



Operator's Manual

MANTGS01 Rev A 1/09/06

TGS Grape Sprayer
2000 Litre
3500 Litre



SAFETY WARNING:

**PLEASE READ THIS MANUAL THOROUGHLY BEFORE ATTACHING
THE SPRAYER TO A TRACTOR OR OPERATING IT.**

No liability can be accepted for any inaccuracies or omissions in this publication, although due care has been taken to make it as complete and accurate as possible.

The information, illustrations and technical data were considered to be correct at the time of preparation.

In accordance with our policy of continuous development Silvan Australia Pty. Ltd. reserves the right to make changes at any time without notice.

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Introduction

Silvan Australia Pty. Ltd. is an Australian owned company specialising in the supply of crop protection equipment to primary producers. A leader in the design of agricultural sprayers, the company was established in 1962 and has grown to become the largest manufacturer and supplier of crop protection equipment in Australia.

At Silvan we are extremely proud of our reputation for quality products backed by quality service. Your investment in a Silvan sprayer is an investment in quality.

This manual covers the 2000 litre and 3500 litre TGS Grape Sprayer fitted with various alternative diaphragm pumps from 163 to 249 litres/minute capacity. This high volume sprayer has been designed and manufactured to provide a high standard of performance and safety and incorporates many innovative features.

To ensure continued efficient performance and safe operation of your sprayer, you need to read this manual thoroughly and fully familiarise yourself with all aspects of the sprayer's operation, maintenance and safety procedures.

Now that you are a proud Silvan owner, all our services and dealer support are available to you should you need them. We assure you of our best attention at all times.

About Your Warranty

Silvan Australia Pty. Ltd. builds equipment to a high level of specification using components from quality suppliers. The following information is provided to assist you with any repairs required within the warranty period.

- All warranty repairs on Silvan products are carried out by Silvan dealers. If any warranty repairs are required on Silvan products, it is recommended that the product be returned to the place of purchase.
- It is good practice to keep a record of equipment maintenance both during and after the warranty period.

The warranty policy on the next page explains the extent and limitations of your Warranty coverage on Silvan Products.

YOUR SPRAYER DETAILS	
Record the details of your TGS Grape Sprayer here for future reference when discussing service with your Silvan dealer, ordering service parts or making a warranty claim.	
SERIAL NUMBER	_____
PUMP MODEL	_____
DATE OF DELIVERY	_____
SELLING DEALER	_____
ADDRESS	_____
TELEPHONE NO.	_____
INSTALLED BY	_____

New Product Warranty

the Silvan Warranty

This warranty is the only warranty applicable to Silvan new products ('Products') and, to the maximum extent permitted by law, is expressly in lieu of any other conditions or warranties expressed or implied in relation to the Products.

Subject only to legislative obligations to the contrary, Silvan shall not be liable for incidental or consequential damage resulting from ownership or use of a Product.

Silvan does not authorize any person to create for it any other obligation or liability in connection with these products.

Silvan warrants its authorised Dealer, who in turn warrants the original purchaser (owner) of each new Silvan product that it will repair or replace the product, or, pay the cost of repair or replacement, as determined by Silvan without charge for labour or any defective or malfunctioning parts in accordance with the warranty limitations and adjustment schedule below.

The warranty period begins on the date the product is delivered to the first retail purchaser for a period of 12 months

This Warranty Covers

Only conditions resulting directly from defects in workmanship or material under normal use and service.

Warranty Exclusions

The Warranty does not cover:

- Conditions resulting from misuse, use of incompatible chemicals, exceeding machine specifications including overloading, impact damage, negligence, accidental damage or failure to perform recommended maintenance services.
- Any product which has been repaired by other than an authorised Silvan service outlet in a way which, in the sole and absolute judgement of Silvan, adversely affect its performance or reliability.
- The replacement of maintenance items such as diaphragms, batteries, V belts and ground engaging components, etc.
- Loss of time, inconvenience, loss of use of the product liability to third parties or any other consequential damages.
- Incidental costs associated with a warranty repair including any travel costs, out of hour's labour charges, cleaning costs, transportation costs, freight costs or any communication costs.

The repair of a defective product qualifying under this warranty will be performed by any authorised Silvan service outlet within a reasonable time following the delivery of the product, at the cost of the owner, to the service outlet's place of business. The product will be repaired or replaced, using new parts supplied by Silvan. Silvan, in its absolute discretion, may choose to pay the cost of replacement or repair of the product.

The owner is responsible for the performance of regular maintenance services as specified in the Owner/Operator Manual applicable to the product. Failure to carry out regular maintenance may invalidate warranty

Safety Information



Before operating the sprayer read the following safety instructions.

Failure to comply with these warnings may result in serious injury or death.

Whilst your TGS Grape Sprayer has been designed and manufactured to incorporate all necessary safety features it is essential that any person who operates or works on the machine is aware of the safety precautions that should be exercised.

- ▲ This sprayer is designed and manufactured solely for the purpose of applying agricultural chemicals to crops. Under no circumstances should it be used for any other purpose.
- ▲ Before using the sprayer carefully read and ensure you understand the contents of this manual and any other manual supplied with the sprayer.
- ▲ Before operating the sprayer read all the safety warnings which are carried on various parts of the machine. Refer to the next page for the location and wording of these warnings.
- ▲ Never allow an inadequately trained person to attach or operate the sprayer.
- ▲ Do not operate the sprayer whilst wearing loose clothing, unrestrained long hair, jewellery or anything which could become entangled in rotating components or limit your vision.
- ▲ Only operate the sprayer on a tractor fitted with a roll-over protective structure (ROPS), or a cab incorporating a ROPS, complying with AS1636 or equivalent.
- ▲ Wear ear protection when operating the sprayer on a tractor that is not fitted with a sound proofed cabin.
- ▲ Ensure the PTO power output and towing capacity of the tractor match the power requirement and loaded mass of the sprayer. Refer to the tractor operator's manual for safe working loads and relevant tractor safety instructions.
- ▲ Exercise extreme care when operating in hilly or uneven terrain to ensure proper stability. Refer also to the tractor manufacturer's operating and safety instructions.
- ▲ Do not operate the sprayer without all the tractor and sprayer safety shields in place. Carefully check that the PTO and driveline shields are correctly installed.
- ▲ Never allow anyone to ride on the sprayer or tractor.
- ▲ Do not operate the sprayer at more than 540 PTO rpm.
- ▲ Apply the parking brake, switch off the tractor engine and remove the key before performing any service work on the sprayer. Ensure the sprayer and boom arms are properly supported and restrained before performing any maintenance work. Do not support the sprayer by the jockey wheel when the tank is full or partly full of liquid.
- ▲ Do not stand near or perform adjustments on the boom arms, air tubes or nozzles without first stopping the tractor engine and removing the key to ensure the arms cannot move due to inadvertent operation of the hydraulic controls.
- ▲ Relieve all hydraulic pressure before disconnecting hoses. Oil escaping under pressure can penetrate the skin, causing serious injury. Seek medical advice immediately if injured by escaping oil.
- ▲ **Before use of any chemicals** refer to the chemical manufacturer's label and safety instructions for safe handling procedures, correct method of use and required protective clothing and equipment. **Always use the recommended personal protective clothing and equipment.**
- ▲ **Always wear gloves when carrying out any adjustments to the sprayer or boom.**
- ▲ Ensure that all operators and associated personnel are familiar with the legal regulations and codes of practice that apply to the safe use, storage and disposal of spray chemicals.
- ▲ **Do not enter the sprayer tank under any circumstances.** If service to the tank is required contact Silvan for correct maintenance procedures.

Safety Information



The locations and wording of the safety warning decals are shown below. It is important that all operators read and follow the information given on all safety decals. Failure to comply with these warnings could result in serious injury or death

The safety decals should be kept clean and legible at all times. If any are missing or unreadable they should be replaced by ordering new decals from your Silvan dealer under the part numbers shown.

<p>Part Number DEC 10 On top surface of drawbar</p>	<p>Part Number DEC 13 On both sides of tank</p>	<p>Part Number DEC 52 On left and right fan air outlets and on both outer air tubes</p>
<p>P/No. 399 14 1000 On PTO Shaft Not shown</p>	<p>Part Number DEC 12 On front of frame</p>	<p>Part Number DEC 48 Adjacent to bottom fill connection and on top surface of drawbar</p>

3500L TGS shown

Features and Specifications

Tank

Polytuff impact resistant polyethylene.
Capacity 2000 litres and 3500 litres.
455 mm screw down lid with basket strainer.
Calibrated, floating ball liquid level sight gauge.
50 mm bottom drain with ball valve.

Bottom Fill

50 mm cam-lever hose coupling.

Chemical Fill

Venturi chemical probe.

Agitation

Continuous by-pass agitation plus twin belt driven propeller agitators.

Clean Water Tank

40 litre Polytuff tank

Pump

Positive displacement oil backed, Nitrile diaphragm pump of varying size depending on sprayer specification.

Performance at 540 PTO rpm

Pump No.	Output	Max. Pressure
	l/min	Bar
APS-166	163	50
IDS-2200	208	50
IDS-2600	249	50

Fan

Diameter (mm)	450
Speed (rpm)	3348
Air Volume (m ³ /hr)	18,000

Drives

PTO	540rpm wide angle constant velocity with safety shields.
Pump	Direct coupled to PTO shaft
Fan	Direct coupled to 2 speed gearbox
Agitators	Flexible self tensioning belts

Controls

Three 12 volt motor valves.
Cabin mounted control box with
Master pump/by-pass switch
(2) Section on/off switches.
Manual pressure regulator.
100mm dia. pressure gauge on front of sprayer.

Filtration

Two stage with removable elements.
Standard mesh shown. Alternatives available.
1) Tank lid strainer 18 mesh.
2) Suction line filter 50 mesh (blue)

Spray Boom

Fully adjustable two row spray boom.
4 poly moulded air tubes shaped to surround vine canopy. Adjustable for canopy width and height.
5 adjustable direction air diffusers on each air tube.
40 interchangeable ceramic 80° cone nozzles, one pair of nozzles per air diffuser.
On/off taps and non-drip valves on nozzles.
Stainless steel spray lines with end flushing taps.
Break-back action on outer arms.
Stainless steel cane deflector bars.
Independent hydraulic folding left and right arms.
Galvanised steel structure.

Chassis, Wheels and Suspension

Heavy duty galvanised steel chassis.
Adjustable drawbar with reversible hitch.
Removable jack with jockey wheel.
Tandem Simplicity axle.
Track width to outside of tyres 1810mm
Tyre size & pressure 31x10.5R15 250kpa (35psi)

Optional Equipment

Farmscan Primo 400 Spray Controller
Air Tube Hydraulic Height Control.

Dimensions and Weights

With standard equipment.
Mass with tanks empty. To calculate gross weight add 1 kg per litre of water fill.

