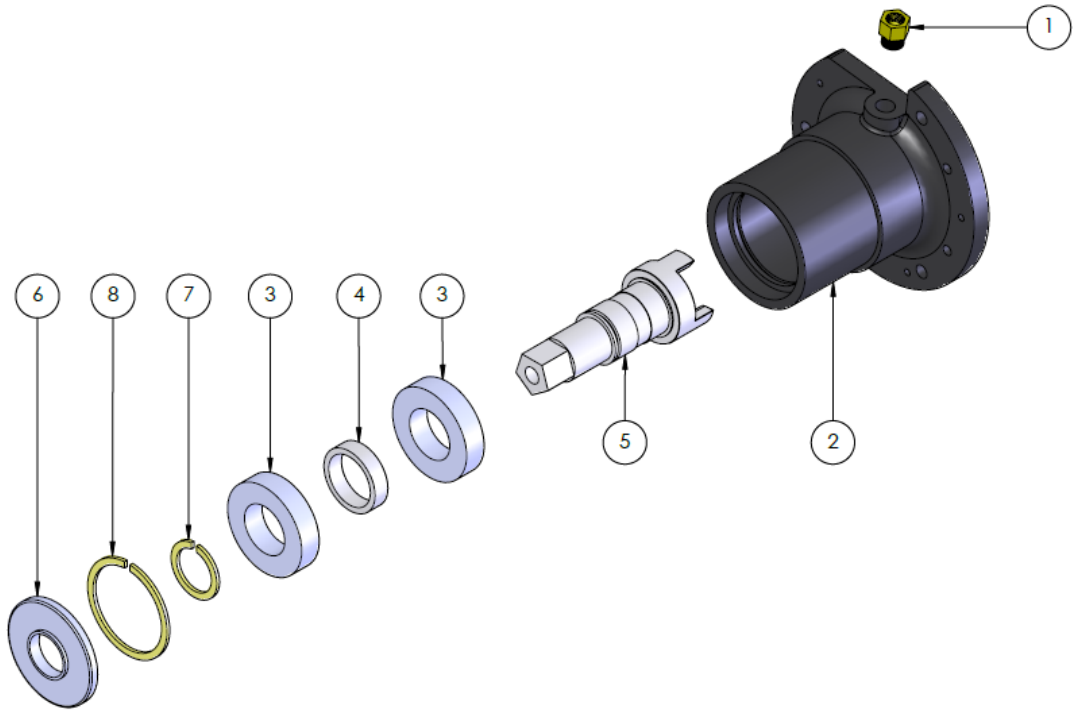
Please contact Technical support for further details

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

HP-319-9
QM-420 DRIVE BODY ASSY

Can also be used for QM-380, replacing HP-219-9 to 9D.

Note this Drive Body is sold as a stand-alone assembly and hence many of the parts are not stocked (bearings & circlips easily obtained from local bearing shop).



NOTE

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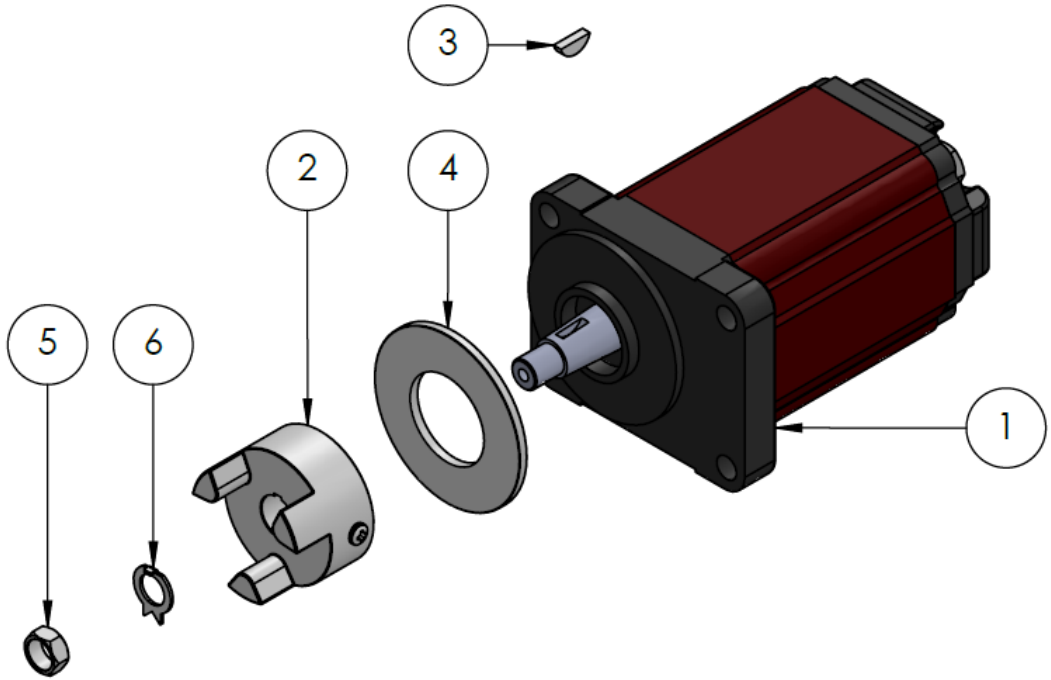
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HP-048	ADAPTOR BRASS M12 X 1M-1/8"F	1
2	*HP-119-9-X4*	*DRIVE BODY CASTING QM380/QM420*	1
3	*HP-119-9-1*	*BEARING 6006 SKF 2RS*	2
4	*HP-119-9-2*	*BEARING SPACER*	1
5	*HP-119-9-5B*	*SHAFT QM380 HYD DRIVE*	1
6	*HP-119-14A*	*Z SEAL Z305F SS304 ASSEMBLY*	1
7	*CIRCLIP34*	*CIRCLIP 2MM THK*	1
8	*CIRCLIP59*	*CIRCLIP 2MM THK*	1

