

## ***Operator's Manual***



MANAB06 Rev E January 2017

### ***Suntuff Linkage Airblast Sprayers*** ***200 litres*** ***400 litres*** ***500 litres***





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## Introduction

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Silvan 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.

This manual covers the 200, 400 and 500 litre sizes of Suntuff Linkage Airblast Sprayers. These Silvan sprayers and associated equipment are designed and manufactured to provide a high standard of performance and safety and incorporate many innovative features. To ensure continued efficient performance and safe operation, you need to read this manual thoroughly and fully familiarise yourself with all aspects of your sprayer's operation, maintenance and safety procedures.

Now that you're 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.



## New Product 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 below explains the extent and limitations of your Warranty coverage on Silvan Products.

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, at 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.



## Specifications

### General

Silvan Suntuff Linkage Airblast sprayers are for use in the application of agricultural chemicals in orchards and vineyards. The sprayers use a high pressure pump and nozzles to atomise the chemical solution, together with a high volume axial flow air fan to distribute the spray.

### Tank

Polytuff impact resistant polyethylene.  
Capacity 200, 400, or 500 litres with calibrated level indicator.  
Offset, non spill screw down lid of 255 mm diameter with basket strainer.  
Continuous by-pass agitation in bottom of tank.

### Pump

Constant displacement oil backed diaphragm pump of varying size depending on sprayer model and specification. Nitrile diaphragm and corrosion resistant, anodised aluminium body.

Sprayer Model	Pump Model
200 litre	APS-71
400 litre	APS-71
500 litre	APS-96

Pump output and maximum operating pressure at 540 PTO rpm as shown below.

Pump No.	Output		Max. Pressure	
	l/min	gpm	Bar	psi
APS-71	71	15.6	40	580
APS-96	94	21.0	40	580

### Fan

Axial flow type of varying diameter depending on sprayer model. Cast aluminium hub with 8 nylon blades (10 on 800mm), polyethylene backing plate with galvanised steel cowling and protective mesh cover.

Sprayer Model	Fan Diameter
200 litre	600 mm
400 litre	700 mm
500 litre	800 mm

### PTO Drive

Quality 540 rpm telescopic drive PTO shaft with safety shields.

### Fan Gearbox

Single speed, oil bath type with neutral position.  
Fan speed 2484 rpm at 540 rpm PTO speed.

### Controls

Manual by-pass to tank.  
Screw type pressure regulator.  
Glycerine filled pressure gauge.  
3 outlet valves with APS-71 and APS-96 pump.

### Nozzles

Screw mounted, brass body with removable ceramic jets and stainless steel swirl plates.  
Flip over action to turn nozzle on or off.  
Larger models fitted with twin jet nozzles for easy changing of application rate.

Fan Size	No. Nozzles	Nozzle Type
600 mm	10 (5 per side)	Single jet
700 mm	12 (6 per side)	Twin jet
800 mm	14 (7 per side)	Twin jet

### Filtration

Three stage with removable elements.  
Tank lid strainer 18 mesh.  
Suction line filter 50 mesh (blue).  
Nozzle strainers Stainless steel.

### Pressure Hoses and Spray Lines

APS-71 & APS-96 Wire braided hydraulic pressure hose and swaged fittings  
Stainless steel spray lines.

### Frame and Hitch

Heavy duty galvanised steel construction.  
Category I linkage on 200 litre unit.  
Reversible Category I and II linkage pins on 400 and 500 litre sprayers.

### Optional Equipment

Two sided vineyard deflector (all models).  
Single side conveyor for trees (800mm fan only).  
Electric motor valve controls in lieu of manual taps (all models)

### Dimensions and Weights

With PTO drive and standard equipment fitted.  
Length **L**, width **W**, height **H**, all in (mm).  
Mass **M** (kg) with tank empty.  
To calculate gross mass with tank filled add 1 kg per litre of tank capacity.  
e.g. for 200 litres add 200kg.

	<b>L</b>	<b>W</b>	<b>H</b>	<b>M</b>
200 litre	1070	1000	1000	95
400 litre	1330	1190	1200	134
500 litre	1400	1190	1325	137

### Power Requirement

Minimum tractor PTO horsepower at 540 rpm.  
200 and 400 litre 25 HP  
500 litre 40 HP

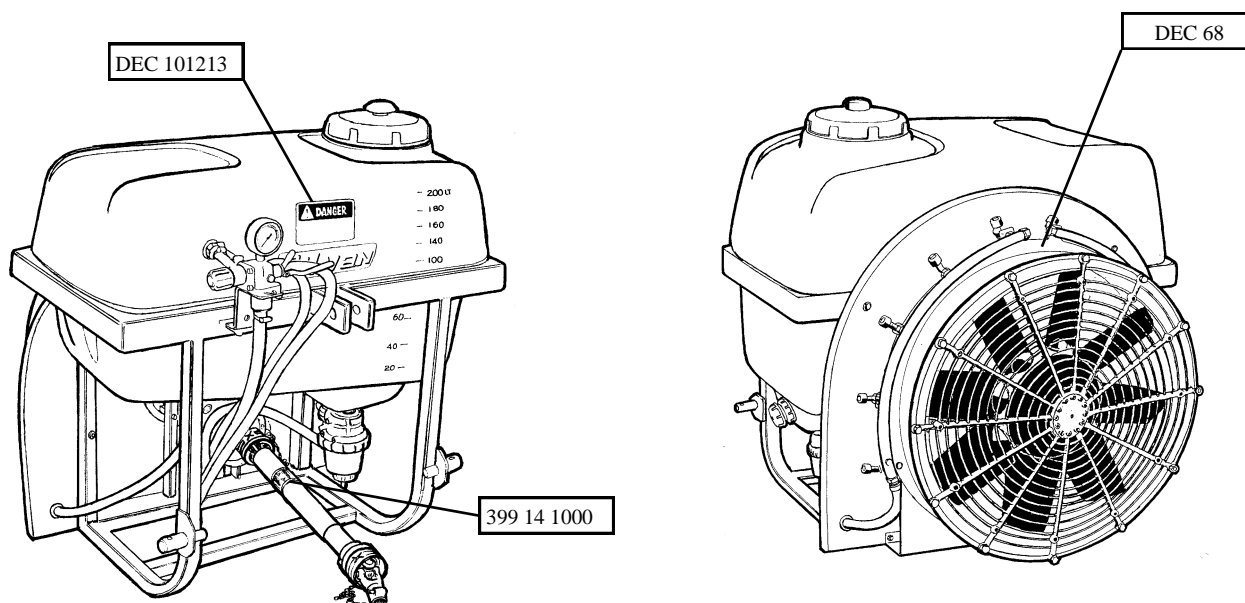
## Safety Information



The location of the safety decals fitted to Suntuff Linkage Airblast sprayers is shown in the diagrams below and their wording is shown on the page opposite.

