LINKAGE TURBOMISER

MANTURB-5

OCTOBER 2020 REVISION B

YOUR SPRAYER DETAILS

Record the details of your Linkage Turbomiser sprayer here for future reference when discussing service with your Silvan dealer, ordering service parts or making a warranty claim.

SERIAL NUMBER _____

FAN MODEL _____

SPRAY HEAD TYPE _____

TANK CAPACITY _____

OPTIONS _____

DATE OF DELIVERY _____

SELLING DEALER _____

ADDRESS _____

TELEPHONE NO. _____

INSTALLED BY _____

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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 Linkage Mounted Turbomiser range of sprayers which are designed for spraying in vineyards, berries, field crops, nurseries and trellis crops by means of a highly efficient turbine fan and a range of spray heads to suit particular crops. The Turbomiser range of sprayers use low volume air shear technology to create spray streams of fine droplets to efficiently cover all leaf surfaces in the crop for maximum chemical protection.

The main spraying system uses a PTO driven turbine fan in a cowling and a centrifugal pump to supply chemical solution to the spray heads where it is atomised by air shear venturi nozzles. The air flow from the fan and spray head then takes the spray mixture into the canopy. An optional automatic spray rate controller can be fitted to provide a consistent chemical application rate and to monitor a number of operating functions.

The linkage Turbomiser range of sprayers is 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.

SAFETY INFORMATION

The wording of the safety decals are shown below and the locations are shown on the next page.
It is important that all operators read and follow the information given on all safety decals.

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/N 95099

P/N 95001

P/N 95065

P/N 95057

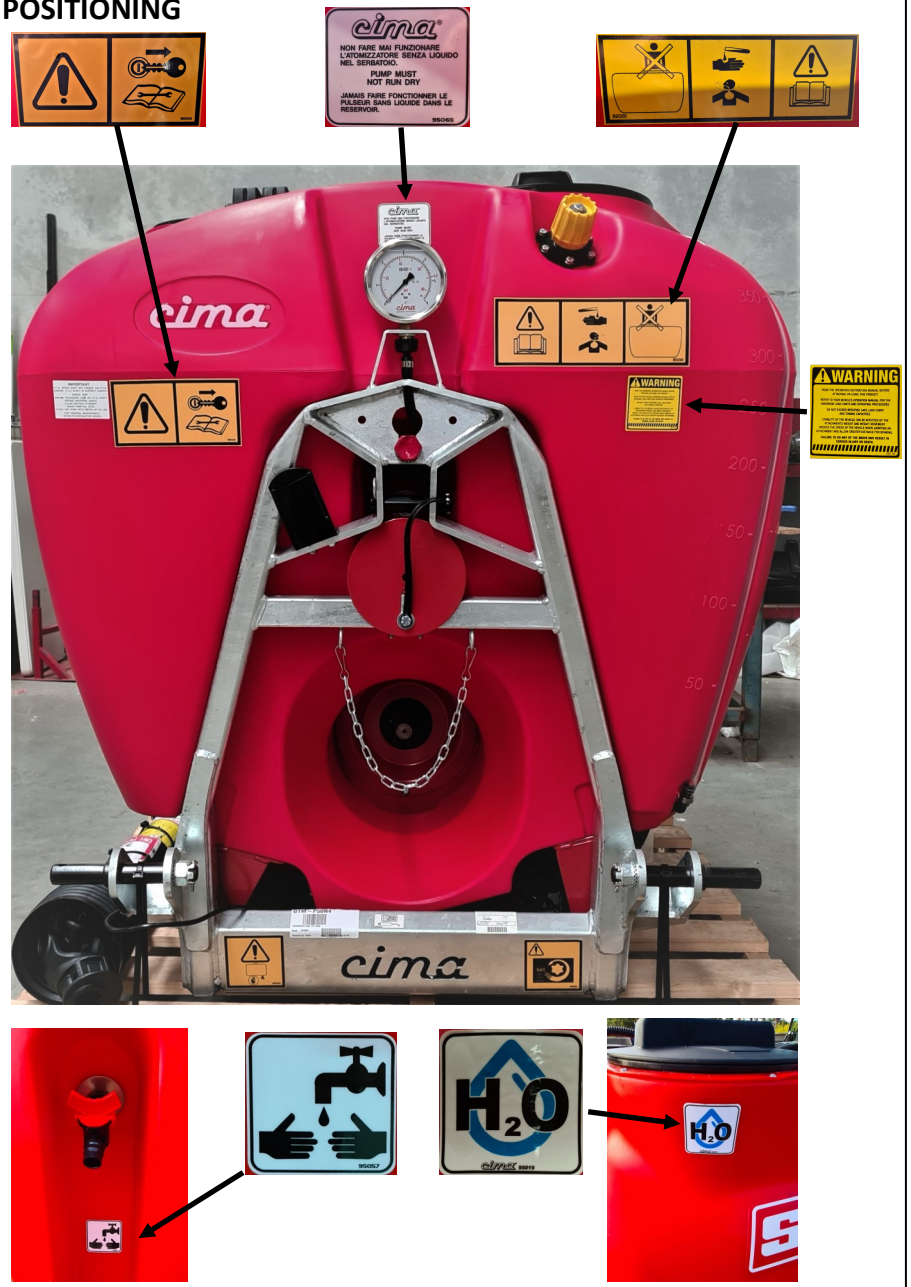
P/N 95098

P/N 95019

DEC 48

SAFETY INFORMATION

DECAL POSITIONING



SAFETY INFORMATION

Whilst your 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 the machine. Refer to the previous 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 lifting capacity of the tractor match the power requirement and loaded mass of the sprayer, as stated in the Specifications section of this manual. 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 at more than 540 PTO rpm.
- Water is loaded into the tank through the smaller lid with strainer. Chemical is loaded via the larger lid with in-built chemical mixer
- The hand wash is filled separately through the lid on the opposite side of the tank to the chemical fill.

SAFETY INFORMATION

- 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.

- 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

- Apply the parking brake, switch off the tractor engine and remove the key before performing any service work on the sprayer. Ensure the sprayer is properly supported and restrained before performing maintenance work.

- Do not stand near or perform adjustments on the fan or spray nozzles without first stopping the tractor engine and removing the key to ensure the sprayer can not inadvertently be started.

- 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.

- If service to the sprayer tank is required contact Silvan for correct maintenance procedures.

CONNECTING TO THE TRACTOR

HITCHING TO THE TRACTOR

- Check that the load capacity of the tractor hydraulic lift arms are compatible with the weight and dimensions of the sprayer with full tanks and the spray head to be used for the crop. See Specifications section further in this manual.
- The PTO horsepower of the tractor must exceed the power absorbed by the sprayer under all conditions.
- Hitching the sprayer to the tractor must be carried out on a level surface with any bystanders well away from the operation.
- Loosen the lift arm horizontal adjustment system.
- Adjust the lift arms so they are wider than the sprayer attachment pins.
- Start the tractor and adjust the lift arms until the ball ends are level with the sprayer pins.
- Insert the ball ends into the pins and lock with the spring clips.
- Connect the top link arm to the sprayer with the pin provided and secure with the “R” clip.
- Adjust the top link arm length if required and attach it to the tractor with its pin and spring clip.
- Bring the top link arm just into tension with its adjustment.
- Start the tractor and lift the sprayer until the two PTO stub shafts are level
- Stop the tractor and adjust the top link until the sprayer is vertical.
- Tighten the horizontal adjustment of the lift arms to prevent any sideways movement of the sprayer.
- The PTO shafts should be aligned both horizontally and vertically.
- When connected, the sprayer frame should be level.

