

Dear Customer

Thank you for choosing a new SAM Vision Crop Sprayer for your future spraying needs.

We urge you to read and fully understand this manual and keep it handy at all times as it could avoid mistakes, frustration and excessive down time.

The Manual is divided into several sections. It is intended to cater for the Farm Maintenance Engineer as well as the Spray Operator and these people must decide which sections of the manual are relevant to them. It commences with General Safety Precautions and then goes on to explain the Traction, Spraying, Hydraulic and Air Systems on the machine, with a brief description of each individual component, their location and function.

Calibration, filling, spraying and cleaning are of particular importance to the spray operator as is the faultfinding section at the rear of this book. Sprayer lubrication and spares may also be found in this manual.

SAM Serial No: Cab No:

Commissioning Date:

Sands Agricultural Machinery Ltd may be contacted as follows:

Telephone: 01692 580522 Fax: 01692 580961
Email: sales@samltd.co.uk Web Site: www.samltd.co.uk

Please ensure that the above details are completed when the machine is commissioned, as this information will be required when ordering spare parts.

A small selection of sprayer parts is enclosed.

DELIVERY

Upon receipt of the sprayer, please check for transport damage. Check all major fixings at this time and at frequent periodic intervals thereafter.

CONDITIONS OF SUPPLY

Sands Agricultural Machinery Ltd cannot be held responsible for injury or damage arising from incorrect handling, usage or storage of this sprayer.

The Customer will become wholly responsible for items or build specifications outside our normal conditions of supply.

WARRANTY

Sands Agricultural Machinery Ltd warrants all its products for a period of 1 year or 800 hours from the date of delivery. Free of charge replacement by post will only be accepted if the failed component(s) are returned, adequately packed and protected, in a representative condition. Any damage not attributed to the failure will be charged. Engine and transmission warranties are extended by their individual manufacturers – consult SAM for details.

**SANDS AGRICULTURAL MACHINERY
OPERATING INSTRUCTION MANUAL**

SAM Ltd reserves the right to charge for fair 'wear and tear' on selected items. Unusual working practices should also be avoided as these often contribute to a shorter working life on associated components.

It is the Company's policy to continually improve and update our products and SAM Ltd, therefore, reserve the right to alter specifications and design without notice.

GENERAL SAFETY

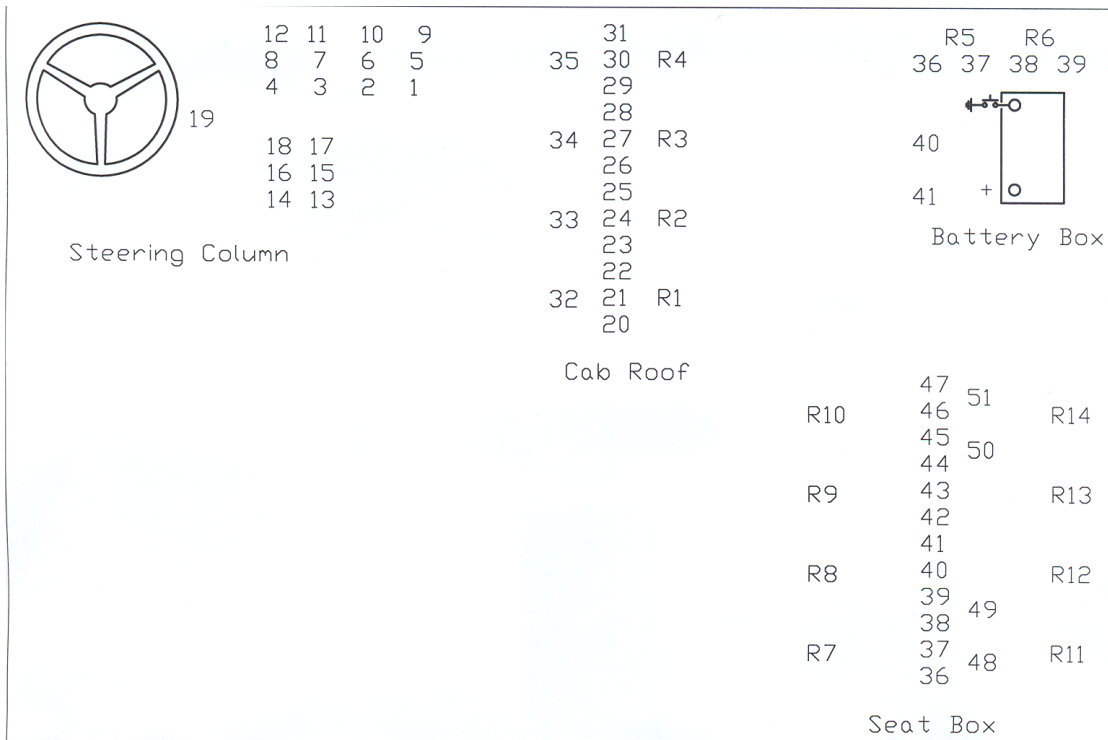
1. This machine must only be used for the purpose for which it was intended i.e. crop spraying.
2. It is against the law for anybody to operate a machine that they do not understand. Please read this handbook carefully before attempting to operate the sprayer.
3. In order to comply with the Health and Safety at Work Act, the sprayer must be thoroughly washed and decontaminated before any person may be permitted to carry out repairs or adjustments.
4. Be aware of the COSHH Regulations and comply with them at all times.
5. Always wear protective clothing when working with chemicals.
6. Always read the label on the chemical container very carefully.
7. The machine must not be used for spraying sulphuric acid unless it has been modified for this purpose.
8. Never operate the sprayer until all guards are in place.
9. Never start the machine until all personnel are clear.
10. Never perform maintenance or repair work while the machine is running. If you are working on a part of the machine not visible from the cab, remove the ignition key.
11. Never work under the machine when it is standing on a jack unless the axle is propped.
12. Extra care should be taken when working on steep hills, as is normal practice with any high clearance tractor. Beware of 'soft spots' and 'pot holes'. Never spray across a dangerously steep hill and never spray across a steep hill with the uppermost boom folded. Wider wheel settings aid stability.
13. Ensure that any replaced component, hose or fitting is of the same specification as that originally fitted. All hydraulic hoses carry an identification number.
14. If frost is expected, anti-freeze should be pumped through the complete spraying system and/or drain down.
15. Before going onto the road, check brakes, lights, indicators and tyre pressures. Lock out 4WS with the isolator switch
16. Extra care should be taken when servicing the battery. The sulphuric acid contained within the battery can cause severe burns as well as explosive gases. Keep cigarettes and sparks away.
17. This machine contains an air reservoir with a maximum pressure rating of 10 bar. The reservoir should be checked on an annual basis by a recognised inspector.
18. As with any high clearance machine with a high centre of gravity, the stability of that machine is directly related to its wheel track width. As tractors have grown in size, their ability to achieve narrow track widths has diminished. Like the tractor, the sprayer track width should also reflect this philosophy.

A 'risk assessment' and 'duty of care' is part of modern farming life and the farmer/contractor has a legal responsibility to consider the sprayer track width in relation to stability in order to achieve a safe working environment.

19. Before any spraying operation and prior to field entry, the spray operator should commence a mental risk assessment of the area. All risks, however minor, should be recorded in some way for later reference by any operator.

Notable risks should include water courses, footpaths, local housing, gradients, pylons and poles, power cables, adjoining crops, wind direction etc.

FUSES AND RELAYS



FUSES					
1	10A Instrument Cluster	2	15A Spare Main Feed	3	15A Wiper Motor
4	15A Brake Light	5	15A Key Feed	6	10A Key Feed
7	10A Key Feed	8	10A Buzzer	9	3A Eng Oil Press Buzzer
10	10A w/Washer & Horn	11	15A Wiper Switch	12	7.5A Spare
13	7.5A Left Side Indicator	14	7.5A Right Side Indicator	15	10A High Beam
16	10A Low Beam	17	10A	18	7.5A Slow Blow Fuse Box
19	10A Engine ECU	20	5A Radio Ign Feed	21	Spare
22	7.5A A/C Clutch	23	40A Rear Work Lights	24	25A Condenser Fan
25	7.5A Mirrors	26	15A Beacon	27	40A Front Work Lights
28	25A Condenser Fan	29	Spare	30	5A Climate Control
31	30A 3-Speed Cab Fan	32	5A Radio – Main Feed	33	Spare
34	Spare	35	3A Interior Light	36	60A Ign Roof Feed
37	60A Ign Roof Feed	38	60A Ign Box Feed	39	60A Ign Box Feed
40	60A Steering Column Feed	41	60A Fuse Box Feed	42	3A Joystick Neutral Start
43	7.5A Alarm	44	Spare	45	Spare
46	Spare	47	Spare	48	5A PC Board
49	5A PC Board	5A	Armrest	51	Spare
52	Spare	53	10A Auto Volume Control		

RELAYS					
R1	Spare	R2	Spare	R3	A/C Condenser Fan
R4	A/C Condenser Fan	R5	Cab Roof Ign Feed	R6	Seat Box Ign Feed
R7	Engine ECU	R8	Alarm Circuit	R9	Spare
R10	Spare	R11	Ign Start	R12	Spare
R13	RDS 'Spray On'	R14	PC Board		

MAJOR SAFETY CRITICAL ITEMS

The braking and steering systems fitted on the sprayer are both safety critical services. These services should be thoroughly inspected at least every 250 hours and should coincide with the hydraulic filter changes.

The two braking systems fitted (primary and parking) require only a visual inspection around the wheel motors. The multi-disc parking brake fitted to each rear wheel motor should be inspected for back plate spring integrity and oil leaks from this area.

The steering system consists of several components, all of which should be checked for tightness, in particular the fixings of the ball joint tapers plus the split pin, the ball joint, track rod, lock nut and the steering ram.

In the case of adjustable axles, the track rod-adjusting bolt and axle clamp should be checked. Axle adjustment is covered in the following pages of this instruction book but we should emphasise that both front and rear axle fixings should be re-checked for tightness after a few hours work. A weekly visual inspection should also be initiated.

Finally, it would be prudent at this time to check for fatigue marking in the highly stressed corners and associated components, especially on older machines. Should any item give cause for concern then contact SAM Ltd immediately.

SAFETY FIRST

All agricultural equipment can be hazardous. When a SAM sprayer is correctly operated and properly maintained, it is a safe machine to work with, but when it is carelessly operated or poorly maintained it can become a danger to you (the operator) and others.

In this handbook and on the machine you will find warning messages. Read and understand them. They tell you of potential hazards and how to avoid them. If you do not fully understand the warning messages, ask your employer or SAM Ltd to explain them.

However, safety is not just a matter of responding to the warnings. All the time you are working on or with the machine, you must be thinking what hazards there might be and how to avoid them.

Do not work with the machine until you are sure that you can control it.

Do not start any job until you are sure that you and those around you will be safe.

If you are unsure of anything, about the machine or the job, ask someone who knows. Do not assume anything.

Remember

BE CAREFUL

BE ALERT

BE SAFE

SAFETY - CHECK LIST

As well as the warnings in this chapter, specific warnings are given throughout the book. This section is designed to give a safety code for use of the machine generally and for operation and maintenance practices.

General Safety

! WARNING **Handbook**

You and others can be injured if you operate or maintain the machine without first studying this handbook. Read the safety instructions before operating the machine. If you do not understand anything, ask your employer or SAM Ltd to explain it. Keep this handbook clean and in good condition. Do not operate the machine without a handbook in the cab, or if there is anything you do not understand.

! CAUTION **Regulations**

Obey all laws and local regulations that affect you and your machine. Ignorance of the law is no defence

! WARNING **Decals**

You can be injured if you do not obey the decal safety instructions. Keep decals clean. Replace unreadable or missing decals with new ones before operating the machine. Make sure replacement parts include warning decals where necessary.

! WARNING **Alcohol and Drugs**

It is extremely dangerous to operate machinery when under the influence of alcohol or drugs. Do not consume alcoholic drinks or take drugs before or whilst operating the machine. Be aware of medicines that can cause drowsiness.

! WARNING
Care and Alertness

All the time you are working with or on the machine, take care and stay alert. Always be careful. Always be alert for hazards.

! WARNING
Clothing

You can be injured if you do not wear the proper clothing. Loose clothing can get caught in the machinery. Wear protective clothing to suit the job.

! DANGER
Parking

Do not leave the driving seat under any circumstances unless the parking brake is on.

! WARNING
Machine Condition

A defective machine can injure you or others. Do not operate a machine that is defective or has missing parts. Make sure the maintenance procedures in this handbook are completed before using the machine.

! WARNING
Controls

Keep the machine controls clean and dry. Your hands and feet could slide off slippery controls. If that happens you will lose control of the machine.

! WARNING
Seat Belt

Operating the machine without a seat belt can be dangerous. Before starting the engine, make sure your seat belt is fastened. Check the tightness and condition of the seat belt securing bolts regularly.

! WARNING
Machine Limits

Operating the machine beyond its design limits can damage the machine and can also be dangerous. Do not operate the machine outside its limits. Do not try to upgrade the machine performance with unapproved modifications.

! WARNING
Visibility

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility.

! WARNING
Exhaust Gases

Breathing the machine exhaust gases can harm and possibly kill you. Do not operate the machine in closed spaces without making sure there is good ventilation. If you begin to feel drowsy, stop the machine at once. Get out of the cab into fresh air.

! WARNING
Noise Level in Cab

With cab door open, the sound pressure level measured at the driver's ear does not exceed 83.5db(A). At working speeds with the door closed this level drops to 72 dB (A) at the drivers ear.

! WARNING
Repairs

Do not try to do repairs or any other type of maintenance work you do not understand. Contact SAM Ltd or get the work done by a specialist engineer.

! WARNING
Communications

Bad communications can cause accidents. If two or more people are working on the machine, make sure each is aware of what the others are doing. Before starting the engine, make sure the others are clear of the danger areas; examples of danger areas are: the rotating shafts and belts on the engine, the booms, and anywhere beneath or behind the machine. People can be killed or injured if these precautions are not taken.

! WARNING
Soft Ground

A machine can sink into soft ground. Never work under a machine on soft ground.