It is important that all operators read and follow the information on all safety decals before operating the sprayer. Failure to comply with these warnings could result in serious injury or death.

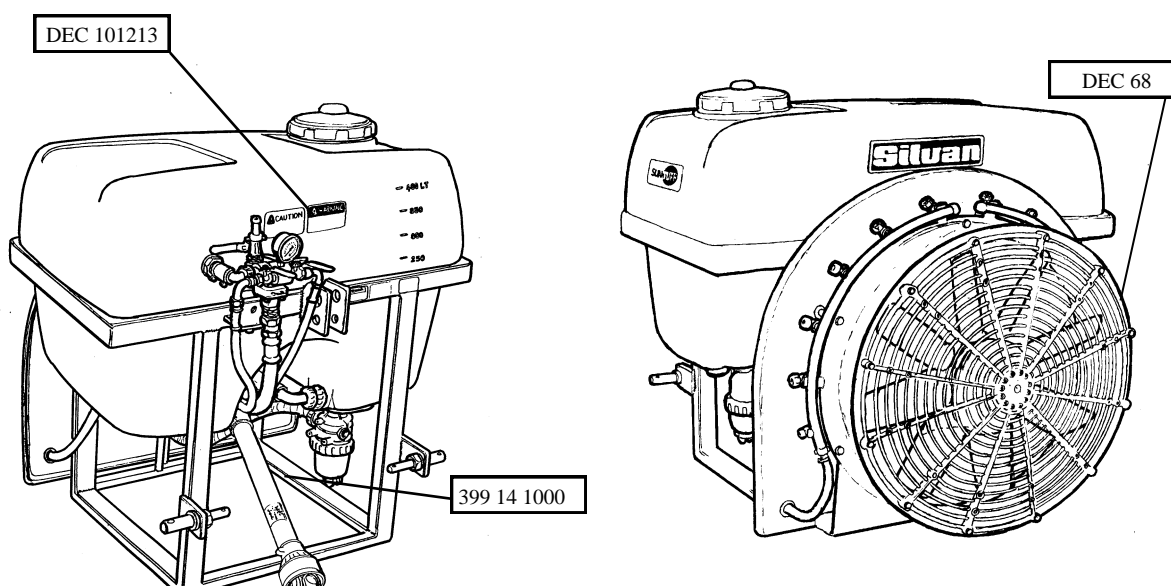
Safety decals should be kept clean and legible at all times. If any decals are missing or unreadable they should be replaced by ordering new decals from your Silvan dealer using the part numbers shown below.



FRONT VIEW

200 LITRE SPRAYER

REAR VIEW



FRONT VIEW


400 & 500 LITRE SPRAYER

REAR VIEW





## Safety Information

**WARNING**

BEFORE APPLYING CHEMICALS WITH THIS SPRAYER READ THE LABEL OF THE CHEMICAL MANUFACTURER OR SUPPLIER FOR THE RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT AND USE IT AS RECOMMENDED.

READ THE OPERATORS INSTRUCTION MANUAL BEFORE ATTACHING OR USING THIS PRODUCT.


REFER TO YOUR VEHICLES OPERATION MANUAL FOR THE MAXIMUM LOAD LIMITS AND OPERATING PROCEDURES.

DO NOT EXCEED SPECIFIED SAFE LOAD CARRY AND TOWING CAPACITIES.

STABILITY OF THE VEHICLE CAN BE AFFECTED BY THE ATTACHMENT'S WEIGHT AND WEIGHT MOVEMENT.

REDUCE THE SPEED OF THE VEHICLE WHEN CARRYING AN ATTACHMENT AND ALLOW GREATER DISTANCE FOR BREAKING.

DO NOT RIDE ON THIS MACHINE.

**DANGER**

DISCONNECT TRACTOR BEFORE ADJUSTING, SERVICING, CLEANING OR INSPECTING SPRAYER.

KEEP CLEAR OF OPERATING MACHINERY.

DO NOT OPERATE WITHOUT GUARDS OR SHIELD IN PLACE.

FAILURE TO HEED THESE WARNINGS COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.

**IMPORTANT**

P.T.O SPEED MUST NOT EXCEED 540 R.P.M & ENSURE P.T.O SHAFT IS CORRECT LENGTH.

EACH DAY: GREASE TELESCOPIC TUBE ON P.T.O SHAFT, GREASE UNIVERSAL JOINTS, CLEAN SUCTION STRAINER, CHECK PUMP OIL LEVEL, FLUSH OUT PUMP WITH WATER AFTER USE. FOR GENERAL MAINTENANCE, REFER TO THE INSTRUCTION MANUAL.

DEC 101213P

Part Number DEC101213P

**DANGER**

**ROTATING  
FAN BLADES**



DEC68

Part Number DEC68

## 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 Silvan Suntuff Linkage Airblast 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 previous page for the 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.
- ▲ Wear ear protection when operating the sprayer on a tractor which is not fitted with a sound proofed cabin.
- ▲ Ensure the linkage capacity of the tractor is suitable for the 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 PTO and driveline shields are correctly installed.
- ▲ Do not operate the sprayer at speeds greater than 540 PTO rpm.
- ▲ Stop the tractor PTO, apply the parking brake and switch off the tractor engine before approaching the sprayer or performing any adjustments or work on it.
- ▲ Never engage the fan drive gearbox with the tractor engine running or the PTO engaged.
- ▲ Disconnect the PTO shaft at the tractor and ensure the sprayer is properly supported before performing any maintenance work.
- ▲ **Before using any chemicals** refer to the chemical manufacturer's label and safety instructions for safe handling procedures and correct method of use. Always use the recommended personal protective clothing and safety equipment.
- ▲ Always wear gloves when removing and cleaning filters.
- ▲ Dispose of empty chemical containers in accordance with the instructions supplied by the chemical manufacturer.
- ▲ 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 is required contact Silvan for correct maintenance procedures.
- ▲ Keep all bystanders away from the sprayer whilst in operation

## Operation

### Attaching to the Tractor

Suntuff 200 litre sprayers are equipped to fit tractors with Category I linkage systems only.

