Agribuggy 1000 Sprayer

EC Declaration of conformity

Kellands Agricultural Spraying Supplies
Brimpsfield Road, Birdlip,
Gloucestershire,
GL4 8JH

Type: KELLANDS DEMOUNTABLE SPRAYER

Model.: .....

Serial no.: .....

Month/year of manufacture: .....

This is to certify that the above machine complies with the Supply of Machinery (Safety) Regulations 1992 (S.I. 1992/3073) as amended by (S.I. 1994/2063) and has been self-certified by the above named company.

Signed .....

Date .....

On behalf of Kellands Agricultural Spraying Supplies.

KELLANDS DEMOUNTABLE SPRAYER FOR THE AGRIBUGGY CHASSIS UNIT

OPERATORS INSTRUCTION MANUAL
16 - 24m ALUMINIUM BOOMS

MANUFACTURED BY:

KELLANDS AGRICULTURAL SPRAYING SUPPLIES,
Brimpsfield Road, Birdlip
Gloucestershire. GL4 8JH
Tel. (01452) 863900
Fax: (01452) 863400
E-mail:
stores@kellands.co.uk
workshop@kellands.co.uk
sales@kellands.co.uk
Web: http://www.kellands.co.uk

THIS MANUAL SHOULD BE KEPT WITH THE MACHINE AT ALL TIMES AND SHOULD BE READ BY ALL OPERATORS BEFORE USING THE MACHINE

After reading this manual and becoming acquainted with the Agribuggy tractor unit (see appropriate manual) and the sprayer, it is recommended that you fill the sprayer with clean water only and have a trial run in a grass or stubble field. It is important that you get used to all aspects of operating, calibrating and cleaning out the sprayer before applying chemicals.

August 2005 - Applicable to machines manufactured from January 2004 onwards.

Table of contents

Introduction

The Kellands demountable sprayer has been designed specifically for the Agribuggy range of self-propelled low ground pressure vehicles. The sprayer is built to varying specifications depending on the customer requirements, although the operation is basically the same for all models.

This instruction manual concentrates on the standard sprayer designed for the Agribuggy chassis unit (2004 specification). Information on non-standard booms, sprayer controls etc. are available on request.

The machine identification/serial no. should have been filled in at the front of this manual before you received your new sprayer, if not please fill it in now. It can be found on the spray pump mounting plate. You will find it useful for future reference particularly when ordering spare parts.

Whilst every precaution is taken in selection of materials and components used in the manufacture of their machines to ensure maximum resistance to corrosive and clogging effects, Kellands Agricultural cannot accept liability for any damage to machines of their manufacture, or any possible lack of efficiency, resulting from the improper use of the sprayer or chemicals, or the use of unsuitable spraying materials.

Kellands Agricultural cannot accept any liability for damage to their machines, or third parties, any accident, injury, or any other occurrence resulting from the incorrect use or maintenance of the machine.

Kellands Agricultural reserve the right to alter specifications as and when necessary without prior notice.

Safety precautions.

For your own and, more importantly, other people's safety please read this section carefully and remember the points made.

- Ensure guards are fitted at all times and are properly maintained.
- Stop engine before attaching PTO shaft or making any adjustments.
- Keep all nuts and bolts tight.
- Always read instructions on chemical containers - if protective clothing is recommended : USE IT.
- Do not, at any time, leave the sprayer unattended whilst it is being filled with water or chemical.
- Ensure the sprayer is thoroughly decontaminated and/or use any necessary protective clothing necessary when making adjustments or carrying out any repairs to the sprayer.
- Do not carry contaminated clothing or spare parts in the cab.
- Only use clean mains water to fill the hand wash tanks.
- Keep clear of overhead power cables when folding and unfolding booms.
- Ensure area is clear and level before folding/unfolding booms.
- Ensure precautions are taken to avoid damage to the sprayer in frosty weather.
- Never allow children to play near the sprayer.
- Adhere to the code of practice for the use of pesticides at all times.
- Keep both the inside and the outside of the sprayer clean.
- **Please remember common sense is the greatest safety factor with any machine.**

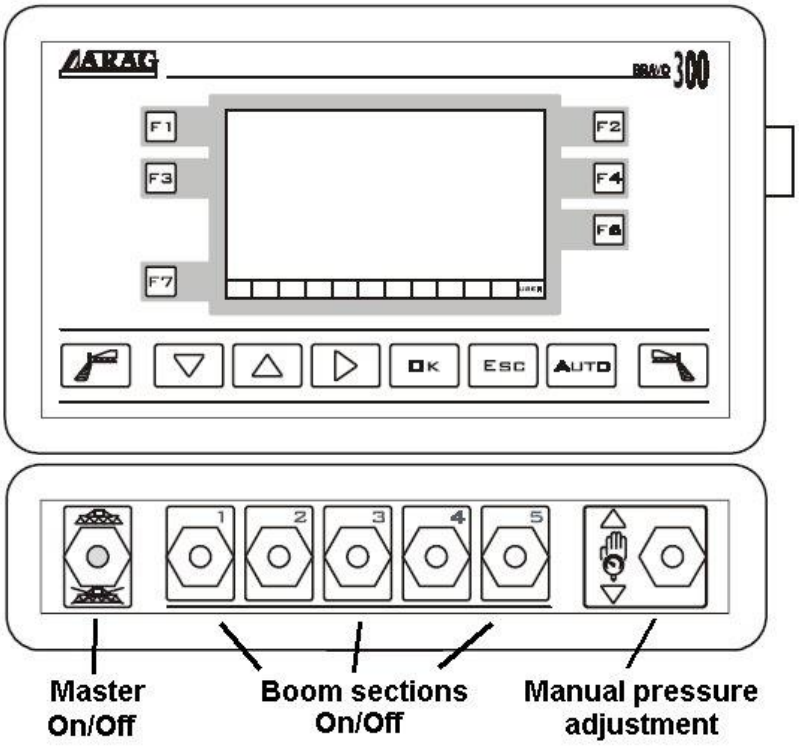
If our service engineers are called out to work on the machine, or if the machine has to be returned to our works for repair, it must be thoroughly decontaminated and cleaned both internally and externally, removing all chemical residues to enable the work to be carried out safely and effectively. If the machine is not clean, we reserve the right to either refuse to carry out the work or to charge for any necessary cleaning.

Environmental considerations.

- Do not fill the sprayer directly from open waters.
- Ensure a non-return valve is always fitted on the end of any self-fill hose.
- When filling from a mains supply, the filling hose should never touch the level of fluid in the tank, i.e. only use water in free fall. This ensures that pollution of the mains cannot occur due to a cut-off of mains flow or sudden pressure drop.
- Always store empty pesticide containers in a secure empty container pound, do not leave them lying around where children and animals can access them.
- Always read the "instructions for use" supplied with the chemicals and follow the recommendations given.
- Check that you have the right chemical for the field you will be spraying.
- Make sure that the crop or pest is at the right stage for best results.
- Check that filters are suitable for use with the chemical to be sprayed.
- Do not spray in windy weather.
- Do not spray if any wind is blowing towards:-
    - Grazing livestock
    - Regularly used pastures
    - Susceptible crops
    - Gardens or orchards and hedgerows
    - Lakes or ponds
    - Occupied premises
- Check that beekeepers have been warned.
- Never blow or suck a blocked nozzle to clear it. Always carry spares and replace blocked jets immediately. Clear blocked jets later with an air line after thoroughly washing them.
- Read all operator's and instruction manuals.
- Before carrying out any spraying operations you should be sure that you are adequately trained and aware of the following relevant Acts of Parliament and legislation controlling the use of pesticides on farms:

The Control of Pollution Act, The Health and Safety at Work Act, the Poisonous Substances in Agriculture Regulations, The Food and Environment Protection Act, The code of Practice for the Use of Pesticides on Farms and Holdings 1990 and The Control of substances Hazardous to Health Regulations.

Cab controls



Master on/off

The main sprayer on/off switch is situated in the lower left corner of the sprayer control panel (see above). Push the switch up to start spraying and down to stop spraying. This switch is connected to Arag area meter to stop area being accumulated whilst turning on headland. It is also connected to the four wheel steering system (if fitted) and (if selected) automatically activates four wheel steer when spray lines are switched off, e.g. when turning.