! WARNING
Jacking

A machine can roll off jacks and crush you unless the wheels have been chocked. Always chock the wheels at the opposite end of the machine to that which is to be jacked. Do not work underneath a machine supported only by jacks. Always support a jacked-up machine on axle stands before working underneath it.

! WARNING **Electrical Circuits**

Understand the electrical circuit before connecting or disconnecting any electrical component. A wrong connection can cause injury and/or damage.

! WARNING **Hydraulic Fluid**

Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help quickly.

! WARNING **Hydraulic Hoses**

Damaged hoses can cause fatal accidents. Inspect the hoses regularly for:

- Damaged end fittings
- Chafed outer covers
- Ballooned outer covers
- Kinked or crushed hoses
- Embedded armouring in outer covers
- Displaced end fittings.

! WARNING **Rams**

The efficiency of the rams will be affected if they are not kept free of solidified dirt. Clean dirt from around the rams regularly. When leaving or parking the machine, close all rams if possible to reduce the risk of weather corrosion.

! WARNING **Fires**

If your machine is equipped with a fire extinguisher, make sure it is checked regularly. Keep it in the operator's cab until you need to use it.

Do not use water to put out a machine fire, you could spread an oil fire or get a shock from an electrical fire. Use carbon dioxide, dry chemical or foam extinguishers. Contact your nearest fire department as quickly as possible.

Firefighters should use self-contained breathing apparatus.

! WARNING **Modifications and Welding**

Non-approved modifications can cause injury and damage. Parts of the machine are made from cast iron; welds on cast iron can weaken the structure and break. Do not weld cast iron. On no account weld or drill the chassis structure. Contact SAM Ltd before modifying the machine.

! WARNING **Metal Splinters**

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft-faced hammer or drift to remove and fit metal pins. Always wear safety glasses.

! WARNING **Cleaning**

Cleaning metal parts with incorrect solvents can cause corrosion. Use only recommended cleaning agents and solvents.

! WARNING **'O' rings, Seals and Gaskets**

Badly fitted, damaged or rotted 'O' rings, seals and gaskets can cause leakages and possible accidents. Renew whenever disturbed unless otherwise instructed. Do not use Trichloroethane or paint thinners near 'O' rings and seals.

! WARNING **Fluoroelastomeric Materials**

Certain seals and gaskets (e.g. crankshaft oil seal) on SAM machines contain fluoroelastomeric materials such as Viton, Fluorel and Technoflon. Fluoroelastomeric materials subject to high temperatures can produce highly corrosive hydrofluoric acid. **THIS ACID CAN SEVERELY BURN.**

New fluoroelastomeric components at ambient temperature require no special safety precautions.

Used fluoroelastomeric components whose temperatures have not exceeded 300°C require no special safety precautions. If evidence of decomposition (e.g. charring) is found, refer to the next paragraph for safety instructions. **DO NOT TOUCH COMPONENT OR SURROUNDING AREA.**

Used fluoroelastomeric components subjected to temperatures greater than 300°C (e.g. engine fire) must be treated using the following safety procedure. Make sure that heavy-duty gloves and special safety glasses are worn:

- Ensure that components have cooled then remove and place material in plastic bags.
- Thoroughly wash contaminated area with 10% calcium hydroxide or other suitable alkali solution, if necessary use wire wool to remove burnt remains.
- Thoroughly wash contaminated area with detergent and water.

- Contain all removed material, gloves etc used in this operation in sealed plastic bags and dispose of in accordance with Local Authority Regulations.

DO NOT BURN FLUOROELASTOMERIC MATERIALS.

If contamination of skin or eyes occurs, wash the affected area with a continuous supply of clean water or with calcium hydroxide solution for 16-60 minutes. Get medical attention immediately.

SAFETY DECALS

! WARNING

Decals on the machine warn you of particular hazards. Each decal is attached close to a part of the machine where there is a possible hazard. Read and make sure you understand the safety message before you work with or on that part of the machine.

Keep all decals clean and readable. Replace lost or damaged decals.

! WARNING

If you need eyeglasses for reading, make sure you wear them when reading the safety decals. Decals are strategically placed around the machine to remind you of possible hazards. Do not over-stretch or place yourself in dangerous positions to read the decals.

WARNING – POWER LINES!!

DANGER OF DEATH – Stay away from power lines while folding booms

In the unlikely event of any part of the machine touching a power line:

**STAY IN THE CAB
DON'T PANIC
TRY TO DRIVE CLEAR
WARN OTHERS TO STAY WELL CLEAR**

If this is not possible or the machine catches fire

JUMP WELL CLEAR – DON'T CLIMB DOWN – the metalwork of the machine may be alive

NEVER TOUCH THE MACHINE ONCE YOU ARE ON THE GROUND

RUN WELL CLEAR WITH LEAPING STRIDES

STAY WELL CLEAR, WIRES MAY RE-ENERGISE WITHOUT WARNING

KEEP EVERYONE AWAY AND CALL YOUR LOCAL ELECTRICITY SUPPLIER ON:

Tel:

ENGINE

All Sands machines are powered by a new range of Deutz water-cooled industrial diesel engines. These engines meet all current E.U. Emission Standards. Power ratings are matched to the gross weight of each machine plus any extra demand required (e.g. air stream fan).

Generally, three engines cover the 'Vision' range of SAM machines and are:

3000 litre capacity	TCD 2012 LO6	132kw (177hp)	at	2300 rpm
4000 litre capacity	TCD 2012 LO6	140kw (188hp)	at	2300 rpm
5500 litre capacity	TCD 2012 LO6	155kw (207hp)	at	2300 rpm

These are DIN rated outputs and will be approximately 15% more powerful than similar SAE-J rated engines.

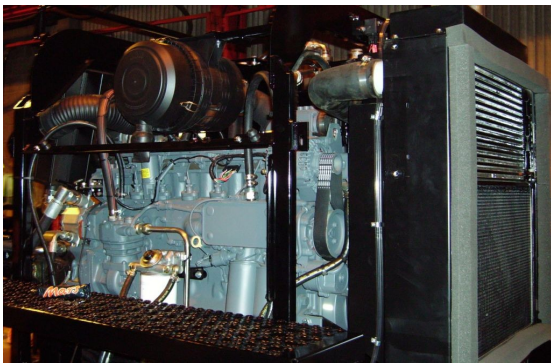
Average fuel consumption is 210 grams/Kwh.

This digital engine has been filled with a high quality, fully synthetic Shell Rimula R6 LM 10w-40 oil approved by Deutz. Any oil used in this engine must be fully synthetic to the same quality. Please refer to the Deutz Handbook for oil specification or contact SAM.

Engine maintenance and routine servicing schedules can be found in the Deutz Handbook.

The first oil and filter changes are due at 500 hours.

An indicator light linked to the engine ECU is mounted at the front of the RH arm rest on the left of the group. It will illuminate for 2 seconds with 'ign on' and extinguish if all is OK. It will flash when an engine fault is detected and the flash count will identify the fault – contact SAM.



The radiator is filled with a 50% Glycoshell antifreeze solution. Glycoshell is a mono-ethylene glycol with additives. Ensure that all other antifreeze concentrates are compatible.

The radiator header tank is fitted with a level sensor connected to a (centre) light on the armrest alongside the ECU light. This light may illuminate several times during the first few hours of work as the engine cooling system slowly expels air and absorbs water. Top up as necessary.

By hinging out the right-hand engine radiator guard, access is gained to the front of the engine and radiator filler cap.

Behind the radiator are two belts. The wide poly 'V' belt drives the fan, alternator, water pump and diesel pump. The smaller 'V' belt drives the air-conditioning compressor. The condition and tension of these belts should be checked at least every 100 hours. If a belt slips, it becomes glazed and will fail to drive correctly, even after it has been correctly re-tensioned. Should this occur then the belt and possibly the pulley will have to be replaced.

By raising the centre guard, access is gained to the top and side of the engine. From this position the dipstick, oil filler cap, oil and fuel filters and water trap are available for service in accordance with the recommendations.



Particular attention should be paid to the hydraulic oil cooler sited on the far left-hand side of the cowling. Not only should it be cleaned thoroughly but it should also be 'back blown' to remove any debris wedged between the fins.

The cooler is thermostatic in operation and will maintain the hydraulic oil temperature above 50°C. The left-hand guard may be hinged out to provide further access to the cooler area.

It should be noted that hot oil in excess of 80 deg C would severely damage the hydrostatic system causing unnecessary expense. The regularity at which the engine/oil cooler is cleaned will depend entirely on the working conditions. When working in oil seed rape for instance it may need cleaning more than once daily. Only the operator can decide.

A visual inspection should be carried out daily.

Warning sensors are fitted at various places around the engine. At the first indication of an over heating engine, the vehicle horn will sound. The vehicle must be stopped **immediately** and the cause found and rectified before moving off.

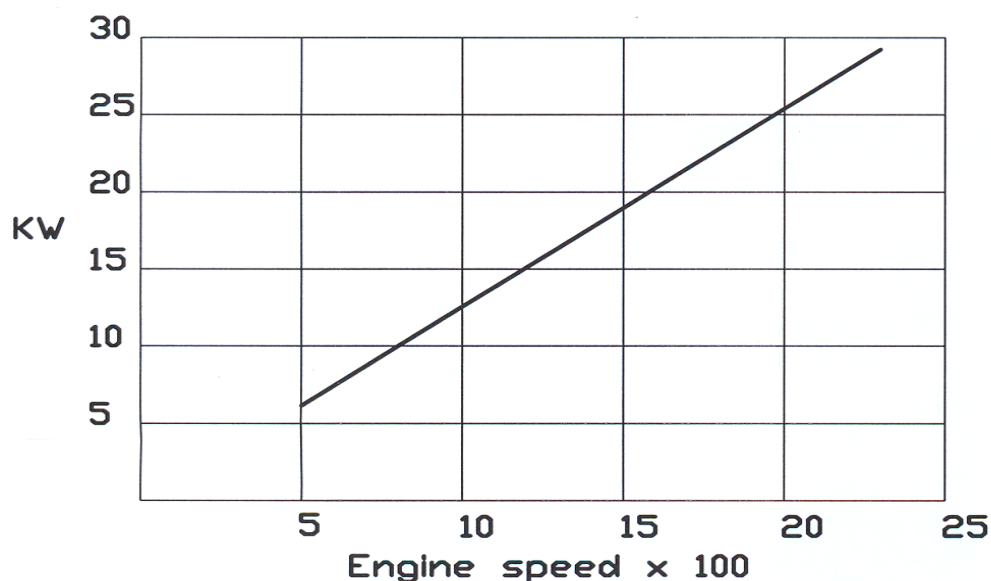
STEERING AND SUSPENSION HYDRAULICS

A small hydraulic pump is mounted on the side of the engine at the fly wheel end to provide hydraulic power for the steering and self-levelling suspension systems only. The PR valve mounted in the steering unit is pre-set to 170 bar (2450 psi). The returning oil powers the hydraulic oil cooler fan.

AUXILLIARY SPRAYPACK HYDRAULICS

A larger hydraulic pump is mounted on the end of the main transmission pump. The total capacity of this pump can be used to power rear end implements up to powers shown on the graph below.

Standard Hydraulic Power Availability



Rear end hydraulics on all SAM sprayers are of the 'load sensing' type. This advanced system uses a large variable output swash plate pump to produce only the oil that is required for any function. It does not produce any surplus oil and as such produces very little heat. If a second or even third function is operated then the pump will sense the demand requirements and respond to them within milliseconds.

As hydraulic pump output is no longer dependent on engine speed, it means that the spray pump and a quick fill pump can run simultaneously at relatively low engine revs. Maximum continuous working pressure must not exceed 170 Bar.

The system parameters, stand by pressure, working pressure, P/R valves should be checked on a regular basis, at least every 1500 hours.

Any rear end equipment provided by the customer must be suitable for load sensing closed circuit use.

Separate details will be provided upon request of 'uprated' or 'non-standard' hydraulic systems.

TRANSMISSION SYSTEM

The drive system used on this machine is pure hydrostatic. Its function is extremely simple and consists of the following:

HYDROSTATIC PUMP

A single pump is mounted directly onto the flywheel end of the engine and turns at engine speed. A mechanical cable, operated from the cab, alters the angle of the 'swash' plate inside the pump, which in turn alters the stroke of the pistons within the pump, and the result is an infinitely variable oil output from a fixed engine speed.

A smaller 'charge' or 'boost' pump is mounted on the end of the main pump; its function is to replace oil to the main pump, which is constantly being lost internally through leakage. It also supplies oil at 30 bar (435 psi) maximum pressure to operate brakes and 2-speed control. Its final duty is to pump the excess oil, which is not used for the aforementioned functions, back to the oil tank via the oil cooler.

The main circuit pressure cut off valve is also contained within the pump and is pre-set at 420 bar (6100 psi).

HYDROSTATIC WHEEL MOTOR

A slow speed wheel motor is mounted into each driving wheel of the machine. Each motor has numerous pistons operating on numerous cam faces. As such, up to eighty piston strokes are therefore required to turn the wheel once, making slow speed operation extremely smooth and efficient. For 'road' use, half the pistons are neutralised, therefore, for the same amount of oil the wheel will turn twice as fast but with half the power.

The speed of operation depends entirely upon the flow from the pump. Maximum field speed is approximately 17 km/h (11 mph) but like any tractor the slower it travels, the more power it has.

The hydrostatic pump carries out the 'primary' braking function. It will produce braking torque equal to the driving torque, since no freewheel action can occur within a hydrostatic wheel motor.

A mechanical disc brake is an integral part of the wheel motors. This 'secondary' mechanical braking system is for **parking/emergency use ONLY**.

Should this brake be operated while the machine is moving, serious damage will result.

The control of the brakes from the cab is via air pilot pressure, therefore, sufficient air pressure must be available before the brakes can be released.

These brakes are failsafe in their operation, spring on - pressure off, and are held off with 'boost pump' pressure, as such, they will be automatically applied when the engine is stopped or when 'boost' pressure fails i.e. if a hydraulic hose fails or from lack of oil in the tank.

The permanent 4WD system employed on all SAM sprayers maximises high tractive effort with more than adequate braking ability.

A 'torque split' effect by controlling oil flow to the front and rear axles is a standard feature of all SAM machines.