Units of 400 and 500 litre capacity are equipped to fit tractors with either Category I or II linkage systems. The inner end of each lower linkage pin is Category I diameter and the outer end is Category II. The lower holes in the top connection plates are Category I diameter and the upper holes are Category II. For best stability install the lower linkage pin with the end which is to be used to the outside.

Remove the PTO shaft from the sprayer by depressing the locking pin. Lower the tractor linkage and attach to the sprayer's lower hitch pins of the appropriate category, then connect the upper linkage arm using the tractor's link pin. Secure all link pins with the tractor's Linch pins. Raise the tractor linkage to the desired spraying height and level the sprayer by adjusting the length of the top linkage arm.

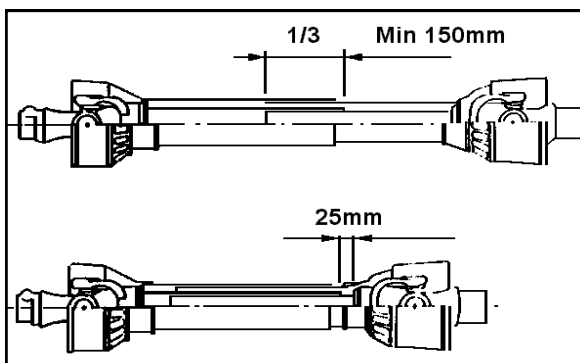
Clean and grease the splines on the tractor and sprayer PTO stub shafts and install the PTO shaft making sure that the spring loaded locking pins engage in the grooves of both stub shafts. Ensure that the tractor's PTO shaft guard is attached to the tractor.

### PTO Shaft Length

*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.*

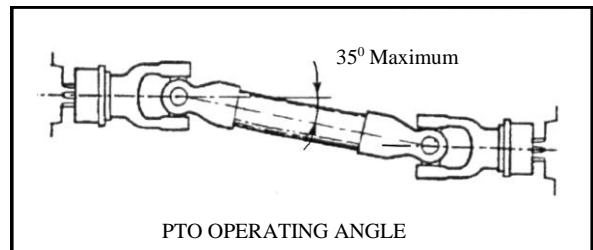
Set the linkage height so the ends of the two drive shafts are at their closest. Install the PTO shaft making sure there is at least 25mm of telescopic travel remaining between the male and female sections. Raise and lower the sprayer to check that the PTO telescopic tubes overlap by approximately 1/3rd their length, and not less than 150mm, in all operating positions.

If the PTO shaft must be shortened cut equal



amounts from both male and female shafts and safety covers. Carefully remove all burrs then clean and relubricate before reassembling.

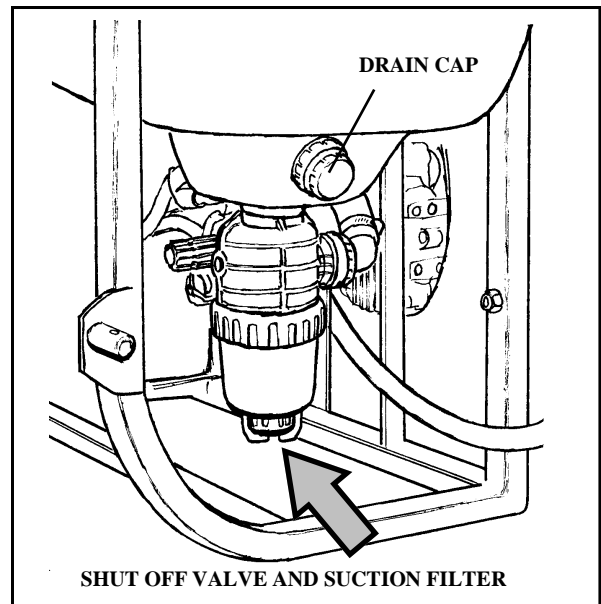
If the operating angles of the PTO shaft exceed 35° a constant velocity joint must be fitted by your Silvan dealer.



### Starting the Sprayer

When starting the sprayer for the first time conduct a trial run using clean water only (no chemicals) to become familiar with the operation of the controls and to check that all systems are functioning correctly without any leakage.

Before filling the tank ensure that the drain cap is fitted and the basket strainer is in place and clean. Close the lid securely after filling.



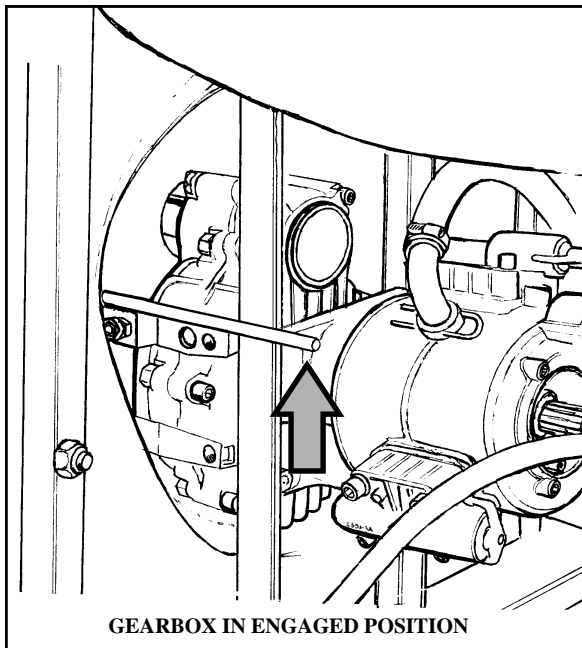
The suction filter is fitted with a shut-off valve which closes automatically when the valve cap is screwed off. This allows the filter cover to be unscrewed and the element to be removed for cleaning while there is fluid in the tank. Gloves should be worn when handling the filter.