Pressure control

The spraying pressure is normally altered from the Arag sprayer controller (see seperate manual) but can also be altered with the manual switch when the controller is set in “manual mode” The pressure can be monitored with the pressure gauge mounted in front of the cab windscreen.

Boom section controls

The sprayer may be fitted with up to 5 boom sections. To stop an individual boom section spraying push the appropriate switch to off and to start it again push the switch to on. The master on/off switch will override all the boom section controls.

The boom section switches are connected to the Arag area meter for more accurate area recording through the "Area Compensation Interface" (see Arag unit manual).

Bout marker control

If a factory fitted bout marker is fitted, it is operated by the push button switches on the Arag sprayer control panel. Depress the button on the left to activate the left hand side, and on the right for the right hand side. Warning lights on the panel indicate which side is in use. (See Arag manual for full instructions).

PTO controls

Please see tractor unit manual for details on the PTO system.

NB. It is recommended that the PTO be run at as low a speed as possible with sprayers that are fitted with high capacity pumps. i.e. 350 rpm for 5/6 cyl pumps & 400 rpm for 4cyl pumps (see tractor manual for more detail). However, please ensure that you have enough liquid flow for agitation with the pump running at your selected speed.

Tank lids & drain

Spray tank

Tank lid

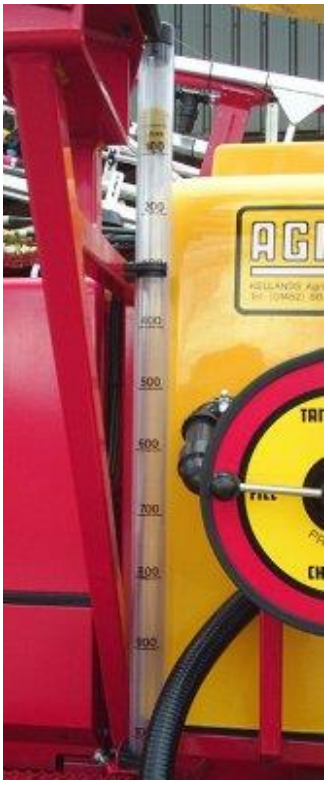
The tank lid is a screw on type and can be opened by turning anti-clockwise.

Tank drain

The spray tank is fitted with a remote drain tap mounted on top of the spray tank. Turn the tap anti-clockwise to drain.
Please remember to take into consideration any environmental regulations before draining the tank.
Ensure the drain tap is closed before filling the tank.

Tank sight guage

A sight level guage is fitted to the front near side of the spray tank. It is important that the machine is on level ground for it to read accurately. Even a slight slope can cause inaccuracies.



Tank sight guage

Main control valves

The main sprayer control valves are situated on the nearside of the machine above the chemical inductor.

Suction control valve

This valve controls the suction side of the pump and selects where the liquid is drawn from - i.e. the main spray tank, the clean water wash tank or the water self fill connector.

Pressure control valve

This valve directs the pressure flow to either the spray controls for normal spraying, the chemical inductor, the tank washing nozzles or directly into the spray tank for quick filling.

Water filling

To fill the sprayer using the self fill hose proceed as follows:

Connect the self-fill hose to the quick release coupler on the bottom of the suction control valve. Always use the hose supplied with the sprayer or one fitted with a non-return valve. **Do not fill the sprayer from open waters.**

Ensure the master sprayer control switch is in the **off** position, engage the pto and turn the pressure and suction valves to the **fill** positions as shown below.

When the desired quantity of liquid has been drawn into the spray tank turn the valves back to the **spray/circulate** positions before stopping the PTO to avoid any liquid running back down the hose. The hose should then be withdrawn from the water source and disconnected.

Main valve positions for water self-filling

Spray/Circulate

After filling the valves should be moved to the positions as shown below. This is the normal position for circulating and spraying.

Valve positions for spraying/circulating

Chemical inductor

The chemical inductor hopper is fitted to the nearside of the spray tank. It works on the venturi principle, i.e. a high pressure flow from the pump passes through a Venturi tube underneath the hopper. This creates a drop in pressure as the flow passes into the larger bore outlet hose. This in turn "sucks" the contents out of the hopper and "blows" it straight through the outlet hose into the tank.

The advantage of this system is that no neat chemical has to pass through the pump and the "sucking" and "blowing" effect mixes and disperses liquid and powdered chemicals in the spray tank without pre-mixing.

The hopper is fitted to a bracket that can be raised and lowered by pressing the catch shown below. This is particularly useful when the machine is fitted with high clearance wheels.

A container flushing nozzle is also built into the hopper which can be used to flush out empty chemical containers with the washings going straight into the hopper.

The chemical inductor can be used with the suction valve in any position but the pressure valve must be in the **Chemical fill** position. The most common position for the suction valve is for it to be used in the water self-fill position (see diagram below) - This is the best time to add chemicals to the tank - i.e. when clean water is being drawn in whilst filling.

Normal Valve positions whilst using inductor

Operating the chemical inductor

Raise/lower

To lower the hopper to the working position support the weight using the handle (page13) and then press the release catch with your foot. The hopper can then be lowered to the working position. To raise the hopper lift it using the main handle until the catch clicks into position.

Operation

1. Run the spray pump to at least 320 revs on the PTO and put at least 200 litres of water into the spray tank.
2. Ensure all the taps on the inductor are turned off.
3. Turn the pressure control valve to the **Chemical fill** position and the suction control to the desired position (preferably water self-fill).
4**.** A high pressure mixing nozzle is fitted into the bottom of the hopper and can be used to mix and flush powders down into the venturi. To turn it on, switch the flip valve on the left hand side of the hopper to the on/up position.
5. Pour chemicals or powders into hopper.
6. Turn main suction valve (page 13) on the inductor to the **on** position when the hopper is half-3/4 full. Chemical/powders will then be drawn out of the hopper.
7. To operate the can-wash, lower the empty container over the rotary nozzle inside the hopper and squeeze the trigger valve on the LH side (page 13) . A spray of water will then be directed into the can. For the best cleaning effect, move the can around so the spray reaches all parts of the can.
8. As soon as the hopper is empty, turn the tap under the hopper to the **Off** position. Failure to do so will cause foaming in the spray tank due to the venturi sucking air. This tap may have to be turned on and off several times during the filling and flushing operation or alternatively may be only partially opened to slow down the flow from the hopper.
9. To wash the hopper out close the lid and ensure it is fastened securely, then squeeze the trigger valve to spray water around the inside of the hopper. The action of the rotary nozzle and its cleaning effect can be seen through the transparent window in the top of the hopper.
10. When you have finished, turn all taps on the chemical inductor to the **OFF** position. Turn the main sprayer pressure valve back to either the **spray/fill** or **spray/circulate** position.

Tank washing system

The tank wash system allows the tank and spray lines to be rinsed out and the washings disposed of in the field.

If you are changing chemicals and crops and there is a potential danger of crop damage being caused by the tank not being thoroughly cleaned, it is recommended that a further full wash is carried out with a cleaning agent by conventional methods afterwards.

The clean water tank holds 10% of the main tank volume. To fill the clean water tank, connect a hose to the small valve situated between the main control valves. **Only clean water should be used.**

Recommended washing procedure

The following procedure is recommended to ensure that your crops are not overdosed and you end up with a relatively clean sprayer using the minimum amount of water and, of course, minimising the possibilities of any pollution.

When you spray a field in which you know you are going to use the tankwash afterwards, the area of the field where you intend to spray the washings should be under-dosed by approximately 15%. The area required can be calculated as follows:

½ wash tank volume ÷ Application rate (l/ha) e.g. 75 ÷ 200 l/ha = 0.375 hectares.

The easiest way to achieve this to increase your speed by 15%. e.g. from 10 to 11.5 kph. Choose a smooth area of the field and before setting off reset the trip area meter on the RDS. You can then simply watch the area meter until you have covered the required area and then slow down again. If you have a variable speed PTO you will need to set it in constant mode. If you have an automatic rate controller you will need to alter either the application rate programmed into the unit or switch it into manual mode.