STOP THE TRACTOR AND REMOVE THE KEY BEFORE FITTING THE PTO SHAFT. ENSURE NO PERSON IS ABLE TO REACH THE HYDRAULIC LIFT CONTROLS OF THE TRACTOR. NEVER STAND TOO CLOSE TO THE SPRAYER WHERE INJURIES COULD OCCUR IF IT SUDDENLY LOWERED.

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

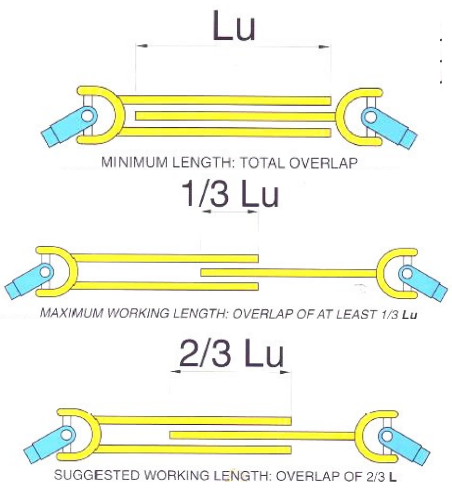
CONNECTING TO THE TRACTOR

CONNECTING THE PTO SHAFT

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 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



PTO SHAFT LENGTH

To Fit The PTO Shaft

Clean and grease the splines on the tractor and sprayer PTO stub shafts and install the PTO shaft. The PTO shaft is fitted with spring loaded pin yokes. To fit the PTO onto the sprayer spline push and hold the locking pin on the PTO yoke and align the splines and push the yoke firmly onto the spline shaft until the spring loaded pin positively engage into the grooves of the stub shaft. Check that the yoke is engaged by ensuring it does not move in either direction along the shaft. Repeat this sequence for the tractor end and then double check that both ends of the PTO shaft are positively engaged. Attach the chain on the PTO shaft cover to a fixed point on the tractor and the chain on the sprayer end to a part of the frame.

After fitting the shaft ensure that the tractor PTO guard is fitted to the tractor.

FEATURES & SPECIFICATIONS

GENERAL

The Silvan Linkage Mounted Turbomiser Sprayer is a low volume air shear sprayer used to apply agricultural chemicals to fruit, vegetable and vine crops. It uses high velocity airflow generated by a turbine fan to atomise and distribute the spray. A range of interchangeable heads are available to modify the spray pattern to suit various crops.

Tank

- Capacity 400 and 600 litres.
- Polytuff impact resistant, UV stabilised polyethylene.
- 355 mm diameter flip top lid with basket strainer and chemical mixer.
- Separate water filling lid 250mm diameter with filter basket.
- Three position ball valve to direct fluid for various functions.
- Tank drain via separate ball valve.
- Liquid level sightline with floating ball.

Agitation

- Pump bypass and pneumatic agitation via air feed from fan cowling.

Hand Washing Tank

- Inbuilt 15 litre Polytuff tank filled through lid (RH rear of unit).
- Discharge tap is fitted on RHS of tank.

Pump

- CD32 centrifugal pump belt driven from fan shaft.
- Toughened nylon construction.
- Stainless steel shaft with silicon carbide/viton mechanical seal.
- 120-140 l/min output depending on model
- Maximum pressure 4.5 Bar
- Power absorbed 2.5 kW

Fan and Drive

- Quality PTO shaft direct to lower fan pulley.
- Poly-vee belt with over-run clutch to fan.
- “SPZ” section vee belt to pump.

	Fan Type			
	P42	P45	P50	P55DS
Fan Diameter (mm)	450	450	500	550
Fan Speed (rpm)	4000	4500	4000	3700
Air Volume (m3/hr)	4000	5400	7550	14000
Air Speed (m/s)	228	188	175	170

- Wire mesh safety screen over fan

Spraying Controls

- Cab-mounted control box with left/right electric section control valves.
- Manual pressure regulator on front of tank.
- 100mm dia. 0-6 Bar pressure gauge on front of tank.
- Rotary distribution plate with 15 settings to calibrate fluid flow to each group of spray nozzles.

Nozzles

- Low volume “air shear” type. Positioned in the air stream of the spray head.

Chemical Filling System

- Chemical mixer in large basket strainer fed with water from main tank.

FEATURES & SPECIFICATIONS

Filtration

- Basket strainers in fill lids (32 mesh)
- Pressure filter on pump - 50 mesh (blue)

Chassis

- Heavy duty galvanised steel chassis.
- P42 and P45 have Cat 1 lift pins
- P50 and P55 have Cat 2 lift pins.
- Lift pins can be fitted in two positions to suit tractor hydraulic lift arms.

Optional Equipment

- Bravo 180S automatic spray rate controller.
- Range of spray heads to suit different crops.

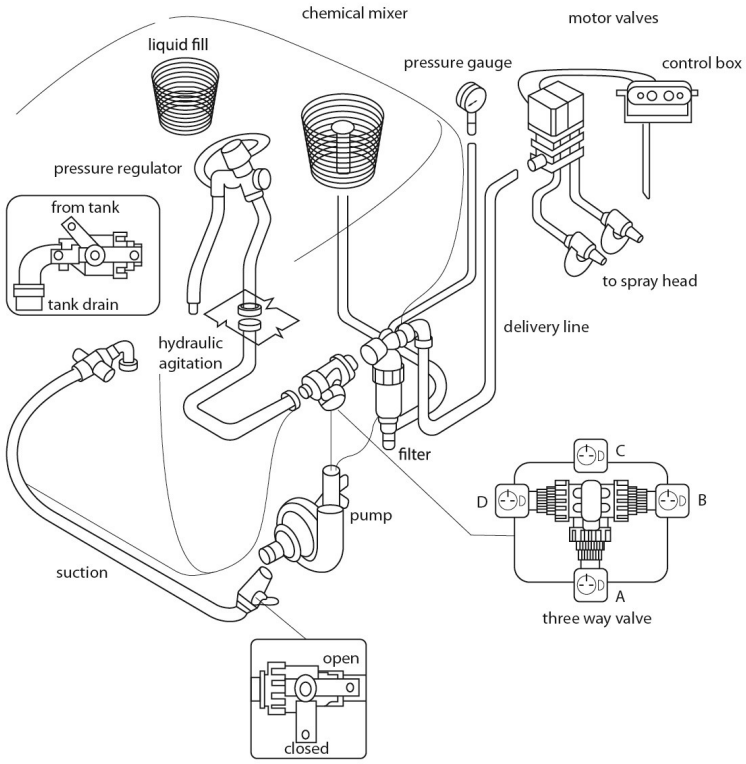
Dimensions and Weights
(not including spray head)

Fan	Tank Size	Tot Width (mm)	Tot Height (mm)	Length (mm)	Weight Empty	Weight Full
P42	400L	1120	1180	1380	200	618
P45	400L	1120	1180	1380	207	625
P50	600L	1450	1230	1450	244	862
P55DS	600L	1450	1230	1450	250	868

Tractor PTO HP Requirement

PTO Power Required		
Fan	kW	HP
P42	13	17.5
P45	17	23
P50	24	32
P55	34	46

SCHEMATIC OF FLUID FLOW



DESCRIPTION OF FLUID FLOW

The schematic diagram on the previous page shows the fluid flow for the range of linkage mounted Turbomiser sprayers.

The spray tank can be filled through the dedicated liquid fill lid (250mm lid diameter) or through the larger 355mm lid. A hand wash tank with its lid on the opposite side of the tank to the chemical lids is filled separately. The tap for the hand wash is located on the RH side of the tank.
DO NOT USE THIS WATER FOR DRINKING.