ELECTRONIC ANTI-SLIP SYSTEM

Working in a similar manner to a vehicle anti-lock braking system. A sensor on each wheel looks at the speed of rotation of that wheel via electronic pulses (up to 60 pulses per revolution). If one wheel should speed up and exceed the averages of the other three wheels by a pre-determined amount, the oil to that wheel is stopped. The wheel is then allowed to rotate via a modulating valve at the average speed of the other three wheels.

The Anti-Slip system will not increase the machine gradability, it will only control a potential 'spin out' to enable the machine to reach its maximum gradability.

An armrest-mounted 3 position switch and warning light selects the anti-slip status:



SPRAY ON

Anti-slip only works when 'Spray On' is selected



OFF

Anti-slip is OFF. Conventional transmission rules apply



PERMANENT

Anti-slip is on all the time.

The anti-slip ECU has four LEDs (wheel sensor connections) which should be flashing green (only when moving). A change of colour identifies a fault. Contact SAM.

SAM VISION 5.5 DRIVE & TRANSMISSION

The 5.5 is currently the largest machine in the SAM Vision range.

Because of its "all up" weight it needs dynamic braking as well as hydrostatic braking to meet the legal braking requirements when on the road.

It also requires heavy-duty wheel motors to carry the load and produce enough traction for all conditions.

Powering the machine is a Deutz engine similar to those in the smaller SAM machines but rated at 155kw (207hp) DIN, and meeting the TIER 3 emissions criteria.

Because of the complexity of controlling a machine like this, the process has been simplified and the machine now drives by wire.

For "road" use the engine remains at tick over until the joystick is moved (or the optional accelerator pedal is pressed). The engine then increases in speed and the machine will pull away with the wheel motors in full displacement. As the vehicle and engine speed increases, the wheel motors change displacement (gear) automatically until the maximum speed of 40kmh is reached. When the vehicle speed is reduced the engine speed reduces automatically, just like an automatic car. If braking is required greater than that produced by the joystick, then the footbrake may be depressed. This will provide braking torque on all four wheels as well as the hydrostatic braking. After using the footbrake, the hydrostatic lever must be returned to neutral before the machine will drive forward.

The Vision 5.5 has an armrest fascia layout that is different from the other Sands machines.

The panel may contain a joystick/foot pedal selector (only if the optional foot pedal has been fitted). If the foot pedal is selected, then the joystick has to be moved fully forward or backward in the first instance in order to dictate the direction of travel.

A field/road selector will be fitted.

In "Road", the machine will drive on the joystick or foot pedal in an automotive manner as described earlier. When field is selected the manner in which the machine drives is dictated by the four way rotary control to the right of the joystick.

The two positions to the right on the 4-way selector are for flat or gently rolling land.

The TOP RIGHT position is for flat or uphill work.

The LOWER RIGHT position is for downhill work.

The two positions to the left on the 4-way selector are for working on **steep** land.

The TOP LEFT position is for flat or steep uphill work.

The LOWER LEFT position is for steep downhill work.

Failure to adhere to this criteria could stop the machine climbing even a modest hill or worse the machine could run away downhill out of control.

To the far right on the panel is the engine throttle control. This control will only activate when 'field' is selected. It enables the engine revs to be set at a predetermined speed prior to moving off.

The cruise control function consists of two switches. The first is the master switch and must be on for cruise control to function. The other selector, if moved down, will SET the speed at which the machine is traveling as the cruise control speed. Once set, the speed can be increased or decreased (ACC or DEC) by momentary operation of the same selector (approx 0.5km/h per time). Pressing the brake pedal or turning OFF the master control will cancel cruise control. Moving the selector up to RES will reset the cruise control to the previous setting.

VEHICLE SUSPENSION

A revolutionary self-levelling suspension system is fitted to all SAM 'Vision' Series machines. Normal suspension is provided by hydraulic rams and gas accumulators fitted at each corner of the machine. The accumulator pre-charge has been set at the factory and needs no further adjustments. The pre-charge should be checked by a competent person every 2000 hours.

The rear axle is of the trailing arm type to reduce front end nodding. For safety reasons, it is not independent therefore the machine will always follow the attitude of the rear axle.

The front axle is free to articulate ensuring that all wheels stay in contact with the ground under normal conditions.

Two leveling valves are fitted to the chassis near each axle. A sensing arm joining each valve to its respective axle determines the correct ride height. Oil is moved 'into' or 'out of' the rams to maintain the same height above the ground whether the tank is full or empty or the booms are open or closed.

The front tripod bearing should be inspected on a regular basis and at least every 250 hours along with the panhard rod. Weekly greasing is essential

The only maintenance on the rear being the regular greasing of the swinging arm bushes and the removal of the mud and stones, which accumulate on top of the swinging arm frame. Should this accumulation be allowed to dry then the rear suspension system will become inoperative.

TYRES

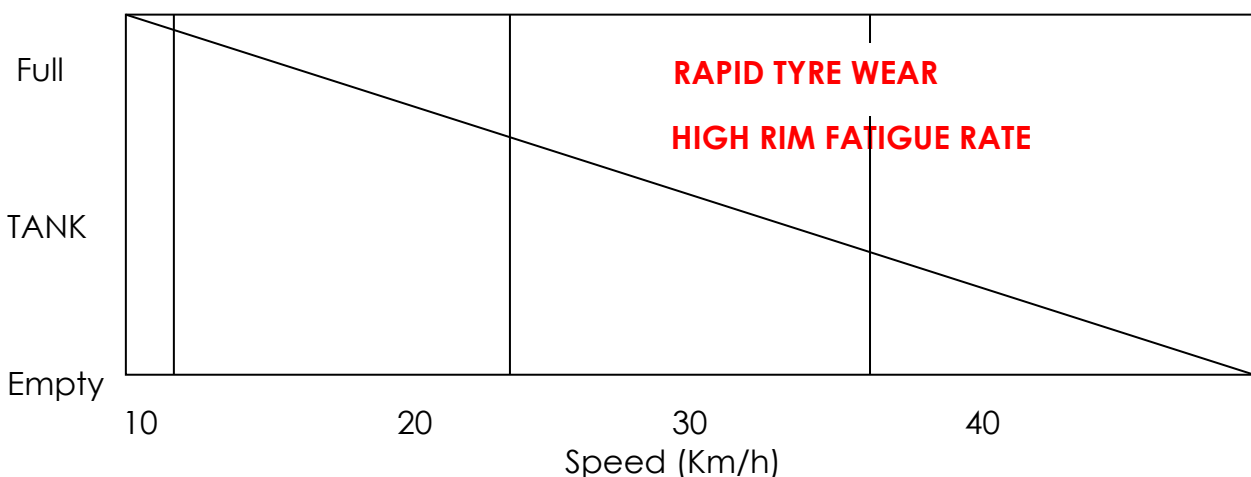
The tyres on a crop sprayer are probably the most abused item on the machine. Because of the 'ever decreasing weight' nature of a crop sprayer, the tyres attract a loading bonus, however, this bonus refers to **low speed** operations only.

Please ensure tyre size i.e. contact area, is suitable for the prevailing conditions. Narrow wheels, very steep slopes and lush green foliage just **DO NOT MIX**.

High loads and high speeds can cause premature tyre wear not only to the tyre tread but also within the tyre carcass. Please refer to the tyre manufacturers data for load / speed information.

Wheel rims and/or centers will also fracture under excess fatigue (i.e. under the above conditions).

Your attention is therefore drawn to the load/speed graph below.



It should be noted that an unusual tyre wear pattern has been identified on machines that spend a large amount of time fully loaded on the road. One or more tyres will show very heavy wear between the center of the tyre and the outside edge but without the feathered edge normally associated with tracking problems. The cause of this phenomenon is the tyre rolling under the rim during cornering. Whilst the wear rate can never be reduced (see load/speed graph), it can be spread more evenly across the tyre by increasing the tyre pressure by approximately 10 psi.



TYRE PRESSURES SHOULD BE CHECKED DAILY

The most popular size tyres and pressures are listed below.

Vision 3000 Litre and Vision 4000 Litre

300/85 R32 (12.4 x 32)	4 Bar (58psi)	This heavy duty Continental tyre is the narrowest available
320/90 R32 (13.6 x 32)	3 Bar (44 psi)	
380/85 R30 (14.9 x 30)	2 Bar (29 psi)	This is the narrowest tyre recommended by SAM

Vision 5500 Litre

380/85 R34 (14.9 x 34)	2.4 Bar (35 psi)	
420/85 R30 (16.9 x 30)	2.4 Bar (35 psi)	

FLOTATION WHEELS

The range of flotation wheels available for SAM sprayers is vast. SAM would not advocate using pressures in any flotation wheel below 1 Bar (15 psi). The ultra low pressures of bygone years have proved to be of no particular advantage to the soil or the crops. It simply caused the tyres to wear rapidly and increased the fuel consumption.

Consult SAM Ltd for further information.

Flotation wheels impose extremely high stresses on all associated components i.e. bearings, axles, kingpins and steering components. A shorter life expectancy on these wearing parts must therefore be expected, especially in the case of bushes.

Any help the operator can give the machine in reducing the stresses caused by flotation wheels: - by not driving on kerbs; by not driving at excessive speeds on ploughed land; by not using excessive acceleration or braking, will extend components' life substantially.

Warranty on component failure, associated with flotation wheels, is severely limited and will only be accepted for a manufacturing defect.

Customer

Wheels and Tyre Information

With your sprayer are a number of options, which are designed to optimize your sprayers' performance, dependant on your land, terrain, crop and weather conditions.

Using the Sprayer - General Operation

Initial consultation in operations, usage and requirements to decide on you optimised wheel options is important in getting the maximum out of the vehicle, - with a sprayer, there are three main permutations of tyre/wheel equipment.

Standard – for a wide range of uses

Where it is possible to use this fitment all the year round, with good results. The limitations are that it may be too wide for rows or not low pressure in operation.

Low Pressure – for use where minimal damage to the soil is needed

For minimal soil damage, these units are kinder to the land. Different options are available to cater for all operations, though there may be increased width for flotation, traction and operational differences to the standard equipment can arise.

Rowcrop – for row usage where growing crop damage is minimised

These units are designed to run down rows, causing minimal growing crop damage. They may give less stability and traction on the road, as well as limiting operational parameters and a reduction in ability to traverse poor field conditions.

Driving Operation and Care

The sprayer is designed to be filled on site, with maximum load in the field, with travel to and from the farm unladen. Where this is not possible, care must be taken to work within the parameters of the particular tyre option fitted. Where maximum load is needed from farm to field, a compromise in vehicle performance may be necessary.

Driving Technique

When travelling down narrow lanes and roads with drainage cut-outs, or potholed and poor uneven surfaces at higher speeds; care should be taken to avoid impact damage. Where it is known of narrow road sections with holes or bumps, speed should be reduced to minimise problems which could lead to damage and ultimately failure of the components. Generally speaking, the higher the tyre pressure - the more shock load and stress is transferred back through the wheel to the disc because the cushioning suspension effect of a high volume tyre at lower pressure is reduced. This is especially relevant to narrow row-crop tyres that may have a pressure of up to 60 PSI to carry the load.

Damage can manifest in vibration through the vehicle, caused by a distortion of the wheel. Where distortion of the wheel is believed to have occurred or an impact 'bleb' in the tyre is evident - a tyre specialist should be contacted to inspect the damage and advise a remedy

Tyre Specifications

The sprayer has options of tyre equipment to maximise the operation of the vehicle for given needs and soil or climate considerations.

The handbook lists the parameters of the fitments, for load speed and pressure.

Tyre Capacities

On the sidewall of the tyre is a rating of the load the tyre will carry at a given speed

For example 142A8

As can be seen on the table below, 142 corresponds to 2650 Kgs

Load Index Table - see page 23

There is a world standard for carrying capacity, with a main capacity in the description of the size.

There is also an additional marking, usually in a circle called the unique point to give a variation in operational capacity. For example an A8 speed rating is in the normal description, but a B rating is given by the unique point.

Speed Index Table – see page 24

Increase and Decrease in Load Capacity

In addition to the unique point, there are variations in capacity of tractor tyres.

There is a bonus in load by going slower, the variations are listed in options.

Normal drive radial tyres have a maximum capacity rated at 1.6bar and 40kph.

Narrow tyres have a maximum capacity rated at 2.4,3.2 or 3.6bar and 40kph

Latest technology - Flexible sidewall tyres, consult data sheets or your tyre specialist

Operating Information

Cleaning

Wheels and Tyres

If a TFR (traffic film remover) is used, it must not be applied neat, and must be diluted to the manufacturer's recommendations – even so, sometimes these can be quite harsh especially when used with a large high pressure industrial pressure washer or steam cleaner.

Steam cleaners and high pressure washing systems should not be directly used on tyres, cleaners can cause premature ageing of tyres and the very high heat that can be generated with modern steam cleaners can soften and lift paint.

Storage

Outside storage will age the tyres, so indoor storage when not in use is advised. If stored outside, store upright to prevent water pooling in them – if stored upright they should be restrained from falling.

Fitment

Wheel and tyre units are heavy so changing fitment involves moving and lifting heavy weights. This is a 2 man operation, using levers to assist in raising the wheels or using specific lifting cradles. Jacking of the vehicle should also be supported by axle stands where a change of wheels occurs.

Tightening of Wheels

In the handbook is a tightening chart and torque tightening specification.

Please ensure that the operator complies with the handbook for retightening procedure.

The nuts should be tightened in a star order and should be tightened to the specified torque.

After driving about 100 m and before placing it under load, retighten wheels to specified torque.

Check wheels after operating sprayer for 3 hours and again after 10 hours.

Check wheels frequently and keep it tight.

Torque of wheel studs

X 460 Nm (340lbs. ft)

Note

A calibrated torque wrench and pressure gauge is needed to ensure safe operation and optimum vehicle performance.

Pressures

Pressures should be checked once a week, but where large temperature changes occur with operations at low pressure – a daily check is advised.

Effects on pressure change by ambient temperature;

For example

A tyre set at 15PSI at 15°C reduces in pressure to 13.4° at 0°C - a 10% drop in inflation pressure

Pressure – CAUTION! The pressurised air in the tyre is dangerous. Explosive separation of a tyre and rim parts can cause serious injury or death. Do not attempt to mount a tyre without the proper equipment and experience to perform the job.