Washing the tank

1. As you finish spraying, empty the tank of as much chemical as possible and switch off.

2. Turn the main sprayer pressure control valve to the **Tank wash** position and the main suction valve to the **Rinse** position. (see below)

Valve positions for tank washing

3) Clean water will then be drawn out of the tank and will be pumped through the rotary flushing nozzles in the tank.

Engine tickover speed is all that is required to operate the rotary nozzles for a good cleaning action. High engine/pto speeds may damage the rotary heads.

For the best cleaning effect it is recommended that the tank and lines be flushed through twice, so only draw half of the clean water out of the tank for now.

4) Whilst the water is being drawn out of the clean water tank, turn the main pressure valve to the **chemical fill** position for a few moments to flush clean water through the chemical inductor. Also operate the other valves on the inductor to flush through all the other pipes and then turn the main pressure valve back to the **tank wash** position.

5) When you have drawn the required amount of water out of the clean water tank, turn the suction valve back to the **spray/circ** position, and the pressure valve back to the spray/circulation position.

6) Turn all the boom switches off and the master sprayer switch on for a few moments - this will flush out the return pipes back to the tank. Turn the master switch off and the boom switches back on again.

7)You can then proceed to spray the washings out on to the under-dosed area of the field.

8) When you have finished, the whole procedure should be repeated with the second half of the clean water.

Agitator

A booster agitator is fitted inside the spray tank for extra agitation if required. It is recommended that it be used when spraying chemicals that are held in suspension or are prone to settling out. It is operated by flipping the valve behind the spray tank down as shown in the picture below.

Quick fill (Optional)

A quick-fill system is fitted to allow filling from an external, high capacity pumped bowser system.

The camlock connecter on the main suction valve is used for both suction and pressure filling. A drop pipe is fitted into the tank so liquid is pumped in below the liquid level to avoid foaming.

Clean water pumped in can also be circulated through the chemical inductor giving clean water for can washing.

The suction valve **must** be turned to the fill position **before** pumping starts.

Purge system (optional)

The purge system is fitted to allow air and clean water to be purged from the boom spray lines and to fill them with fresh chemical ready for spraying. It is only necessary to use it when starting from scratch and when changing chemical.

Separate operating instructions are available at the rear of this manual if you have this system fitted.

Wash lance / hose reel (Optional)

The sprayer may be fitted with a hand washing lance for cleaning booms off in the field or designated washing area. Please consult the appropriate regulations before using the washing system.

The hose reel and control valve are situated on the off side of the sprayer. The lance is fitted with a trigger mechanism.

To wash the outside of the machine off with clean water proceed as follows:

a) Set engine on a fast tickover with the spray pump running at 200-250rpm.

b) Set main pressure valve to **Spray/circulate.**

c) Set main suction valve to **Rinse.**

d) Switch all boom sections **OFF**

e) Switch master spray control to **ON**

f) Increase spraying pressure to 5bar

d) Allow a few seconds for the clean water to circulate through the pump and then turn the lance control valve to the **On** position.

e) Wash the boom/machine as required and then return the valves and switches to their normal spray positions.

The hose reel and lance

Boom balance return valves

Whilst spraying if a boom section is switched off the flow of liquid is returned to the tank through its respective balanced return valve. When correctly set these valves ensure that the spraying pressure remains constant no matter how many sections are turned on or off.

They have no effect whatsoever when all the boom sections are switched on. Each valve only affects the spraying pressure when its respective boom section is switched off.

These valves should be re-set whenever you change jets although if you are only changing to a jet one size up or one size down you are unlikely to see a significant fluctuation in the spraying pressure. However, if you are changing from a very small jet to a very large jet and you do not adjust the balanced returns, you will see a marked increase in the spraying pressure when you switch a boom section off.

It is extremely important to ensure that these valves are set accurately if your sprayer is fitted with a flow based automatic controller such as the RDS Delta 3 or Pro series or the Arag Bravo 300. If they are not then the actual application rate can vary from the target and indicated rate by a significant amount when you are spraying with one or more sections switched off.

Arag boom valves

Balanced return adjusters

Setting up

NB The balanced return valves are not normally pre-set because of the varying flow rates of the many different nozzles that are available. You must therefore set them up as follows BEFORE applying chemical**.**

The valves should only be set up when the sprayer is clean and whilst spraying out clean water – You will find it a quick and easy operation if you have someone to help you.

1/ Set the sprayer up for spraying with your selected jets fitted and then switch the sprayer on.

2/ Set the spraying pressure to your target pressure. e.g. 3 bar.

3/ Switch the LH boom section off and watch the pressure gauge to see if the pressure alters.

4/ If the pressure increases, turn the knob on the LH valve anti-clockwise until the pressure drops to the original setting. e.g. 3 bar. If the pressure decreases, turn the knob clockwise until the pressure reaches the original setting. e.g. 3 bar.

5/ Switch the LH boom section back on again - the pressure should remain at the original setting. e.g. 3 bar.

6/ Repeat the above procedure with each boom section in turn until all have been set for the nozzle you are going to use. When you have finished you will find you can have any combination of sections switched on or off and the pressure will remain constant.

Pressure (Safety) relief valve

A pressure regulator is fitted in the control manifold to act purely as a safety relief valve. To set it up proceed as follows:

1) When you have finished calibrating the sprayer and setting it up for spraying with the size of jets that you intend to use, switch the sprayer on (with clean water only) and increase the spraying pressure with the electric pressure control to approx. 2 bar (30 psi) above your target spraying pressure.

2) Assuming that you can achieve this pressure (if you can't see 4 below), unscrew the pressure relief valve until the pressure just, and only just, starts to drop. The "safety" pressure is then set.

3) The pressure can then be reduced again with the electric pressure regulator to your target pressure.

4) If you cannot reach this pressure screw in the pressure relief valve until the pressure increases to your "safety pressure". It is then set and the pressure can be reduced again to your target pressure.

Safety pressure regulator

Calibration

It is outside the scope of this manual to go through the complete nozzle selection procedure. You should have been taught the ins and outs of spray quality, nozzle selection procedures, volumes etc. during your sprayer operators training, however the following notes should serve as a useful reminder.

The recommended procedure for calibrating this, or any other sprayer, is as follows:

1. Read label

Check the label on the chemical pack (or accompanying leaflet) for recommended volume of application and spray quality (nozzle type and operating pressure). Decide on application rate.

2. Calibrate speed

The Agribuggy chassis unit is fitted with an electronic speed meter, however, this will only be accurate if the information programmed into it is correct. Please see the chassis unit manual for the correct calibration procedure.

The following procedure should be used to double check the accuracy of the instrument.

a. Carry out a trial run to establish a forward speed which gives an acceptable level of boom stability and an appropriate gear and engine speed for the ground and crop conditions.

b. Carry out a check over a marked distance of 100 metres, using the speed decided above. Measure the time taken, in seconds, to cover this distance.

c. Establish the actual forward speed from the formula: **360 ÷ Time in seconds = speed in km/h**

d. Adjust engine speed and repeat check to get required forward speed.

3. Calculate Nozzle output

a. Measure and record the nozzle spacing. Kelland sprayers normally have a spacing of 0.5 metres.

b. Calculate and record the output per nozzle required to achieve the intended volume of application using the following formula:

Application volume (l/ha) X Speed (km/hr) X Nozzle spacing (m) ÷ 600 = Nozzle output (l/min)

4. Select and fit nozzles

Refer to nozzle manufacturer's data charts or cards, or to MAFF lists, and select type and size of nozzle that will provide the calculated nozzle output and the spray quality required. Record the recommended spraying pressure for the required output.

5. Check nozzles

a. Fill sprayer with CLEAN water, start spraying and set pressure to the pressure decided above.

b. Check spray patterns and alignment visually. Replace any faulty nozzles and re-check.

c. Compare the output of individual nozzles by use of either a nozzle flow meter or a calibrated recording jug. Replace nozzles with more than a ± 5% variation from the average.