Please contact Technical support for further details

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

HP-219M6.5CE-2
HYD MOTOR 6.5CC INC SPIDER COUPLER

Very similar to the 9.8cc version, the only variation being the length of the red motor body, 60mm for 6.5cc.



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ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	HP-219M6.5CE	HYDRAULIC MOTOR 6.5CC GRP 1.5	1
2	HP-219-1A1	COUPLING HALF GROUP 1.5 TAPER	1
3	HP-219-1D1	WOODRUFF KEY	1
4	HP-219-4A	ALUMINIUM LOCATING RING 30MM	1
5	*M10FHHNUT*	*M10 FINE HALF HEX NUT*	1
6	*M10STARWASHER*	*M10 STAR WASHER*	1

Please contact Technical support for further details

SECTION 10

ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

PLUMBING SCHEMATICS – SLIMLINE 2000

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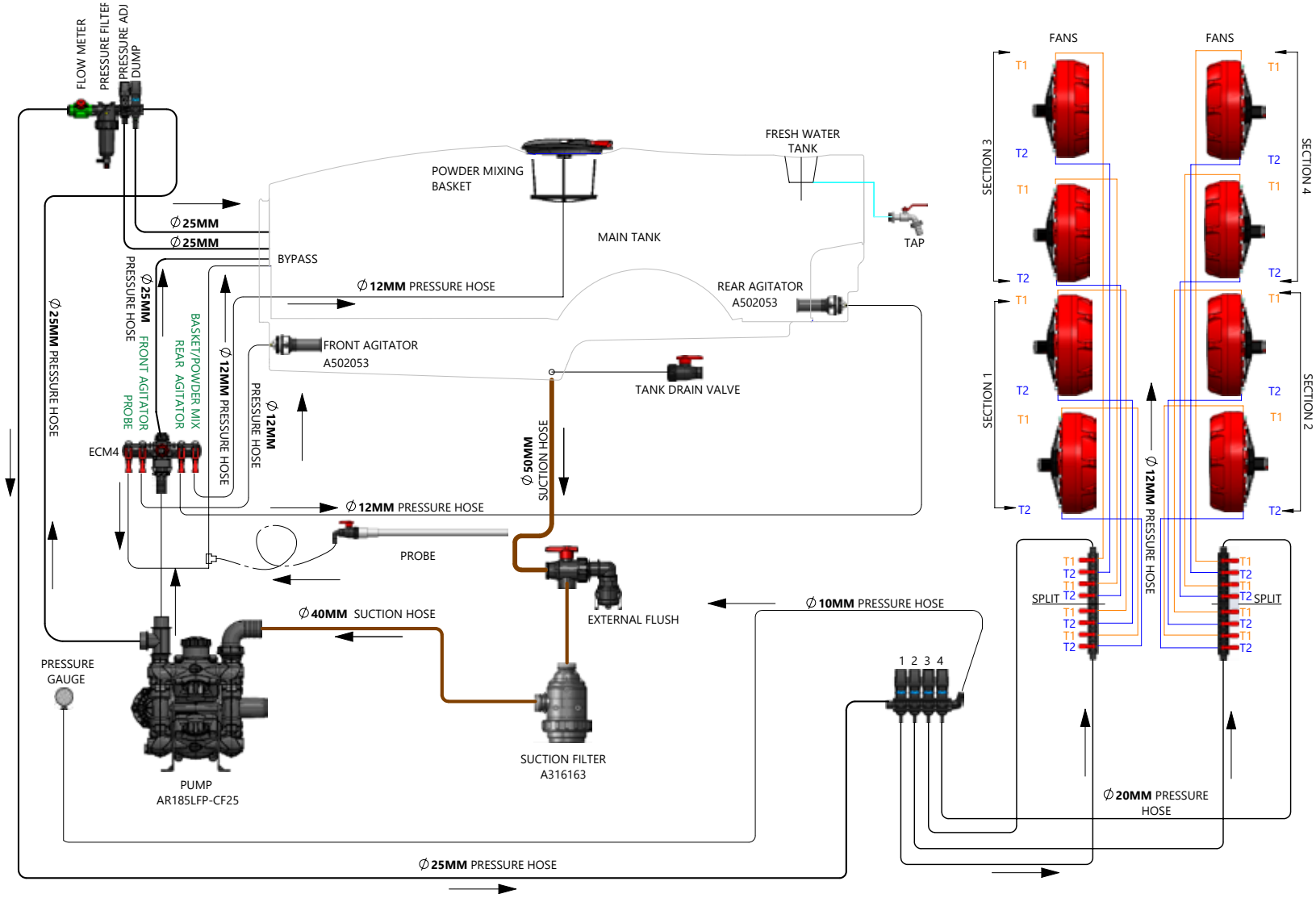
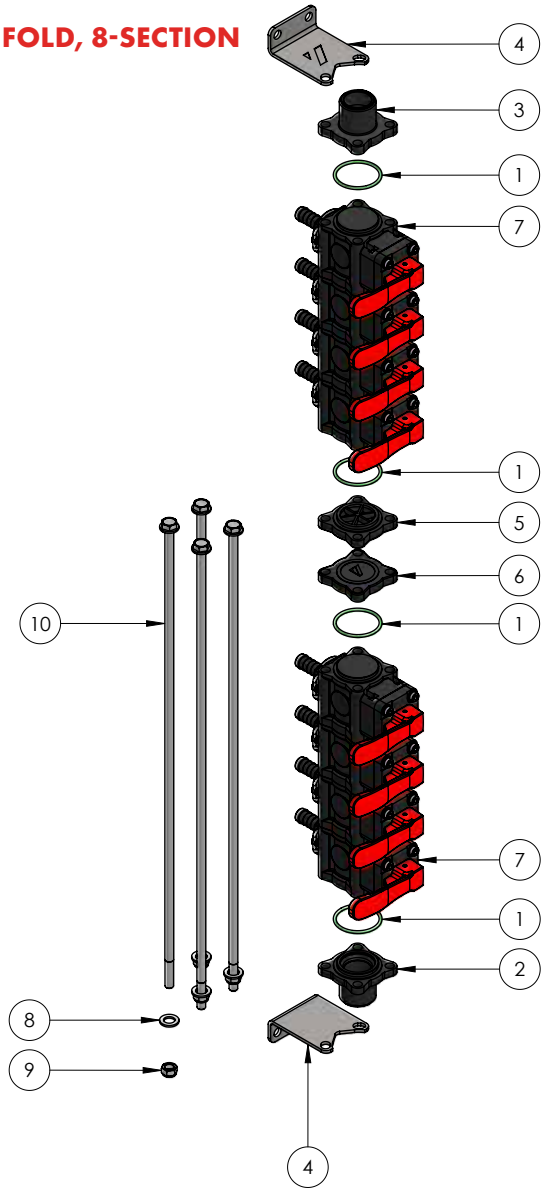