The level of liquid in the spray tank is shown by the LH side sightline with floating ball indicator.

To operate the sprayer the suction valve/drain valve under the rear of the tank is turned on with the long handle facing the tank wall. Chemical solution is drawn from the tank sump through the suction line to the inlet side of the belt driven centrifugal pump. A filter on the outlet side of the pump prevents foreign material entering the delivery lines to the spray heads. The filter incorporates a replaceable element which can be cleaned when the three way valve on top of the pump outlet is set to the Maintenance “D” position.

The manual pressure regulator on the discharge side of the pump is used to set the spraying pressure. Excess fluid from the pump is by-passed through the manual regulator into the tank and helps keep the contents agitated.

Pressurised fluid is directed to the electric valve block which includes two on/off section valves that direct liquid to the left and right sides of the sprayer.

Fluid from the pump can be directed via the bottom of the filter up to the chemical mixer in the larger filter basket to assist mixing of chemicals especially wettable powder formulations. A valve in the line isolates the mixer when spraying commences.

The three way valve on the pump outlet has four positions to enable various functions (see Operation section following).

The tank can be drained through the same three way valve that directs flow from the tank through the suction line to the pump. The long side of the handle is turned to the rear of the valve and the protective cap removed to enable the drain function.

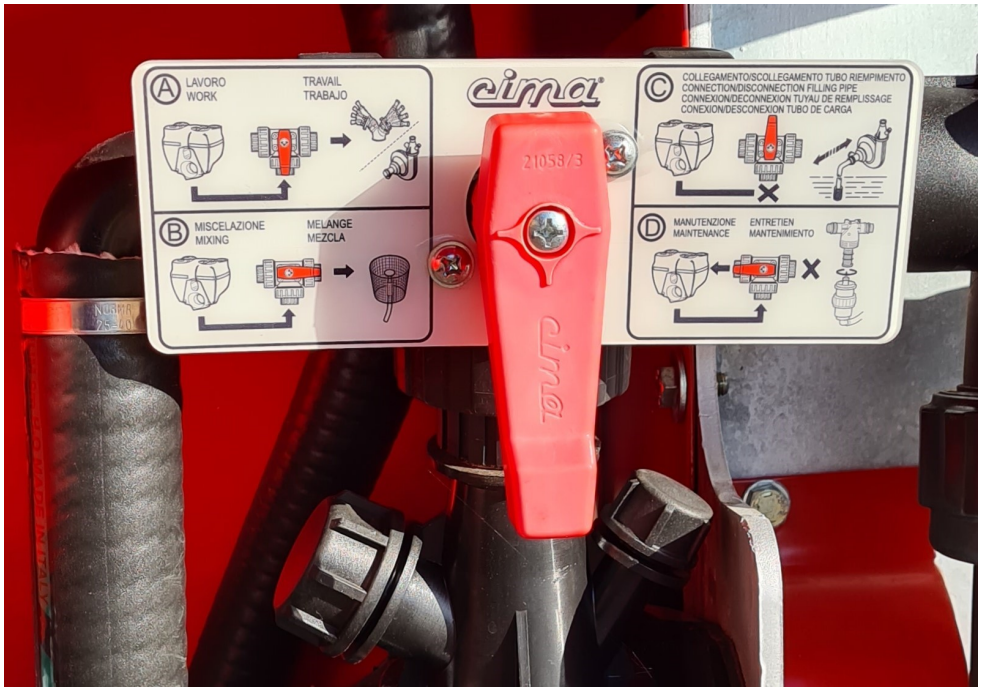
OPERATION

Three Way Ball Valve

Located on top of the pump outlet, this valve is connected to the filter and through the tank to the manual pressure regulator and bypass agitation line.

This valve can be placed in four positions to perform various functions.

A.WORK (as shown below)



The handle is pointed vertically down. Liquid flow from the pump is directed to both the filter and through the tank wall to the manual pressure regulator. From the filter the flow goes to the section valves and on to the spray heads. The manual pressure regulator sets the working pressure and any excess fluid is used as bypass agitation for the tank contents.

THE VALVE MUST BE IN THIS POSITION TO PERFORM THE SPRAYING FUNCTION.

B. MIXING

The handle is pointing horizontally to the right. With the section valves turned OFF all liquid flow from the pump is directed to the chemical mixer in the basket strainer of the large lid through the bottom of the filter. There is a valve in the line from the bottom of the filter to isolate the chemical mixer. This setting is used for mixing wettable powder formulations where maximum flow is required through the chemical mixer. The valve must be returned to position **A. WORK** to resume spraying.

OPERATION

Filter Valve open, flow from pump going to chemical mixer.

Filter Valve closed, chemical mixer isolated. Valve should be in this position when three way valve is in **A. WORK** mode.

C. CONNECT/DISCONNECT FILLER PIPE

The handle is vertically upwards. This setting isolates the pump from the distribution plumbing. It is set when the pump is used to fill the tank from an external water source e.g. dam or stream.

NEVER USE THE SPRAYER WITH THE VALVE IN POSITION C. PUMP DAMAGE WILL OCCUR AFTER VERY SHORT TIME RUNNING WITH NO OUTLET FLOW FROM THE PUMP.

D. MAINTENANCE

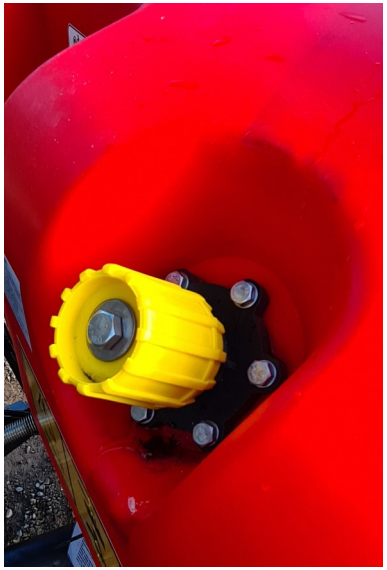
The handle is pointing horizontally to the left . This setting isolates the filter but allows flow from the pump to return to the tank through the manual pressure regulator. The filter screen is able to be cleaned even with a full tank. Return valve to position **A. WORK** to resume spraying after filter is re-assembled.

MANUAL PRESSURE REGULATOR

The manual pressure regulator is mounted on the tank and is connected to the three way valve on top of the pump. It regulates the operating pressure of the sprayer by controlling the return flow to the tank. The return flow is part of the agitation system of the tank contents. As the regulator is closed (turned clockwise) to increase the spraying pressure the return flow for agitation is decreased.

OPERATION

When spraying using heavy wettable powder products which require good agitation to stay in suspension it is advisable to set the calibration discs (see Calibration section in this manual) so that the pump can run at 1-1.5 Bar pressure to provide the maximum return flow for agitation.



Pressure Regulator.

To increase pressure rotate handle clockwise. To reduce pressure rotate handle anti-clockwise.

Set the preferred spraying pressure with the spray heads operating.

MOTORISED SECTION VALVES

Linkage mounted Turbomiser sprayers are fitted as standard with two 12 volt motorised section valves and a cabin mounted switch box. Power for the valves is from a cigarette lighter type plug. The switch box reverses the polarity of the power supply to open and close the valves. There is a tractor mounting bracket supplied for the switch box and when the unit is off the tractor there is a bracket on the front of the frame to hold the switch box securely.

OPERATION

STARTING THE SPRAYER

When starting the sprayer for the first time grease all lubrication points, check the oil level in the top fan pulley and measure the length of the drive belt tension springs as outlined in the Maintenance section. Conduct a trial using water only (no chemicals) to become familiar with the controls and check all systems are functioning correctly without any leaks.