	Length	Width	Height	Mass
	(dimensions in mm)			(kg)
2000 litre	4300	2450	3375	980
3500 litre	5075	2650	3375	1020

Tractor Requirement

Minimum recommended engine power rating.
2000 litre 48 kW (65 HP)
3500 litre 56 kW (75 HP)

Features and Specifications



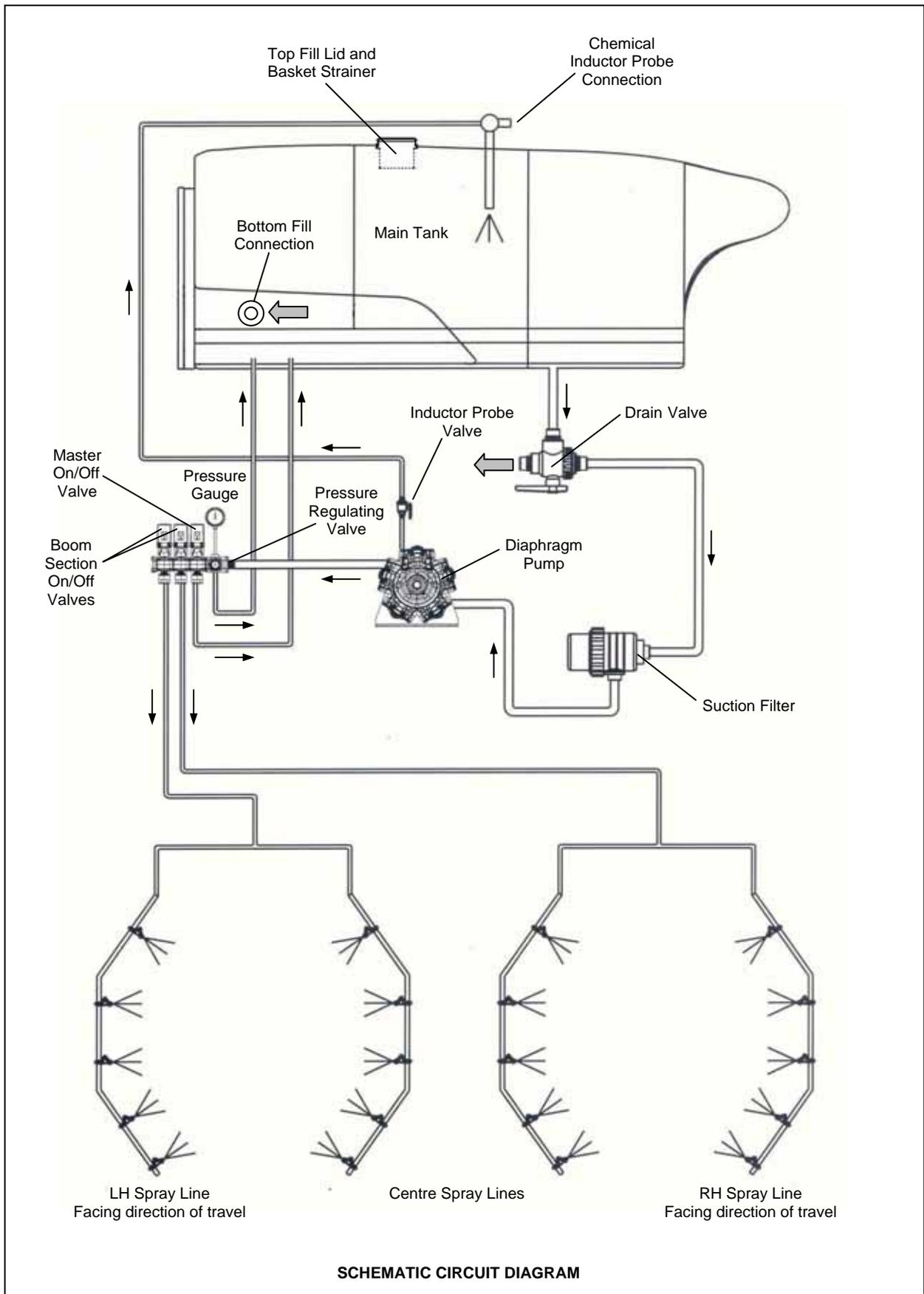
- Poly-moulded Air Tubes
- Independent Hydraulic Boom Fold
- Fully Adjustable 2 Row Boom
- Cane Deflector Bars
- Breakback Outer Arms
- Stainless Steel Spray Lines
- Flushing Taps
- Tandem Simplicity Axle 10.5 x 15 Tyres
- Galvanised Steel Chassis and Boom Frame
- Turbine Fan
- Interchangeable Ceramic Nozzles
- Adjustable Air Diffusers
- Nozzle On/Off Taps



- Jack with Jockey Wheel
- Adjustable Drawbar & Hitch
- Top Fill Lid with Basket Strainer
- Chemical Inductor Probe
- 3500 litre Main Tank
- 40 litre Clean Water Tank
- Pressure Gauge
- Suction Filter
- Drain Valve
- Sight Gauge
- Access Platform & Hand Rail both sides
- Bottom Fill Connection
- Wide Angle PTO Shaft not shown
- Diaphragm Pump
- Twin Propeller Agitators

FEATURES OF THE TGS GRAPE SPRAYER (3500 litre shown)

Description of Fluid Flow



Description of Fluid Flow

The schematic diagram opposite shows the fluid flow of the TGS Grape Sprayer.

The main tank can be filled either through the top or the bottom but the recommended method is through the bottom fill connection, which is more convenient and prevents chemicals from frothing. The bottom fill incorporates a cam-lock hose coupling.

If the top lid is used for filling, a basket strainer is provided to prevent entry of foreign material.

The level of liquid in the main tank is shown by a floating ball sight-line and calibration marks on the LH side of the sprayer.

For rapid emptying, a large diameter outlet under the LH side of the sprayer discharges through a manual drain valve. During filling and spraying this valve is turned to the "Pump" position. Turning the valve to its midpoint (handle vertical) closes the valve to allow removal of the suction filter element without losing fluid from the tank.

Liquid chemicals are added to the main tank with a detachable inductor probe and hose, connected by a cam-lock coupling to a venturi in the tank. Opening the inductor valve, mounted on the pump, directs pressurised fluid from the pump to the venturi and applies suction to the probe. Solid chemical can be dissolved in water to allow use of the probe or it can be added through the top opening in the tank.

The chemical mixture is drawn from the underside of the tank through the suction line to the inlet side of the diaphragm pump, which is driven directly by the PTO shaft. A filter in the suction line ensures that no foreign material enters the pump. The filter incorporates a replaceable element.

Fluid is discharged from the pump through a manual pressure regulator to a 12 volt electrically operated valve block, mounted at the front of the sprayer.

The manual pressure regulator is used to set the spraying pressure, which is shown on the pressure gauge mounted at the pump.

The electric valve block incorporates a Master on/off valve and two boom Section on/off valves that are operated by switches on a control box mounted in the cabin. The Master on/off switch changes the pump between by-pass and pressure modes. The Section on/off switches stop and start spraying on the left and right sides of the boom.

By-passed fluid from the pressure regulator and Master valve is returned to the underside of the main tank, which keeps the chemical solution mixed.

Two propeller agitators in the front of the tank are belt driven from the PTO shaft to provide further mixing of the solution.

Boom Circuit

The boom section valves direct fluid to the spray lines on the boom air tubes. The circuit diagram shows the section of the boom that is controlled by each valve. Once the boom pattern is set with the section on/off switches, spraying is stopped and started with the master switch.

Each spray line is connected to ten nozzles, arranged in pairs on the five air diffusers of each air tube. The application rate can be varied by fitting nozzles with different size orifices.

An on/off tap on each pair of nozzles enables the spray pattern to be varied. The taps incorporate a non-drip valve that is activated once spraying pressure falls below approximately 0.5 Bar. A tap at the lower end of each spray line is used to flush the system.

The turbine fan is driven at constant speed by the PTO shaft through a direct coupled, two speed gear box. Air is directed to the vertical air tubes of the boom and discharged through the diffusers, which atomizes the liquid discharged from the spray nozzles. The angle of the diffusers can be adjusted to vary the discharge pattern.

Clean Water Tank

The clean water tank is not connected to the spraying circuit. It is filled through the top opening and provides clean water for washing purposes through a tap on either side of the sprayer. Under no circumstances should it be used for drinking.

Connecting to the Tractor



CABIN CONTROL BOX

Installing the Cabin Control Box

Before attaching the sprayer to the tractor, install the cabin Control Box.

Using the bracket and hardware provided with the sprayer, install the control unit in a suitably protected position within the cabin where it will be easily seen and within convenient reach. All switches should be in the "off" position whilst installing.

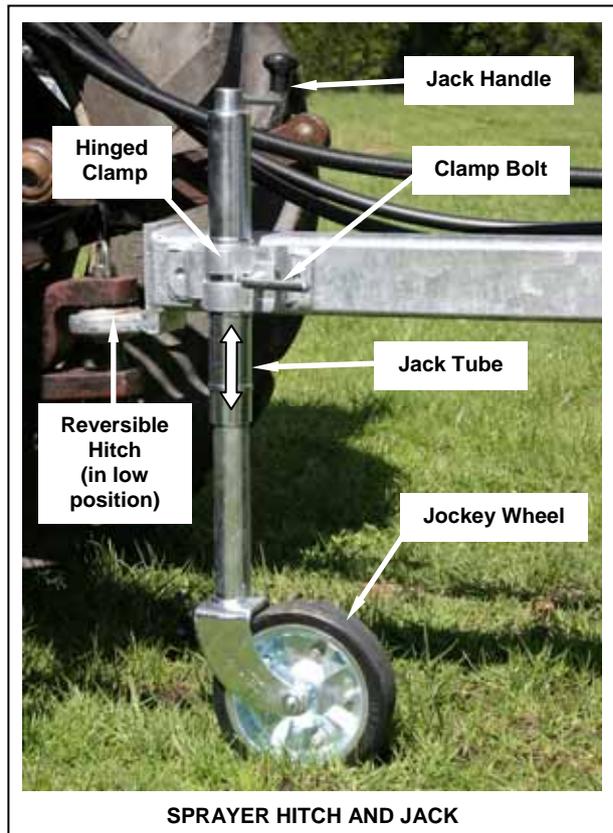
Connect the electrical cable provided directly to the battery. Positive = Brown Negative = Blue
If the cable needs to be extended it is important to use wire of the same diameter.

Run the control box wiring loom back to the sprayer through a convenient outlet in the tractor cabin, ensuring that it does not rub on any sharp edges. Connect the control loom to the sprayer loom at the quick release coupling and ensure that all wiring is clear of the PTO shaft and tractor wheels.

Hitching to the Tractor

Attach the sprayer hitch to the tractor drawbar using the hitch pin supplied with the tractor. Make the connection on a level surface with the sprayer tanks empty. Use the sprayer jack to adjust the height of the hitch to match the tractor drawbar then back the tractor into position. Install the hitch pin and secure it with its locking pin.

Wind the jack handle to transfer the weight of the sprayer onto the tractor. Wind the jack up fully, loosen the clamp bolt, raise the jack tube to full height and re-tighten the clamp bolt. If this does not provide sufficient ground clearance for on-farm operations the jack can be removed by undoing the clamp bolt and swinging the hinged clamp open. Close the hinge and refit the clamp bolt. Always remove the jack when travelling on the road.



SPRAYER HITCH AND JACK

To unhitch the sprayer from the tractor, reverse the above procedure.