Please contact Technical support for further details

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

KH-5120
QM-420 MANUAL TAP MANIFOLD, 8-SECTION



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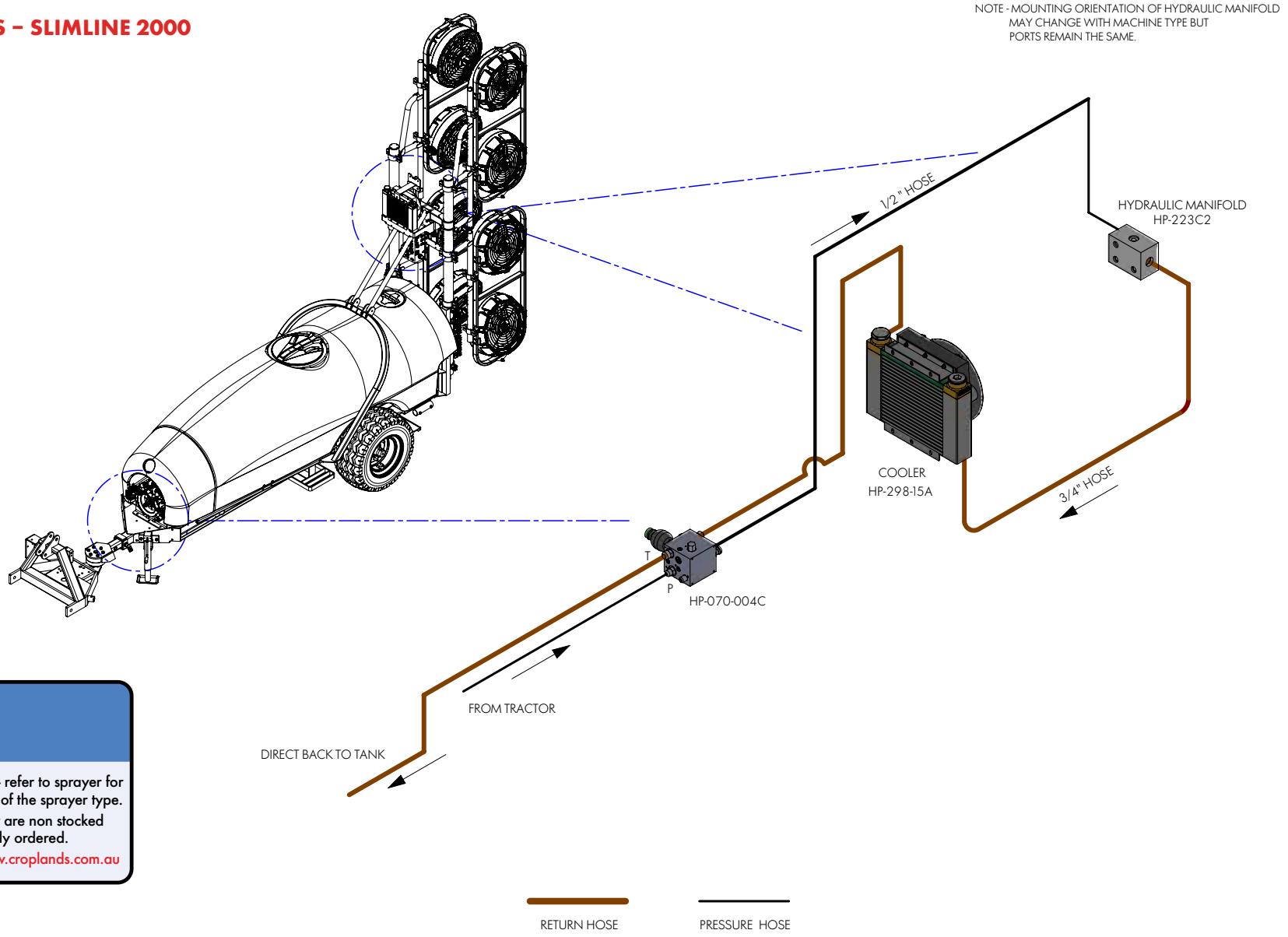
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	AG10071V	O RING 2" VITON	10
2	A463000.040	FLANGE 463 SERIES 1" BSP	1
3	A463000.140	FLANGE FOR 463SER VALVE 1"	1
4	A463011.100	VALVE MOUNTING BRACKET	2
5	A463011.110	BLANK ADAPTOR	1