NOTE: THE PUMP MUST NEVER RUN DRY OR SIGNIFICANT DAMAGE WILL OCCUR IN A VERY SHORT TIME.

PROCEDURE.

- Turn section valves OFF at switch box.
- Check the three way valves from the tank to the pump are OPEN.
- Set three way valve on top of pump to A. WORK position.
- Completely open manual pressure regulating valve (rotate anti-clockwise).
- Open valve from bottom of filter to chemical mixer.
- Tank can be filled through the supplementary fill point adjacent to the main tank lid to about 1/3 capacity.
- Start tractor, engage PTO at sufficient rpm to start fan turning, when the pump has primed gradually increase rpm to approximately 500 PTO rpm.
- Close manual pressure regulator until approximately 2 Bar appears on the pressure gauge.
- The chemical mixer under the main tank lid will be operating and measured chemical can be poured directly into the mixer basket.
- Wear the specified personal protective equipment when handling chemicals and beware of any chemical splash.
- When all chemical has been mixed into the tank turn off the valve from the filter to the chemical mixer. The pressure showing on the gauge will increase.
- Fill remainder of tank then close all lids and secure.
- When ready to start spraying increase PTO rpm to 540, turn on section valves for spray heads and adjust pressure to the level determined during the calibration procedure.
- The pneumatic agitation tap on top of the tank can be opened for extra agitation of the tank contents.
- If as the tank empties foaming of the chemicals becomes excessive close the pneumatic agitation tap to reduce agitation.

Pneumatic agitation Open  Closed 

OPERATION

- If more flow is needed to the chemical mixer for powder chemicals turn three way valve on top of pump to position **B.MIXING.** Remember to return to position **A. WORK** before spraying.

EMPTYING THE SPRAYER

- As soon as the tank empties as shown by a drop in pressure or a “fluttering” of the spray stream at the heads disengage the PTO to stop the pump. **THE PUMP MUST NOT RUN DRY.**
- When spraying is finished an amount of clean water can be circulated through the pump, valves, spray heads and tank to help flush any remaining chemical residues from the system.
- This rinse liquid must be disposed of according to any government and local authority requirements.
- The tank can then be drained through the valve under the tank at the rear of the frame.
- Wear appropriate protective clothing to avoid contact with any chemical residues.

When spraying it is necessary to run the fan at 540 PTO rpm to achieve the air speed required to effectively atomise the spray liquid at the air shear nozzles in the spray heads.

ADDING CHEMICALS

- Carefully read and follow all safety precautions provided 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.

Before adding chemicals read and follow the chemical manufacturer's instructions and wear the recommended personal protective clothing.

CALIBRATION

DISC SELECTION AND CALIBRATION

Turbomiser air shear sprayers use a metering disc at each spray head (or multiple discs on some head types) to regulate the flow to determine the required application rate.

Chemical application rates and hence metering disc 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.

Disc selection can be made by following four steps shown on the following pages. The final step, checking calibration after disc 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:

1. Application rate in litres per hectare (l/ha).
2. Travel speed (km/hr) The speed indicated by your tractor can be checked by timing the machine 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.

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

   Note: If an automatic spray rate controller is fitted it will automatically maintain the application rate if the speed alters.
3. Row width (m) The distance between rows measured in metres in one pass.
4. Number of disc assemblies operating on the sprayer.
5. Spray pressure (Bar). A spray pressure of between 1 and 3 Bar is usually selected. Lower pressures will allow use of larger disc holes which can reduce the chance of blocking and also allows more liquid to bypass for tank agitation.

CALIBRATION

STEP 2 Output per Disc Assembly Required

Calculate the spray output required in litres per hour (l/hr) per disc using the following formula.

$$\text{Output (l/hr/Disc)} = \frac{\text{Application Rate (l/ha) x Speed (km/h) x Row Width (m)}}{\text{10 x No. of Disc Assemblies}}$$

STEP 3 Disc Setting and Spraying Pressure

a) From the Disc Output Chart on the next page select the disc setting and spraying pressure that most closely match the required output per disc which was calculated in Step 2.

b) Set the disc position by loosening both wing nuts on the disc assembly and rotating the disc until the required number appears in the recess. After setting the position retighten the wing nuts.
Set all discs on the head to the same position.

Note: The calibration discs fitted to Turbomiser sprayers are colour coded yellow. The holes in the discs have a square leading edge and a chamfered edge on the other side. Ensure the square edge faces upstream towards the incoming fluid flow.

c) Set the spraying pressure to the figure chosen from the Disc Output Chart by adjusting the manual throttling valve as described in the previous section headed Manual Pressure Regulator.

STEP 4 Calibration Checking

After setting the disc positions and spraying pressure, test the sprayer with water to confirm the disc output rate.
Fill the tank to the brim or a specific mark then run the sprayer at 540 PTO rpm for a measured time at operating pressure with all nozzles spraying. A run time of 2 minutes should be sufficient.
Measure the litres of water required to refill the sprayer to the brim or chosen mark, then use the following formula to calculate the output rate per disc assembly.
Verify that the result matches the required output rate that was calculated in step 2.

$$\text{Output (l/hr/Disc)} = \frac{\text{Volume to refill (litres) x 60}}{\text{Time (mins) x No. of Disc Assemblies}}$$

CALIBRATION

For small variations, increase the spraying pressure to increase the output or reduce the pressure to reduce output.

DISC OUTPUT CHART

DISC OUTPUT CHART For Yellow Colour Coded Disc			
Output Volume (Litres/Hour) per Disc Assembly			
DISC SETTING	**PRESSURE**		
	1 Bar (14.5 psi)	2 Bar (29 psi)	3 Bar (43.5 psi)
1	42	57	60
2	45	63	72
3	51	78	90
4	63	87	105
5	81	117	141
6	87	126	150
7	135	210	255
8	165	234	285
9	213	300	363
10	246	351	429
11	309	453	561
12	390	600	726
13	471	726	906
14	534	810	1026
15	588	882	1161

CALIBRATION EXAMPLE

This example applies to a unit fitted with a spray head which has four disc assemblies. The same procedure would be used for a head with a different number of discs by simply inserting the appropriate number in the calculation.

STEP 1 Operating Factors

a) Required application rate = 300 L/ha

b) Chosen speed = 6 km/hr

c) Spraying width = 3 m

d) No. of disc assemblies = 4

CALIBRATION

STEP 2 Output required per disc assembly

From the formula on page 22 the calculation is:

$$\text{L/hr/disc} = \frac{300 \times 6 \times 3}{10 \times 4}$$

$$= 135 \text{ l/hr}$$

STEP 3 Disc selection and spraying pressure

From the output chart on the previous page choose the disc and spraying pressure that gives the output closest to 135 l/hr.

Disc position 7 at 1 Bar pressure gives 135 l/hr.

STEP 4 Verify the Selection

Verify the disc setting and pressure using the calibration check outlined on page 22.

CALIBRATION WORKSHEETS

The calibration worksheets on the following page can be used to record the results of calibration tests on your sprayer.