6. Calibrate sprayer

a. Using a calibrated jug, measure the output from at least four nozzles or at least one nozzle from each boom section, and compare with the calculated nozzle output.

b. If the output differs by a small amount from the calculated output, alter the pressure accordingly and repeat the calibration until you have established the correct pressure for the required application rate.

c. If the output differs by a large amount, re-check calibration and calculations and change the nozzle size and/or forward speed if necessary.

Field operation.

The Agribuggy chassis unit is capable of working at speeds in excess of 16 km/h, however, these sorts of speeds are very rarely suitable for crop spraying operations. Speeds considerably higher than those used for conventional tractor spraying can normally be used however, due to the excellent boom stability of the Kellands sprayer. For most spraying operations you should be able to spray at between 10 and 12 km/hr. When deciding working speeds, the following factors must be taken into consideration:

a) Size, shape, contours of field and obstacles - can you maintain your target speed?

b) Ground conditions - if the whole field is wet or there are wet patches - again, can you maintain your target speed? - you may have to consider taking smaller tank loads if conditions are bad.

c) Application volume / spray quality - make sure you can get the required spray quality if you are using large jets and a high speed to get your required application rate.

d) Spray drift - Ensure that you don't use too high a pressure with an undersized nozzle to get your required application rate at a high speed.

e) Target - don't forget the whole object of the crop spraying operation is to hit the target weed or crop with the chemical. If the crop is dense and the target is weeds in the bottom of the crop, then don't go too fast or the spray will not penetrate.

f) Boom stability - It is most important that the boom is stable whilst spraying. A boom that is bouncing or yawing will cause uneven application, particularly at the boom tips. This will be more noticeable with booms over 12 metres wide.

When you have decided your working speed, have calibrated the sprayer and have become fully acquainted with the operation of the chassis unit and the sprayer, it is recommended that you practice in a suitable field with clean water only. This is particularly important if you have not driven a self-propelled sprayer before - there are an awful lot of new things to get used to!

When spraying at relatively high speeds, it is very important that your working speed is maintained to avoid under or over dosing. It is important that two bouts are sprayed around the headland when using a 12 metre boom to give yourself plenty of time to turn the sprayer on and off. Maintain your working speed as you travel on to the headland and turn the sprayer off before you start turning. After turning, straighten up and accelerate to your target speed before switching on again. **If you turn whilst spraying you will get considerable overdosing at the outside of the inner boom.**

For the same reasons always reverse into corners and accelerate as quickly as possible as you switch the sprayer on - the motorised valves fitted on the sprayer tend to be a little slow building up to full pressure which, of course, is a definite advantage in this situation.

If the sprayer is fitted with an automatic spray rate controller (RDS Delta 3/4 or Pro Series) it is still important to keep as near to your target speed as possible or the spray quality will vary considerably.

When spraying potatoes and other dense crops with row crops fitted, always try to travel in the same direction each time you spray the field. The tops will then tend to grow in that direction with very little damage caused. If you change direction each time, you will find the tops are dragged back the other way, causing considerably more damage.

Folding/unfolding booms

The machine must be stationary when folding and unfolding booms and should be parked on as level ground as possible.

Ensure you are well clear of any obstacles especially overhead power cables.

Spool controls

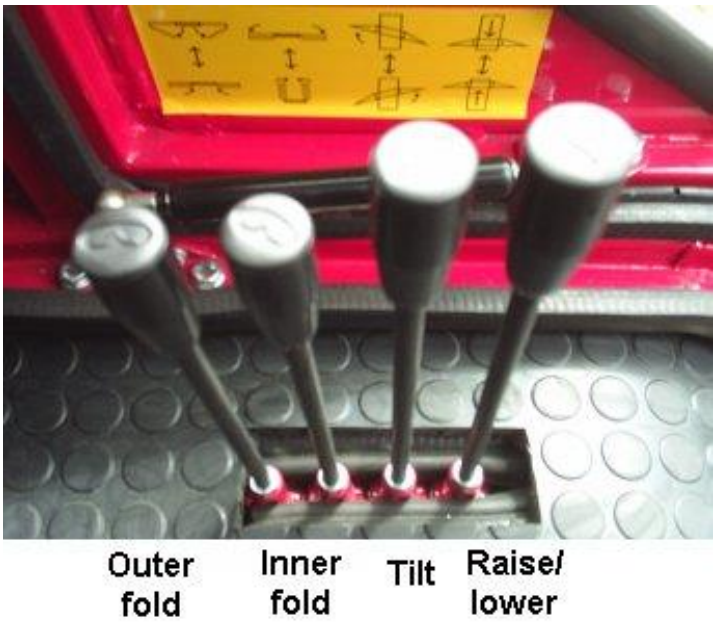
Agribuggy

The manual hydraulic spool valve controls on the Agribuggy are positioned to the left hand side of the driver's seat.

It should only normally be necessary to run the engine at tick-over to open and close the booms.

The decal to show the operation of the boom controls is positioned in front of the levers.

Manual Spool controls – Agribuggy



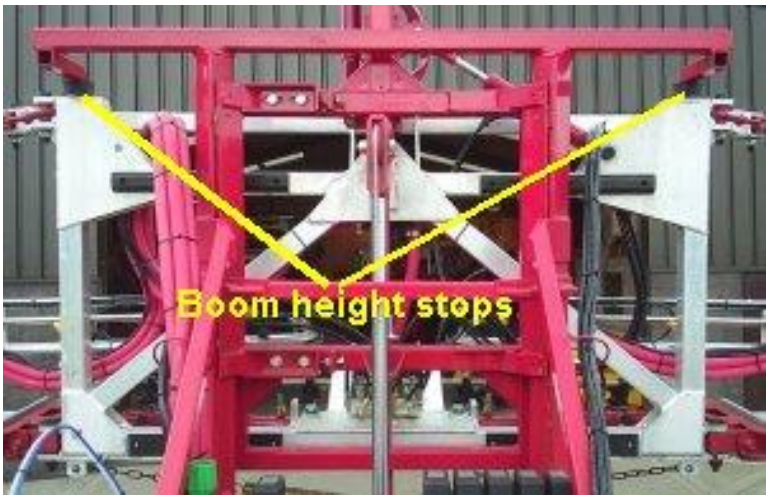
Unfolding

1. Raise the boom to the top of the height mast ensuring that the centre section hits both the rubber stops.

2. Open the boom out to 12 metres "first fold".

3. Open boom out to full width "second fold" (if required).

4. Lower boom to working height.



Folding

1. Make sure you are parked on level ground and are well clear of obstacles and overhead power cables.

2. Using the hydraulic tilt ram ensure that the boom is level.

3. Raise the boom to the top of the height mast ensuring that the centre section hits both rubber stops (Top right).

4. Fold outer sections in to 12 metres.

5. Fold inner sections in until boom touches the vertical plates on the front boom rests.

6. Lower boom down into boom rests ensuring the pressure is off the hydraulics and the boom is seated into the rear rests.

Front boom rest

Hydraulic break-back (optional)

On some variants the second fold rams may have a hydraulic break-back incorporated as a safety precaution. This is used when the boom tips (and also the normal break-back) have been removed from the 24m boom for spraying at 20m.

If the end of the boom hits an obstacle oil will be forced out of the ram and back to the hydraulic tank through a safety relief valve. The hydraulic pressure will be lost out of the second fold rams and it will be necessary to re-pressurise them by activating the outer section spool lever before continuing.

Whilst the boom is being used at 24m the break-back system should be switched off or un-coupled.

Rear boom rest

Maintenance

Aluminium boom suspension system

It is essential the the aluminium boom be checked for wear, adjustments made and lubrication carried out on a regular basis. Failure to do so will lead to the suspension system becoming ineffective which will in turn lead to boom fatigue, cracking, eventual failure and very expensive repairs or replacements. A correctly maintained boom will last the life of the machine.