6	A463011.120	CLOSED ADAPTOR	1
7	A463051	VALVE MANUAL 13MM TAIL	8
8	M8FWASHER	M8 FLAT WASHER ZP	8
9	M8NNUT	M8 NYLOC NUT HT ZP	4
10	M8X510ROD	M8 X 510LG THREADED ROD	4

Please contact Technical support for further details

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

HYDRAULICS SCHEMATICS – SLIMLINE 2000



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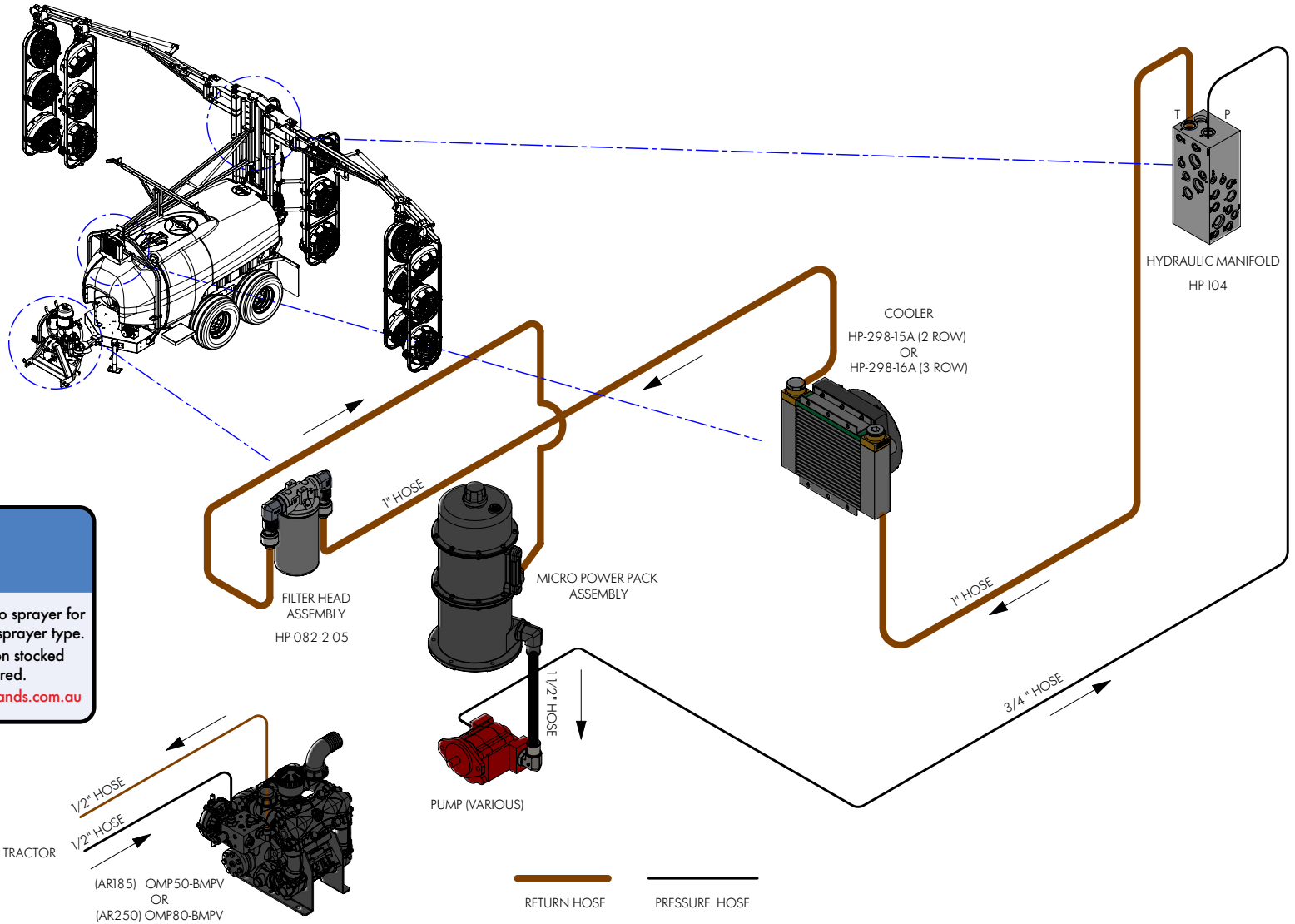
SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