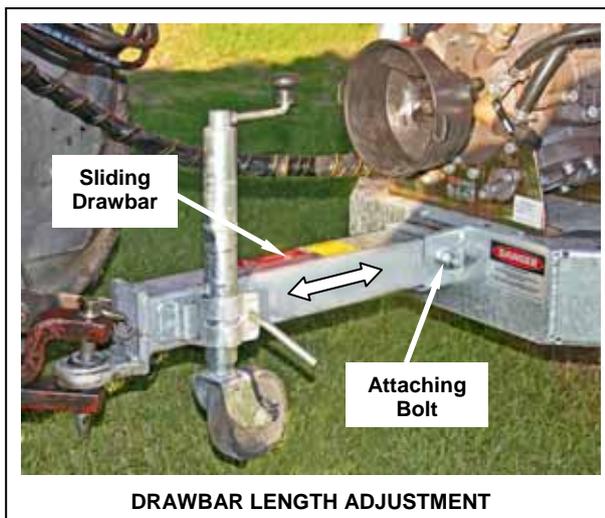
When connected, the sprayer frame should be level and the hitch point should be as near as practical to midway between the PTO shaft universal joints with the height difference between the joints not more than about 10cm. This will ensure the joint angles are similar during turns and within the allowable limit. To achieve this it may be necessary to adjust the height and length of the tractor drawbar. It may also be necessary to adjust the sprayer drawbar as described below.

Adjusting the Drawbar

To adjust the sprayer drawbar, support the front of the sprayer frame on a suitable stand that will safely take the weight of the sprayer. The sprayer tanks must be empty. Chock the wheels to avoid the sprayer moving inadvertently.

Lower the sprayer onto the support stand and remove the bolt attaching the drawbar to the sprayer frame. To adjust the hitch height, slide the drawbar out and rotate it 180° to either the high or low position. Reinstall the drawbar and slide it so the attaching bolt can be passed through the hole nearest to the required length. There are three alternative holes in the drawbar.

Connecting to the Tractor



Securely tighten the attaching bolt. Raise the sprayer with the jack to remove the support stand and connect to the tractor as previously described.

Connecting the PTO Shaft

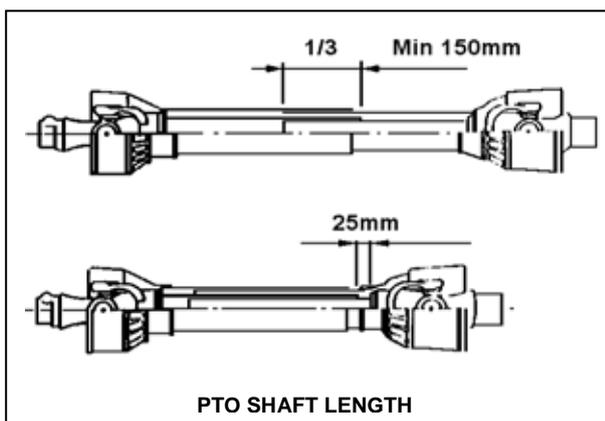
Clean and grease the splines on the tractor and sprayer PTO stub shafts and install the PTO shaft with the wide angle joint fitted to the tractor. Make sure the spring loaded locking pins engage in the grooves of both stub shafts.

Ensure that the tractor PTO guard is attached to the tractor.

Note: Upon delivery of a new sprayer it is the selling dealer's responsibility to install and set the PTO shaft to the correct length. The following information is provided for reference.

The telescoping tubes must overlap by at least $\frac{1}{3}$ their length, but not less than 150mm, in all operating positions and there must be at least 25mm telescopic movement remaining at the minimum operating length, refer diagram.

If the PTO shaft has to be shortened, cut equal amounts from both male and female shafts and safety covers. Carefully remove all burrs then clean and relubricate before reassembling.



Relieve all hydraulic pressure before connecting or disconnecting hoses. Oil escaping under pressure can penetrate the skin, causing serious injury. Seek immediate medical treatment if injured by escaping oil.

Connecting Hydraulic Hoses

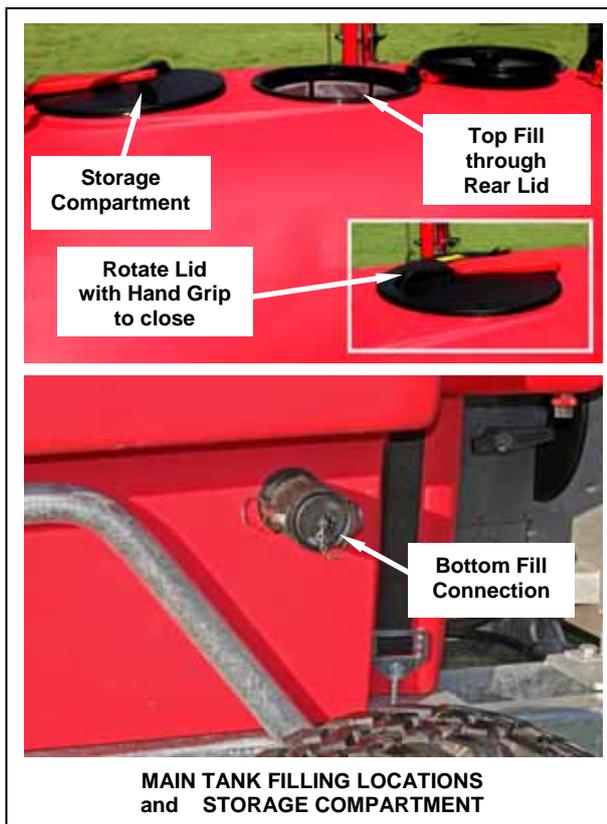
When attaching or removing hydraulic hoses make sure the quick release connections are clean to avoid contaminating the system. Ensure the hoses are well supported and clear of the tractor wheels.

Two sets of remote hydraulic connections are required to operate the boom folding system, one pair for each side.

The pressure hoses can be identified by the regulating valve adjacent to the quick release connector. They should always be connected to a pressure outlet. If connected in the opposite manner no damage will be done but the tractor control will move the boom in the reverse direction. For safety reasons it is therefore important to always connect the hoses to the correct sockets.

Important: When connecting the hoses for the first time adjust the boom fold speed with the regulating valves on the pressure hoses so that the boom can be unfolded and folded at a speed that enables easy control at 540 PTO rpm. Each time that the hoses are removed and reconnected check that the boom fold speed is satisfactory and adjust if necessary. Refer to Adjusting the Boom Fold Speed in the Operation section.

Operation



Filling the Main Tank using Bottom Connection

The main tank can be filled through either the top or bottom but the recommended method is through the bottom fill connection, which is more convenient and prevents chemicals frothing. It is also safer as the tank can be filled from ground level.

Before filling, first check that the red handle of the drain valve is turned to the "Pump" position. The drain valve is located at the LH front of the sprayer.

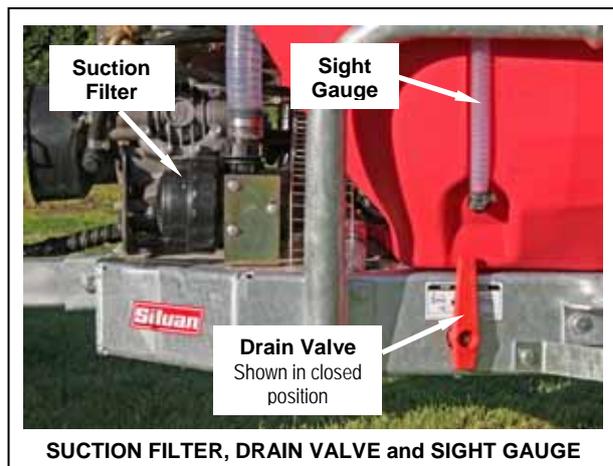
Undo the catches and remove the cap from the bottom fill connection, which is located on the LH rear side of the main tank. Connect a filling hose with a 50mm cam lock coupling to the bottom fill connection and turn on the water supply.

The red ball in the sight gauge indicates the level of liquid in the tank. The volume can be read from the litre scale markings moulded into the tank. The gauge is visible from the tractor so the content can be observed whilst spraying.

When filling is complete, shut off the supply and disconnect the hose. The connection incorporates a non-return valve. Replace the cap and close the catches.

Filling the Main Tank using the Top Lid

If filling the tank through the top use the steel mesh platform on the side of the sprayer frame to gain access to the filler lid. For safety reasons do not climb on the tank or stand on the tyres.



The rear lid, which is fitted with a basket strainer, is used to fill the tank. To open the lid, rotate it with the handgrip to release the screw seal then swing it open on the hinge. Before filling check that the basket strainer is clean. The basket can be removed for cleaning if necessary.

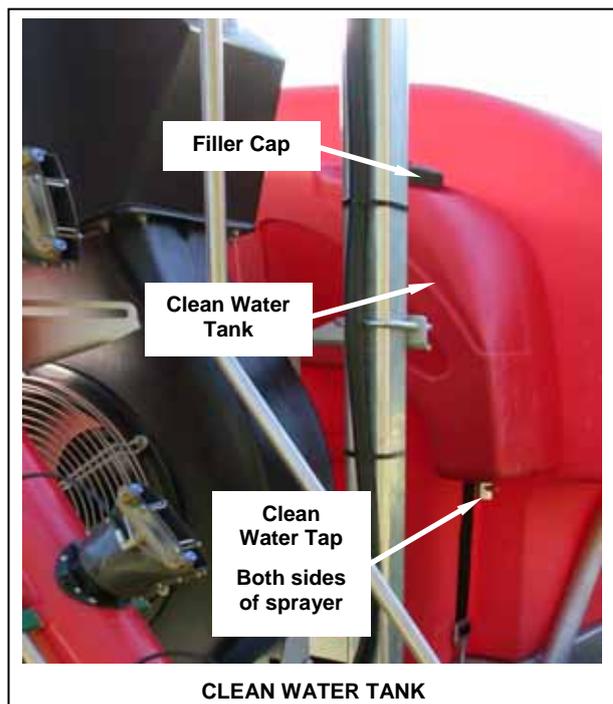
After filling, close the lid and lock it by turning the handgrip.

Filling the Clean Water Tank

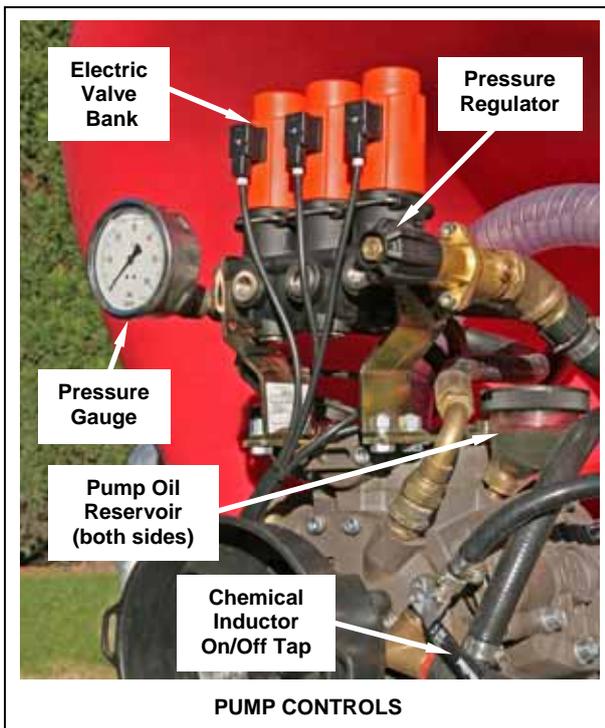
The clean water tank provides a convenient water supply for washing purposes.