Always maintain the correct tyre pressure. Do not inflate the tyres above the recommended pressure. Never weld or heat a wheel and tyre assembly. The heat can cause an increase in air pressure resulting in a tyre explosion. Welding can structurally weaken or deform the wheel.

When inflating tyres, use a clip-on chuck and extension hose long enough to allow you to stand to one side and NOT in front of or over the tyre assembly.

Maintenance and Care

Check tyres for cuts, bubbles or other damage weekly. Also inspect wheels for deformation/damage.

An expert should always be called in to make a qualified judgement on the tyres and to carry out repairs.

Tyres age as a result of physical and chemical processes and this may impair their performance. Premature aging can be caused by sunlight, chemical contact, running tyres underinflated.

Load Index Table

L1	Kg	L1	Kg	L1	Kg	L1	Kg	L1	Kg	L1	Kg	L1	Kg
0	45	40	140	80	450	120	1400	160	4500	200	14000	240	45000
1	46.5	41	145	81	462	121	1450	161	4625	201	14500	241	46250
2	47.5	42	150	82	475	122	1500	162	4750	202	15000	242	47500
3	48.7	43	155	83	487	123	1550	163	4875	203	15500	243	48750
4	50	44	160	84	500	124	1600	164	5000	204	16000	244	50000
5	51.5	45	165	85	515	125	1650	165	5150	205	16500	245	51500
6	53	46	170	86	530	126	1700	166	5300	206	17000	246	53000
7	54.5	47	175	87	545	127	1750	167	5450	207	17500	247	54500
8	56	48	180	88	560	128	1800	168	5600	208	18000	248	56000
9	58	49	185	89	580	129	1850	169	5800	209	18500	249	58000
10	60	50	190	90	600	130	1900	170	6000	210	19000	250	60000
11	61.5	51	195	91	615	131	1950	171	6150	211	19500	251	61500
12	63	52	200	92	630	132	2000	172	6300	212	20000	252	63000
13	65	53	206	93	650	133	2060	173	6500	213	20600	253	65000
14	67	54	212	94	670	134	2120	174	6700	214	21200	254	67000
15	69	55	218	95	690	135	2180	175	6900	215	21800	255	69000
16	71	56	224	96	710	136	2240	176	7100	216	22400	256	71000
17	73	57	230	97	730	137	2300	177	7300	217	23000	257	73000
18	75	58	236	98	750	138	2360	178	7500	218	23600	258	75000
19	77.5	59	243	99	775	139	2430	179	7750	219	24300	259	77500
20	80	60	250	100	800	140	2500	180	8000	220	25000	260	80000
21	82.5	61	257	101	825	141	2575	181	8250	221	25750	261	82500
22	85	62	265	102	850	142	2650	182	8500	222	26500	262	85000
23	87.5	63	272	103	875	143	2725	183	8756	223	27250	263	87500
24	90	64	280	104	900	144	2800	184	9000	224	28000	264	90000
25	92.5	65	290	105	925	145	2900	185	9250	225	29000	265	92500
26	95	66	300	106	950	146	3000	186	9500	226	30000	266	95000
27	97.5	67	307	107	975	147	3075	187	9750	227	30750	267	97500
28	100	68	315	108	1000	148	3150	188	10000	228	31500	268	100000
29	103	69	325	109	1030	149	3250	189	10300	229	32500	269	103000
30	106	70	335	110	1060	150	3350	190	10600	230	33500	270	106000
31	109	71	345	111	1090	151	3450	191	10900	231	34500	271	109000
32	112	72	355	112	1120	152	3550	192	11200	232	35500	272	112000
33	115	73	365	113	1150	153	3650	193	11500	233	36500	273	115000
34	118	74	375	114	1180	154	3750	194	11800	234	37500	274	118000
35	121	75	387	115	1215	155	3875	195	12150	235	38750	275	121000
36	125	76	400	116	1250	156	4000	196	12500	236	40000	276	125000
37	128	77	412	117	1285	157	4125	197	12850	237	41250	277	128500
38	132	78	425	118	1320	158	4250	198	13200	238	42500	278	132000
39	136	79	437	119	1360	159	4375	199	13600	239	43750	279	136000

Speed Index Table

Speed Symbol	Speed Category (kph)	Speed Symbol	Speed Category
A1	5	J	100
A2	10	K	110
A3	15	L	120
A4	20	M	130
A5	25	N	140
A6	30	P	150
A7	35	Q	160
A8	40	R	170
B	50	S	185
C	60	T	190
D	65	U	200
E	70	H	210
F	80	V	240
G	90	Z	Over 240

DUAL WHEELS

Dual wheels are a poor alternative to flotation wheels. They are less flexible than the single wheel option and transmit very high shock loads into associated components. SAM would suggest a 30% reduction in speed be implemented.

WHEEL NUTS

The standard wheel fixing is by 8 x 22mm studs. These should be correctly tightened to 460Nm (340lbs.ft.) and checked after the first three hours work and daily thereafter.

Caution: loose wheel nuts cause excessive fatigue and cracking.

TRACK ADJUSTMENT

All standard machines have the same track capability via adjustable axles 1830 (72") – 2135 (84") in 102 (4") increments i.e. 51 (2") per wheel.

A narrow axle version is available for the 'Vision 3.0': 1625 (64") to 1830 (72") in 102 (4") increments i.e. 51 (2") per wheel.

MANUAL SLIDING AXLES

The engine must be stopped and **the parking brake applied.**

Lift one end of the machine until the tyres are clear of the ground. Loosen the two clamps at either end of the axle beam.

Caution: Ensure the machine is well supported. A single jack under the centre of the axle is not acceptable.

Remove the four screws in the bottom of the axle beam.

Remove the two track rod adjusting screws.

In the bottom face of the axle beam are two slots and in each slot is a screwed stop (screwed into the sliding leg). If the stop is allowed to slide from one side of the slot to the other then the movement will be 6" (152mm). This equates to 12" (305mm) over the complete axle. However, if the stop is moved to either of the two other positions within the slot then the movement is reduced to 4" (102mm) or 2" (51mm).

Pull the sliding legs to the required position.

Pull the track rods to the correct position and refit the securing bolts.

Refit and lightly tighten the four screws in the bottom of the axle beam. Lightly re-tighten the clamps at the end of the axle beam. Lower the machine to the ground and fully tighten clamps and fixing screws.

Repeat this exercise on the second axle.

RE-CHECK THE BOLT TENSION AFTER THE FIRST HOUR'S WORK.

HYDRAULIC SLIDING AXLES

The engine must be stopped and **the parking brake applied.**

Lift one end of the machine until the tyres are clear of the ground. Loosen the two clamps at either end of the axle beam.

Caution: Ensure the machine is well supported. A single jack under the centre of the front axle is not acceptable.

Remove the four screws in the bottom of the axle beam.

Remove the two track rod adjusting screws.

In the bottom face of the axle beam are two slots and in each slot is a screwed stop (screwed into the sliding leg). If the stop is allowed to slide from one side of the slot to the other then the movement will be 6" (152mm). This equates to 12" (305mm) over the complete axle. However, if the stop is moved to either of the two other positions within the slot then the movement is reduced to 4" (102mm) or 2" (52mm).

On the front axle suspension plate is a hydraulic valve. With the manual handle supplied, raise the valve manual control fully up.

Start the engine and turn the steering wheel in the appropriate direction to slide the axles to the correct position (at the fullest extent of the slot).

Note: It is normal for only one axle leg to move at a time. When the first leg moves to its fullest extent the second leg will start to move providing the steering wheel continues to be turned.

Pull the track rods to the correct position and refit the securing bolts.

Refit and lightly tighten the four screws in the bottom of the axle beam. Lightly re-tighten the clamps at the end of the axle beam. Lower the machine to the ground and fully tighten clamps and fixing screws.

Repeat this exercise on the second axle. When complete, reset the hydraulic valve fully down. This hydraulic valve is fail-safe and will also reset itself when the parking brakes are released.

RE-CHECK THE BOLT TENSION AFTER THE FIRST HOUR'S WORK

OIL TANK

The oil tank is mounted directly behind the cab.



This fully baffled tank contains approximately 200 litres (45 gallons) of oil, (see lubrication section).

It is this oil, which is the lifeblood of the machine, and, because of this, it must be kept exceptionally clean. Two 125 µm suction strainers filter the oil before it leaves the tank.

Two 10µm 'suction' filters – Pt No 1120 – fitted on the left hand side of the tank top filter the oil before it enters the 'boost pump'. All return oil, except wheel motor drainage, passes through two 10µm 'return' filters –Pt No 1121 – fitted on the

right hand side of the tank top.

Wheel motor drain oil returns to tank via an internal magnetic filter, and finally a 40 µm strainer is fitted into the filler cap, primarily to filter air entering the reservoir and secondly to ensure clean oil only enters the reservoir.

A level gauge is fitted to the left side of the tank, and contains a thermometer.

The oil level must always be between the min/max lines on this level gauge. The oil tank temperature should stabilise between 50°C - 80°C.

When topping up the tank, use a clean container and the correct grade of oil (HV46) - **NOT UNIVERSAL TRACTOR OIL.**

A float switch is fitted to the side of the tank. If the oil level drops dangerously low, then the vehicle horn will sound. **STOP IMMEDIATELY** - and investigate. Also, see section on engine.

All filters must be changed after the first 10 hours and, thereafter, every 250 hours or when the clogging indicator shows a blockage, whichever comes first. **SAM LTD ONLY RECOMMENDS THE USE OF SAM SUCTION AND RETURN FILTERS.**

A sample of hydraulic oil should be analysed at the beginning of each season to ascertain as to whether the oil should be changed or not. Your oil supplier can usually carry this out.

Water is the usual cause of contamination in hydraulic oil and can normally be traced back to condensation in the oil tank.

If emulsified oil is present, it is instantly recognisable as a milky yellow translucent material in the sight gauge. The oil must be changed **IMMEDIATELY**.

Every time the tank is emptied, the opportunity should be taken to clean the strainers within the tank.

Only 'lint free' cleaning material should be used inside the hydraulic tank.

HOT TRANSMISSION OIL

A small audible warning device is fitted inside the steering column, which warns of high 'closed loop' transmission oil temperature.

Should this item ever sound off **DO NOT STOP**, as this will entrap the excessively hot oil within the 'closed loop' circuit, simply reduce speed by approximately 25% by pulling back the joystick slightly. The device will stop sounding after approximately 3-4 minutes.

THE CAB



The heavily built cab fitted to the 'Vision' range is fully suspended on anti vibration mounts. The filtration system complies with the latest H.S.E. forced air filtration recommendations. This means the air in the cab is changed at least 60 times per hour and a positive pressure is held within the cab of at least 1mm water gauge at all times. The door must obviously be closed. Finally, a high capacity carbon filter is fitted within the cab roof space.

The carbon filter must be changed every 500 hours or annually – whichever is the sooner. Access to the filter element is gained by tilting the roof cover. A washable

pre-filter is fitted over the carbon package and may be washed when necessary. The frequency of washing will depend on working conditions. A 50-hour visual inspection is therefore recommended.

Protective clothing is necessary when handling the filter, as it will be contaminated.

An advanced Climate Control System is fitted which will automatically adjust the incoming air to provide a comfortable working environment.

The 9 outlet vents will produce a very large volume of air at low velocity. The vents may be directed where required. Maximum windscreen demisting may be achieved by closing the main outlet vents with only the two front roof vents remaining open and directed at the screen.

Welding or drilling of the cab frame **must be avoided**, as this will weaken the structure.

A small hammer is provided to smash any window to act as an emergency exit. The hammer blow should be directed at the corner of any window.

On all machines, the steering column contains two warning lights marked 'S' and 'R' and refer to the 'suction' and 'return' filters fitted to the hydraulic tank top.

These contamination indicators should not be illuminated while the oil is warm. Should either of these lights come on then the relevant filters should be changed **immediately**.

FAILING TO DO SO COULD CAUSE EXTENSIVE DAMAGE TO THE TRANSMISSION SYSTEM.

It should be noted that during cold weather when the machine is first started the contamination indicators may illuminate for short periods but should extinguish as soon as the oil becomes warm.

CLIMATE CONTROL

A fully automatic, state of the art, climate control system is now a standard feature in all SAM machines. The control box for this system is roof-mounted to the right-hand side of the radio. It contains an LCD screen to display information, 2 pairs of buttons either side of the screen and a row of 4 buttons below the screen.

'AUTO' is the first of the lower buttons. It turns the system on and allows it to work within selected parameters.

The second 'SNOW FLAKE' button engages the air-con compressor. "A/C" will appear on the screen. The air-con compressor must be engaged if the required in-cab temperature is lower than ambient temperature. Pressing this button again will disconnect the compressor and 'ECON' will appear in the screen.

The third 'OFF' button turns off the complete system.

The 'EXT' button, when pressed, will display the outside temperature for approximately 65 seconds.

The two buttons to the left of the screen are to set the desired in-cab temperature within the boundaries of 18° - 28°C. Outside these boundaries the unit will show either 'Hi' or 'Lo' and will produce maximum heating or cooling depending on the selection. Climate control will be de-activated.

The two buttons to the right of the display are for manual fan speed selection. The unit will normally set the correct fan speed but, should the operator require a different setting, then this can be accommodated. Pressing the slow setting beyond the slowest speed will also turn 'OFF' the unit.

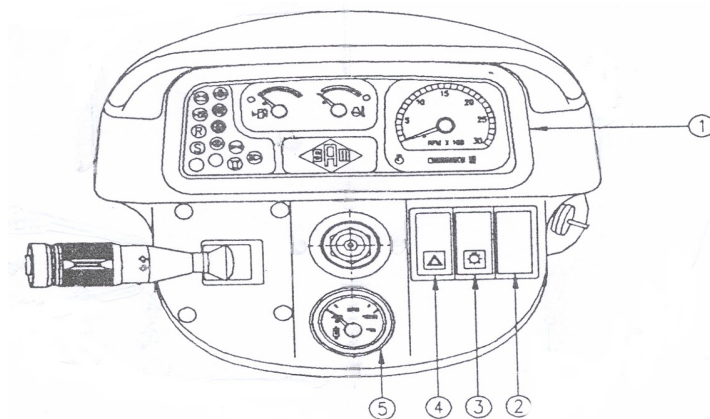
Four sensors are placed around the cab to measure:

- Incoming air temperature
- Minimum evaporator temperature
- Mixed air temperature
- Cab temperature

Should any of these sensors fail then a malfunction code will flash on the screen i.e. 'E3' or the AC symbol will flash.