## Operation

When the sprayer is operating the valve must be fully screwed in to open the shut-off valve and allow fluid to pass through the filter. Directional arrows are moulded into the valve cap to show the opening and closing operation.

Check that the oil level in the diaphragm pump is level with the mark in the viewer and if necessary top up with SAE 20W-40 multigrade engine oil. When starting for the first time ensure that the gearbox oil level is correct and that the PTO has been lubricated - refer Maintenance section.



Check that the fan gearbox is engaged. The selector lever should be in the up position. Never engage the fan drive with the tractor engine running or the PTO engaged. Moving the lever to the down position puts the gearbox into neutral and the pump will operate without the fan.

Flip the required number of spray nozzles to the open position, (refer to next page). Refer to the Calibration section for information on nozzles and jet selection.

Before engaging the PTO, move the by-pass control "A" to the by-pass position (clockwise) and close the outlet valves "C".

Engage the tractor PTO slowly and allow the sprayer to run in by-pass mode. Once the pump is primed increase the tractor speed to 540 PTO rpm.

The by-pass lever can then be moved to the operating or pressure position (anti-clockwise) and the pressure can be adjusted by regulator knob "B" whilst observing the gauge.

The pump is designed to operate up to a maximum pressure of 40 Bar (580 psi). Refer to the pump identification plate and the Specifications page for details.

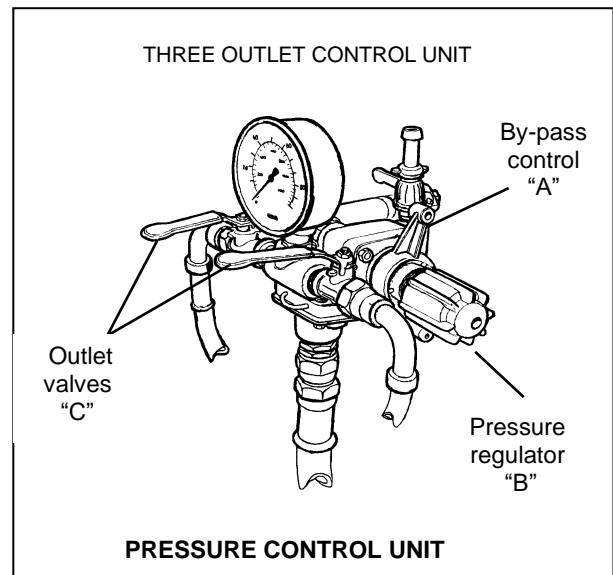
The pressure used for spraying may be varied between 10 Bar (145 psi) and the pump's maximum depending upon the application rate - refer to the Calibration section.

Open the outlet valves to commence spraying.

### Three Outlet Control Units

All models use a three outlet control with two outlets connected to the airblast nozzles whilst the third can be used to connect a spray gun or other device.

The selection of by-pass or pressure mode is controlled by the lever "A" - refer diagram below. Moving the lever clockwise through its full travel selects by-pass which reduces the pump's operating pressure by allowing liquid to bypass the pressure regulator. Note, this operation does not fully shut off the flow to the individual outlet taps. Moving the lever full anti-clockwise, re-directs pressurised fluid to the outlets.



## Operation

System pressure is regulated by turning knob "B" and observing the reading on the gauge. Turning the knob clockwise increases the pressure and turning anti-clockwise decreases pressure.

Fluid is directed to the airblast nozzles by outlet valves "C" which are open when the lever is in line with the direction of flow and closed when across the direction of flow. The valves may be operated individually to direct spray to either side or as a pair to spray simultaneously from both sides.

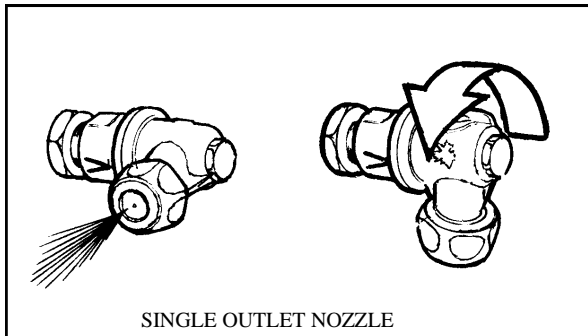
If you wish to stop spraying but leave the tractor PTO running, close the outlet valves "C" and move the by-pass lever "A" to by-pass mode.

For spraying applications using only the third outlet, the fan can be disengaged to reduce unnecessary wear and fuel consumption.

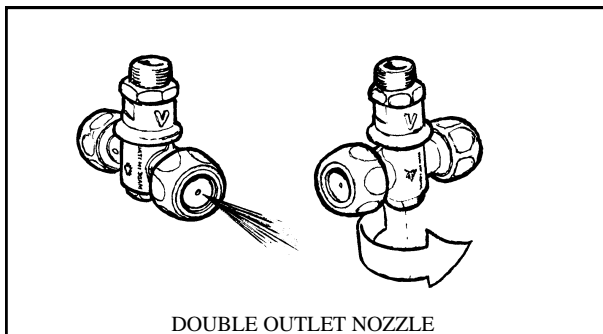
### Flip On/Off Nozzles

**Warning !** Relieve pressure in spray lines before rotating nozzles.

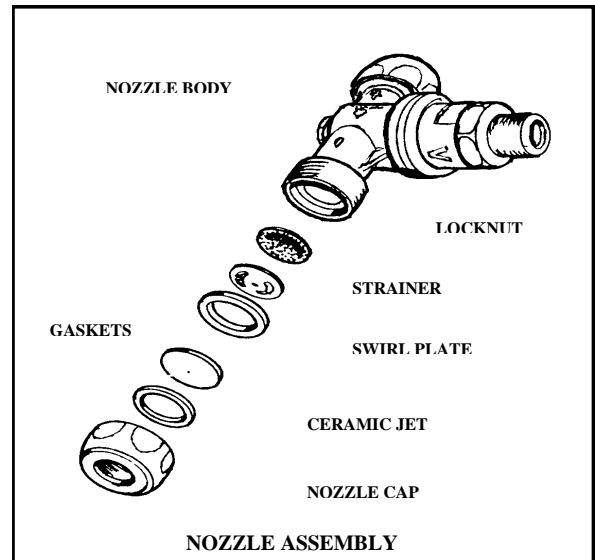
The flip on/off nozzles incorporate an off position to allow individual jets to be turned off when not needed. The jets can be positioned by loosening the attaching locknut and aligning the outlet to the required angle. These two features enable the spray pattern to be regulated to achieve the required coverage without wastage of chemicals.