Lubrication

Height mast

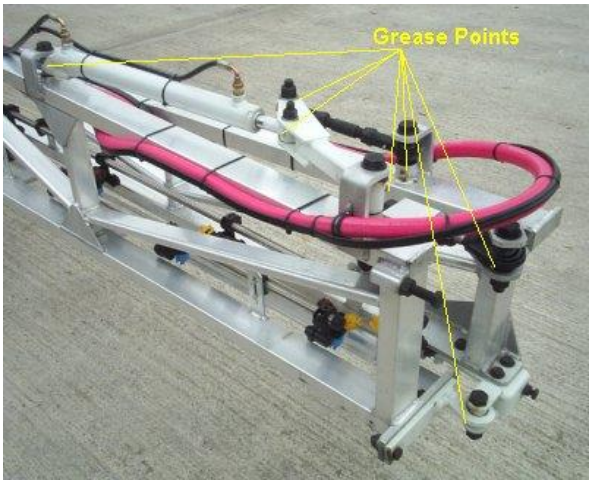
The height mast / sliding frame should be kept well coated in oil or grease. If the mast dries up you may experience difficulty in raising and lowering the booms when they are in the folded position. The mast may need lubricating daily if you are opening and closing the booms a lot, especially if the weather is hot and you are working in dusty conditions. The mast should be degreased periodically, particularly after working in dusty conditions, and relubricated.

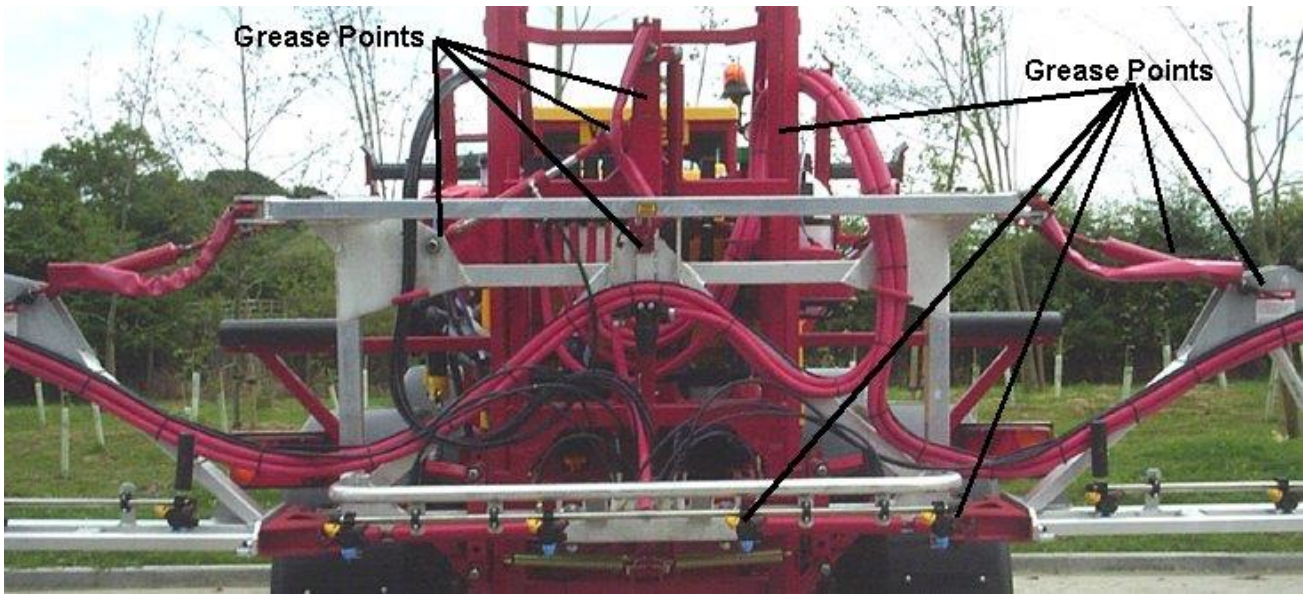
Grease nipples

The boom is fitted with grease nipples on the majority of the pivot points. These should be greased at least once a week. Any pivot points that are not fitted with grease nipples should be oiled generously.

It is particularly important to keep the main boom suspension unit well lubricated to ensure that the suspension system works freely.

There is also a grease nipple on each yoke of the PTO shaft (if fitted) and a grease point on each end of the PTO shaft guard - again grease weekly.





Boom lubrication points

Boom adjustments

Various areas of the boom may need adjusting from time to time as wear naturally takes place. It is important to keep the boom adjusted correctly to get the best life and performance from it.

You should also thoroughly inspect the boom from time to time for any signs of fatigue or cracking. It is much easier to repair a cracked boom than a broken one.

Height mast / slide frame

It is important that movement between the sliding frame and the height mast should be kept to a minimum. If the movement becomes too great the booms will not clear the front supports by an adequate margin when you are folding them in.

There are nylon wear pads in between the height mast and slide frame, 4 at each side.

Check that these are O.K. then adjust the slide frame with the two adjustable slides fitted to the offside of the frame, one at the top and one at the bottom (see right).

Top slide frame adjusting bracket

Adjust as follows:

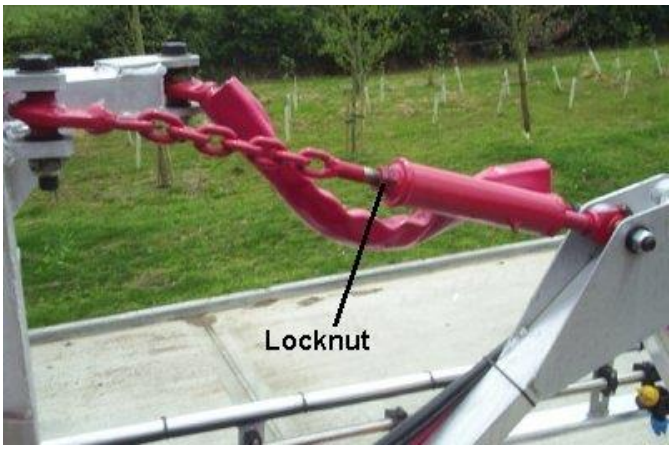
1) Slacken off the two set studs securing the top bracket to the frame.
2) Slacken off the locknut on the adjusting bolt.
3) Turn the adjusting bolt to push the slide bracket up to the height mast - do not over tighten.
4) Tighten the two securing studs and the adjuster bolt locknut.
5) Repeat with the lower bracket.
6) With the booms open lift the boom up and down to check that the carriage does not bind. If it does slacken the slides off slightly and try again.

Boom dampers.

The main boom sections are suspended on damper units to absorb shock loads. After initial use and from time to time afterwards the booms may start to sag.

If so slacken off the locknut (see right) and turn the damper to shorten the overall assembly length. When set at the required level remember to tighten the locknut.

These dampers should be checked regularly to ensure that they are working correctly by "bouncing" the boom up and down by hand and checking that the suspension action is still working. If it is not then the shock loads will be carried down the boom resulting in the booms cracking. Replacement units are available from your dealer or Kellands Agricultural.



Boom damper

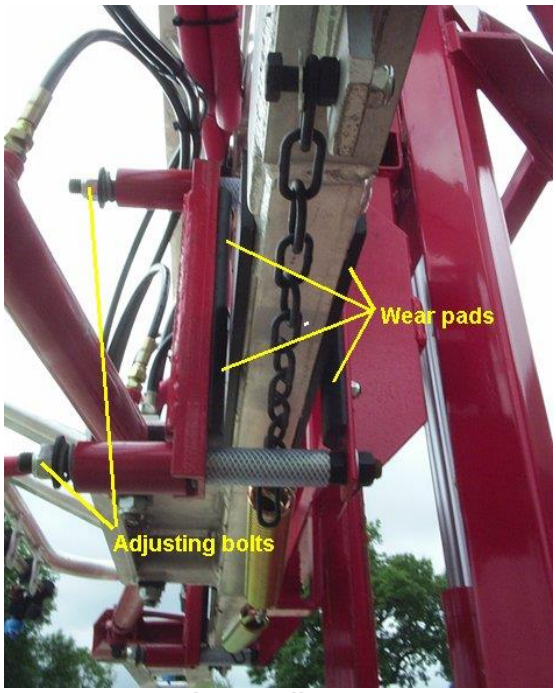
Anti-yaw adjustment

The boom is fitted with an anti-yaw device to damp out any yawing movements of the boom. As the nylon wear plates begin to wear the play will increase.