Contact SAM Ltd for interpretation or service.

STEERING COLUMN



1. Main Instrument Cluster

Rev Counter
Hour Meter
Fuel Contents Gauge
Engine Oil Temperature Gauge

Warning Light Cluster

Left Column Top to Bottom:

Battery – Low Fuel – Suction Filters - Return Filters – Blank

Second Column Top to Bottom:

Oil Pressure – Park Brake – Air Filter – Air Pressure – Blank (but will illuminate for 2 seconds with 1gn on)

Third Column Top to Bottom:

Turn – Beacon

Fourth Column:

Main Beam

2. Spare

3. Vehicle Lighting Switch

4. Hazard Warning Switch

5. Hydraulic Oil Tank Temperature

The steering column is adjustable for both rake and reach.

The fuses attached to the steering column are described in another part of the manual, as is the inbuilt buzzer.

The ignition key will start and stop the engine.

ARMREST CONTROLS



The right hand armrest contains all the essential controls for the machine. The most obvious being the transmission control joystick.

This joystick is locked in neutral until unlocked by moving the joystick to the left against the detent. The joystick is connected by cable to the pump 'swash plate' control system.

Pushing the joystick forward will drive the machine forward. The further forward the joystick is pushed, the faster the machine will travel.

If the joystick is returned to neutral then the machine will stop. The quicker the joystick is moved, the quicker the response, whether it be acceleration or braking. Care must be taken not to induce skidding by moving the lever too rapidly.

Moving the joystick further to the left against the detent enables the joystick to move backwards.

Moving the joystick backwards drives the machine backwards and the same rules apply.

The engine can only be started with the joystick in neutral.

Positioned around the face of the joystick is an arc of buttons. Each button controls a spray line. The top centre button represents the centre (backframe) spray line. Seven section spraylines are a standard build on SAM machines although four, five and six sections can be accommodated.

The centre joystick button is the master ON/OFF control. When the machine is being calibrated in the yard, this control must be 'on' to generate spray pressure but the spraylines may be turned 'off' to prevent loss of chemical.

On the rear of the joystick are two further buttons. These are used to raise or lower the boom.

The other functions of the armrest control are listed below.

Warning Lights: Engine ECU, Water Level, Smart Drive

Sprayline Sections

Spraylines, Spraypump, Smart Drive, 4WS

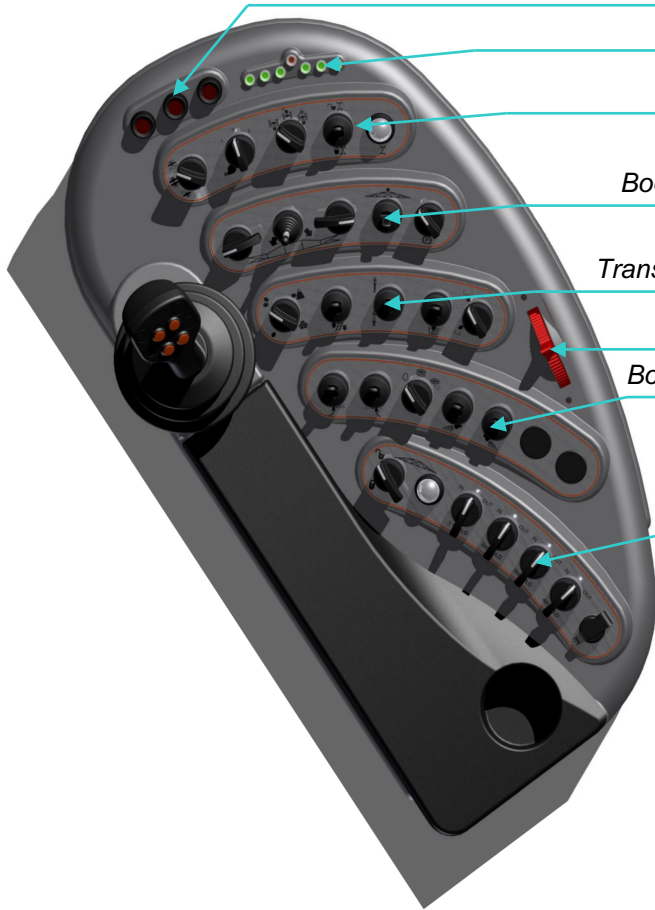
Boom Contour, Incline, Headland Control, Park Brake

Transmission, Step, Dualride, Tankwash, Tank Selector

Engine Throttle

Boutmarker, Slugpellet Applicator, Boomend Nozzels

Boomlock & Indicator, Boomfold, 12v Socket



TRANSMISSION SELECTOR

The four driving modes are:



Road – maximum speed but with reduced motor torque.



Maximum Tractive Effort – all wheel motors with full power capability – generally only suitable on flat land.



Conventional Spraying – used for flat land, steep uphill and moderate downhill spraying. Gives best overall performance.



Steep Downhill – this mode provides the best control when descending a steep hill when traction is marginal. If mode 3 is being used and the rear wheels begin to skip, mode 4 may be selected on the move.

Remember: if the machine will not climb the hill in Mode 3, never attempt to descend the hill

The vehicle has a permanent four-wheel drive system but this is only relevant when all wheels can provide tractive effort.

DIFF LOCKING

If an electronic anti-slip system is fitted, it is controlled by a simple on/off switch. It will work in any drive mode.

Foot Pedal Control (Vision 3.0 & 4.0)

If this option is fitted, the following method of driving must be strictly adhered to.

On the driver's armrest, a rotary two-position switch is fitted and marked 'hand' and 'foot'.

When 'hand' is selected, the machine may be driven in the normal manner as described earlier in this manual using both the Joystick to control machine speed and braking, and the engine throttle mounted on the far right of the armrest, to control engine speed.

This is still the preferred driving method for field spraying.

If 'foot' is selected, the joystick will not produce any machine movement and the armrest mounted engine throttle will become inoperative.

The two floor mounted pedals are as you would find in an automatic car with the accelerator on the right and the brake alongside it on the left. In this case the brake is not proportional, it is simply a switch, on or off.

In order to drive when 'foot' is selected, the direction of travel must first be determined by moving the joystick fully in the appropriate direction.

This operation will NOT cause the machine to move.

Pressing the foot pedal and increasing the engine revs will provide machine movement. The speed of machine movement is totally dependant on engine speed.

If the drivers foot is removed from the foot throttle the speed of braking will be directly proportional to engine speed slowdown.

For a more rapid slowdown, the brake (switch) pedal may be depressed which will cause the transmission pump to immediately return to neutral.

Caution: It is not advisable to use the footbrake when driving the machine with the joystick (hand).

Caution: The machine may creep on tick over when 'foot' is selected – exactly the same as an automatic car would do. The parking brake should be used any time the machine is stationary.

Caution: Never switch between the two drive modes while the machine is moving.

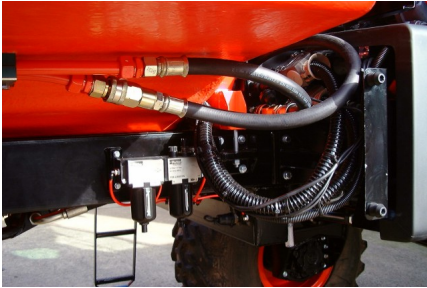
Caution: The joystick must always be returned to neutral before switching between drive modes. Failure to adhere to this simple rule could cause the machine to suddenly drive off.

SPRAYLINE SELECTOR

When twin spray lines are fitted to a boom, a spray line selector is also fitted. When 'forward' is selected, only the front spray line can be controlled by the joystick buttons. When 'rear' is selected, then only the rear spray line is controllable. When the selector is centered then both spray lines are active.

AIR SYSTEM

An air compressor mounted directly on the engine provides the air for the machine.



An unloader valve is mounted on the air tank inlet port. This is preset to maintain the air pressure at approximately 9 bar (130 psi). Absolute minimum working pressure is 7.5 bar (110 psi). The air reservoir, mounted below the engine, should be drained daily.

NOTE - water is present in compressed air even on the hottest days.

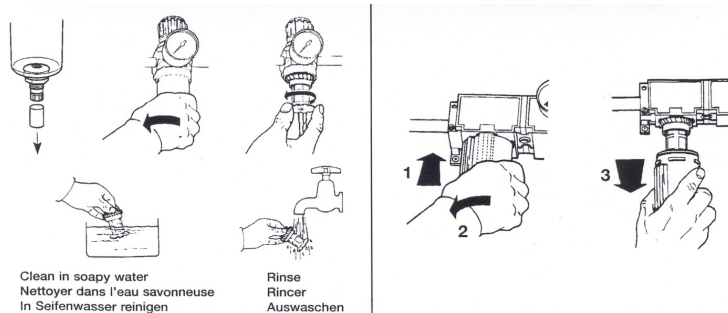
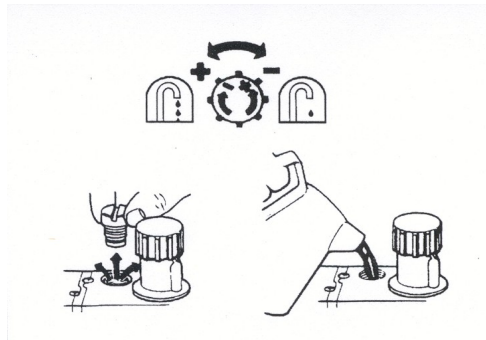
THIS AIR RESERVOIR MUST BE CHECKED ANNUALLY BY A RECOGNISED INSPECTOR.

Air is fed to the operators pneumatic control panel via a filter/lubricator assembly and copies of the manufacturer's service instructions follow.

SAM Ltd recommends the use of 'Tellus 37' lubricant in the lubricator bowl.

It is impossible for SAM Ltd to satisfactorily adjust the lubrication rate. The customer must regulate this himself over several weeks.

Oil usage should be in the region of one bowl every 500 to 600 hours.



TANK

The heavy-duty fully baffled fibreglass tank has a nominal capacity of between 3000 litres (660 gallons) and 5500 litres (1210 gallons) depending on specification and is suitable for all agrochemicals. All tanks have a nominal 50 – 100 litre over capacity.

The charging hole in the top of the tank holds a large capacity filter basket.

The tank lid is fitted with a breather but if filling is being carried out with a high capacity pump, it is advisable to remove this lid to prevent excessive pressure build up in the tank.

SIGHT GAUGE

The Sight Gauge fitted is usually of the 'float and weight' type. The float is retained in the tank on a stainless steel guide and is attached to the weight retained within a transparent tube normally fixed to the boom rest.

The top half of the Sight Gauge is visible from the driver's seat and provides a visual indication of when the tank is nearing empty. Because the float is located close to the center of the tank, an extremely accurate reading of tank contents is provided at all times.

ROTARY TAPS



At the rear left-hand corner of the machine are two rotary taps. The tap labeled 'suction' dictates where the spray pump will suck its water from. This may be from the spray tank, the wash tank or from an outside source, "self fill". The final position on this tap will isolate the main filter.

The 'pressure' tap dictates where the spray pump will transfer its water to. This may be 'spray' for normal use, washing or agitation; 'hopper Venturi' so that the induction hopper will operate or 'pump out' to transfer surplus liquid into a holding tank. The protective cap on the 'pump out' outlet should be removed prior to

selecting this position.

Also mounted in the rotary tap panel are additional switches for use while the machine is stationary.

A boom lift (lower switch) is provided to make easier the removal of the induction hopper from the stowed position.

A spray pump on/off switch is also provided for easier control of the induction hopper, self fill or pump out facility.

A quick fill pump switch may also be fitted.

FILTER



A large capacity suction filter is fitted on the left-hand side of the machine behind the rear wheels. The 30-mesh element should be cleaned frequently to eliminate pump cavitation and loss of spraying pressure. The filter is fitted in the suction line between the rotary 'suction' tap and the pump. The rotary 'suction' tap may be turned to isolate the liquid flow to the filter.

CHEMICAL INDUCTION HOPPER

This hopper is normally stowed at the rear of the machine alongside the spray pump and is of the Venturi type.



The booms should be lifted slightly to enable the hopper to swing out and down to a working position.

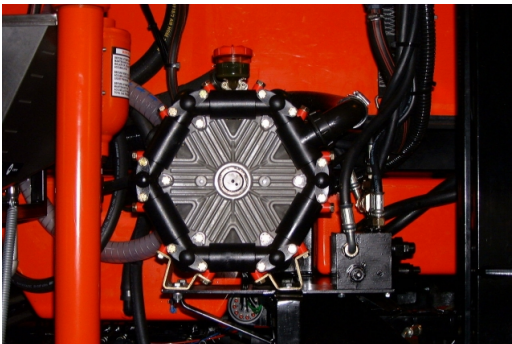
Select Venturi position on the rotary 'pressure' tap. Select wash down ring on front left hand side of hopper, add chemical. Suction is controlled by 2-way tap mounted at the bottom end of the hopper. The two-way tap should be closed after each induction process. Failure to close this tap will cause severe frothing within the spraytank as air is inducted through the Venturi.

To wash out chemical containers, select can wash position with 3-way tap on left-hand side of hopper. Wash out containers. Please ensure correct disposal of containers.

If a two speed spray pump is fitted, either speed will operate the Venturi but the fast speed will give the greater performance.

NB: Ensure suction tap is fully closed and rotary 'pressure' tap is in spray position after use.

PUMP



The machine is fitted with a hydraulically driven 6-diaphragm pump. Providing the engine revs are at 1000 rpm or above, the spray pump will turn at approximately 540 rpm. This speed is automatically maintained irrespective of engine speed above 1000 rpm.

The size of the spray pump depends on the machine specification.

Larger spray pumps are 2-speed. The majority of conventional spraying may be carried out at the slower pump speed with a corresponding increase in pump life.

For example: a 400 litre pump at slow speed will provide enough water for 200 lph at 14Km/h with a 36m boom.

The induction hopper will work with both pump speeds except for the AR500 pump when maximum speed must be used.