QM-420 WINDCOMP MPP HYDRAULIC SUPPLY SYSTEM, REV0

NOTE - MOUNTING ORIENTATION OF HYDRAULIC MANIFOLD MAY CHANGE WITH MACHINE TYPE BUT PORTS REMAIN THE SAME.



NOTE

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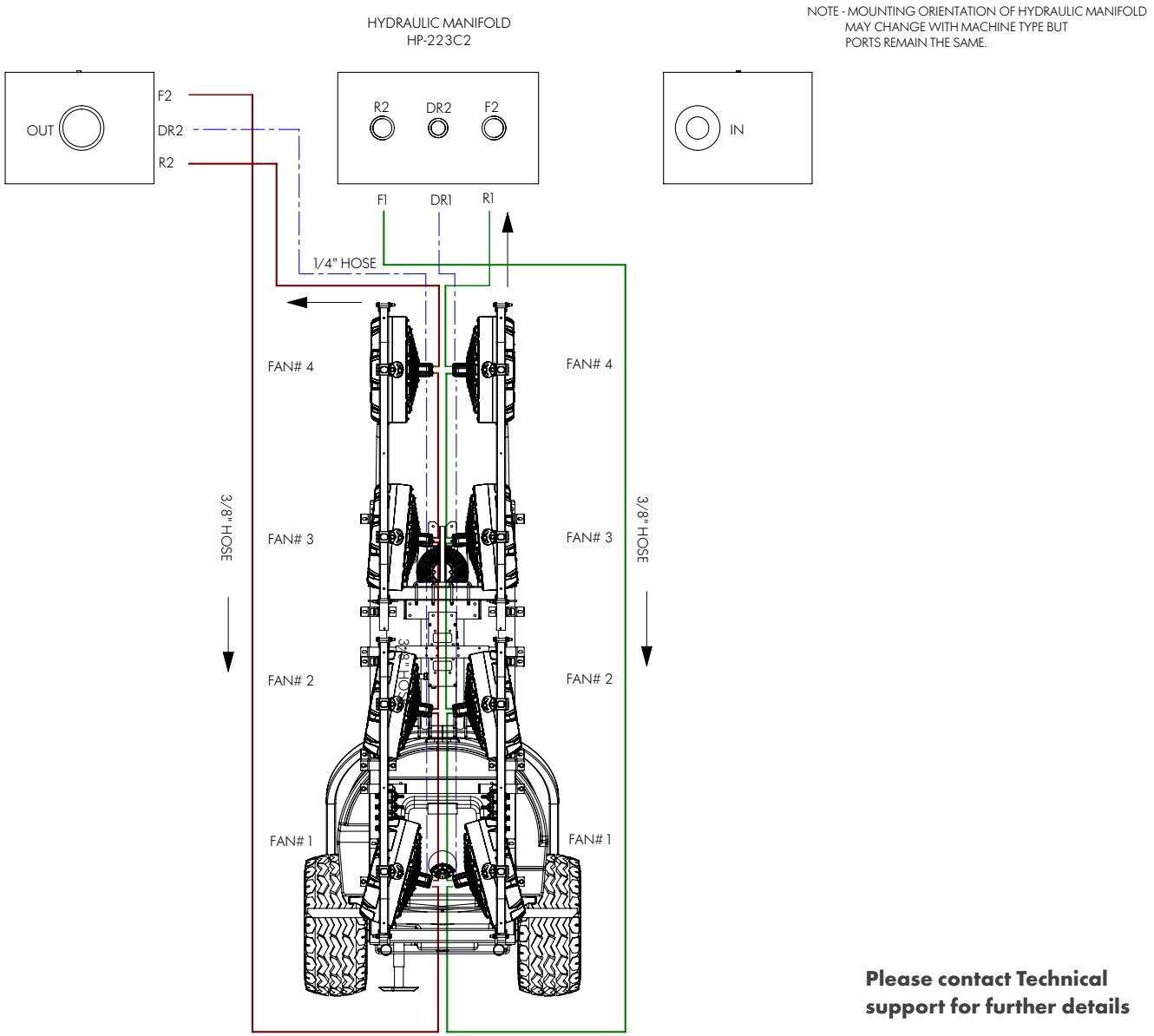
Items in italics or without a part number are non stocked items and may need to be specially ordered.