Under no circumstances should it be used for drinking.

The tank should be filled with clean water through its top screw lid at the same time as the main tank is filled. A discharge tap is provided on either side of the sprayer for convenient access.



Operation



Front Lid Storage Compartment

The front lid of the main tank covers a receptacle that can be used for storing small items, such as gloves.

Suction Filter

The suction filter should be cleaned after each tank of chemical mixture is emptied and at the end of each day. This routine ensures it is ready for the next filling. Refer to the Maintenance section for filter cleaning information.

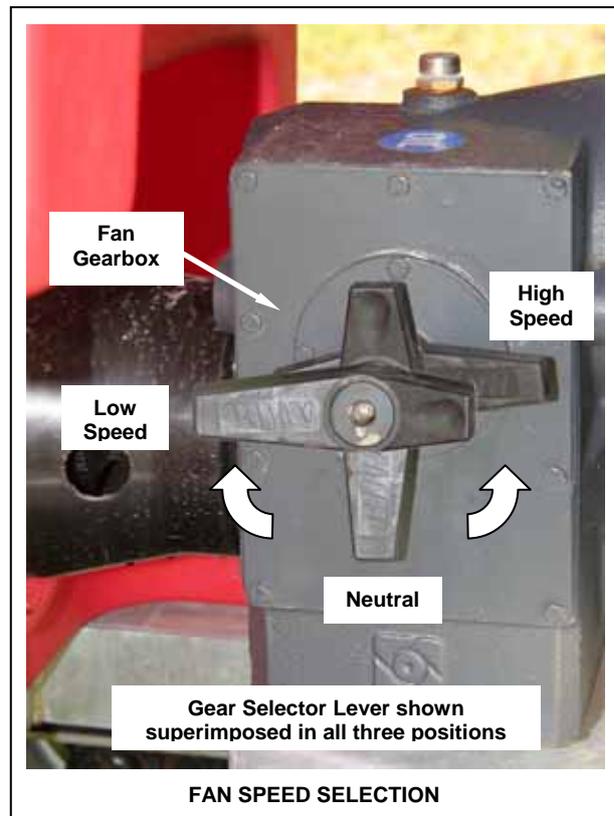
The filter is located at the LH front of the sprayer. The element can be removed for cleaning by unscrewing the black plastic ring and removing the cover. The sprayer must be stopped before removing the element. To prevent liquid draining from the tank when the element is removed, close the drain valve by turning the handle vertical before removing the element.

Setting the Spraying Pressure

Spraying pressure is set with the regulator knob above the pump. Turning the knob clockwise increases pressure and turning it anti-clockwise decreases pressure. Pressure is shown on the gauge, which can be seen from the tractor seat.

Fan Speed

Fan speed is selected by turning the lever on the LH side of the gearbox at the rear of the sprayer. High speed produces maximum airflow and is used for normal spraying. Low speed produces less airflow and can be used to protect the crop canopy from damage.



The neutral position of the gearbox enables the pump and agitators to be operated without the fan. This position can be used when running the sprayer to mix the chemical solution.

To maintain the correct airflow the sprayer should always be operated at 540 PTO rpm. The fan drive incorporates an over-running clutch to prevent drive line overload.

Never engage the fan drive with the tractor engine running or the PTO engaged.

Starting the Sprayer for the First Time

Before starting the sprayer for the first time grease the lubrication points on the PTO shaft and check the oil level in the pump and the gearbox. Refer to the Maintenance section for further information.

Ensure that the boom fold speed regulating valves have been adjusted to give a speed that enables easy control at 540 PTO rpm. Refer to Adjusting the Boom Fold Speed in the Operation section.

Conduct a trial run using water only to familiarise with the controls and to check that all systems are functioning correctly without leakage.

Fill the sprayer with about 500 litres of water through the bottom fill.

Check that the fan gearbox is engaged. Use the high speed position for the trial run.

Operation



Start the tractor, run the engine at low speed and engage the PTO. Set the Master switch of the cabin control box to the "off" position so that the sprayer is running in by-pass mode.

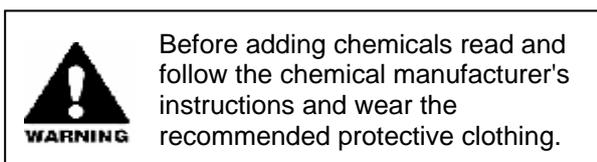
Once running satisfactorily, increase speed to 540 PTO rpm, turn the Master switch on and set the spraying pressure with the pressure regulator.

Make sure all bystanders are clear then unfold the boom. Switch the LH and RH sections on and check that all nozzles are spraying. Inspect the sprayer for any leaks and tighten connections if necessary.

Starting Procedure for Regular Operation

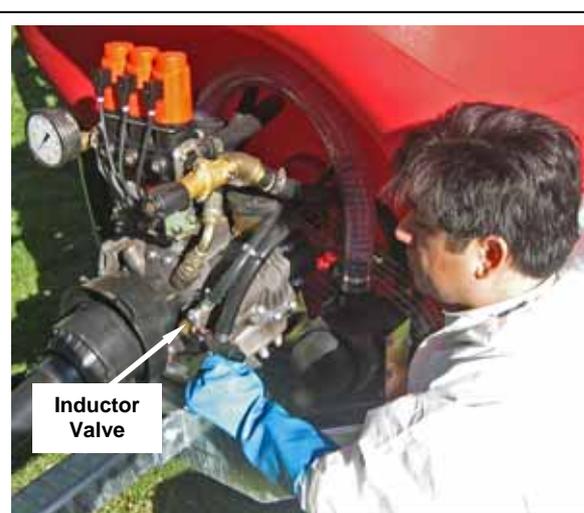
After the initial trials the following starting procedure can be used for regular spraying.

1. Start the tractor, engage the PTO and slowly bring the speed up to 540 PTO rpm.
2. Set the master switch on and open and close each boom section to check that it is functioning.
3. To commence spraying open the required boom sections with their control switches.
4. Spraying may then be stopped and started using the master switch to maintain the required boom configuration.



Adding Chemicals

Carefully read and follow all safety precautions provided by the chemical manufacturer.



CHEMICAL PROBE
Always wear the protective clothing recommended by the chemical manufacturer.

Always wear gloves, eye protection and all the recommended protective clothing whilst mixing and filling the sprayer with chemicals. Take care to avoid spillage of chemicals or mixed solution. Wash your hands after filling if they have come into contact with concentrate or mixed solution.

Store unused chemicals and dispose of empty chemical containers as recommended by the chemical manufacturer or relevant authority.

Adding Chemicals with the Probe

Liquid chemicals can be added to the tank safely and conveniently using the inductor probe while the sprayer is running, which will thoroughly mix the solution.

Operation

Chemical may be transferred by inserting the probe into the original drum or a measured amount can be decanted into a suitable container. Powdered chemical can be added with the probe by first dissolving in water, or dry if they are flowable powders.

Before adding any chemicals fill the tank with approximately 500 litres of water.

Close the boom sections so that the pump output will be by-passed to the tank to mix the solution.

Connect the probe hose to the cam lock connector on top of the main tank. The probe valve should be closed.

Put the gearbox into neutral, start the sprayer and run at 540 PTO rpm. Open the inductor valve on the LH side of the pump.

Place the probe in the container and open its valve by turning the handle to align with the probe. Chemical will be drawn from the container and transferred to the tank. When all chemical has been added, shut the probe valve and close the inductor valve. Remove the probe hose from the cam lock connector, refit the cap and close the catches.

Continue filling the main tank with water and keep the sprayer running to thoroughly mix the solution.

The probe should be rinsed and left in a safe location at the filling station for the next filling.

Adding Chemicals through the Top Opening

Powdered or liquid chemicals can be added through the rear lid on top of the tank if necessary but this method is not recommended, as it is safer and more convenient to use the probe.

If adding chemicals through the top opening stand on the steel mesh platform on the side of the sprayer. For safety reasons do not climb on the tank or stand on the tyres.

When adding liquid chemical use the basket strainer. If adding powdered chemical remove the basket strainer.

Draining and Flushing the Sprayer

Carry out the following routine at the end of each day when spraying and before storing the sprayer.

Open the drain valve and empty any unused solution from the tank. Rinse the tank through the top opening with a hose until clean water runs from the drain outlet, then close the drain valve. Never leave chemicals in the tank that could settle to the bottom and break into lumps that may block the suction filter.

Remove and clean the suction filter.



Add clean water to the tank and run the sprayer at 540 PTO rpm for several minutes with all sections open to flush the system and remove all chemical from the pump, valves and spray lines.

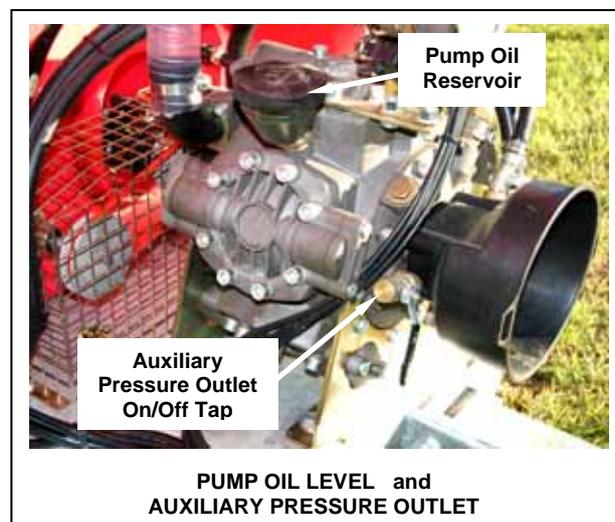
Open the yellow tap at the bottom of each spray line to assist flushing. The tap is open when aligned with the spray line and closed when across.

Close the flushing taps after flushing for several minutes and continue running until clean water is sprayed from all nozzles. Empty any unused flushing water from the tank with the drain valve.

Dispose of unused chemical mix, rinse water and containers as recommended by the chemical manufacturer or relevant government authority.

Auxiliary Pressure Outlet

A pressure outlet and tap are fitted to the RH side of the pump for auxiliary operations such as using a hand spray. The pressure is adjusted with the spraying pressure regulator.



Operation

Spray Boom Operation

The boom is controlled by two sets of remote hydraulic outlets, one for each side. The tractor hydraulic control levers are used for the folding and unfolding operations.

The speed at which the boom folds can be regulated by adjusting the valves on the pressure hoses so that maximum control can be maintained, see below.

When folded, the arms rest on a support saddle on each side of the sprayer and are not held by any lock mechanism. A ratchet strap is supplied with the sprayer for securing the arms in the folded position when transporting the sprayer on the road.

The dropper bars that support the outer air tubes incorporate a hinge at the top that allows them to swing back if an obstacle is accidentally contacted.

Stops are fitted to the outer droppers to prevent them contacting the main tank when the boom is folded.