The nozzles fitted to 200 litre sprayers have a single outlet which is turned on or off by rotating the nozzle through 90°.



The nozzles fitted to 400 and 500 litre sprayers have two outlet jets, one at each end of the nozzle, but only the jet which is flipped to the outward facing position is "on". This facilitates convenient changing between jets of different sizes, for example, when requiring application rates to suit concentrate and dilute spraying.



Both types of nozzle incorporate ceramic jets, stainless steel swirl plates and stainless steel mesh strainers, separated by neoprene gaskets. The purpose of the swirl plate is to create a conical spray pattern. Nozzle output at a particular spray pressure can be varied by fitting different combinations of jet and swirl plate as shown in the Nozzle Output Chart on page 12.

Ceramic jets are sized according to the diameter of the central hole in millimetres.

Swirl plates can either have a closed centre, identified as CC, or a central hole which is sized in millimetres. Closed centre swirl plates produce a hollow cone spray pattern and are fitted for low outputs. For higher outputs, swirl plates with a central hole are necessary to fill the centre of the conical spray pattern.

Ceramic jets and swirl plates normally have a long wear life and require little maintenance other than regular checking and cleaning of strainers. 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 jets are detected then the full set of jets, swirl plates and gaskets should be replaced.

## Nozzle Selection and Calibration

### Nozzle Selection and Calibration Checking

Chemical application rates and hence nozzle selections will vary greatly depending on the crop type and the stage of crop development. Information on application rates should be available from your chemical supplier or State Department of Agriculture.

Nozzle selection can be made by following the four simple steps shown below. The fourth step, checking the calibration after nozzle selection, improves 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) **Speed (km/hr)** The travel 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.

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

c) **Row width (m)**

The distance between rows measured in metres.

d) **Spray pressure (Bar)** A spray pressure of between 20 and 30 bar is usually selected. Lower spray pressures will produce larger droplets which are generally less effective than smaller droplets produced at higher pressures.

#### STEP 2 Total Output Required

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

$$\text{Total output (l/min)} =$$

$$\frac{\text{Application rate (l/ha)} \times \text{Speed (km/hr)} \times \text{Row width (m)}}{600}$$

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

a) Nozzle sets to suit a variety of applications can be selected directly from the Jet / Swirl Plate Combination charts on the following pages.

b) For other applications or those not requiring all jets to be used, such as vineyards, the correct nozzles can be selected by calculating the nozzle requirements for one side of the sprayer then copying the selected nozzles on the other side of the sprayer.

Decide on the number of nozzles to be used on one side and the percentage of spray required from each (the total should be 100%).

To obtain the individual nozzle flow rates, halve the total output calculated at Step 2, to obtain the total output for one side, and multiply it by the percentage output required from each nozzle.

Use the Nozzle Output Chart on the following page to select the nozzle and swirl plate combination which will give the required nozzle output at the spraying pressure you have chosen.

$$\text{Output per side (l/min)} = \frac{\text{Total output (l/min)}}{2}$$

$$\text{Nozzle output (l/min)} = \frac{\text{Nozzle percentage (\%)} \times \text{Output per side (l/min)}}{100}$$

Add up the flow rates of the individual jets to check that the total output per side 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 jets, test the sprayer with water to confirm the application rate.

Fill the tank to the brim or 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 brim or 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.

A nozzle selection example and worksheets to record calibration results are shown on page 13.

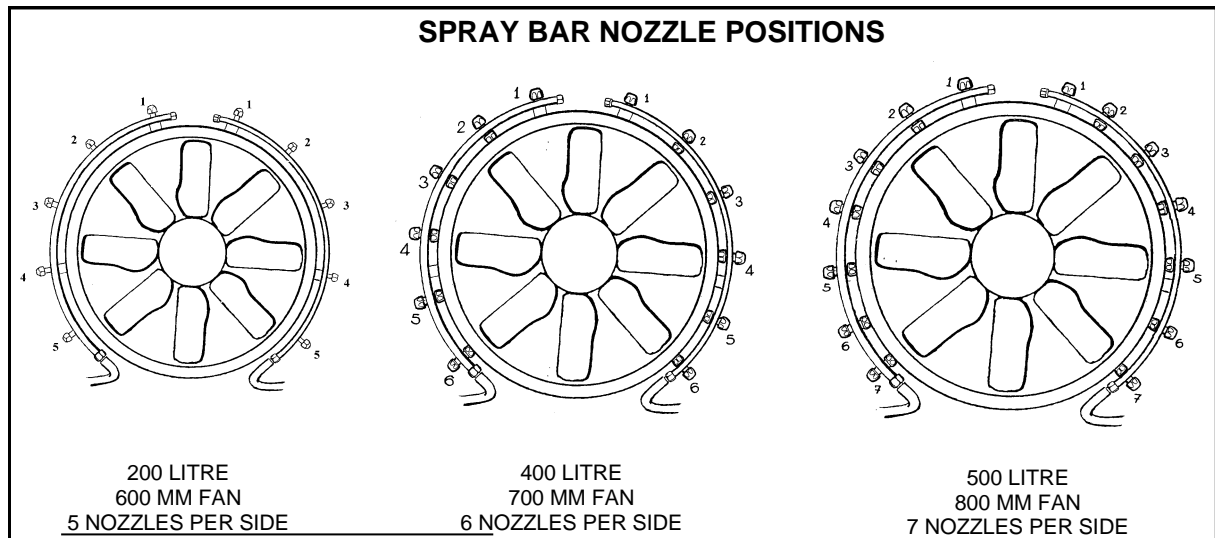
## Nozzle Selection and Calibration

### When to Spray

Results will be best when the wind speed is low, temperature is low and relative humidity high. An ideal time is at sun up when these conditions are most likely to apply.

### Spray Bar Nozzle Positions

The Spraybar Nozzle Positions for each of the three Suntuff Linkage Airblast models shown in the diagrams below correspond to those in the Jet/Swirl Plate Combination Charts.