CALIBRATION

CALIBRATION WORKSHEET

Machine Details

Sprayer Model: _____

Head Fitted: _____

No. Disc Assemblies: _____

Spraying Requirements

Application Rate: _____ litres/ha

Speed of Travel: _____ km/hr

Row Spacing: _____ metres

Required Output per Disc Assembly

$$\text{Output per disc (l/hr)} = \frac{\text{Application Rate x Speed x Row Width}}{\text{10 x No disc assemblies}}$$

$$= \frac{\text{x} \qquad \text{x}}{\text{10 x}}$$

= litres/hr

Settings Selected from Chart

Disc Position: _____

Pressure setting: _____ Bar

Verification Test

Date of Test: _____

Run Time: _____ minutes

Refill Volume: _____ litres

Calculated Output: per disc assembly _____ litres/hr

$$\text{Output per disc (l/hr)} = \frac{\text{Vol. to refill (litres) x 60}}{\text{Time (min) x No disc assemblies}}$$

$$= \frac{\text{x 60}}{\text{x}} = \text{litres/hr}$$

Machine Details

Sprayer Model: _____

Head Fitted: _____

No. Disc Assemblies: _____

Spraying Requirements

Application Rate: _____ litres/ha

Speed of Travel: _____ km/hr

Row Spacing: _____ metres

Required Output per Disc Assembly

$$\text{Output per disc (l/hr)} = \frac{\text{Application Rate x Speed x Row Width}}{\text{10 x No disc assemblies}}$$

$$= \frac{\text{x} \qquad \text{x}}{\text{10 x}}$$

= litres/hr

Settings Selected from Chart

Disc Position: _____

Pressure setting: _____ Bar

Verification Test

Date of Test: _____

Run Time: _____ minutes

Refill Volume: _____ litres

Calculated Output: per disc assembly _____ litres/hr

$$\text{Output per disc (l/hr)} = \frac{\text{Vol. to refill (litres) x 60}}{\text{Time (min) x No disc assemblies}}$$

$$= \frac{\text{x 60}}{\text{x}} = \text{litres/hr}$$

OPERATION

SPRAYHEAD OPERATION AND ADJUSTMENT

Spray Head Configuration

A comprehensive range of interchangeable spray heads can be fitted to the Turbomiser sprayer to suit a wide variety of crops and differing methods of cultivation.

Each head can be configured in a variety of ways to optimise the spray pattern by using some, or all, of the following methods of adjustment:

1.The alignment of the spray diffusers can be adjusted to control the direction of discharge. On some heads they can also be relocated.

2. The liquid flow rate to each nozzle can be adjusted with an individual control tap; or turned off completely to avoid chemical wastage on areas- not requiring coverage. On heads with fishtail diffusers, the control taps close off the fluid flow to sections of the spray bar within the fishtail.

3. The proportion of the air flow which passes through each outlet of the multiple trumpet diffusers, fitted to Vineyard, 4x4 and 5x5 heads, can be regulated by fitting a different size trumpet. The trumpets are a push fit in their sockets and the size is marked on the body of each trumpet. The standard sizes are 6/50, 8/50 and 10/50. The first number relates to the size of the trumpet (the higher the number the larger the trumpet) and the other numbers signify that the connection is 50 mm in diameter.

4. The air flow through any trumpet can be stopped by replacing it with a plug-in blanking cap. This will increase the air flow through the remaining un-blanked trumpets.

5. In some situations multiple trumpet diffusers can be replaced by a single cannon to propel the discharge over a greater distance in a more concentrated pattern. The cannon is marked with its size and plugs into the same socket as the diffuser. The usual cannon size is 22.5/120, indicating a 120 mm connection.

Adjusting Sprayheads

At all times when working near the rear of the sprayer exercise extreme care and wear the appropriate protective clothing. Heads should only be adjusted with the sprayer stationary and the tractor PTO drive disengaged. Never stand on the machine to make adjustments.

After adjustment check the spray pattern in the crop for correct targeting before proceeding with the spray run.

Selecting the Travel Speed

Correct ground speed is an important factor in achieving good crop coverage whilst avoiding overspray and wastage of chemicals.

OPERATION

The most suitable speed can be established by making a trial run using water in the tank and having an assistant observe the penetration and crop coverage.

1. Firstly consider the terrain of the orchard or vineyard and choose a speed which will ensure safe operation.
2. Fill the tank with water and set the calibration discs to give a medium application rate (300 to 400 l/ha) to make the spray pattern and coverage easily visible to the observer.
3. Choose a speed that you believe is suitable and begin a spraying run with the observer walking behind the machine to check the extent of crop penetration.
4. In vines and trellis fruit crops, the observer should expect to see the spray just “puffing” through the far side of the target if the travel speed is correct. In tree crops the observer should expect to see the spray penetrating about 3/4 of the way through the target.
5. If the penetration is greater than described, increase the ground speed and retest. If less than described then reduce the speed and retest. Adjust the speed in small increments until a satisfactory coverage is achieved and note the result for future reference.

VINES

Double Sided 4x4 and 5x5 Heads

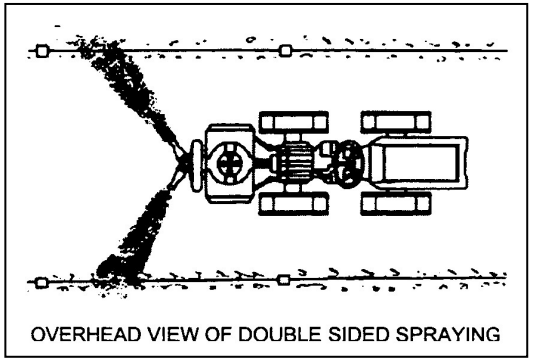
These heads have multi trumpet diffusers and are normally used in overhead and traditional trellis systems.

Set the diffusers at an angle from the rear of the sprayer and direct them vertically at the crop to obtain complete coverage and also to minimise overspray.

Turn off the fluid flow to any trumpets which are not directed at the crop. Blank these trumpets if it is necessary to increase the air flow to the other trumpets to gain proper crop coverage.

Observe the spray output from each trumpet and adjust the individual control taps to achieve a visually similar output pattern from all trumpets.

The diffusers should be at sufficient distance from the crop to produce some overlap of the spray discharge to avoid “stripping” in the cover.



OVERHEAD VIEW OF DOUBLE SIDED SPRAYING

OPERATION

Vineyard/Skip Row Heads

The Vineyard head provides a converging spray from multi trumpet diffusers above and below the crop to give broad, even coverage in many vine canopy systems. It can also be used for skip row spraying by fitting cannons in the top diffusers.

Standard Configuration

The diffusers should be angled back to assist in canopy penetration and to reduce “shingling”, or the overlapping of leaves under spray action.

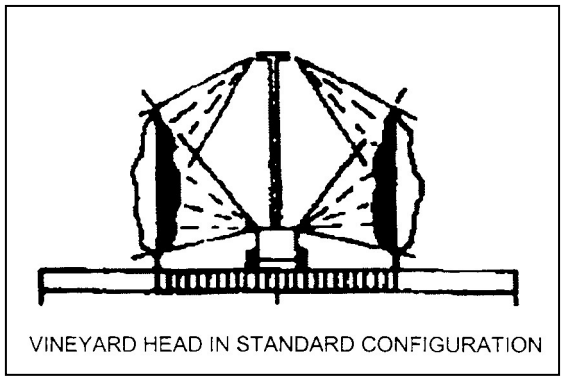
The vertical alignment of the upper and lower diffusers should be set to achieve a converging air flow but should not clash. The air streams should cross 40 to 50 cms from the centre of the vine body to ensure coverage of all shoots.

Using larger trumpets in the locations which are directed at critical points in the crop will ensure greater penetration of these areas.

Difficult to penetrate, or fruiting, zones may be targeted by using a cannon in the lower diffuser. In some circumstances, cannons may be used in both the upper and lower diffusers to direct large volumes of water and air at fruit lines.

New Plantings

For new plantings the top cannons only can be used to direct the spray onto the vines from above.



VINEYARD HEAD IN STANDARD CONFIGURATION

Skip Row Spraying

In skip row spraying the upper diffusers are fitted with single cannons to propel the discharge across to the next row on either side, whilst the lower diffusers use multi trumpets to cover the rows adjacent to the sprayer.