LINE STRAINER



This extra fine mesh filter is fitted directly before the boom manifold and is particularly useful for low volume work where crystallising chemical presents a problem.

Two elements are supplied - blue 50 mesh for conventional 200L/ha outputs. A finer red 80-mesh element for low volume work. Finally, the element may be removed for high output rates.

The tap fitted to the strainer bowl is used for flushing the filter clean. It should be used at least daily and before every change of chemical.

Please dispose of the flushings in an environmentally friendly manner

SPRAY LINES

A single stainless steel $\frac{3}{4}$ " sprayline is a standard fit to all Vision models. Each complete boom is normally fitted with seven sprayline sections all controllable from the cab and each section is fitted with a triplet nozzle body at $\frac{1}{2}$ m spacing.

The spray nozzles will normally be ISO colour-coded with outputs to suit.

A 'Top Hat' filter is fitted above every spraylip. Please ensure the flow rate through the 'top hat' filter is adequate for the tip size.

This single sprayline will be of the prime and purge type.

If a second sprayline is fitted it will usually be controlled by a boom valve. A removable cap is fitted at each end of the sprayline to provide cleaning access.

Fitted at $\frac{1}{2}$ m spacing along this sprayline are diaphragm check valves (DCV's). These valves eliminate dripping when the spray is turned off. If drips are present, it usually indicates dirt under the diaphragm.

A tap is fitted to the rear manifold so that the spraylines may be isolated.

BOOM VALVES



These valves are only fitted to a non-prime and purge sprayline. This is usually a second fertilizer line.

These valves are to an exclusive failsafe design. Air pressure at a minimum 7 bar (100 psi) is required to open the valves and so allow water to pass to the spray lines. When the air pressure is released, the valves, acting under very strong spring pressure, will close instantly. NB. See 'Main ON/OFF Valve'.

These valves are fitted with a dual O-ring sealing system. If one of these O-rings should fail, liquid will be seen to leak out of the valve body from the drain hole. A seal kit is available. It is advisable that these valves be serviced prior to each spraying season simply by stripping them and lubricating the shafts and seals with **PETROLEUM JELLY**.

PRIME & PURGE SYSTEM

This exclusive system uses mini air valves on the nozzle bodies in place of the conventional spring loaded DCVs. The mini air valves will open under air pressure thus allowing the nozzle to spray, and close under spring pressure thus preventing any further passage of liquid to the nozzle.

The conventional boom valve is not used in this system to control the flow of water to the spray line although it is still used on the purge return line.

During a 'spray off' situation, as in headland turns, filling, field entry etc., residual pumping pressure (approximately ½ Bar) is used to circulate liquid through the spray lines and back to tank via a small purge line. No liquid is lost through the nozzles because, during 'spray off', the mini valves on the nozzle bodies are closed. Chemical is being continually agitated and cycled i.e. tank, pump, spray line, tank. All air will be purged from the spray lines and there will be no chemical 'hot spots'.

When 'spray on' is selected, the spray pressure will instantly increase. The mini valves will open so that spraying starts and the purge (boom) valve closes so that no liquid returns to the tank via the spray line. 'Spray off' reverses the process and instantly washes any accumulated material back to the tank.

Note: If a small air tap is fitted to isolate some of the mini valves, chemical can accumulate in the redundant nozzle bodies. To prevent total blockage of these nozzle bodies, the small air tap should be opened and the bodies flushed during the normal boom flush operation at least on a daily basis.

WASH TANK

A wash tank is fitted at the rear of the spray pack below the main tank. It should be filled with clean water from a hose pipe via a Q/R coupling at the rear left-hand side of the machine. A simple 2-way tap controls water into the tank. Despite an over large breather, this tank could be damaged if filling is carried out using a high capacity pump. There is sufficient water in this tank to enable the largest SAM spray tank to be washed with 10 litres of water for every square meter of tank surface area. A sight gauge is fitted to this tank.

MAIN ON/OFF VALVE



Situated at the rear of the tank on top of the manifold assembly, this valve is probably the most important item on the machine. It is pneumatically operated in two directions and controls the flow of water to the tank.

When the valve is open (spray off) the water being pumped to the manifold chooses the simplest route through the valve and back to the tank. Air is also prevented from operating the boom valves, and so these remain closed, thus preventing the water from entering the spray lines.

When the valve is closed (spray on), the water is pressurised and so travels to the booms and to those spray lines where the boom valve is open.

This valve is fitted with a dual O-ring sealing system. If one of these O-rings should fail, liquid will be seen to leak out of the valve body from the drain hole. A seal kit is available. It is advisable that this valve be serviced prior to

each spraying season simply by stripping it and lubricating the shaft and seals with petroleum jelly.

BOOM (Gullwing)

The SAM Gullwing folding boom of up to 36 metres in width is based on the well-proven space frame construction.

The folding mechanism is in-cab controlled with two rotary switches (booms up to 24m) or three rotary switches for booms larger than 24m

After lifting the boom clear of its rest, both main sections may be opened to 12m. Both sides may then be opened to their maximum. Folding 'in' is the reverse.

Occasionally independent end fold switches are provided when requested.

Never fold any boom section until the mating section has fully completed its total movement.

A 2-way breakback, usually of 2 metres in length, is incorporated at each boom end. Maintenance spent in this area is time well spent.

Single boom working is not possible with this boom although the boom may be used quite happily at 12 metres.

This boom normally has a 7 section shut off. Hydraulic, mechanical and pneumatic locking mechanisms are used to ensure boom integrity and safety.

The anti-yaw mechanism on this boom is based on rubber buffers that have been pre-loaded prior to delivery. No adjustments are necessary in this area.

Boom straightness affects boom ride and as such, boom straightness should be checked weekly. Adjustment is simple –with the main sections fully open, loosen the hydraulic ram end and turn the ram shaft in the appropriate direction. Tighten the ram end.

BOOMS SHOULD NEVER BE FOLDED WHILE THE MACHINE IS MOVING.

It is extremely difficult to remove every trace of air from a hydraulic ram circuit. Every effort is made during manufacture to remove this air from the hydraulic system but with up to 13 rams on a boom, it is inevitable that air will become entrapped occasionally.

The cure is simple and as follow:

Start engine and run at 1000 rpm.

Simply loosening the hydraulic fittings and pressurizing the appropriate circuit may accomplish the bleeding of the boom fold rams.

It may be necessary to bleed the boom circuits more than once during the first few weeks of use.

The SAM boom suspension system is one of the finest in production with a hydraulic accumulator eliminating vertical shock loads. A short pendulum with gimbal capability stops tractor roll being transmitted to the boom.

Damping is provided with conventional shock absorbers. Anti-yaw is a standard fitment.

The boom can be contoured; raised and folded hydraulically all from the driver's seat by pneumatic pilot control.

The hydraulic spool fitted in the lift/lower section of the hydraulic valve bank is restricted in one direction. This valve will control the speed of **descent** of the booms; it will not affect the lifting speed. This valve is pre-set during manufacture and should not normally need adjusting. However, if adjustment is felt to be necessary, then the following precautions should be taken:

1. Never attempt to adjust the valve from the back of the machine, either under the boom back frame or through the framework.
2. Open the booms fully prior to adjustment.
3. Stand on top of spray tank.

Adjustment may be made from this position ONLY in complete safety.

Please note: the valve should be easily adjustable by finger pressure after the locking grub screw has been loosened.

SAM 36/40 METRE GULLWING BOOM

A SAM Gullwing 36 metre boom is also capable of spraying at 24 metres and 12 metres.

Never fold a boom over 24m without the boom first being locked! Prior to any folding operation it would be advisable to momentarily select the opposite folding direction in order to release the load from the boom locks.

Periodic "loading" of the boom rams during spraying would be an advantage to boom integrity.

A SAM 40m boom uses all the components of a 36m boom but with a vertical folding two metre extension fitted between the breakback fixing plates.

Care

Extra care should be taken to prevent stress damage on this boom.

Although the boom is 50% wider than a conventional 24 metre boom, its stress factor increases by 225% for any similar operation.

The boom **will** be damaged by rapid acceleration, rapid deceleration and rapid turns.

All driver actions should be gentle and controlled. High constant spraying speeds will not damage the boom.

Care should be taken when folding a 40m boom. The boom should be lowered to the bottom of the mast prior to vertically folding the 3m ends. Please see the section in this handbook "General Safety/Warning Powerlines".

WARNING – POWER LINES!!

DANGER OF DEATH – Stay away from power lines while folding booms

In the unlikely event of any part of the machine touching a power line:

**STAY IN THE CAB
DON'T PANIC**

**TRY TO DRIVE CLEAR
WARN OTHERS TO STAY WELL CLEAR**

If this is not possible or the machine catches fire

JUMP WELL CLEAR – DON'T CLIMB DOWN – the metalwork of the machine may be alive

NEVER TOUCH THE MACHINE ONCE YOU ARE ON THE GROUND

RUN WELL CLEAR WITH LEAPING STRIDES

STAY WELL CLEAR, WIRES MAY RE-ENERGISE WITHOUT WARNING

KEEP EVERYONE AWAY AND CALL YOUR LOCAL ELECTRICITY SUPPLIER ON:

Tel:

BOOM LOCK

All booms wider than 24m will have a boom lock fitted as standard. Generally, this will be a horizontal ram on the bottom of the backframe which will push the boom level to the machine. This ensures the boom will fold correctly especially if folding is taking place on a side slope.

The boom should be unlocked after unfolding and locked prior to folding.

The control for this function is fitted on the armrest. It consists of a rotary switch which must be held in the required position for approximately 5-10 seconds to allow the ram to move. An indicator alongside the switch will indicate the boom lock status.

Occasionally the boom lock will be two hydraulic rams taking the place of conventional shock absorbers. In this case the boom should be leveled prior to locking before the folding takes place.

In all cases the boom must be unlocked before use.

AUTOMATIC VOLUME CONTROL

All SAM machines are fitted with an Auto Volume Control System. Several different types of systems are used depending on the application and customer choice. All systems will normally be of the **PRESSURE** based type as these are more accurate and reliable than the flow based systems. A full set of operating instructions for the system fitted is provided.

Notes

Whilst the Auto Volume Control system is capable of controlling the sprayer at any speed up to 99 km/h, it is the nozzle that sets the speed parameters.

In practice, the usable speed range of any nozzle is generally no more than 4 Km/h. It is for this reason that the simulated speed during calibration should be the same as the target speed in the field. Any deviation from the target speed will affect the droplet size so it is always advisable to drive as close to the target speed as possible.

If an RDS instrument is used with the optional 'Trueflow' software installed then the litres/hectare readout is based on the actual flow passing through the flow meter. It is not a calculated figure. This flow meter does not control the system. It only displays what it sees. The system is pressure based and is controlled by the pressure sensor fitted to the distribution manifold.

BOOM INCLINE OPTION

This feature allows each boom to be inclined upwards by approximately 10° from the 12m hinge and can improve spraying in valleys or on undulating land. Raising one or both booms will not normally affect the boom ride but they should be lowered to their rest position prior to folding.

HEADLAND CONTROL OPTION

When engaged, headland control automatically raises the boom away from the crop every time 'spray off' is operated. This removes the risk of expensive boom damage during particularly awkward headland turns. It is also one important function (boom lift) which the operator no longer has to worry about. As soon as 'spray on' is selected, the boom immediately drops to its previous spraying position.

The initial boom working height should be set with both 'headland control' and 'spray on' selected but without selecting any spray lines.

DUAL RIDE OPTION

The operator has the choice of using the excellent hydro-pneumatic vehicle suspension system fitted to every Sands machine or, at a flick of a switch, experience a far softer ride on the front suspension.

The difference between the two ride modes can only be appreciated on a rough field where the front axle has to work harder. Very little difference will be noticed on the road where axle movement is minimal.

DEMOUNTING (Optional)



One man in a matter of minutes may easily demount the spray/spreader packs normally carried on the rear end of the vehicle.

With the engine stopped, release the two bolts at the front of the spray pack. Release the rear-locking bolts and withdraw them as far as possible. Uncouple the two pneumatic plugs on the right hand side of the machine behind the engine plus any electrical connections and also the two hydraulic lines.

THESE TWO HYDRAULIC PIPES MUST BE RE-CONNECTED TO EACH OTHER.

With the four jacking legs positioned at each corner of the spray pack, lift the pack approximately 25 mm (1"). Drive forward slowly until the spray/spreader pack is left free standing.

Remounting is the reverse of the above.

NOTE: The support legs are not intended to take end thrust. If the machine and the spray/spreader pack are not correctly aligned when remounting, damage could occur to the legs.

BEWARE! When the spray pack or any other implement is removed, the power unit will become extremely front end heavy.

The power unit must never be driven in a demounted state except to manoeuvre to the next implement pack, which should be parked alongside.

For safety and to prevent both rear wheels lifting:

1. Only demount on a flat hard pad.
2. Never leave the power unit in a demounted state.
3. Never exceed 5 km/h (3 mph) when demounted.
4. Be extremely careful when stopping and reversing.
5. Never take the power unit on the public highway in a demounted state.

Any rear end equipment fitted by the customer **MUST** conform to the normal axle weight distribution. You are strongly advised to contact Sands Agricultural Machinery Ltd prior to any rear end implement adaptations.

In order for customers to conform with weight distribution requirements on additional rear end equipment, all additional demount chassis supplied by SAM Ltd have the capability of accepting up to 18 large (50kg) Ford front end weights.

FILLING THE SPRAYER

WITHOUT SELF FILL ATTACHMENT

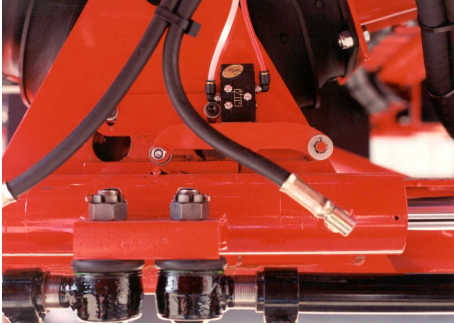
1. Fill the tank with a minimum of 100 litres (20 gallons) of clean water through the charging hole filter basket.
2. Ensure the rotary 'suction' tap is turned to 'spray tank' and turn off the manifold tap at the rear of the machine. The rotary 'pressure' tap should be turned to 'spray'
3. With the engine running at 1000 rpm, engage the spray pump but with all other controls in the 'off' position.
4. Pour in the recommended quantity of chemical after relating the area to be sprayed with the tank size. The addition of chemical may be through the top charging hole or into the induction hopper.
5. Top up the tank with clean water, washing surplus chemical through the filter basket.
6. Allow the solution to circulate for a few minutes before attempting to spray.
7. Turn the rear manifold tap 'on'.