For further parts information refer to: www.croplands.com.au

SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

ORCHARD STD HYDRAULIC FAN CIRCUIT, 9.8CC, 8 FAN



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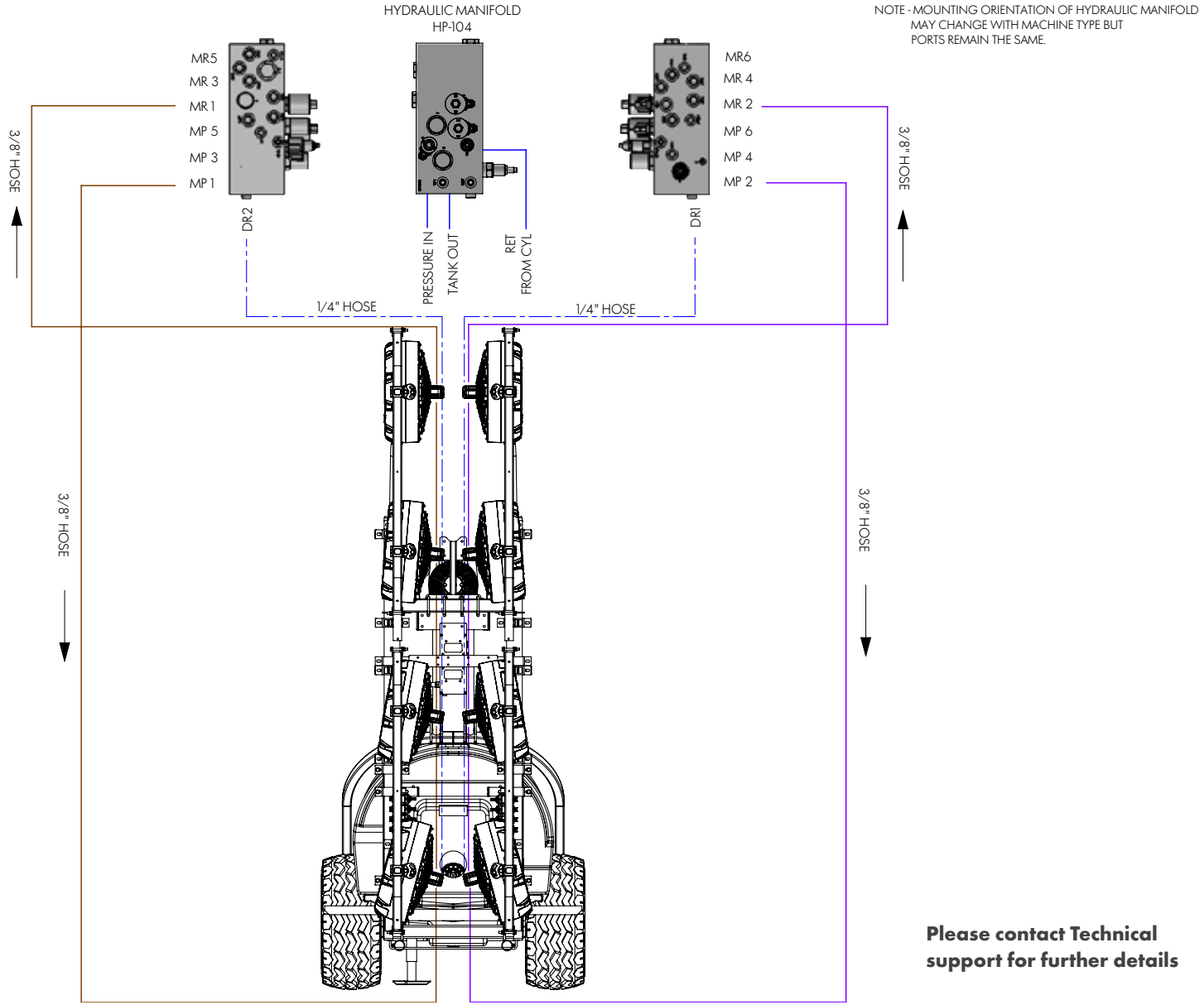
SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