You will find that the booms will not clear the front supports by an adequate margin when you are folding the booms if the play becomes too great.

The gap between the spring cover tube and the rear wear plate should not exceed 30mm. It should be checked with the boom open and it can be adjusted by tightening the two nuts indicated.

Ensure that the top and bottom bolts are adjusted evenly.



Anti-yaw adjustment

Wear pads

There are two sets of wear pads fitted to the boom and anti-yaw plates. These should be kept lightly lubricated and should be regularly inspected for wear and replaced when necessary. If they get badly worn they will stop the boom suspension system working and will cause boom problems as previously discussed.

Boom folding

Folding chains

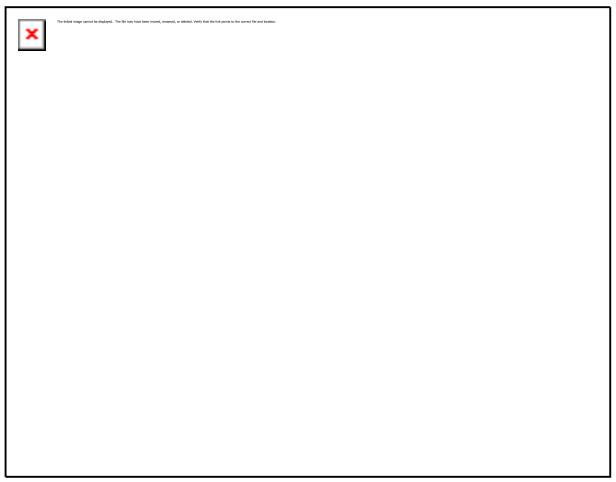
As the booms fold inwards the weight is taken on the folding chains instead of the dampers. The length of these chains should not be adjusted unless absolutely necessary. They should always be slack when the boom is fully down in its rests in the transport position.

If you do not have adequate clearance between the booms and the front supports when folding the booms, ensure that the sliding frame and the anti-yaw device are both adjusted correctly first before touching the folding chains. If you do find it necessary to shorten these chains it is imperative that they are not over-shortened. Doing so will reduce the amount of weight carried on the front supports in the transport position and increase the pressure on the aluminium centre section. This, over the long term, will lead to fatigue and possible boom failure.

Main fold rams

The main boom fold rams should be adjusted so that the booms just touch the front inner boom support plates when the booms are in the fully closed position. If the booms are forced too hard against these plates when you fold the booms, damage will eventually be caused.

If adjustment is necessary slacken off the locknut shown on the right and turn the ram rod with a suitable spanner. Remember to re-tighten the locknut when correctly set.



Outer fold rams

The second fold rams are part of a complex folding mechanism, and should only be adjusted by a suitably qualified person.

Outer fold ram speed adjustment

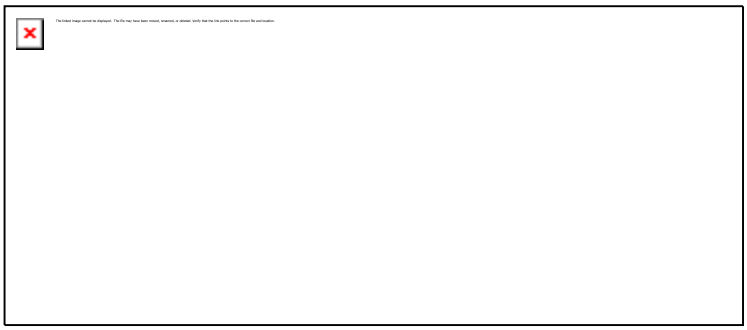
The outer fold rams are fitted with adjustable cushioning devices. At each end of the travel of the ram the in-built cushions slow the folding down to stop the boom slamming against the stops.

These are normally factory pre-set but the adjustment is quite fine and they may go out of adjustment after a little while.

If the speed of folding at the end of the stroke is too fast or too slow it can be adjusted by one of two adjusters as shown on the picture below

The adjuster on the inner end of the ram (A) adjusts the speed as the boom is folding out to its fully open position. It has no effect on the speed of the ram as it folds in.

The adjuster on the outer end of the ram (B) adjusts the speed as the boom is folded in on to its rests. It has no effect on the speed of the booms as they fold out.



Outer boom fold ram cushioning adjusters

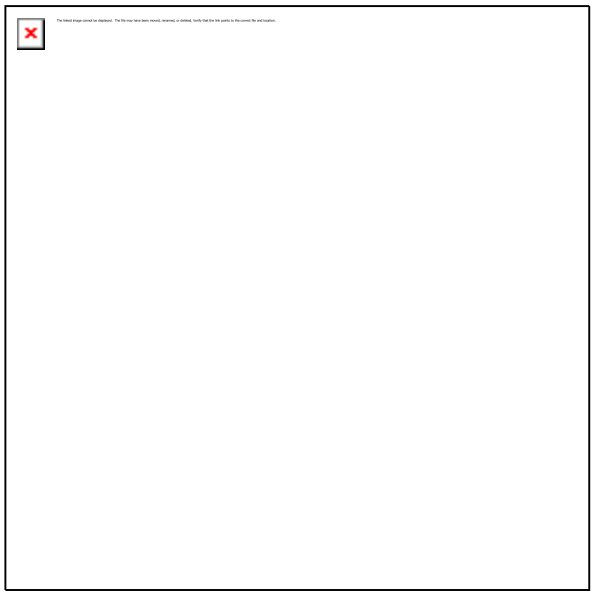
To adjust the speed/cushioning effect insert an allen key into the appropriate grub screw and hold it still. Slacken off the locknut and move the allen key 1/8th of a turn - clockwise to slow down, anticlockwise to speed up. Hold it still again whilst you tighten the locknut. Then try the boom folding - if it is not right repeat above procedure until it is.

Do not speed the boom folding up faster than the original factory settings or serious boom damage can result.

Main lift ram

The main lift ram relies on a wire rope to lift the boom. After a while this may stretch and the back frame will not travel all the way to the top of the height mast.

It is easily adjusted by shortening the threaded eye bolt shown on the right.



Main lift ram cable adjuster

Maintenance and technical information.

The life of your sprayer will depend on the care it receives throughout its life. It is the operator's responsibility to ensure that the machine is not only correctly operated, but also to ensure that any maintenance operations outlined in this manual are carried out. Please remember that you are obliged to keep your sprayer in top working condition under the various acts and codes of practice mentioned previously. If you are unsure of how to carry out any of the maintenance or repair operations, please do not hesitate to enlist the help of Kellands Agricultural.

Cleaning

The sprayer should always be kept clean and **MUST be washed out daily** even if you are using the same chemical the next day.

DO NOT leave chemicals in the tank overnight if you can possibly avoid it.

If your sprayer does not have the tank wash system fitted, particular care must be taken in washing the inside of the top of the tank using a hosepipe and brush if necessary.

To get rid of any remaining traces of chemical in the sprayer it is generally better to wash it through several times with relatively small amounts of water i.e. 100-200 litres than it is just to spray one large amount through.

For a thorough wash out, firstly add about 200 litres of clean water to the sprayer and circulate it whilst washing the inside of the tank with a hose. Then spray the water out through the spray lines and finally drain out the tank.

During the washing process direct the water through the chemical inductor for a while and operate the flush ring, can-wash and flushing hose. Also turn the booster agitator on for a while, if you have not been using it, checking that the nozzles in the tank are not blocked. Whilst spraying the water out of the tank turn the boom section switches off for a few moments to flush out the balanced return pipes back to the tank. **It is important that all the hoses on the sprayer are flushed through during the cleaning process.**

After the initial flush out repeat the process adding some cleaning agent to the water and, when you have finished, give it a final rinse through with clean water again. Leave the pump running for a while with the tank drain open each time to empty as much water as possible out of the system. You cannot hurt the spray pump by running it dry.