### Standard Jet/Swirl Plate Setup

200 litre model All nozzles 0.8 /CC

400 litre model Side 1, All 0.8/CC, Side 2, All 1.2/CC

500 litre model Side 1, All 0.8/CC, Side 2, All 1.2/CC

### Jet/Swirl Plate Combination Charts

The following Jet/Swirl Plate Combination Charts show the total sprayer output that can be achieved from each of the three Suntuff Linkage Airblast models at various operating pressures using different sets of jets and swirl plates, e.g. 0.8/CC indicates a 0.8mm jet combined with a Closed Centre swirl plate.

Each of the jet/swirl plate sets is a typical combination that will be suitable for a number of spraying applications. Use of these charts eliminates the need to calculate the output from individual nozzles. Ensure that the chart used is the one which is applicable to your sprayer model.

CHART NO. 1 - JET / SWIRL PLATE COMBINATIONS - FOR 200 LITRE AIRBLAST SPRAYER WITH 5 JET SPRAYBAR														
NOZZLE POSITION	AB005	AB015	AB025	AB035	AB045	AB055	AB065	AB075	AB085	AB095	AB105	AB115	AB125	AB135
1	0.8/CC	1.0/CC	-	-	-	1.0/CC	1.2/CC	-	1.2/CC	-	1.5/CC	-	1.2/CC	1.8/CC
2	0.8/CC	1.0/CC	1.2/CC	1.5/CC	1.8/CC	1.5/CC	1.2/CC	1.5/CC	1.5/CC	2.0/CC	1.5/CC	1.8/CC	1.8/CC	1.8/CC
3	0.8/CC	1.0/CC	1.2/CC	1.5/CC	1.8/CC	1.5/CC	1.2/CC	1.5/CC	1.5/CC	2.0/CC	1.5/CC	1.8/CC	1.8/CC	1.8/CC
4	0.8/CC	1.0/CC	1.2/CC	1.5/CC	1.8/CC	1.2/CC	1.2/CC	1.5/CC	1.2/CC	2.0/CC	1.5/CC	1.8/CC	1.5/CC	1.8/CC
5	0.8/CC	1.0/CC	1.2/CC	-	-	1.0/CC	1.2/CC	1.5/CC	1.0/CC	-	1.5/CC	1.8/CC	1.5/CC	1.8/CC
TOTAL SPRAYER OUTPUT (BOTH SIDES) - IN LITRES PER MINUTE														
PRESSURE (BAR)	AB005	AB015	AB025	AB035	AB045	AB055	AB065	AB075	AB085	AB095	AB105	AB115	AB125	AB135
10	9	13	14	14	16	18	17	18	19	20	23	22	23	27
15	10	15	16	16	19	21	20	22	22	23	27	26	28	32
20	12	17	18	19	22	25	23	25	25	26	31	29	31	36
25	13	19	21	20	25	26	26	26	27	28	33	33	35	41
30	14	21	22	22	27	28	28	29	29	31	36	36	38	45

## Nozzle Selection and Calibration

CHART NO. 2 - JET / SWIRL PLATE COMBINATIONS - FOR 400 & 500 LITRE AIRBLAST SPRAYER WITH 6 JET SPRAYBAR														
NOZZLE POSITION	AB006	AB016	AB026	AB036	AB046	AB056	AB066	AB076	AB086	AB096	AB106	AB116	AB126	AB136
1	-	0.8/CC	1.0/CC	-	1.0/1.0	1.2/CC	1.2/CC	-	-	-	1.5/CC	1.2/1.0	1.0/1.0	-
2	0.8/CC	0.8/CC	1.0/CC	1.0/1.0	1.0/1.0	1.2/CC	1.5/CC	1.5/1.2	1.5/1.2	1.5/1.2	1.8/1.5	1.5/1.2	2.0/1.8	2.0/1.8
3	0.8/CC	0.8/CC	1.0/CC	1.0/1.0	1.0/1.0	1.2/CC	1.5/CC	1.5/1.2	1.5/1.2	1.5/1.2	1.8/1.5	1.5/1.2	2.0/1.8	2.0/1.8
4	0.8/CC	0.8/CC	1.0/CC	1.0/1.0	1.0/1.0	1.2/CC	1.5/CC	1.2/1.0	1.5/1.2	1.5/1.2	2.0/CC	1.5/1.2	1.0/1.0	2.5/CC
5	0.8/CC	0.8/CC	1.0/CC	1.0/1.0	1.0/1.0	1.2/CC	1.2/CC	1.2/1.0	1.2/1.0	1.5/1.2	1.2/CC	1.2/1.0	1.0/1.0	1.0/CC
6	-	0.8/CC	1.0/CC	1.0/1.0	1.0/1.0	1.2/CC	1.0/CC	-	-	-	0.8/CC	1.0/1.0	0.8/CC	0.8/CC
TOTAL SPRAYER OUTPUT (BOTH SIDES) - IN LITRES PER MINUTE														
PRESSURE (BAR)	AB006	AB016	AB026	AB036	AB046	AB056	AB066	AB076	AB086	AB096	AB106	AB116	AB126	AB136
10	7.2	10.8	15.6	16.0	19.2	20.4	23.2	24.4	26.6	28.8	33.2	34.8	36.2	37.0
15	8.0	12.0	18.0	19.0	22.8	24.0	27.2	28.8	31.2	33.6	39.0	41.0	44.6	45.6
20	9.6	14.4	20.4	22.0	26.4	27.6	31.2	32.8	35.6	38.4	44.6	46.8	50.4	51.4
25	10.4	15.6	22.8	24.0	28.8	31.2	34.0	36.4	39.4	42.4	49.2	51.8	55.4	56.8
30	11.2	16.8	25.2	26.0	31.2	33.6	37.0	39.6	43.0	46.4	53.2	56.4	60.0	61.8
40	12.8	19.2	28.8	30.0	36.0	38.4	41.6	46.4	50.8	55.2	62.0	66.2	68.4	70.6