Folding and Unfolding the Boom

Always ensure that the boom is folded or unfolded in a safe area where it will not foul on any other objects. Look up before folding or unfolding to check for obstructions. Never fold or unfold near overhead power lines. Ensure that all bystanders are clear before moving the boom.

Unfolding: The boom will slide free from the saddles when unfolded. Use the tractor hydraulic lever to slowly unfold one arm at a time until the hydraulic cylinder is fully extended.

Folding: Fold the boom slowly, one arm at a time with the tractor hydraulics until the arm rests on the support saddle.

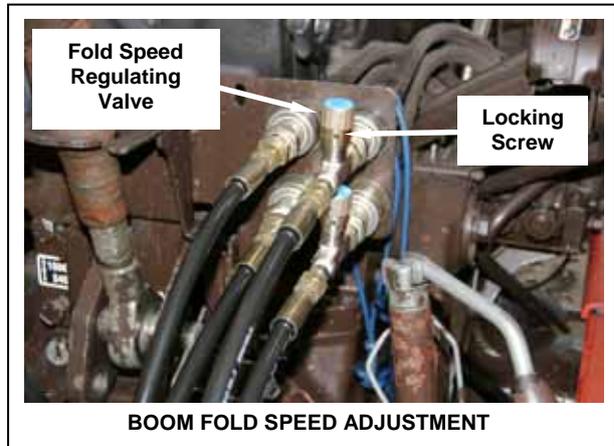
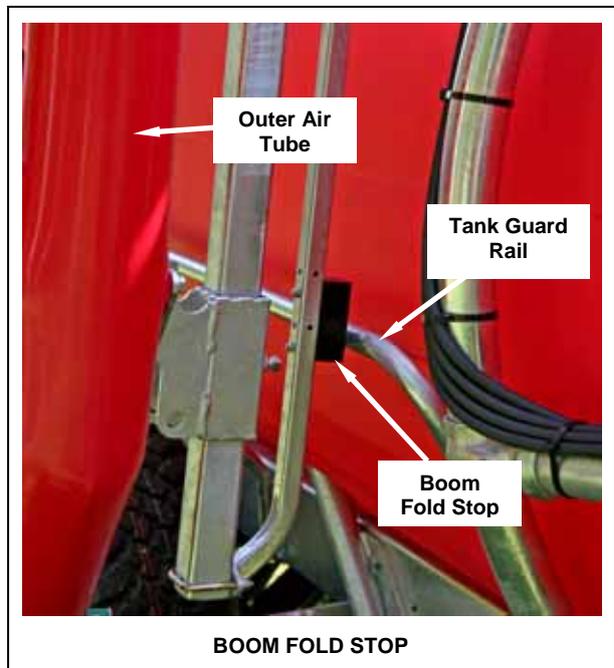
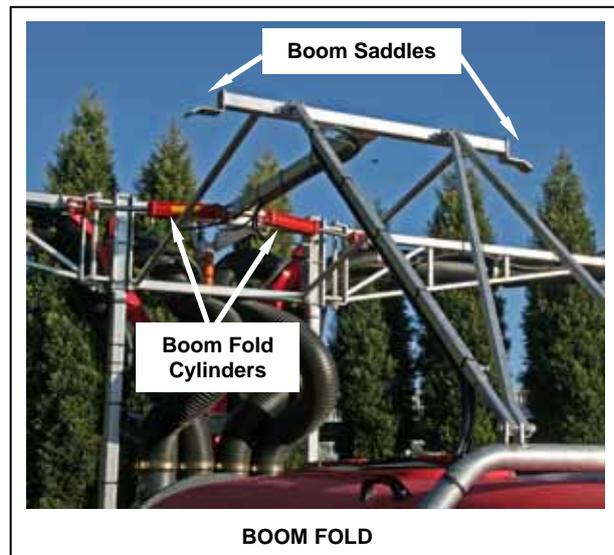
Adjusting Boom Fold Speed

A regulating valve on the pressure hose to each fold cylinder controls the speed of the boom arms. The valves are located adjacent to the quick release couplings at the forward end of the hoses. Turning the valve clockwise reduces folding speed and turning it anti-clockwise increases speed.

Run the tractor engine at 540 PTO rpm and adjust one arm at a time. Loosen the locking screw in the valve knob with an Allen key. Fold and unfold the arm several times and observe the speed. Turn the valve to give the required speed.

Only small adjustments are needed to make a difference to the arm fold speed. When satisfied tighten the locking screw.

Adjust the other arm to a similar speed.



Operation

Configuring the Spray Boom

The air tubes are shaped to the contour of the vine canopy and their position can be adjusted vertically and horizontally to vary the distance between the nozzles and the canopy.

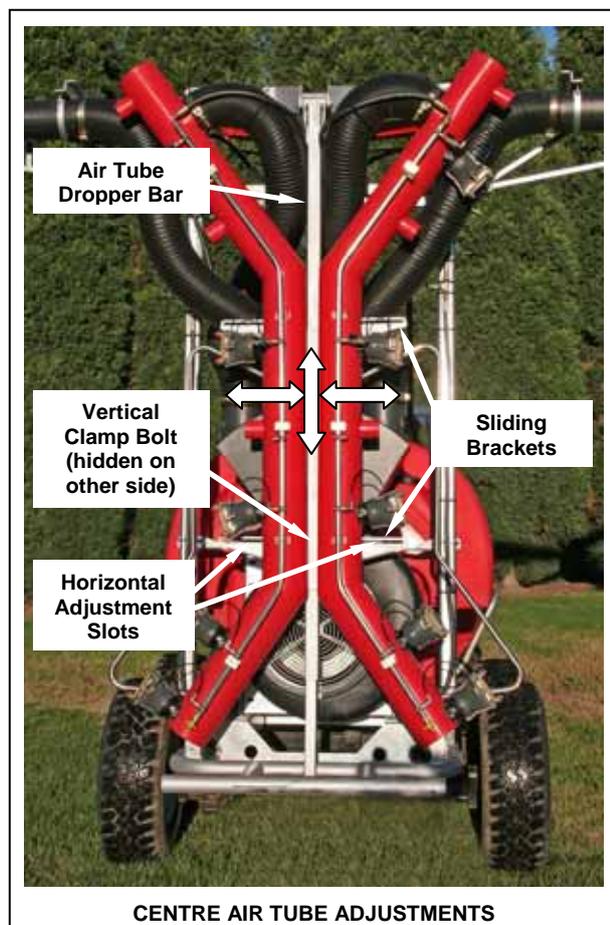
The direction of each air diffuser can be adjusted to give optimum spray coverage.

The spray pattern can be varied by turning the spray mix on or off at the tap on the spray line to the pair of nozzles on each air diffuser. When the mix is turned off, air continues to be discharged from the diffuser.

The application rate can be varied by installing nozzles with different size orifices.

The following information describes the procedure for each of the above adjustments.

When changing the boom configuration, the tractor engine must be stopped, the key removed and the parking brake applied. This is an essential safety precaution.



Positioning the Centre Air Tubes

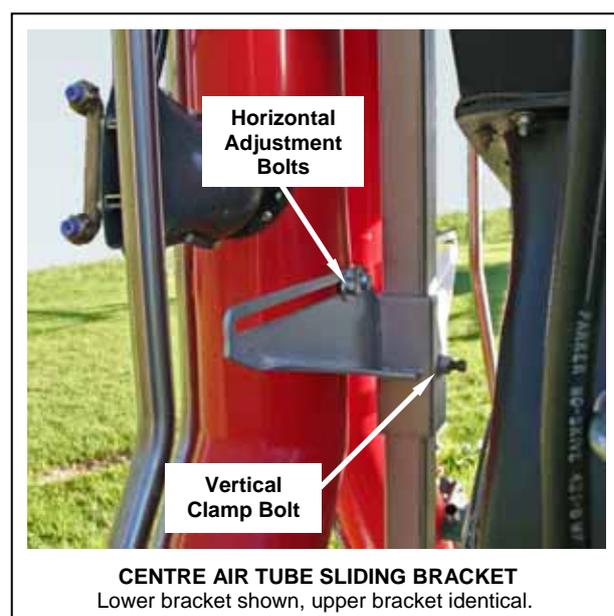
The centre tubes are attached to a vertical dropper bar by two sliding brackets that enable vertical positioning of the tubes to match the height of the canopy and horizontal adjustment to vary the distance from the diffusers to the crop.

The height of the tubes should be set so that the lower diffusers drive the spray under the canopy to achieve good penetration in the centre.

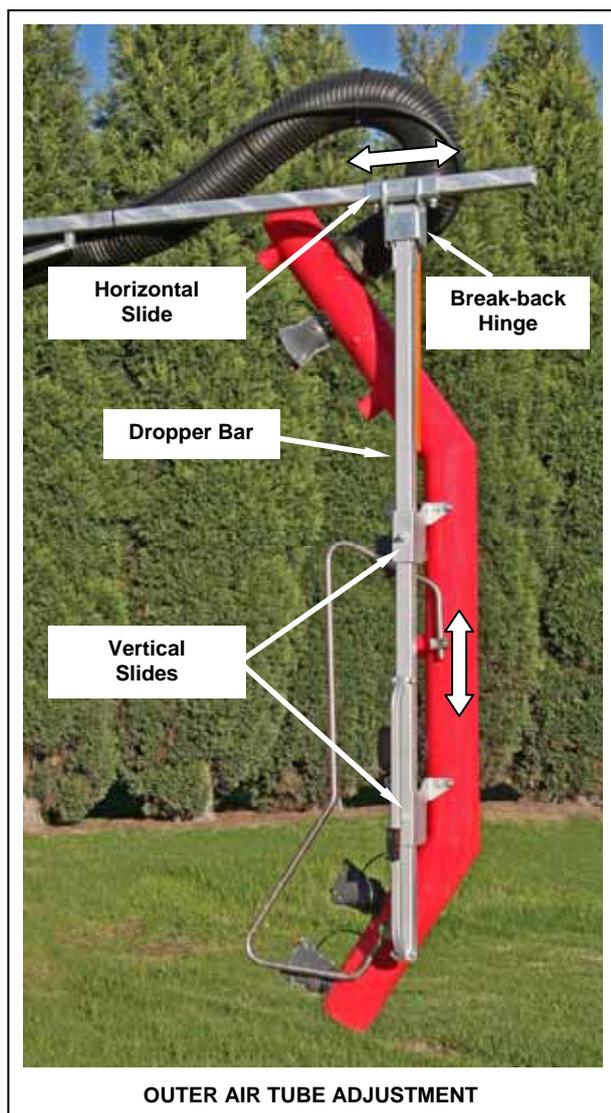
To adjust the height, loosen the vertical clamp bolt in the upper and lower sliding brackets and slide the pair of tubes along the dropper to the required height, then securely re-tighten the clamp bolts.

The horizontal position of the centre tubes should be set so the air diffusers are at a distance from the canopy that will give full spray coverage. This will depend upon the row spacing and the stage of crop development. At the start of the season the tubes will need to be set towards the outer limit of the horizontal adjustment and brought closer to the centre of the sprayer as the crop develops. The tubes should be equidistant from the sprayer centre line so that the nozzles will be the same distance from the row on either side.