This type of operation is particularly applicable to young vines, or those with up to 1/3 canopy, but can only be carried during suitable weather with the wind generally below 5 kph to avoid spray drift.

OPERATION

Set the top cannons at right angles to the line of travel, or angled back by up to 10 degrees, and adjust them vertically so that the spray stream covers the canopy in the skip row. Retest the alignment with the unit at operating speed.

To minimise overspray, turn off the fluid flow to any trumpets on the lower diffusers which are not targeting the crop and if necessary replace the trumpet with a blanking plug.

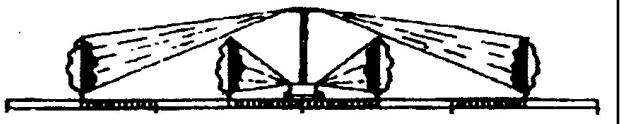
Fitting 6/50 trumpets to the bottom diffusers will increase the air flow through the upper cannons and assist targeting of the skip row.

Depending upon the density of the canopy, skip row spraying can be done by travelling along:

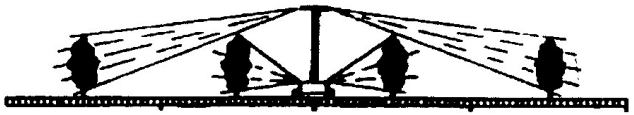
Every second row (if density is sufficient to allow spray to cover only one side of crop) or,

Every fourth row (where density is lighter and the spray can penetrate the full crop).

Refer to the diagrams below.



a. Travelling down every second row
Canopy density allows covering of one side of crop only
Treated area is equal to two row widths



b. Travelling down every fourth row
Canopy density allows spray to penetrate full crop
Treated area is equal to four row widths

VINEYARD HEAD IN SKIP ROW CONFIGURATION

Skip Row Calibration

Because skip row spraying covers more than one row for each pass of the sprayer, the “Treated Width” must be used in Step 2 of the calibration calculation rather than the “Row Width”, refer to page 23.

The treated width is equal to either:

Two row widths, or four row widths as shown in the diagram above.

OPERATION

TREE AND ORCHARD CROPS

Trees and orchard crops can be sprayed with the Vineyard head, the Hi Low Orchard head or the Turbo Tower head (Citrus head).

Vineyard Head

The Vineyard head is useful for spraying palmette and trellis grown trees in protected situations such as under netting. It should be used with four trumpets (five trumpets on fan size P55) in each of the upper and lower diffusers, which should be angled back to reduce shingling.

The air streams from the upper and lower diffusers should cross but not clash. Raising the upper diffusers by adding extra tower sections may assist coverage of tall crops.

Hi Low Orchard Head and Turbo Tower Head (Citrus Head)

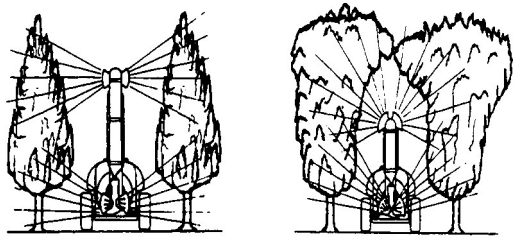
These heads are fitted with fishtail diffusers with the upper units mounted on an air tower. The Turbo Tower head also has diffusers at an intermediate height on the air tower. Both types are useful in bigger, denser trees. They are fitted to Turbomiser models fitted with the larger P55 fan, where the additional airflow increases spray penetration and enables a higher travel speed.

The diffusers should be adjusted vertically to give even coverage across the whole target.

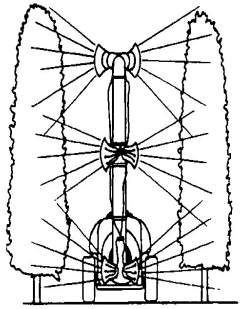
After setting the air direction, the fluid flow should be regulated with the individual taps on the fluid lines to produce an even spray from each diffuser and across the whole head.

If tree crops overhang the row, it may be necessary to reduce the height of the Hi Low head by removing the upper air tower section.

The Turbo Tower head should be used in taller crops, as its intermediate diffusers will ensure adequate coverage in the central area of the crop.



HI LOW ORCHARD HEAD



CITRUS HEAD

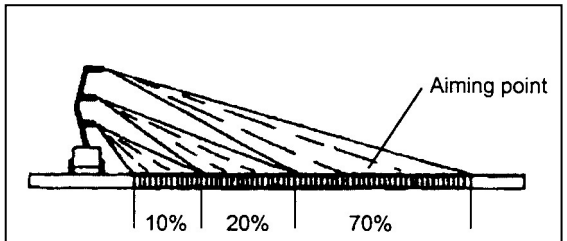
VEGETABLES AND NURSERIES

Super Cannon and Turntable

The Super Cannon enables efficient coverage of vegetable, nurseries, row and field crops. It consists of a large top cannon to cover approximately 70% of the target furthermost from the sprayer, a smaller cannon covering about 20% of the spray area in the middle region and a fish tail diffuser to cover the remaining 10% of the area close to the sprayer, as shown below.

To achieve the necessary fluid flow the top cannon is supplied through two distributors and the lower cannon and bottom diffuser are supplied by one common distributor.

The head is adjusted so that the large cannon is aimed at a position just above the ground and a little under 70% of the distance from the sprayer to the edge of the treated width. The smaller cannon and the fishtail diffuser should then be adjusted to aim at their portions of the treated width so that a continuous coverage is achieved.



SUPER CANNON
Showing coverage from each element

The turntable, if fitted, should be rotated to angle the Super Cannon to account for the effect of the sprayer's forward speed and any breeze. The spray stream will be most effective when travelling with a following breeze.

When the correct combination of vertical adjustment and windward angle is achieved, the coverage of the crop will become visibly more uniform and a downward, rolling effect in the spray stream will be observed through the crop right to the edge of the treated width.

Once the air direction has been set the fluid flow can be regulated. The flow to the bottom diffuser should be reduced at the tap until an even, fine spray pattern is achieved. This will direct more fluid to the small cannon which has a greater area to cover. The fluid taps on the top cannon should then be adjusted to provide an even output to the outside fluid streams with slightly more output from the centre fluid streams. When calibrating the Super Cannon the width measurement is the swath width being sprayed by the unit in metres. Extra flow can be directed to the top diffuser cannon if that is required for effective coverage as long as the total flow remains as calculated during the calibration process.

OPTIONAL EQUIPMENT

OPTIONAL EQUIPMENT

Automatic Rate Controller

In addition to the functions of the standard control- box, the optional Bravo 180S Automatic Spray Rate Controller enables pre-programmed application rates to be selected and maintained whilst operating and it also monitors information which can be used to increase the efficiency of spraying. Using a flowmeter installed in the valve bank, an electric pressure regulating valve and a speed sensor the controller varies the flow to maintain the pre-set application rate if speed changes during operation.

Spraying can be stopped and started, pressure can be regulated and the discharge can be directed to either, or both, sides of the sprayer whilst operating. Any of the pre-programmed application rates can be selected whilst spraying and the controller will maintain the rate if ground speed varies by making pressure adjustments.

The controller monitors and provides a read out of ground speed, application rate, flow in litres/ minute, area covered, chemical volume used and remaining in the tank. The built in memory retains the information when the sprayer is switched off.

A comprehensive installation and operation manual is provided with the controller.