CHART NO. 3 - JET / SWIRL PLATE COMBINATIONS - FOR 500 LITRE AIRBLAST SPRAYER WITH 7JET SPRAYBAR														
NOZZLE POSITION	AB007	AB017	AB027	AB037	AB047	AB057	AB067	AB077	AB087	AB097	AB107	AB117	AB127	AB137
1	-	-	-	-	-	-	-	-	-	-	1.2/CC	-	1.2/1.0	-
2	-	-	-	0.8/CC	-	-	-	-	1.0/1.0	-	1.5/CC	1.2/1.0	1.5/1.2	1.5/1.2
3	0.8/CC	0.8/CC	1.0/1.0	0.8/CC	1.0/CC	1.0/1.0	1.2/CC	1.2/1.0	1.0/1.0	1.2/1.0	1.5/CC	1.2/1.0	1.5/1.2	1.5/1.2
4	0.8/CC	0.8/CC	1.0/1.0	0.8/CC	1.2/1.0	1.0/1.0	1.5/CC	1.2/1.0	1.0/1.0	1.2/1.0	1.5/CC	1.2/1.0	1.5/1.2	1.5/1.2
5	0.8/CC	0.8/CC	1.0/1.0	0.8/CC	1.2/1.0	1.0/1.0	1.5/CC	1.2/1.0	1.0/1.0	1.2/1.0	1.2/CC	1.2/1.0	1.2/1.0	1.5/1.2
6	-	0.8/CC	-	0.8/CC	1.0/CC	1.0/1.0	1.0/CC	-	1.0/1.0	1.2/1.0	1.0/CC	1.2/1.0	1.0/1.0	1.5/1.2
7	-	-	-	0.8/CC	-	-	-	-	1.0/1.0	-	1.0/CC	1.2/1.0	1.0/1.0	1.5/1.2
TOTAL SPRAYER OUTPUT (BOTH SIDES) - IN LITRES PER MINUTE														
PRESSURE (BAR)	AB007	AB017	AB027	AB037	AB047	AB057	AB067	AB077	AB087	AB097	AB107	AB117	AB127	AB137
10	5.2	7.0	9.5	10.4	12.0	12.6	15.0	15.0	19.0	20.0	25.5	30.0	37.9	43.2
15	6.2	8.2	11.3	12.4	14.0	15.1	17.5	18.1	22.7	24.2	30.1	36.2	44.8	50.4
20	7.2	9.6	13.0	14.4	16.0	17.3	20.2	20.6	25.9	27.5	34.3	41.3	51.2	57.6
25	7.9	10.5	14.2	15.7	17.8	19.0	22.2	22.5	28.4	30.0	37.8	45.0	56.0	63.0
30	8.5	11.4	15.4	17.0	19.7	20.5	24.2	24.3	30.7	32.4	41.3	48.6	60.1	69.0
40	9.8	13.1	17.9	19.7	22.6	23.8	27.3	28.1	35.8	37.4	46.6	56.2	71.7	82.2

### Nozzle Output Chart

The Nozzle Output Chart below shows the output from a single nozzle for the full range of jet and swirl plate combinations, at various spraying pressures. It can be used to calculate nozzle selections for situations which are not covered by one of the Sets shown in the Jet/Swirl Plate Combination Charts.

NOZZLE OUTPUT CHART							
JET SIZE	SWIRL PLATE	SINGLE NOZZLE OUTPUT - IN LITRES PER MINUTE					
		10 Bar	15 Bar	20 Bar	25 Bar	30 Bar	40 Bar
0.8	CC	0.9	1.0	1.2	1.3	1.4	1.6
1.0	CC	1.3	1.5	1.7	1.9	2.1	2.4
1.2	CC	1.7	2.0	2.3	2.6	2.8	3.2
1.5	CC	2.3	2.7	3.1	3.3	3.6	4.0
1.8	CC	2.7	3.2	3.6	4.1	4.5	5.0
2.0	CC	3.4	3.8	4.3	4.7	5.1	5.7
2.2	CC	3.8	4.1	4.6	5.1	5.6	6.6
2.5	CC	3.9	4.7	5.4	6.0	6.6	7.7
1.0	1.0	1.6	1.9	2.2	2.4	2.6	3.0
1.2	1.0	2.5	3.0	3.4	3.8	4.1	4.7
1.5	1.2	3.6	4.2	4.8	5.3	5.8	6.9
1.8	1.5	5.0	5.9	6.7	7.4	8.0	9.5
2.0	1.8	6.2	7.8	8.7	9.6	10.4	11.8
2.2	2.0	7.8	8.7	9.9	11.2	12.5	14.3
2.5	2.2	8.8	10.5	12.1	13.5	14.7	16.2





## Nozzle Selection and Calibration

### Nozzle Selection Example

This example applies to a 200 litre model with 5 nozzles per side but the same procedure can be used for the larger models by allowing for the additional nozzles in the calculation 3b).

#### STEP 1

- a) Required application rate = 800 l/ha
- b) Chosen speed = 5 km/hr
- c) Row width = 3 m
- d) Spray pressure = 25 Bar

#### STEP 2

Total spray output needed (l/min) =

Application Rate (l/ha) x Speed (km/h) x Row width(m)

$$= \frac{800 \times 5 \times 3}{600} = 20 \text{ l/min}$$

#### STEP 3

For a standard application on a 200 litre unit using 5 nozzles per side, with each giving an equal discharge, refer to Chart No. 1 on the previous page.

The chart shows Nozzle Set 2 (1.0 mm jets and CC swirl plates in all nozzles) will give 19 l/min at 25 Bar. Install this Set and spray at a little over 25 Bar to achieve the 20 l/min required.

For 400 or 500 litre sprayer models refer to Charts No. 2 and No. 3, respectively.

b) For non standard applications calculate the flow required for each nozzle then consult the Nozzle Output Chart on the page 13 to select the jet and swirl plate to install in each nozzle.

#### STEP 4

Fill the tank with water to a mark. Run for 2 minutes at 540 PTO rpm and a little under 25 Bar with all nozzles operating. Measure the volume to refill to the mark. This should be very close to 40 litres if calibration is correct.