If you have been spraying with a particularly "potent" or concentrated chemical circulate a detergent mix through the sprayer and spray lines and leave to stand overnight. Before commencing spraying circulate the mix again, spray it out and then flush through twice more with clean water remembering to ensure that all the hoses are flushed through as above.

The outside of the sprayer should also be cleaned down immediately after use.

Please remember to follow the Code of Practice etc. when washing the sprayer out and disposing of tank washings.

When you have finished, remove all the filters and nozzles from the sprayer and check them for cleanliness. Clean them off with brush in a bucket of water if necessary and then replace.

Frost protection

It is most important that all the components on the sprayer are protected from damage caused by frost.

It is extremely difficult with today's modern sprayers and complicated plumbing systems to drain every last drop of water from the sprayer without disconnecting a number of hoses. For this reason the most practical method of frost protection, assuming you cannot store the sprayer in a frost protected building, is to use motor vehicle anti-freeze.

1) Wash out the sprayer thoroughly as on previous page and drain as much water out as possible.

2) Pour 10 litres of antifreeze and 20 litres of water into the tank.

3) Run the pump and circulate the mixture around the system, observing the notes on the previous page about flushing all the hoses through (Inductor, can-wash, agitator etc.).

4) Switch the sprayer on and spray the mix out through the spray lines to protect the filters, spray lines and nozzle bodies.

5) Before using the sprayer again flush the antifreeze out of the system with clean water

Filtration

Efficient filtration is essential for successful crop spraying, especially with increasing use of low-volume application techniques requiring the use of small nozzles.The Kellands sprayer is normally fitted with a three stage filtration system. Firstly there is a high capacity suction filter, followed by a pressure side filter after the pump and finally line filters fitted on the boom - one for each section.

They should all be cleaned out at least once daily and each time you wash out to change chemicals. If you are spraying a particularly "sticky" chemical or wettable powders held in suspension you may have to clean some of the filters out more often. Experience will soon tell you how often to clean them.

Not only is it most important that the filtration system is kept clean and well maintained, but also that the correct size mesh is used in each filter for the different rates of flow and chemical used. Always read the chemical container label for advice on filtration.

Filtration should be applied in three stages starting with a coarse mesh and progressing to finer sizes. In order to maintain efficient filtration without restricting liquid flow the screen area used should be as large as possible.

Recommended mesh sizes

Use the chart below to establish which size element should be fitted in each filter for each different nozzle used. Your nozzle selection chart will show the nozzle output in litres/min for each particular tip. The elements are all colour coded for easy reference.

Nozzle output in litres/min at 3 Bar
(flat fan, standard pressure tips)

0.4 - 0.7

0.8 - 1.3

1.4 - 2.2
(standard for Kellands sprayer)

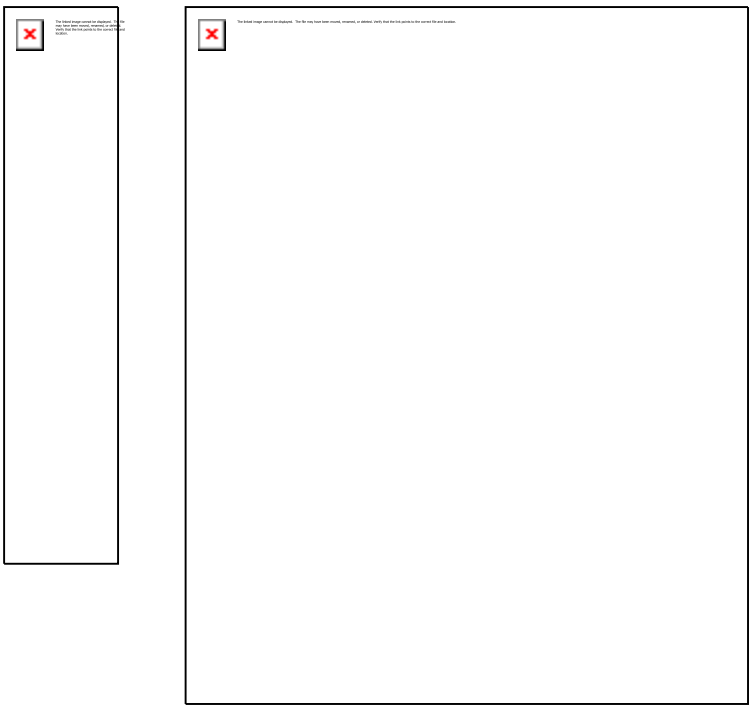
2.3 - 3.3

Over 3.4 litres / min

Main suction filter

The main suction filter is situated alongside the pump on the back of the sprayer.

To remove the filter element firstly turn the yellow cap anti-clockwise on the underside of the filter bowl, unscrew the threaded ring and remove together with the lower bowl . The element can then be removed for cleaning. After cleaning reassemble ensuring the sealing ring is correctly seated. The bowl should not be removed whilst there is chemical in the spray tank.



Main suction filter assembly

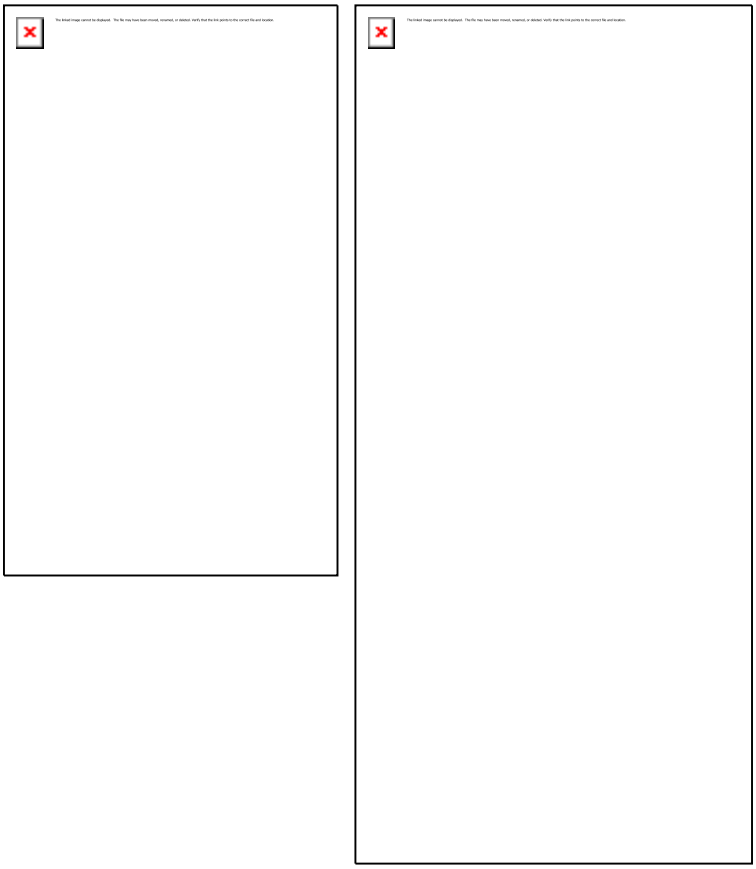
Main pressure filter

The main pressure filter is situated on the back of the sprayer. It is a flushable type of filter which means it can be flushed out at any time without having to remove the bowl. (see right) When spraying some chemicals it may be advisable to flush the filter out every few tank loads.

Dispose of flushings carefully! - Do not flush straight onto the ground other than in designated areas.

The bowl should, however, be removed periodically to inspect the element and to give it a thorough clean. This time period will depend on what type of chemicals you are using - please use your own judgement. It should always be removed when giving the sprayer a thorough wash out.