WITH SELF FILL ATTACHMENT

1. Connect the suction hose, complete with foot valve and strainer, to the 'self fill' inlet below the rotary taps. The strainer end of the hose should be placed in a suitable water supply.
2. Turn the rotary 'suction' tap to 'self fill' and the 'pressure' tap to spray
3. With the engine running at 1000 rpm, engage the spray pump but with all other controls in the 'off' position.

4. When there is at least 100 litres (20 gallons) of water in the tank, pour in the recommended quantity of chemical after relating the area to be sprayed with the tank size. The addition of chemical may be through the top charging hole or into the induction hopper.
5. Continue filling with water until the tank is full, then:
6. Turn the rotary 'suction' tap to the 'spray tank' position and disconnect the suction fill hose.
7. Allow the solution to circulate a few minutes before attempting to spray.

ALL WHEEL STEER



The 'All Wheel Steer' (AWS) system employed on SAM sprayers is designed with efficiency, safety and simplicity in mind.

It uses no electronics only compressed air to sense the relative positions of each axle.

It is self-aligning and requires no bleeding or re-setting.

The AWS system is for part-time operation only and is used to produce tight turns with the least crop damage, when required.

The system may be selected at any time by depressing the left foot pedal and holding it depressed. However, the rear axle will not engage until the front axle is perfectly straight. This may be when travelling straight in a tramline or when the front axle is being steered and passes through centre. When the rear wheels begin to steer a visual indication is displayed on the driver's console.

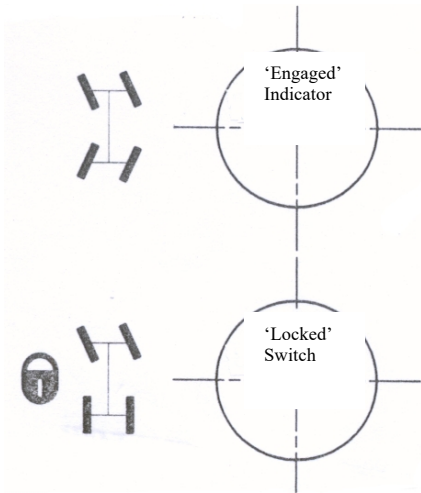
The foot switch may be released when the rear axle begins to steer, and the axle will continue to steer, until it once again hits centre.

In short, the rear axle will only engage when the front axle is straight, and will only disengage when it is itself straight.

Leakage within the steering system is corrected every time the rear axle disengages.

BEWARE: There are a number of situations in which AWS should **NOT** be used. They are as follows:

1. On side slopes when any 'crabbing' will be amplified by the steering rear axle.
2. When turning on steep hills where the rear end inertia could turn the machine over.
3. In potato rows where the rear wheels will try and climb the balks.
4. On any field spraying where rear axle movement is amplified by the boom thus causing an overlap/underlap situation at the boom tips.
5. Never engage AWS at speeds over 15 km/h especially on the Public Highway. Not only is it illegal, but it could cause an accident by the machine running out of control.



A rear axle isolator switch is positioned on the driver's console and should be used for all road journeys or anytime AWS is not anticipated.

If the Air System fails, the machine will automatically revert to two-wheel steer. If the machine is parked with AWS engaged, and air pressure is lost, the machine will 'crab' on start-up, until air pressure is re-instated.

To re-set the rear wheels, the rear axle should be locked with the isolator switch. The front wheels should then be turned to a similar, opposite angle (as in 4WS).

After releasing the rear axle isolator switch, the rear wheels may be turned in conjunction with the front wheels back to the centreline where the system will re-align itself.

Please only engage and use AWS while the machine is moving.

WASHING OUT THE SPRAYER

On all machines a tank washing facility is installed which enables the tank and booms to be flushed with clean water prior to leaving the field.

Set the rotary 'suction' tap to wash tank and the 'pressure' tap to 'spray'. With the main spray on/off control off, clean water will be transferred to the spray tank. On completion of the transfer rotate the suction tap to 'spray tank'

If the machine is fitted with the 'Tank Selector' option on the cab armrest panel, simply select the smaller 'wash tank'. Reset the switch to the larger spray tank when the transfer is complete.



With the spray lines turned off and 'Tank Wash' selected, the machine should be operated as for 'calibrating' the spraying system i.e. 'Auto'. Select a simulated speed 2 Km/h above the target speed to generate a higher than normal spray pressure and main On/Off 'ON'. This will generate spray pressure and flush the water through an 'intank' cleaning nozzle. After 2-3 minutes of tank cleaning the 'tank wash' may be turned 'off' and the spray lines turned 'on'.

The cleaning water will now be flushed from the tank through the spray lines onto the headland.

Remember: both spray lines require flushing

even though only one has been used.

The spraying system can now be considered 98% clean and will require only a quick flush through on returning to the yard.

Clean and replace the suction filter element.

LUBRICATION

GREASE - the following items should be regularly lubricated with a lithium based gun grease. A sodium-based grease is water-soluble and could be washed away by rain, whereas a lithium-based grease is not.

- Boom pendulum
- Boom hinges
- Rear axle
- Ram clevis pin
- Boom adjusters
- Butterfly valve
- Front axle tripod bearing
- Front axle
- Breakback
- Roger rail roller pins
- Cylinder ball ends

LUBRICATING OIL - An SAE 30-grade mineral oil should be used to lubricate:

- Air system (also see section on Air System)
- AR & Imovilli Spray pumps

The 'suction' and 'pressure' rotary taps should be lubricated with just '**ONE**' pump of a silicon based gun grease '**ONCE**' per year. Over lubrication of these taps will destroy the seals and render the taps inoperable.

ENGINE - Please refer to the Deutz Operating Manual for lubrication information.

HYDRAULIC OIL - Only a good quality hydraulic oil type **HV46** that conforms to AFNOR NF 48600 or ISO 3448 - CETOP RP 75 is suitable. **ANY OTHER GRADE OR SPECIFICATION OF OIL WILL CAUSE SERIOUS DAMAGE TO THE TRANSMISSION SYSTEM.**

A Universal oil is **NOT ACCEPTABLE**.

SAM Ltd cannot emphasise enough how important it is to use the correct grade of hydraulic oil (HV46) in the machine.

This machine has been filled with Shell Tellus T46 which is a high quality HV46 oil.

Many oil companies now run a regular testing service for their customers and we, as a company, would advocate its use. We would recommend an oil sample be taken from the tank – not drain oil from the filters during the filter change operation – analysed and the findings noted. Potential failures could then be identified at an early stage.

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DRAWBARS

With permanent 4WD on the SAM range of machines, it is possible to tow water bowzers within the weight limits listed below:

Vision 3.0 – 5.5 with a centre pull sliding drawbar = 5000 Kg
Non-standard drawbars as marked

In addition, maximum nose weight must not exceed 100Kg, thus dictating a 4-wheel bowser.

A 50mm ball hitch is only suitable for loads up to 3500Kg.

Trailer braking must comply with RVCU (1986) regulations.

On a hydrostatic machine, this generally means a hydraulic over-run system of at least 35% efficiency.
Maximum speed with an agricultural trailer is 20 mph.

DO'S AND DON'T'S

DON'T'S

1. Do not put chemical in a dry tank.
2. Do not leave water or chemical solution in the tank overnight.
3. Do not weld on the machine without first disconnecting the battery.
4. Do not drive the machine with unsupported folded booms.
5. Do not spray in high winds
6. Do not use incorrect or dirty oil in the machine.
7. Do not fold spray boom under or near power lines.
8. Do not put incomplete chemicals in the same tank mix – check with your agronomist.

DO'S



1. Do study the chemical manufacturer's recommendations.
2. Do check nozzle output and pattern frequently.
3. Do take adequate precautions when frost is expected.
4. Do check forward speed at regular intervals
5. Do wear protective clothing (**THIS IS LAW**).
6. Do check for boom 'overlap'.
7. Do check for correct boom height, especially in crops of varying heights.
8. Do study this manual carefully - preventative maintenance is cheaper than compulsory maintenance.
9. Do contact SAM Ltd if there is any query on the control or operation of the machine.

10. Do have your machine regularly checked by our Service Engineers, especially at the end of every season.
11. Do STOP immediately the horn sounds and remove the cause.

PESTICIDE SPRAYING AND THE ENVIRONMENT

Used correctly, pesticides do not pose any more of a threat than many other modern inventions. Used incorrectly or thoughtlessly then problems may occur.

As commercial users of pesticides, the following points should be observed as guidelines on the safe use of pesticides.

- People living close to the intended area of pesticide operation should be advised so that they can take necessary action to prevent pets and livestock from straying into treated areas.
- Where there are risks to grazing animals, the period over which they must be kept away from the treated area, as indicated on the product label, should be observed.
- Do not spray hedge bottoms.
- Do not spray pesticides near ditches, rivers, lakes or other watercourses.
- Never empty tank or spray container washings, surplus diluted tank contents or concentrated product into any waterway or drained area.
- Never dispose of empty containers in ponds or other watercourses.
- Do not fill spray tanks from watercourses without a suction fill non-return valve, which will prevent siphoning back of pesticide into the watercourse.
- Select products that are specific to the pest or weed to be controlled.
- Consider not treating boom width or part of boom width closest to boundary.

SPRAY DRIFT is the most common culprit in reported incidents of pesticides misuse. Drift is related to:

- Spray quality
- Wind velocity at spray nozzle height
- Boom height
- Stability of local atmospheric conditions

The following actions should be observed:

- Listen to the weather forecast particularly wind speed and direction. The Met Office gives this as 'force' measured at 10m from the ground. Wind speed at boom height, the critical drift figure, will be roughly half this.
- The safest conditions in which to spray is a steady force 2 light breeze blowing away from susceptible crops, open water or neighbours land.

- Keep spray boom as low as possible consistent with an even spray pattern.
- Match spray quality to conditions - small drops are more likely to be caught by the wind.
- If conditions are unsuitable or unpredictable, do not spray.

The Food and Environment Protection Act 1985 stipulates that users shall take all reasonable precautions to protect the health of human beings, creatures and plants, to safeguard the environment and, in particular, to avoid pollution to water.

FIELD CRAFT (Operation)

Before any spraying takes place, check the following:

- Is the pesticide the correct one for the crop?
- Is the dose, volume or both correct?
- Is the weather suitable at present and going to remain so? (You do not want half a tank of pesticide left should it rain.)
- Ensure the wind speed and direction will not blow any drift to other crops, waterways, private gardens or members of the public.

If the above criteria are satisfactory, the following should be observed:

- Always use acceptable methods of swathe matching (tramlines, marker pegs etc.)
- Before starting to spray, correctly calibrate the machine.
- Set the boom to the correct height. Spray fans or cones from alternate nozzles should just overlap above the target.
- Spray round the headlands and reverse into the corners.
- Spray the longest side first, if possible. If not, spray so that the wind takes the spray away from your spraying direction.
- Whilst spraying keep a constant look out for blocked nozzles and a change in wind speed, direction etc.

USEFUL PUBLICATIONS

The following publications are recommended as useful references in the field of pesticides use.

Health and Safety Executive Booklets

Crop Spraying AS6: Poisonous Chemicals on the Farm HS (G)2

Prevention of Accidents AS12: Storage of Pesticides on the Farm AS18

Department of the Environment, Food and Rural Affairs: Guidelines for Applying Crop Protection Chemicals - Booklet 2272 published by HMSO

Department of the Environment, Food and Rural Affairs: Guidelines for the Disposal of Unwanted Pesticides and Containers on Farms and Holdings published by DEFRA

The UK Pesticide Guide (Annual) published by CAB/BCPC

Revised Draft Code of Practice for the Agricultural & Commercial Horticultural Use of Pesticides published by DEFRA

Agricultural Training Board (ATB) Leaflets

Controlling Weeds, Pests and Diseases in Crops

Crop Spraying - Trainee Guide 3000-7/80 M9D2

Preparing Field Crop Sprayers - Trainee Guide 1000-7/87 M9D1

Control of Substances Hazardous to Health Regulations 1988 Leaflets

Introducing Assessment IND(G)64(L)

Introducing COSHH IND(G)65(L)

Hazard and Risk Explained IND(G)67(L)

FAULT FINDING

Listed below are a number of common sprayer faults with their 'causes' and 'cures'. We hope these cures will assist you in maintaining your sprayer in a good working condition.