ORCHARD WINDCOMP HYDRAULIC FAN CIRCUIT, 9.8CC, 8 FAN



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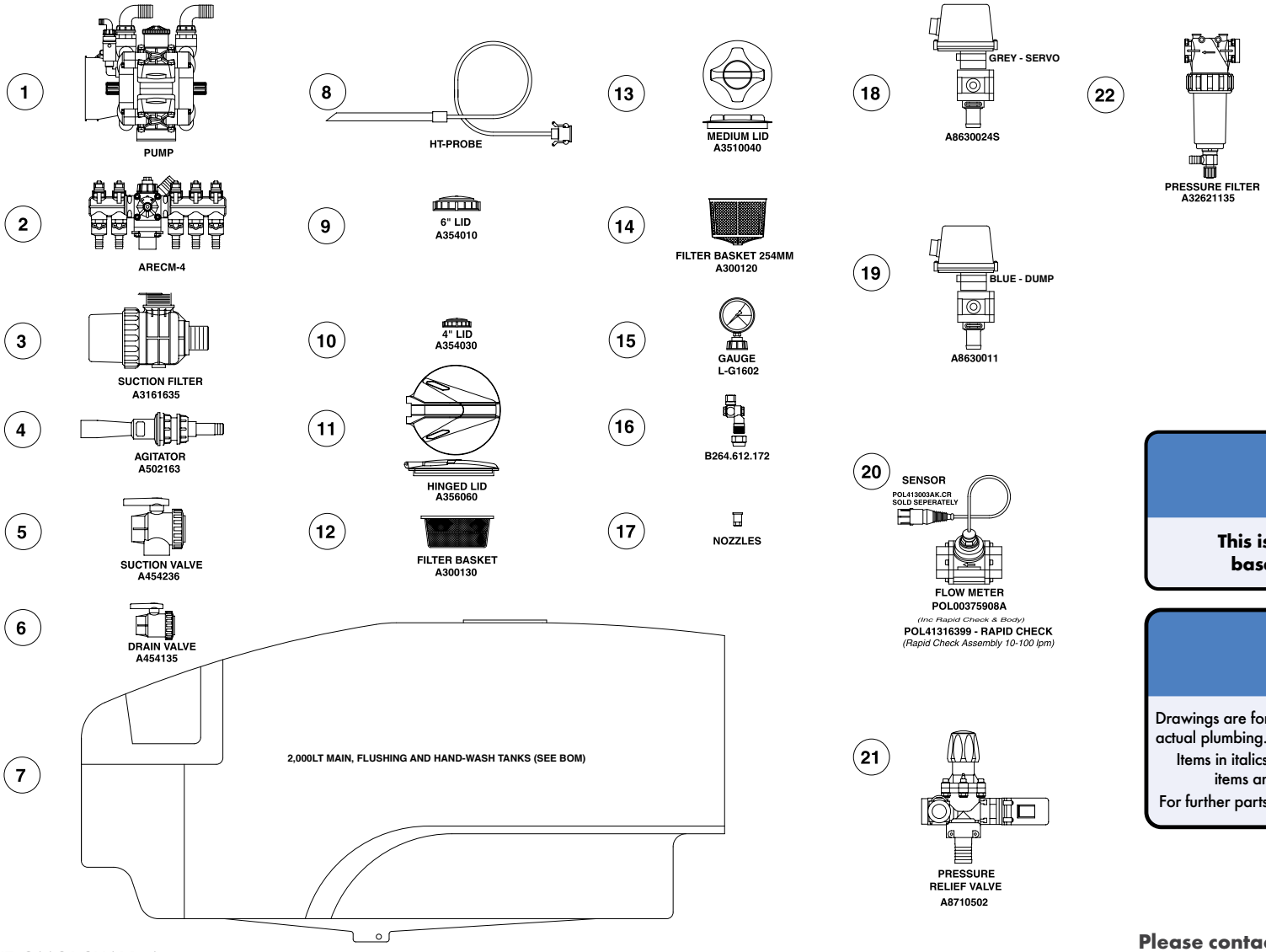
SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

LIQUID SYSTEM COMPONENTS



NOTE

This is a representative parts list based on a 2000 Lt XL model

NOTE

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SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

HT-QMPOM000509C - QUANTUM MIST™

POS	PART NO	DESCRIPTION	QTY
1	AR PUMP	AR PUMP (VARIOUS)	1
2	ARECM-4	ECM 4 WAY LESS FILTER #30027	1
3	A3161635	FILTER 1 1/2" 50 MESH	1
4	A502163	AGITATOR	2
5	A344236	BALL VALVE POLY 1 1/2" 3 WAY	1
6	A454135	BALL VALVE POLY 1 1/4" 2 WAY	1
7	P2000AB-RAW	TANK 2000LT POLY RAW AIRBLAST	1
7a	P2000AAB-130RAW	2000 HORT 130L FLUSH TANK	1
7b	P2000AAB-15RAW	2000 HORT 15L HANDWASH TANK	1
8	HT-PROBE	CHEMICAL SUCTION PROBE (option)	1
9	A354010	LID 6" c/w BREATHER & SEAL	1
10	A354030	LID 4" c/w BREATHER & SEAL	1
11	A356060	LID, HINGED 180degrees 382mm	1
12	A300130	FILTER BASKET 254mm DEEP	1
13	A3510040	LID, MEDIUM 355mm	1
14	A300120	FILTER BASKET 254mm DEEP	1
15	L-G1612	GAUGE 100MM 2500KPA	1
16	B264.612.172	SWIVEL NOZZLE SINGLE 1/4"BSPM	8/fan
17	AZ-ATR-YW-80C	JET CONE ATR 80 DEG (YELLOW)	4/fan
	AZ-ATR-BN-80C	JET CONE ATR 80 DEG (BROWN)	4/fan