To set the horizontal position loosen the bolts attaching one of the tubes to the upper and lower sliding brackets and move the tube along the slots in the brackets to the desired position. Ensure that the tube remains vertical and securely re-tighten the bolts. Set the other tube to the same distance from the centre of the sprayer.



Operation

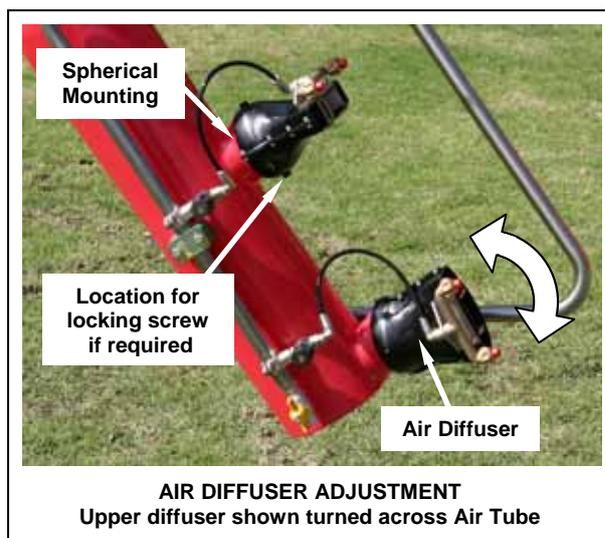


Positioning the Outer Air Tubes

The outer tubes are attached to a vertical dropper bar by two sliding brackets that enable the height to be adjusted. The dropper bars slide on a horizontal rail and incorporate a hinge so they can swing back if an obstacle is contacted.

The outer tubes should be positioned so the diffusers give full spray coverage to the far side of the row and are a similar distance from the canopy as the centre diffusers.

To set the horizontal position of the outer tubes loosen the clamp bolts in the slide at the top of each vertical dropper. Slide the tubes to the required position and securely re-tighten the clamp bolts. The right and left tubes should be set the same distance from the sprayer centre line. The tube support sleeve will slide freely on the upper rail if you pull back near the bottom of the tube with one hand and push higher up with the other hand.



The height of the outer tubes should be set so the lower diffusers drive the spray under the canopy to achieve good penetration in the centre. To adjust the height, loosen the clamp bolts in the upper and lower vertical slides and move the tube along the dropper bar to the required height, then securely re-tighten the clamp bolts. The outer tubes should be set at the same height as the centre tubes.

Air Diffuser Adjustment

By twisting or rotating the diffuser on its spherical mounting the direction of spray from each diffuser can be varied to suit the shape of the canopy or to concentrate spray from several diffusers in one area. The friction of the mounting will hold the diffuser in position but if required a screw can be inserted in the boss on the diffuser to lock it in position.

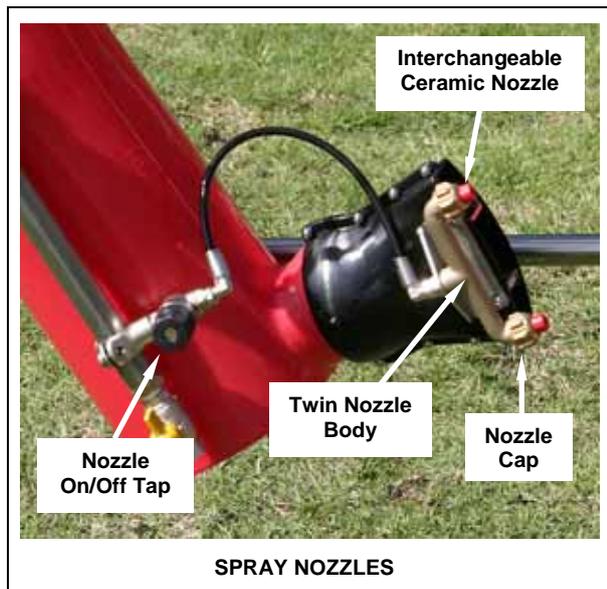
The chemical flow to the pair of nozzles on each diffuser can be stopped with the nozzle on/off tap but the airstream will continue to be discharged from the diffuser.

Early in the season the canopy may not be tall enough to require use of the upper diffusers. Turning the chemical off but leaving the airflow on will create a downward curtain of air that will help drive any off-target spray towards the canopy.

Changing Spray Nozzles

A pair of interchangeable Albus ATR nozzles is fitted to each air diffuser. The nozzles are designed to produce fine droplets that are ideal for foliar application of insecticides and fungicides. The nozzle assembly consists of a ceramic orifice plate and a ceramic swirl core that can be easily separated for cleaning. Liquid passes through the helical slots in the swirl core and into the swirl chamber where it acquires high rotational velocity and discharges in an 80° hollow conical pattern.

Operation



Spray output at a particular pressure can be varied by fitting nozzles with different size orifice plates. The nozzles are colour coded to assist identification. Refer to the Nozzle Chart in the Calibration section.

To change the nozzle unscrew the nozzle cap and remove the nozzle (orifice plate and swirl core assembly). Replace with a nozzle of the required size, refit the nozzle cap and securely tighten.

Ceramic nozzles normally have a long wear life and require little maintenance other than regular checking. The spray pattern should be observed periodically against a dark background to detect signs of wear, which will be indicated by a streaky or broken pattern. If worn nozzles are detected then the full set of nozzles should be replaced.

The spray line to each pair of nozzles is fitted with an on/off tap and a non-drip valve that closes when the spray pressure drops below 0.5 Bar.

Road Travel

When towing the sprayer on a public road always ensure that it is equipped with all the necessary lights and signs to comply with local regulations.

Travel at slow speed and only with the main tank empty. The weight of the sprayer when all tanks are full could overload the braking capability of the tractor and result in an accident. The tyres are rated to 30 kph for road travel.

Remove the jack from the drawbar to ensure there is adequate ground clearance.

The master switch of the cabin control box should be switched off.

Ensure that the spray boom is correctly folded and secured with the ratchet strap supplied with the sprayer. Lock the remote hydraulic control lever of the tractor or disconnect the boom hydraulic hoses to prevent accidental unfolding. Watch out for overhead power lines.

Calibrating the Sprayer

Nozzle Selection and Calibration Checking

Chemical application rates and hence nozzle selections will vary greatly depending on the crop type, stage of crop development and the regional area. Information on application rates should be available from your chemical supplier.

Nozzle selection can be made by following the four simple steps shown below. The final step, checking calibration after nozzle selection, is essential for spraying efficiency by ensuring a known amount of spray is applied per hectare.

STEP 1 *Operating Factors*

First establish the following factors.

- a) **Application rate (l/ha)** in litres per hectare.
- b) **Travel speed (km/hr)** The speed indicated by your tractor can be checked by timing the sprayer over a measured distance. The timing should be done in seconds over 100 metres with the PTO engaged and water in the tank to simulate real spraying conditions. In hilly terrain the sprayer should be timed driving up and down the hill and the two times averaged. The speed can be calculated according to the following formula.

$$\text{Speed (km/hr)} = \frac{360}{\text{Time in Seconds for 100m}}$$

- c) **Row width (m)** The distance between rows measured in metres.
- d) **Spray pressure (Bar)** A pressure of between 10 and 20 Bar is usually selected. Lower spray pressures will produce larger droplets which are generally less effective than the smaller droplets produced at higher pressures.
- e) **No. of Rows** This is 2 for the TGS Sprayer.

STEP 2 *Total Output Required*

Calculate the total spray output required in litres per minute (l/min) using the following formula.

Total Output (l/min) =

$$\frac{\text{Application rate (l/ha)} \times \text{Speed (km/hr)} \times \text{Row width (m)} \times \text{No. Rows}}{600}$$

Check that the calculated output does not exceed the rated capacity of the pump. If it does, reduce the travel speed or the application rate.

STEP 3 *Nozzle Selection*

The size of each individual nozzle can be selected as described as follows.

Decide on the number of nozzles to be used. The total number of nozzles fitted to the sprayer is 40 (10 per air tube). If all nozzles are not used, the number of nozzles will be the number that are turned on.

$$\text{Nozzle Output (l/min)} = \frac{\text{Total Output}}{\text{Total No. of Nozzles Used}}$$

Add up the flow rates of the individual nozzles to check that the total output matches the calculated value. Small variations can be corrected by increasing pressure to increase output or reducing pressure to reduce output.

STEP 4 *Calibration Checking*

After installing the selected nozzles, test the sprayer with water to confirm the application rate.

Fill the tank to a specific mark then run the sprayer for a measured time at operating pressure and with nozzles spraying. A run time of 2 minutes should be sufficient.

Measure the volume of water, in litres, required to refill the sprayer to the specific mark chosen then divide this volume by the time of the test run, in minutes.

$$\text{Output (l/min)} = \frac{\text{Volume to refill (litres)}}{\text{Time (min)}}$$

Verify that the measured output matches the value calculated at Step 2. For small variations increase the spraying pressure to increase the output or reduce the pressure to reduce output.

Calibrating the Sprayer

ALBUZ ATR NOZZLE CHART												
PRESSURE BAR	OUTPUT - IN LITRES PER MINUTE											
	WHITE ATR-03	LILAC ATR-04	BROWN ATR-06	YELLOW ATR-08	ORANGE ATR-12	RED ATR-16	GREY ATR-18	GREEN ATR-20	BLACK ATR-25	BLUE ATR-28		
3	0.21	0.28	0.38	0.57	0.77	1.08	1.18	1.40	1.57	1.92		
4	0.24	0.32	0.43	0.65	0.89	1.24	1.35	1.60	1.80	2.20		
5	0.27	0.36	0.48	0.73	0.99	1.38	1.50	1.78	2.00	2.45		
6	0.29	0.39	0.52	0.80	1.08	1.51	1.63	1.94	2.18	2.67		
7	0.32	0.42	0.56	0.86	1.17	1.62	1.76	2.09	2.35	2.87		
8	0.34	0.45	0.60	0.92	1.24	1.73	1.87	2.22	2.50	3.06		
9	0.36	0.48	0.64	0.97	1.32	1.83	1.98	2.35	2.64	3.24		
10	0.38	0.50	0.67	1.03	1.39	1.92	2.08	2.47	2.78	3.40		
11	0.39	0.52	0.70	1.07	1.45	2.01	2.17	2.58	2.90	3.56		
12	0.41	0.55	0.73	1.12	1.51	2.09	2.26	2.69	3.03	3.71		
13	0.43	0.57	0.76	1.17	1.57	2.17	2.35	2.79	3.14	3.85		
14	0.44	0.59	0.79	1.21	1.63	2.25	2.43	2.89	3.26	3.99		
15	0.46	0.61	0.81	1.25	1.69	2.33	2.51	2.99	3.36	4.12		
16	0.47	0.63	0.84	1.29	1.74	2.40	2.59	3.08	3.47	4.25		
17	0.48	0.64	0.86	1.33	1.79	2.47	2.67	3.17	3.57	4.37		
18	0.50	0.66	0.89	1.37	1.84	2.54	2.74	3.25	3.67	4.49		
19	0.51	0.68	0.91	1.40	1.89	2.60	2.81	3.34	3.76	4.61		
20	0.52	0.70	0.93	1.44	1.94	2.67	2.88	3.42	3.85	4.72		
21	0.54	0.71	0.95	1.48	1.99	2.73	2.95	3.50	3.94	4.84		
22	0.55	0.73	0.98	1.51	2.03	2.79	3.01	3.57	4.03	4.94		
23	0.56	0.74	1.00	1.54	2.07	2.85	3.07	3.65	4.12	5.05		
24	0.57	0.76	1.02	1.58	2.12	2.91	3.14	3.72	4.20	5.15		
25	0.58	0.77	1.04	1.61	2.16	2.97	3.20	3.80	4.28	5.25		

Nozzle Output Chart

Use the above chart to select nozzle sizes as described by the procedure in Step 3) on the previous page

Calibrating the Sprayer

Nozzle Selection Example

STEP 1

- a) Required application rate = 2000 l/ha
- b) Chosen speed = 5 km/hr
- c) Row width = 3 m
- d) Spray pressure = 20 Bar
- e) Number of rows = 2

STEP 2

Total spray output needed (l/min) =

$$\frac{\text{Application Rate (l/ha)} \times \text{Speed(km/h)} \times \text{Row width(m)} \times \text{No. of Rows}}{600}$$

$$= \frac{2000 \times 5 \times 3 \times 2}{600} = 100 \text{ l/min}$$

STEP 3

Nominate the total number of nozzles to be used. For this example, all nozzles are on.