MAINTENANCE

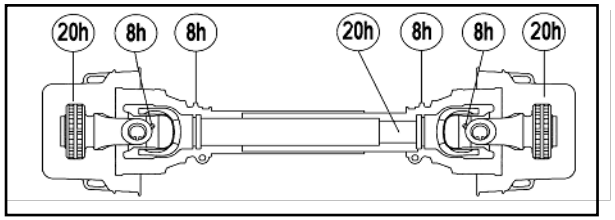
LUBRICATION AND MAINTENANCE

Start Up Inspection

During the first few days of operation, before starting each day check that all hardware is tight and tighten all hose clamps. Inspect the unit for leaks while running.

PTO Shaft to Tractor

Grease the PTO shaft with multi-purpose grease at the time intervals shown below. This is the amount of lubrication recommended for normal operation. More frequent inspection and lubrication may be needed under very dusty conditions.



Every 20 hours slide the PTO shaft apart, clean the telescopic tubes with kerosene and apply multi-purpose grease to the sliding surfaces, then reassemble. This is most important in dusty conditions.

Filters

Clean all filters regularly. The best method is to wash them with a soft bristle brush. Check for any tears or holes and replace if damaged.

Check and if necessary clean the basket strainer under each tank lid before filling.

Always clean the pressure filter before each tank refill and at the end of the day. Adjust the three way valve to position D (see pages 16/17) then unscrew the filter cover to remove the element, clean and refit. Ensure the O-ring is in good condition when refitting. Return Three way valve to position **A, Work** before resuming spraying.

Tank, Pump and Spray Lines

At the end of each day run clean water through the pump, spray heads and lines to purge them of chemicals. Rinse out the tank to remove any powdered material.

Never leave chemicals in the tank that may settle to the bottom, harden and break into lumps as this may block the filter or cause pump damage.

Dispose of unused chemical, 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 or electrical valves.

MAINTENANCE

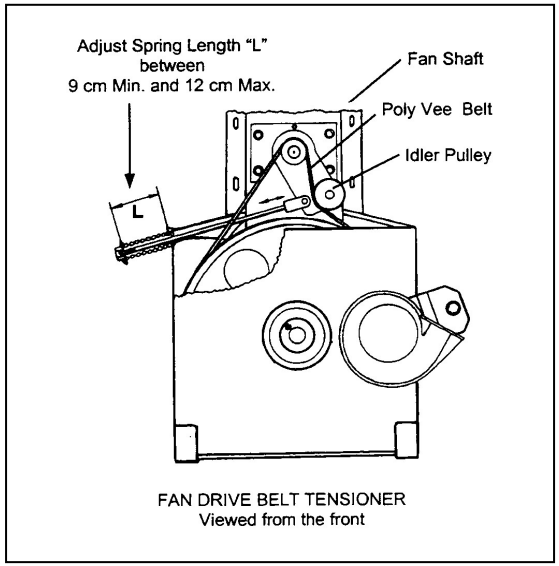
Adjustment of Drive Belts

Check the tension on the belts driving the fan and pump regularly and if necessary adjust as described below.

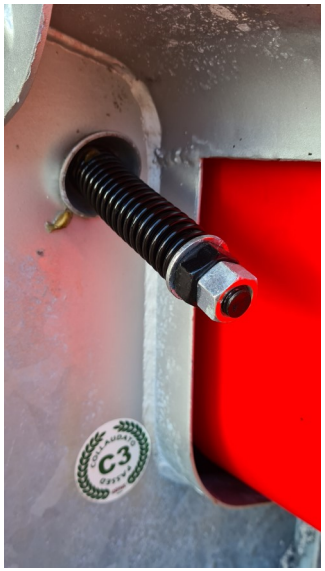
Fan Drive Belt

As the poly-vee fan belt transmits considerable power, correct tension needs to be maintained to avoid loss of air flow due to belt slippage. Tension is applied by means of an adjustable, spring loaded link connected to the arm of an idler pulley running on the back of the belt. The spring loading maintains constant tension and minimises the need for frequent adjustments.

The tension link is accessible from the RH side of the sprayer between the rear of the tank and the fan. To adjust, loosen the locknut and turn the inner nut so that the length of the spring is between the 9 and 12 cm as shown in the diagram. Retighten the locknut.



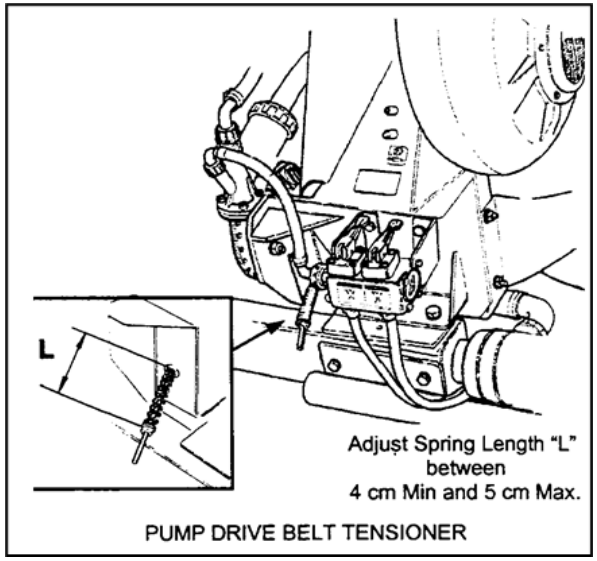
FAN DRIVE BELT TENSIONER
Viewed from the front



Pump Drive Belt

An "SPZ" section vee belt from the fan shaft drives the centrifugal pump which is mounted on a pivoting bracket. Tension is applied by means of an adjustable, spring loaded link connected to the pump bracket. It is essential that the spring is kept adjusted to the correct length to avoid low fluid pressure due to belt slippage. The spring is accessible at the LH rear corner of the sprayer. To adjust, turn the nut so that the length of the spring is between 4 and 5 cm as shown in the diagram on the next page.

MAINTENANCE



PUMP DRIVE BELT TENSIONER

Fan Shaft Bearings

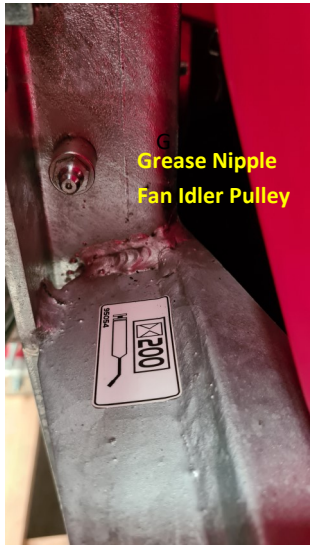
Check the oil level in the fan bearing housings daily and if necessary top up with SAE 90 oil. Remove the dipstick assembly. Clean the dipstick and re-insert it, then remove and check the oil level which should be between the two marks on the dipstick. If necessary add oil to bring the level to the top mark. Reinstall the dipstick and push in securely.

Change the oil annually. Remove the drain plug from the tube beneath the fan and remove the dipstick to allow the oil to drain freely. Replace the drain plug and fill with SAE 90 oil to the upper mark on the dipstick. Requires approximately 160ml of oil.

MAINTENANCE

Other Greasing Points

Lubricate any other grease points, usually only two, the over-run clutch next to the input shaft spline and the fan drive idler pulley, annually or as directed by maintenance decals.



TROUBLE SHOOTING

TROUBLE SHOOTING

Pump does not prime

- Insufficient liquid in tank to cover suction inlet.
- Suction line loose allowing pump to suck air.
- Manual pressure regulator fully shut.
- Section valves shut.

Fan noisy and/or vibrating

- Bearings worn.
- Fan damaged or out of balance.
- Tractor PTO incorrectly installed.

Over-run clutch noisy

- Clutch requires greasing.
- Clutch pawls worn.