POS	PART NO	DESCRIPTION	QTY
18	A8630024S	PROPORTIONAL SERVO VALVE 7 SEC	2
19	A8630011	DUMP/BOOM SHUT OFF VALVE 3 WIRE	1
20	POL00375908A	FLOW METER R/CHECK ZAFF	1
21	A8710502	RELIEF & DUMP VALVE ASSEMBLY	1
22	A32621135	FILTER S/F 80MESH FLANGED TYPE	1

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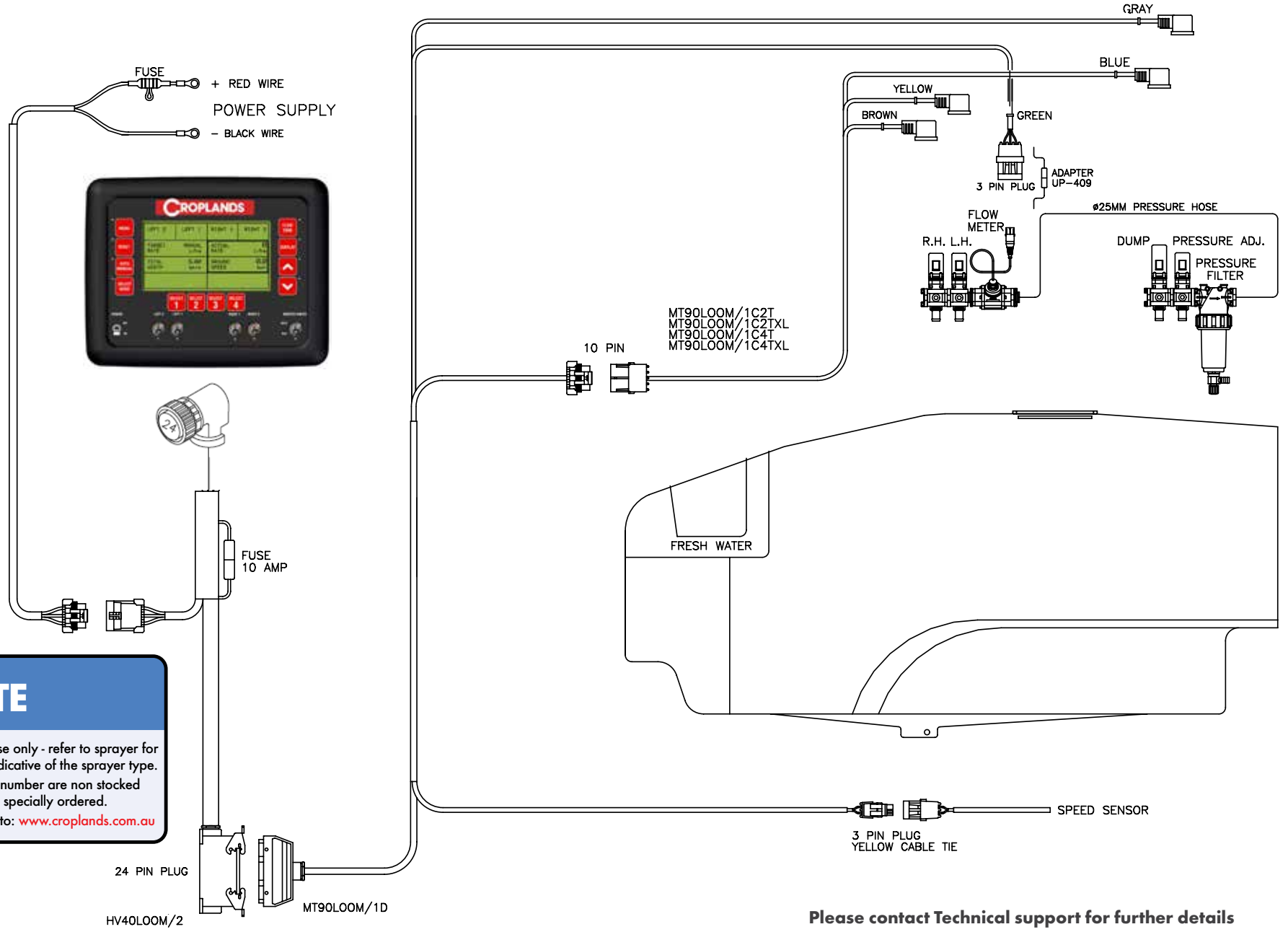
SECTION 10
ASSEMBLY DRAWINGS, PARTS & SCHEMATICS

HV4000 SCHEMATICS



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