Total number of Nozzles = 40

Then calculate the output required from each nozzle at the required spray pressure.

$$\frac{\text{Total Output (l/min)}}{\text{Number of Nozzles}} = \text{Output per Nozzle (l/min)}$$

$$\frac{100}{40} = 2.5 \text{ (l/min)}$$

a) Select the ATR nozzle from the chart on the previous page that gives the closest match to the calculated output per nozzle at the required pressure. At 20 Bar this is 2.67 l/min from the RED ATR-16 nozzle.

Small variations in output may be corrected by operating at a slightly higher pressure to increase output or a slightly lower pressure to reduce output.

The chart output of 2.67 l/min at 20 Bar is slightly higher than required so decrease the spraying pressure to achieve the required output. By observing the outputs in the ATR-16 nozzle column at pressures below 20 Bar it can be seen that lowering the spraying pressure to 17.5 Bar should give the required 2.5 l/min output. This can be verified during the trial run with water

STEP 4

Install the selected ATR nozzles on either side of the sprayer.

Conduct a test with water at 17.5 Bar to verify the actual output as described in Step 4 on page 20. Small variations from the required output may be corrected by adjusting the pressure as stated previously.

Calibrating the Sprayer

Calibration Worksheets

The four worksheets below can be used to record the results of calibration tests on your sprayer

Date of Test: _____

Application Rate: _____ litres/ha

Speed of Travel: _____ km/hr

Row Spacing: _____ metres

No. of Rows _____

Output (l/min)

$$= \frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width} \times \text{No. Rows}}{600}$$

$$= \frac{\quad \times \quad \times \quad \times}{600}$$

= litres/min

:No. of nozzles : _____

Output per nozzle : _____ litres/min

Nozzle Selection : _____

Pressure Setting: _____ Bar

Measured Output: _____ litres/min
(from test run)

Date of Test: _____

Application Rate: _____ litres/ha

Speed of Travel: _____ km/hr

Row Spacing: _____ metres

No. of Rows _____

Output (l/min)

$$= \frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width} \times \text{No. Rows}}{600}$$

$$= \frac{\quad \times \quad \times \quad \times}{600}$$

= litres/min

:No. of nozzles : _____

Output per nozzle : _____ litres/min

Nozzle Selection : _____

Pressure Setting: _____ Bar

Measured Output: _____ litres/min
(from test run)

Date of Test: _____

Application Rate: _____ litres/ha

Speed of Travel: _____ km/hr

Row Spacing: _____ metres

No. of Rows _____

Output (l/min)

$$= \frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width} \times \text{No. Rows}}{600}$$

$$= \frac{\quad \times \quad \times \quad \times}{600}$$

= litres/min

:No. of nozzles : _____

Output per nozzle : _____ litres/min

Nozzle Selection : _____

Pressure Setting: _____ Bar

Measured Output: _____ litres/min
(from test run)

Date of Test: _____

Application Rate: _____ litres/ha

Speed of Travel: _____ km/hr

Row Spacing: _____ metres

No. of Rows _____

Output (l/min)

$$= \frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width} \times \text{No. Rows}}{600}$$

$$= \frac{\quad \times \quad \times \quad \times}{600}$$

= litres/min

:No. of nozzles : _____

Output per nozzle : _____ litres/min

Nozzle Selection : _____

Pressure Setting: _____ Bar

Measured Output: _____ litres/min
(from test run)

Optional Equipment

Farmscan Primo 400 Spray Controller

The sprayer can be supplied with an optional Farmscan Controller in lieu of the standard electric cabin control system. The Farmscan system provides additional facilities for controlling and monitoring spraying performance. Refer to the Farmscan Instruction Manual for further details.

The following information describes the installation and sprayer operating procedures that differ when the Farmscan unit is supplied. All other information contained in this manual is applicable.



Installing the Farmscan Cabin Control Unit

Before attaching the sprayer to the tractor, install the Farmscan cabin control unit.

Using the bracket, securing knobs and hardware provided with the sprayer, install the control unit in a suitably protected position within the cabin where it will be easily seen and within convenient reach. Refer to the Farmscan manual for important points to note when selecting the position

Ensure that the power switch of the controller is off whilst making these connections. Connect the electrical power supply cables of the loom directly to the 12 volt tractor battery. The connection method and the positive and negative cable colours are shown in the Farmscan manual.

Plug the rectangular end of the loom into the socket on the rear of the controller and tighten the securing screws.

Run the quick coupling end of the loom through a convenient opening in the tractor cabin, taking note of the points given in the Farmscan manual.

Use the cable ties provided to secure the loom. If it is necessary to drill a hole for the loom, install a rubber grommet so the cable is not chuffed.

Do not switch the power on to the controller until the content of the Farmscan manual has been read and is fully understood.

Installing the Farmscan Electrical Loom

Remove the end caps from each loom section and plug the ends together, noting the position of the indexing lug, then tighten the screw coupling. When disconnecting ensure the caps are refitted to avoid damage or contamination of the connecting pins. Ensure the loom is well supported and clear of the tractor wheels when turning

Operating the Sprayer with the Farmscan Fitted

Some of the information in the following sections is also applicable to the standard sprayer. It has been included to make the text complete and avoid the need for cross referencing. It is necessary to refer to the relevant illustrations in the standard section of the manual.

Starting the Sprayer for the First Time

Before starting the sprayer for the first time grease the lubrication points on the PTO shaft and check the oil level in the pump and the gearbox. Refer to the Maintenance section for further information. Conduct a trial run using water only to familiarise with the controls and to check that all systems are functioning correctly without leakage. Fill the sprayer with about 500 litres of water through the bottom fill.

Check that the fan gearbox is engaged and the required high or low speed is selected.

The sprayer should be initially started without pressure in the system. On the Farmscan controller, turn the Master switch off (up) and close all Boom switches (up). Turn the Power switch on (down) and set the unit to manual control by depressing the Manual button. Set the spraying pressure to zero by depressing the down button (marked with a downward facing arrow) for a few seconds to ensure the pressure-regulating valve is fully opened.

Start the tractor, run the engine at low speed and engage the PTO. Once running satisfactorily, increase speed to 540 PTO rpm.

Set the controller display to "Pressure" and progressively increase pressure. Refer to the Farmscan Operator's Manual for information on regulating the pressure.

For the initial trial set the pressure to the upper end of the range to be used for spraying, which is normally carried out between 10 to 20 Bar.

Make sure all bystanders are clear then unfold the boom, switch all sections on and check that all nozzles are spraying.

Optional Equipment

Inspect the sprayer for any leaks and tighten connections if necessary.

Use the test run to familiarise with the other functions of the Farmscan controller, refer to the Farmscan Operator's Manual.

Starting Procedure for Regular Operation with Farmscan Controller fitted

After the initial trials the following starting procedure can be used for regular spraying.

1. At the Farmscan controller, set the power switch on, master switch off and close all boom switches.
2. Start the tractor, engage the PTO and slowly bring the speed up to 540 PTO rpm.
3. Set the required application rate with the Farmscan controller.
4. Set the master switch on and open and close each boom section to check that it is functioning.
5. To commence spraying open the required boom sections with their control switches.
6. Spraying may then be stopped and started using the master switch to maintain the required boom configuration.

Adding Chemicals using the Probe with Farmscan Controller fitted

Liquid chemicals can be added to the tank safely and conveniently using the inductor probe while the sprayer is running, which will thoroughly mix the solution. Chemical may be transferred by inserting the probe into the original drum or a measured amount can be decanted into a suitable container. Powdered chemical can be added with the probe by first dissolving in water, or dry if flowable powders.

Before adding any chemicals fill the tank with approximately 500 litres of water.

Turn the Farmscan controller on and close the boom sections so that the surplus pump output will be by-passed to the tank to mix the solution. Set the controller to manual to provide maximum flow to the inductor.

Connect the probe hose to the cam lock connector on top of the main tank. The probe valve should be closed.

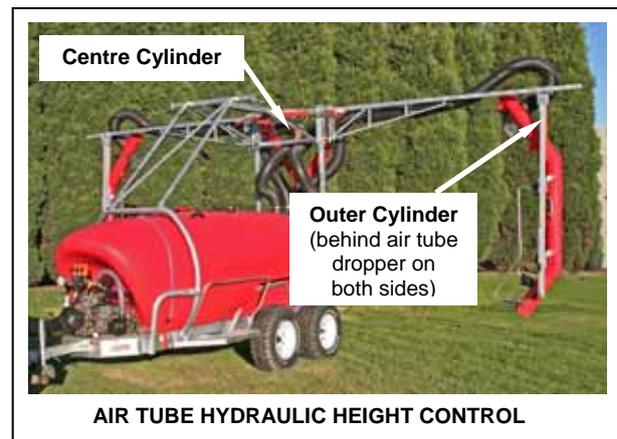
Put the gearbox into neutral, start the sprayer and run at 540 PTO rpm. Open the inductor valve on the LH side of the pump.

Place the probe in the container and open its valve by turning the handle to align with the probe. Chemical will be drawn from the container and transferred to the tank.

When all chemical has been added, shut the probe valve and close the inductor valve. Remove the probe hose from the cam lock connector, refit the cap and close the catches.

Continue filling the main tank with water and keep the sprayer running to thoroughly mix the solution.

The probe should be rinsed and left in a safe location at the filling station for the next filling.



Air Tube Hydraulic Height Control System

The sprayer can be supplied with a hydraulic system to adjust the height of the air tubes from the tractor seat. This enables easy on the go changing between vine canopies of varying height.

The system requires an additional pair of remote hydraulic outlets on the tractor and is operated by the tractor hydraulic control lever. The air tubes are raised or lowered by three hydraulic cylinders; one on the centre dropper and one on each of the outer droppers. The three cylinders receive oil from a central distribution block and operate in parallel.