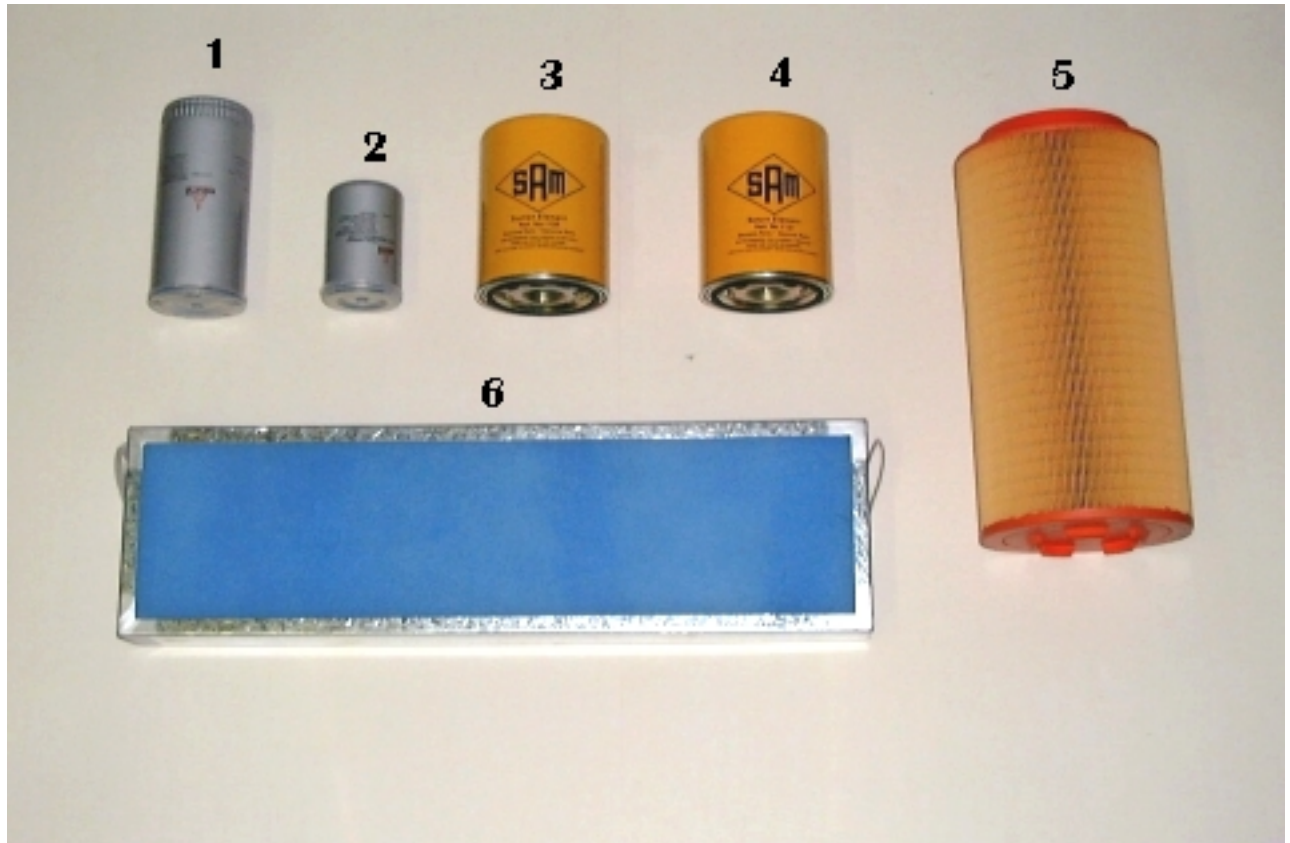
FAULT	CAUSE	CURE
'Loss of' or 'no' spray pressure	Blocked filter	Clean
Red indicator comes on	Pump not turning or turning slowly	Check oil level
	Spool valve stuck	Free off manually after oiling air pilots
	Main ON/OFF valve stuck open	Clean valve
	Worn pumps, valves or diaphragms	Check and replace
Spray pressure will not regulate	Blocked filter	Clean
	Tips too big	Check/change tips
	Butterfly valve not revolving	Check/lubricate
	9 kph switch turned on	Turn off
Chemical in pneumatic panel	Leaking boom valve	Repair or replace
Fine foam in tank	Air leak in suction side	Locate and repair
Coarse foam in tank	Too much agitation during filling	Reduce agitation
Streaks in spray fan or cones	Partially blocked or worn nozzles	Check/clean/replace
Narrow spray fans or cones	Pressure too low	Increase pressure
Hydraulics will not function	Low air pressure	Check air system for leaks
	Low oil level	Replenish
	Dirty hydraulic filter	Change filter
	Pressure relief valve stuck open	Consult SAM Ltd
Booms will not fold	Dirt in regulators	Clean and re-adjust
Speed/area inaccurate		See operating instructions
Filtration fan will not operate	Tripped out	Check trip
Fluctuating speed / pressure (SAC II)	Wheel magnets	Check magnets

SPARES LIST



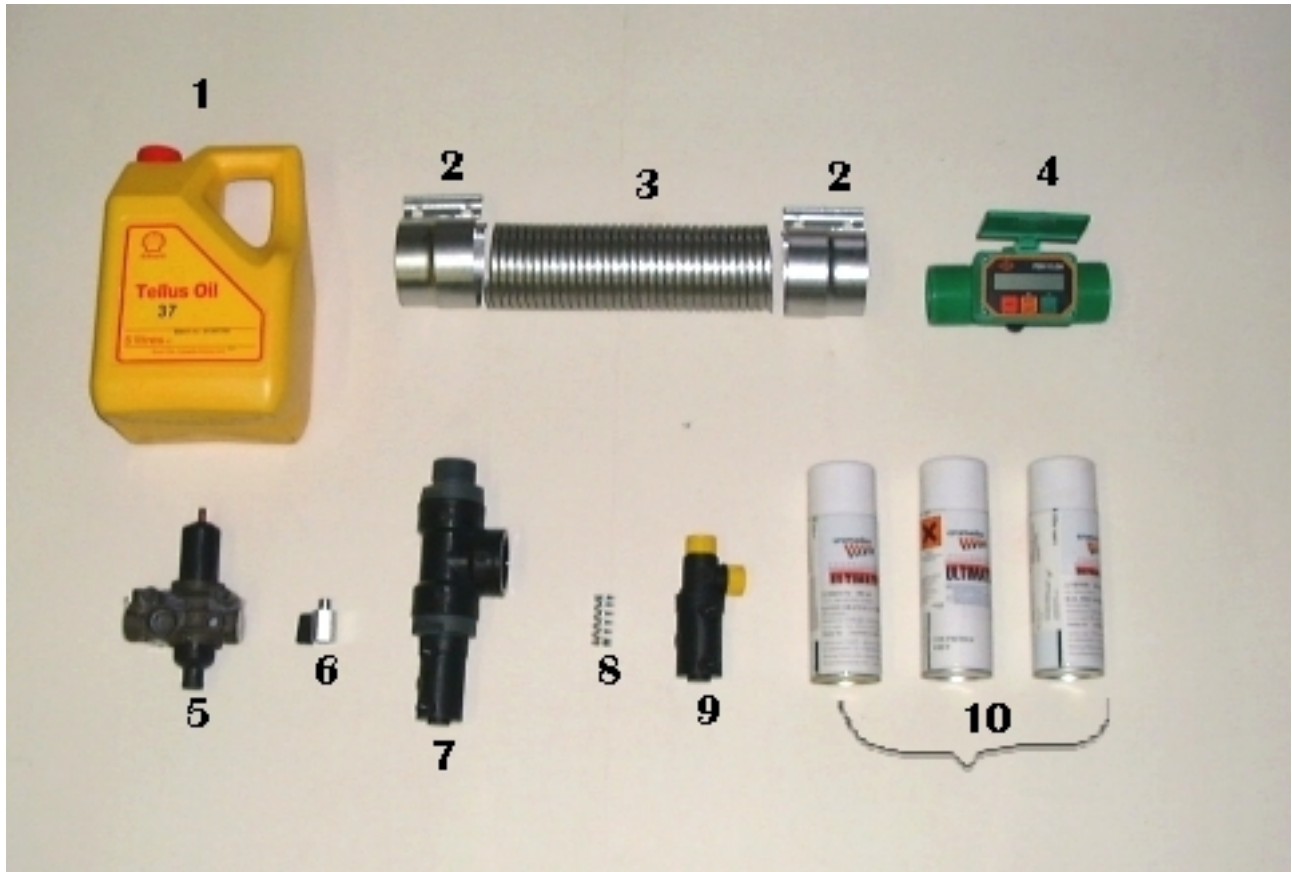
	Description	Part Number
1	Element Main Filter (White)	49A637BK
2	Main Filter Assembly	48A673BK
3	Element (Fine) Main Filter (Blue)	49A637BL
4	Body, Main Filter	4900A676
5	Element, Pressure Filter (50 Mesh Blue)	21A63150
6	Element, Pressure Filter (80 Mesh Grey)	21A63180
7	Pressure Filter Assembly	20NF62550
8	Self-Fill Pipe Filter complete with Non Return Valve	0825A369
9	End Cap (Snaplock)	02200P20
10	End Cap (Hiplock)	Z00CAP
11	Hosetail Coupling (Hiplock)	200C
12	Hosetail Coupling (Snaplock)	02200C20
13	O-Ring Main Filter	4900A519
14	O-Ring Pressure Filter	21G10090

**SANDS AGRICULTURAL MACHINERY
OPERATING INSTRUCTION MANUAL**



	Description	Part Number
1	Engine Oil Filter	1181749
2	Engine Oil Fuel Filter	1181917
3	Suction Filter (Hydraulic)	1120
4	Return Filter (Hydraulic)	1121
5	Engine Air Filter	1180867
6	Cab Filter	ZF1001

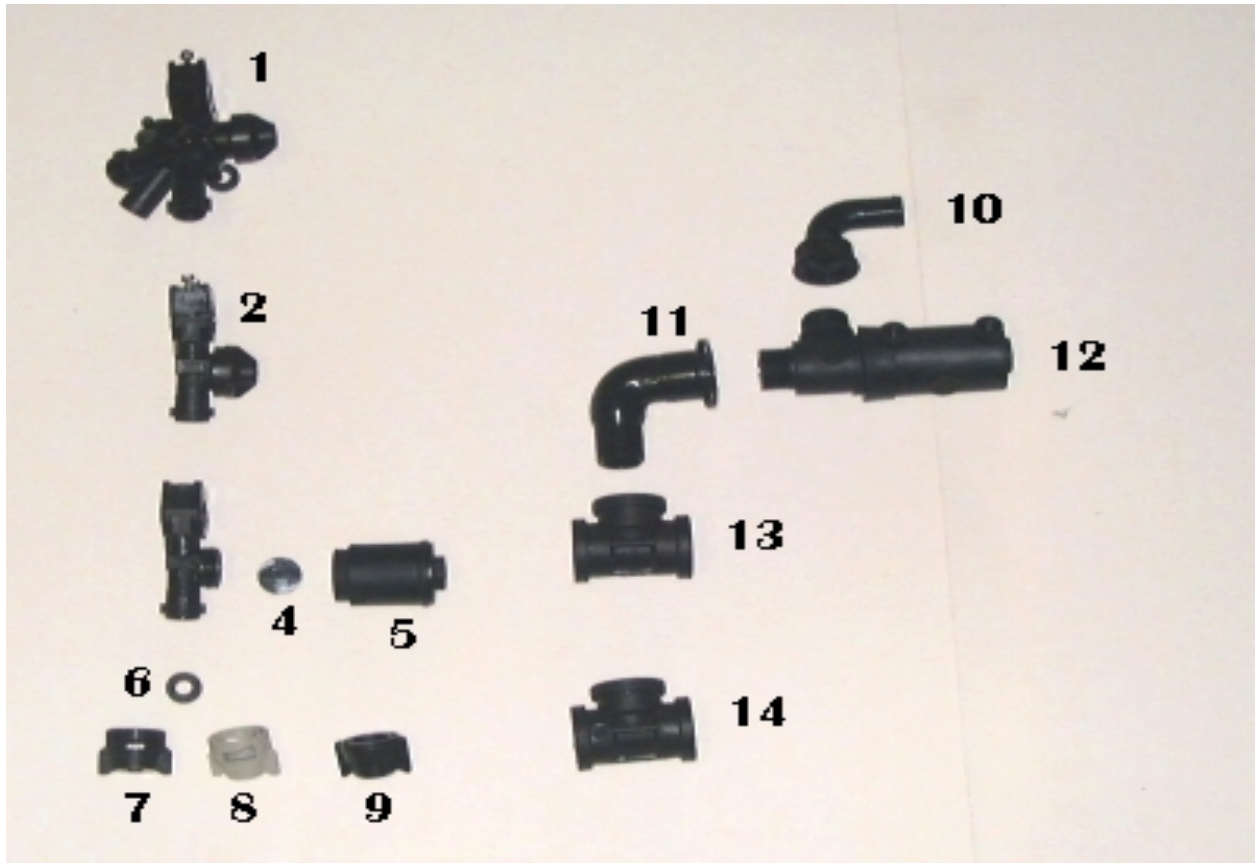
**SANDS AGRICULTURAL MACHINERY
OPERATING INSTRUCTION MANUAL**



	Description	Part Number
1	Air System Oil (5 litre)	1794
2	Exhaust Clamp	61776
3	Exhaust Flexible	61203
4	2" Pony-Flow Meter	200PFLOW
5	Air Tank Unloader Valve	DR3550
6	Air Tank Drain Tap	0491 0413
7	Main On/Off Valve	43SAM112
8	Spring Main Boom On/Off	430Q1107
9	Boom On/Off	43SAM34
10	Touch-up Paint (all colours)	



	Description	Part Number
1	2" Rotary Tap	5WAYSAFI
2	Mixing Bowl "Dumpy" Tap	VSMT200
3	½ 3-way Tap – Mixing Bowl	56003000
4	1" Flow Turbine	S/SNR/FLOW/004
5	Sensor 1" Turbine	S/SR/500-2-005
6	Nozzle Body Diaphragm (pack of 12)	PK-CP21953-EPR
7	2" Hosetail	11132050
8	1" Hosetail	11131025
9	¾" Hosetail	11133420
10	¾" x ½ Hosetail	11133413
11	½ x ¾ Hosetail	11131220
12	½ Hosetail	11131212
13	1 ½ 9° Hosetail	35113640
14	½ M/F 90° Elbow	SL050-90
15	PPS Elbow Hosetail (Blue)	PN16114
16	½ Hosetail Coupling	02050C12
17	½ End Cap	02075P34
18	½ Male Coupling	02050F12
19	3/8 PPS Hosetail	33AF3438



	Description	Part Number
1	½ Triplet Nozzle Body	Z4216-1/2-NYB
	¾ Triplet Nozzle Body	Z4216-3/4-NBY
2	½ Single Nozzle Body	QJ17560-1/2-NYB
	¾ Single Nozzle Body	QJ17560-3/4-NYB
3	Nozzle Body complete with Chem-Saver	QJB395421/21/8NY
4	Diaphragm Chem-Saver	CP4620V1
5	Chem-Saver complete with Diaphragm	B39535-2-1/8
6	Cap Seal	CP19438-EPR
7	ISO Fan Cap	CP25611-1-NY
8	Albuz Fan Cap (Grey)	CP36540-1-NY
9	End Cap – Spray Line	01402909
10	¾ Cap Liner Assembly	35SAM3490
11	¾ M/F 90° Elbow	35SAMA470
12	Boom Section On/Off	43SAM34
13	½ x ½ x ¾ Tee	3500A382
14	¾ Tee	3500A381