Drive shaft noisy

- PTO shaft not secured properly to shafts.
- Incorrect hitch point and PTO geometry.
- Universal joint crosses worn.

Pump does not reach correct pressure

- PTO not operating at full 540 rpm.
- Pump drive belt loose and/or slipping.
- Pump impeller badly worn.
- Manual pressure regulating valve not correctly adjusted.
- Pressure gauge faulty or line blocked.
- Tap for chemical washer in large filter basket left on.

Pump leaking liquid

- Mechanical seal worn or damaged.

Air speed or volume reduced

- Fan mesh blocked with leaves or debris.
- PTO not operating at full 540 PTO rpm.
- Fan drive belt loose and/or slipping.
- Head air outlets not matched to fan size.

TROUBLE SHOOTING

TROUBLE SHOOTING

Spray heads “fluttering”

- Air outlets incorrectly aligned.
- Air blanking caps fitted but liquid flow not turned off.
- Blocked or damaged fluid lines.
- Air leaking into fluid line between nozzle and calibration disc assembly.

Individual outlets not spraying

- Individual adjusting taps turned off.
- Manifold blocked.
- Hoses bent or crushed.
- Calibration disc holes blocked.

Flow delayed when spray heads turned on

- One way check valves, if fitted to the spray head, may be blocked or fitted in the wrong flow direction.

Poor tank agitation

- Chemical left in tank whilst not operating.
- By-pass agitator in bottom of tank blocked.

Electric valves not operating

- Wiring damaged or corroded.
- Poor connection to tractor power supply.
- Low battery voltage.

INSTALLATION CERTIFICATE

PRE DELIVERY, INSTALLATION and WARRANTY REGISTRATION FORM GENERAL

IMPORTANT: This is to be completed and returned to Silvan within 10 working days of installation.
Failure to do so may result in a limited warranty period.

PRODUCT DETAILS	OPTIONAL EQUIPMENT
Model Description:	☐ Hose Reel ☐ .....
Silvan Serial No.:	☐ Controller ☐ .....
Pump Model & Serial No.:	☐ ..... ☐ .....
Original Equipment Manufacture's Serial No's:	

PRE-DELIVERY CHECKS As Applicable	Tick when passed
All equipment correctly supplied in good order. Owner's Kit supplied.	
PUMP Check diaphragm pump oil level and gearbox if fitted to motorised unit.	
Check surge chamber pressure suits operation pressure if fitted.	
Check pump feet are secure.	
Check pressure switch operates if fitted (12 Volt Models).	
FILTRATION Check lid strainer and suction filter element.	
Check suction filter O-ring for correct position.	
HOSING Check hoses for kinks or damage.	
Check clearance from wear points.	
Check hose clamps and fittings are tight.	
ELECTRIC CONTROLS Connect to 12 volt supply and check operation.	
TANK Check for sealing of all outlets.	
Clean contaminants from tank.	
Check lid for correct sealing.	
Check mounting points are correct and tight.	
BOOM OPERATION Ensure boom folds correctly.	
Ensure boom height control operates correctly.	
ENGINE Check lubrication level and top up if necessary.	
Operate engine and ensue it starts and runs correctly.	
MISCELLANEOUS Lubricate all grease points as per Operator's Manual.	
Check all safety guards are secure and safety decals are in place.	
Check all operational equipment supplied for completeness and fitment.	

OPERATION and INSTALLATION CHECKS	Tick when passed
OPERATION Fill tank with water above all fittings and check the drain plug, filter, suction and by-pass hoses for leaks.	
Check folding operation of boom.	
Check optional equipment fitted for correct operation.	
Attach to vehicle, ensure control valve is in by-pass and all taps off.	
Start motor and adjust pump to maximum operation pressure and check for leaks of control, hoses and nozzles.	
All optional equipment fitted and operating correctly.	
INSTALLATION Has pre-delivery check been carried out?	
Has the PTO shaft been installed and length checked?	
Are all safety covers and safety decals in place?	
Has the customer received and read the Operator's Manual?	
Has the customer been fully instructed by the dealer of the safe operation in actual working and transport conditions?	
Has the customer been fully instructed in calibration?	
Is the customer satisfied with the sprayer's performance?	
Is the customer fully instructed in the sprayer's service and maintenance requirements?	
Does the customer fully understand the Silvan New Product Warranty Policy?	

SILVAN AUSTRALIA PTY. LTD.
ABN 48 099 851 144
68 Atlantic Drive, Keysborough VIC, Australia 3173
Mail to P.O. Box 4453 Dandenong Sth VIC 3164
TELEPHONE: (03) 9215 2700 **Facsimile:** (03) 9215 2701
Freecall: 1300 SILVAN Facsimile: 1800 SILVAN
Email: support@silvanaust.com Web: www.silvan.com.au

SILVAN NEW ZEALAND AUSTRALIA PTY. LTD.
22 SUNSHINE AVE., HAMILTON 2001, NEW ZEALAND
TELEPHONE: (07) 849 6030 **Facsimile:** (07) 849 6070
Email: infonz@silvanaust.com Web: www.silvannz.co.nz

WHITE COPY – SEND TO SILVAN, BLUE COPY – RETAINED BY DEALER,
YELLOW COPY – RETAINED BY OWNER

IT IS THE RESONSIBILITY OF THE DEALER TO FILL OUT AND RETURN THIS FORM TO SILVAN AUSTRALIA PTY LTD

IMPORTANT
By signing this Pre-delivery, Installation and Warranty Registration Form:
(a) The Customer acknowledges that he/she is trained and fully responsible for the safe operation of the sprayer.
(b) The Customer undertakes further, to train any person who might be required to operate the sprayer in all safety aspects as per the Operator's Manual.

Customer Name: .....
Address: .....
..... P/C .....
Email: .....
Date of Installation: .....
Customer Signature: .....
Subscribe me to the Silvan Newsletter ☐

In signing, the dealer meets his obligations of installation, service and warranty start-up as a servicing dealer and supplier of plant.

Dealer Name: .....
Address: .....
..... P/C .....
Phone: .....
Dealer Signature: .....

CERT02 REV H 16/06/20

SILVAN 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 recommend-ed 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 below explains the extent and limitations of your Warranty coverage on Silvan Products.

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and for compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

We warrant our goods to be free from defects in materials and workmanship for the warranty period of 12 months from the date the product is delivered to the consumer.

Silvan warrants its authorised Dealer, who in turn warrants the original purchaser (consumer) 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 below.

This Warranty is in addition to any other rights and remedies available to consumers under the law.

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 as specified in the Owner/Operator Manual applicable to the product.
- Damage caused by continued use of a product after initial failure
- Any product which has been repaired by other than an authorised Silvan service outlet in a way which, in the sole and absolute judgment of Silvan, adversely affect its performance or reliability.
- The replacement of maintenance items such as diaphragms, batteries, V belts and ground engaging components, etc.

How to claim Warranty

Return the goods to the place of purchase at your cost and within the warranty period along with evidence of the purchase date. If the original supplier cannot be contacted then contact Silvan as below and we can direct you on how to proceed with your warranty claim.

How your claim will be managed

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 depending on the extent of the problem at the discretion of Silvan and the Silvan dealer.

Silvan Australia Pty Ltd
68 Atlantic Drive,
Keysborough,
Victoria 3173
1300 SILVAN (745 826)
support@silvanaust.com

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SILVAN AUSTRALIA

SILVAN AUSTRALIA PTY. LTD.

ABN 48 099 851 144

Head Office

68 Atlantic Drive,

Keysborough,

Victoria 3173,

Australia

Telephone: 1300 745 826

Facsimile: 1800 745 826

www.silvan.com.au