Adjustable needle valves are fitted to the cylinders to regulate the speed of travel. The centre cylinder has two valves, the upper valve adjusts upward speed and the lower valve adjusts downward speed. The outer cylinders have one valve that regulates speed in both directions. The valves are normally adjusted to synchronise the cylinders and produce a uniform change in height. For special situations one or more valves can be closed to maintain a fixed height on the relevant air tube(s) whilst the others are raised or lowered.

To adjust the valves first loosen the locking screw in the knob with an Allen key. Turning the valve clockwise reduces cylinder speed and turning it anti-clockwise increases speed.

Optional Equipment

Run the tractor engine at 540 PTO rpm and raise and lower the cylinders several times before adjusting the needle valves. Adjust the valves on the centre cylinder to give a speed that enables easy control of air tube height. Then adjust the valves on each of the outer cylinders so they reach the upper and lower limits of the stroke at the same time as the centre cylinder. This should provide a uniform lift across the boom.

Only small adjustments are needed to make a difference to cylinder speed. When satisfied with the adjustments raise and lower the cylinders several times to verify that they lift evenly, make any small adjustments that may be necessary and then tighten all three locking screws.



Lubrication and Maintenance



WARNING

Before carrying out any lubrication or maintenance, apply the tractor parking brake, switch off the engine and remove the key. Ensure the sprayer and boom arms are properly supported and restrained before performing any maintenance work. Do not support the sprayer by the jockey wheel when the tank is full or partly full of liquid. **Always wear appropriate personal protective equipment when performing any maintenance.**

Start-up Inspection

During the first few days of operation, before starting each day check that all hardware is tight, in particular the wheel bolts. Inspect for any leaks whilst running and tighten all hose fittings.

Filters

Clean all filters daily or as stated below. More frequent cleaning may be found necessary depending upon circumstances.

If top filling is used check, and if necessary, clean the basket strainer under the tank lid before each top fill.

Always clean the suction filter after each tank of chemicals is emptied. Before removing the element turn the drain valve to the off position to prevent fluid draining from the tank.

The best method for cleaning filters is to wash them with a soft bristle brush. Check for any tears or holes and replace if damaged. Take care that the sealing 'O' rings are refitted.

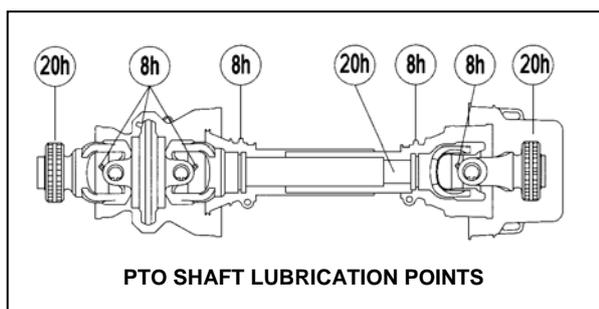
Tank and Spray Lines

At the end of each day run clean water through the pump and lines (ensuring to open and close all valves 4 times) to purge them of chemicals. Rinse out the tank to remove powdered material.

Never leave chemicals in the tank that may settle to the bottom, harden and break into lumps as this may block the suction filter. Refer to the Operation section for information on draining the tank and flushing the system.

Dispose of unused chemicals, chemical mix, rinse water and chemical containers as recommended by the chemical manufacturer or the relevant government authority.

Caution Do not use a high pressure washer to clean around fan bearings, pump seals or electrical valves.



Wide Angle PTO Shaft

Grease the PTO shaft with multi-purpose grease at the locations shown before starting for the first time and then at the intervals shown. This is the amount of lubrication recommended for normal operation. More frequent lubrication may be needed under very dusty conditions. Ensure that both universals in the wide angle joint are lubricated.

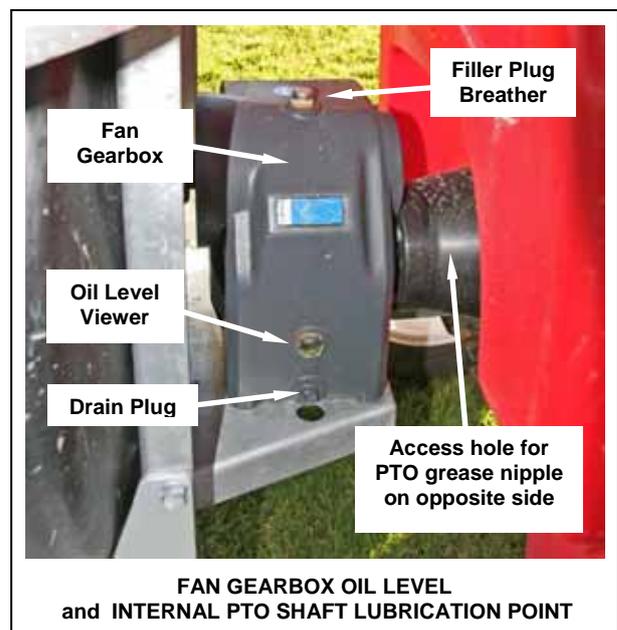
Internal PTO Shaft

Grease the front and rear joints of the internal PTO shaft with multi-purpose grease every 300 hours. The front universal is at the rear of the pump and can be reached through the wire mesh safety guard. The rear universal can be reached through the access hole on the LH side of the black plastic cover in front of the gearbox.

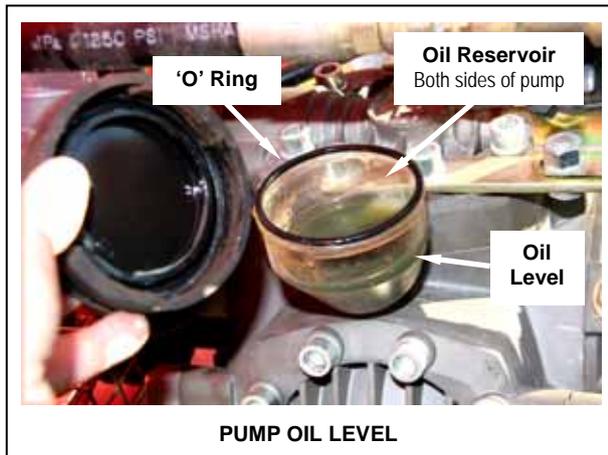
The telescoping sections of this internal shaft do not require regular greasing as the shaft length is constant and the sections do not slide in operation. Check that the shaft is free to slide during annual inspection.

Gearbox

Check the oil level when the sprayer is started for the first time and then every 50 hours. The level should be halfway up the viewer on the side of the gearbox. If required top up with SAE 85W-140 gear oil. Keep the breather clean.



Lubrication and Maintenance



Diaphragm Pump

Check the oil level in the reservoirs on each side of the pump every day, before starting the sprayer. The oil should be level with the mark on the reservoir. If necessary, top up with SAE 20W-40 multi-grade engine oil. Ensure that the 'O' ring is fitted before replacing the reservoir cover.

Pump Annual Maintenance

Drain the oil from the pump annually, or at the end of each spraying season and refill with above oil.

Remove the pump heads, carefully inspect the diaphragms and replace if necessary. Check the inlet and outlet valves, seats and springs for wear or chemical corrosion and replace as necessary.

Refer to the pump instruction manual for further details on the above maintenance operations.

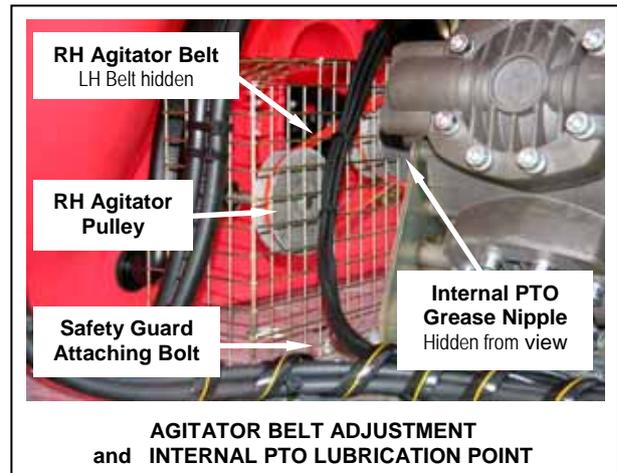
Agitator Drive Belts

The two propeller agitators are driven from the PTO shaft at the front of the sprayer by flexible tubular belts that are self tensioning. To check whether the agitators are driving correctly observe them through the top opening of the tank when the tank is empty and also observe the drive pulleys when the tank is full.

If they are not driving continuously it indicates that one or both of the belts has stretched and requires shortening.

To access the belts remove the four bolts attaching the mesh safety guard and remove the two sections of the guard. If necessary cut the plastic ties connecting the hoses to the guard sections.

Remove the belt from the agitator pulley and cut it at either side of the join, adjacent to the ends of the connector piece. Shorten the belt to 630 mm, remove the connector from the cut section and use it to rejoin the shortened belt. Refit the belt to the agitator pulley.



Shorten the other belt by the same method, if required.

Refit the safety guard and tighten the four attaching bolts securely.

Tyres

Inspect regularly. Keep inflated to 250 kpa (35 psi).

Wheel Hubs

Remove the wheel hubs annually and check that the bearings are in good condition and adequately greased. Repack with multi-purpose grease as required.

Adjust the wheel bearings by tightening the axle nut, then back it off by approximately 1/6 turn before installing a new cotter pin. Check that the hubs are free to rotate without any end-play.

Annual Inspection

At the end of each season or every 350 hours inspect the sprayer for any signs of damage, corrosion or leakage. Replace any parts that are affected by chemical contamination. Check that all bolts are securely tightened and that all

Trouble Shooting

Pump does not prime

- No liquid in tank or insufficient to cover suction inlet.
- Suction filter blocked.
- Suction filter bowl loose or missing O-ring.
- Suction line loose allowing pump to suck air.
- Pump not in by-pass mode. Turn Master switch off.
- Pump valve springs broken or valves worn.
- Drain tap not in Pump position.

Pump does not reach correct pressure

- Pump not operating at full 540 rpm.
- Suction filter blocked.
- Pressure regulator not correctly adjusted
- Pressure regulator valve and seats worn.
- Pressure gauge faulty
- Pump diaphragms ruptured (pump oil grey).
- Worn nozzles or capacity of nozzles greater than capacity of the pump.

Fan noisy and/or vibrating

- Gearbox bearings worn.
- Fan damaged or out of balance.
- Tractor PTO incorrectly installed.
- Hitch point and PTO geometry not correct.

Driveshaft noisy

- PTO shaft not secured properly to shafts. Ensure locking pins engaged in the grooves.
- Universal joint crosses worn.
- Hitch point and PTO geometry not correct.

Air stream reduced

- Fan gearbox lever in neutral or low position.
- Not operating at full speed of 540 rpm.
- Fan mesh blocked with leaves or debris.

Poor tank agitation

- Chemical left in tank whilst not operating.
- Chemical incorrectly mixed before filling.
- Mechanical agitator belt loose and/or slipping

Pump and hoses vibrating.

- Pump surge chamber pressure incorrectly adjusted or surge diaphragm ruptured.
- Air entering the suction line through loose or damaged fittings.
- Pump valves or valve springs worn or damaged
- Worn nozzles or capacity of nozzles greater than capacity of the pump.
- Air trapped in filter or suction lines.

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