### Calibration Worksheets

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

Sprayer Model:	_____
Date of Test:	_____
Application Rate:	_____ litres/ha
Speed of Travel:	_____ km/hr
Row Spacing:	_____ metres
Output (l/min) =	$\frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width}}{600}$
=	$\frac{\quad \times \quad \times \quad}{600}$
=	_____ litres/min
Jet Set (from chart):	_____
Pressure setting:	_____ Bar
Measured Output: (from test run)	_____ litres/min

Sprayer Model:	_____
Date of Test:	_____
Application Rate:	_____ litres/ha
Speed of Travel:	_____ km/hr
Row Spacing:	_____ metres
Output (l/min) =	$\frac{\text{Application Rate} \times \text{Speed} \times \text{Row Width}}{600}$
=	$\frac{\quad \times \quad \times \quad}{600}$
=	_____ litres/min
Jet Set (from chart):	_____
Pressure setting:	_____ Bar
Measured Output: (from test run)	_____ litres/min

## Optional Equipment

### Two Side Conveyor

The two side conveyor controls the shape of the airblast to produce a horizontal discharge from each side of the sprayer for efficient coverage of vines or crops of similar height. It is normally ordered as a factory fitted option and is available for all three Suntuff Linkage Airblast models. Once installed no adjustment is necessary. Depending upon the sprayer model and number of nozzles fitted, it may be desirable to turn off the upper nozzle on each spray bar to achieve the best spray pattern.



### Single Side Conveyor

The single side conveyor controls the air output of the fan to direct all the air from the left side of the sprayer for efficient coverage of tree crops. It is normally ordered as a factory fitted option and is available for the 700mm and 800mm fan models. The right hand spray bar is relocated into the upper section of the conveyor outlet, as shown in the diagram, and the unit incorporates an adjustable vane which can be used to regulate the height of discharge.

### Electric Valve Controls

The electric valve control system enables spraying to be stopped and started, the pressure adjusted and the output to be directed to the left, right or both spraybars from the tractor cabin whilst on the move. It is available as a factory fitted option and can be supplied on all Suntuff Linkage Airblast models.

The control box can be permanently installed in the tractor cabin with a multi pin plug allowing the wiring to the sprayer to be easily connected or disconnected.

The electric valves consist of a master valve to switch from bypass to pressure, section valves for left and right spraybars and an electric pressure adjusting valve to fine tune the spraying pressure.

Full instructions for fitting the control box and operating the system are given in the Operators Manual supplied with the unit.





## ***Trouble Shooting***

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### **Pump does not prime**

- No liquid in tank or not covering suction inlet.
- Suction filter blocked.
- Suction filter stop valve closed.
- Suction filter bowl loose or missing O-ring.
- Suction line loose allowing pump to suck air.
- Bypass control not in by-pass position.
- Pump valve springs broken or valves worn.

### **Pump does not reach correct pressure**

- Pump not operating at full 540 rpm.
- Suction filter blocked.
- Suction filter stop valve partly closed
- 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.
- PTO incorrectly installed.
- PTO geometry not correct.

### **Driveshaft noisy**

- PTO shaft not secured properly to shafts.
- Universal joint crosses worn.
- PTO geometry not correct.

### **Air volume reduced**

- Fan mesh blocked with leaves or debris.
- Not operating at full speed of 540 rpm.
- Fan gearbox not in gear.

### **Poor tank agitation**

- Chemical left in tank whilst not operating.
- Chemical insufficiently mixed before filling.

### **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 nozzles too big for the capacity of the pump.
- Air trapped in filter or suction lines.

## Lubrication and Maintenance

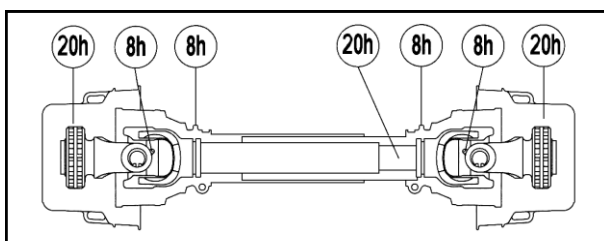
### Daily Maintenance

#### General

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

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.



#### Pump

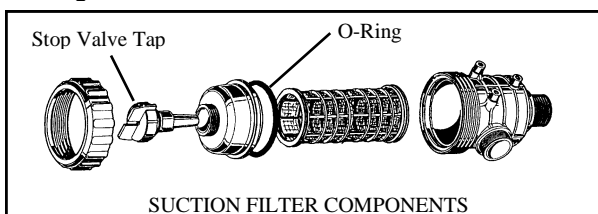
Check the oil level in the viewer daily and if necessary top up with SAE 20W-40 multigrade engine oil. The oil must reach the mark on the side of the oil level viewer.

#### Filters

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

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

Always clean the suction filter before each tank refill and at the end of the day. Close the stop valve by pushing and unscrewing the yellow/red tap, then unscrew the filter cover to remove the element. Ensure the O-ring is in good condition when refitting.



### Tank, Pump and Spray Lines

At the end of each day run clean water through the pump and lines 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.

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

### Weekly Maintenance

**PTO Shaft (Every 20 Hrs)** 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.

### Monthly Maintenance

**Gearbox.** Check the oil level every 50 hours and if required top up with SAE 80W-90 gear oil.

The oil should be level with the centre of the input shaft and can be checked through the filler plug in the top of the gearbox using a piece of wire as a dip stick.

### Annual Maintenance

**Diaphragm Pump.** Drain the oil from the pump annually, or at the end of each spraying season.

Remove the pump heads, carefully inspect the diaphragms and replace if necessary. Also check the inlet and outlet valves, seats and springs for wear, damage or chemical corrosion and replace as necessary. Refill with SAE 20W-40 multi-grade engine oil.

Check the air pressure in the surge chamber at the end of the pump. The air pressure behind the chamber's diaphragm smoothes out the pulsations in fluid flow and should be set in accordance with the spraying pressure being used - refer chart below. Adjust the pressure at the valve fitting on the chamber using a compressed air hose fitted with a tire valve connection and a reliable pressure gauge.

Spraying (Bar)	2 - 5	5 - 10	10 - 20	20 - 50
pressure (psi)	29 - 73	73 - 145	145 - 290	290
Surge air (Bar)	2	2 - 5	5 - 7	7
pressure (psi)	29	29 - 73	73 - 102	102

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

### Hardware

At the end of each season generally inspect the sprayer for any signs of damage and check that all bolts are securely tightened.

## Notes

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