NB Some plumbing systems are arranged so that the flushing line is returned directly to the spray tank



Main pressure filter assy

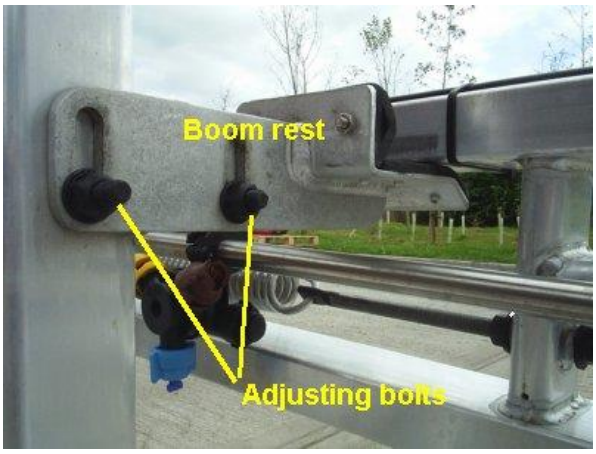
Line filters

The line filters are normally mounted on the spray boom as shown on the right.

If large jets are being used you may find that the line filters are unnecessary. If this is the case the filter element may be removed completely from the filter housing.

To remove the filter simply unscrew the lower bowl and remove the filter element. Ensure the O ring seals are clean and in good order before replacing.

Outer boom rests



The outer boom rests support the outer boom sections whilst transporting and whilst spraying at 12 metres. It is most important that the rest takes the weight of the outer section when it is folded in. When starting off or climbing hills ensure the outer sections do not move back off the rests or serious damage to the outer hinge points may result.

The spray pump

The spray pump fitted to your sprayer is a diaphragm type pump and may be one of several different types and/or sizes, however, the operation and maintenance is the same for all of them.

Pulsation damper

The damper is fitted to smooth out any pulsations in the flow of water away from the pump.

For it to work correctly the air diaphragm should be inflated with a hand or foot pump to approx. one third of your normal spraying pressure.

Spray pump lubrication

The oil level should be kept up to the mark on the transparent bowl on the top of the pump. It should be topped up with a good quality 20W/30 motor oil.

Change the oil every 200 hrs or at the end of the season. There is an oil drain plug located at the base of the pump body. Rotate the pump shaft slowly by hand until the oil stops flowing.

Slowly refill, rotating the shaft by hand again, until the level reaches the mark on the reservoir.

If the oil changes to a milky colour this is a sign of water leaking into the oil through the diaphragms - they should then be checked immediately.

It is good practice to overhaul the pump replacing diaphragms, valves and seals at the end of each season if you spray large acreages.

Hoses

All the hoses on the sprayer should be inspected periodically for any signs of deterioration. Also check for any signs of chafing, particularly around the areas of the height mast where the boom goes up and down.

Damaged or perished pipes should be replaced immediately. The consequences of a high pressure hose bursting can be very serious.

Parts

All replacement parts are available from Kellands Agricultural. Some parts are fairly common and may also be available from other local sources. If you require any parts information please do not hesitate to contact either your dealer or ourselves.

When ordering parts please give us as much information as possible including the following:

The model/build number - this is on a plate on the front offside of the chassis e.g. AG14

The sprayer model and serial number, on a plate next to the sprayer controls.

Arag automatic sprayer controllers

An Arag Bravo automatic sprayer controller may be fitted to your Agribuggy sprayer as standard or optional equipment. If it is, you will find the main operating instructions in an accompanying Arag manual.

Instructions on how to calibrate the tractor unit wheel circumference, the engine tachometer and the PTO tachometer can be found in the tractor unit manual.

The following notes on the Arag automatic controller are specific to the Kelland sprayer and should provide a further useful reference.

Before attempting to use the Arag the safety relief valve pressure must be set to approx. 2 bar (30 psi) above your target pressure. This pressures must be set when the Arag valve is in the fully closed position.

There after the pressure is only normally altered by depressing the + / - buttons on the head unit or by using the manual switch on the control panel.

De-mounting

It is recommended that the optional de-mount legs are used when removing the sprayer from the chassis unit. If you make your own legs ensure that they support the sprayer in such a way that it can't be pushed or blown over when it is removed. Ensure the sprayer is demounted on firm, level ground

If you remove the sprayer from the chassis unit when row crop wheels are fitted it is advisable to lower it down on the jacks, after de-mounting, to the lowest position to make it more stable.

When fitting the de-mount legs ensure that the safety pins are fitted through the holes in the inside end of the legs so that they can't slip out of their locating sockets.

Remove the 4 main mounting bolts and jack up evenly so that each leg is taking an equal amount of weight.

Slacken the chemical inductor mounting bolt, slide the inductor from its mounting socket and slot it in to the socket on the nearside, front demount leg.

Be sure all services have been disconnected and the lowest point on the sprayer is well clear of the chassis before driving away.

The main mounting bolts.

The cone guidance system automatically aligns the demount frame when re-fitting.

Nozzle application rate chart - Standard ISO tips

BPC Spray quality	Fine	Medium	Coarse

ISO Colour /Ref BPC Quality Filter mesh	Pressure bar	Flow L/min	Application Rate Litres/Hectare						
			6 km/h	8 km/h	10 km/h	12 km/h	14 km/h	16 km/h	18 km/h
Orange 01 Fine 100 mesh	2.0	0.33	66	50	40	33	28	25	22
	2.5	0.37	74	56	44	37	32	28	25
	3.0	0.40	80	60	48	40	34	30	27
	3.5	0.43	86	65	52	43	37	32	29
	4.0	0.46	92	69	55	46	39	35	31
Green 015 Fine 100 mesh	2.0	0.49	98	74	59	49	42	37	33
	2.5	0.55	110	83	66	55	47	41	37
	3.0	0.60	120	90	72	60	51	45	40
	3.5	0.65	130	98	78	65	56	49	43
	4.0	0.69	138	104	83	69	59	52	46
Yellow 02 Fine 80 Mesh	2.0	0.65	130	98	78	65	56	49	43
	2.5	0.73	146	110	88	73	63	55	49
	3.0	0.80	160	120	96	80	69	60	53
	3.5	0.86	172	129	103	86	74	65	57
	4.0	0.92	184	138	110	92	79	69	61
Lilac 025 Fine/med 80 Mesh	2.0	0.82	163	122	98	82	70	61	55
	2.5	0.91	183	137	110	91	78	68	62
	3.0	1.00	200	150	120	100	86	75	67
	3.5	1.08	216	162	130	108	93	81	72
	4.0	1.15	231	173	139	115	99	87	77
Blue 03 Fine/med 80 Mesh	2.0	0.98	196	147	118	98	84	74	65
	2.5	1.10	220	165	132	110	94	83	73
	3.0	1.20	240	180	144	120	103	90	80
	3.5	1.30	260	195	156	130	111	98	87
	4.0	1.39	278	209	167	139	119	104	93
Red 04 Medium 50 Mesh	2.0	1.31	262	197	157	131	112	98	87
	2.5	1.46	292	219	175	146	125	110	97
	3.0	1.60	320	240	192	160	137	120	107
	3.5	1.73	346	260	208	173	148	130	115
	4.0	1.85	370	278	222	185	159	139	123
Brown 05 Medium 50 Mesh	2.0	1.63	326	245	196	163	140	122	109
	2.5	1.83	366	275	220	183	157	137	122
	3.0	2.0	400	300	240	200	171	150	133
	3.5	2.16	432	324	259	216	185	162	144
	4.0	2.31	462	347	277	231	198	173	154
Grey 06 Medium 50 Mesh	2.0	1.96	392	294	235	196	168	147	131
	2.5	2.20	440	330	264	220	189	165	147
	3.0	2.40	480	360	288	240	206	180	160
	3.5	2.60	520	390	312	260	223	195	173
	4.0	2.80	560	420	336	280	240	210	187
White 08 Coarse 50 Mesh	2.0	2.61	522	392	313	261	224	196	174
	2.5	2.92	584	438	350	292	250	219	195
	3.0	3.20	640	480	384	320	274	240	213
	3.5	3.46	692	519	415	346	297	259	231
	4.0	3.70	740	555	444	370	317	277	247
Cream 10 Coarse 30 Mesh	2.0	3.27	654	491	392	327	280	245	218
	2.5	3.65	730	548	438	365	313	274	243
	3.0	4.00	800	600	480	400	343	300	267
	3.5	4.32	864	648	518	432	370	324	288
	4.0	4.62	924	693	554	462	396	347	308

SPRAYLINE PURGE

OPERATION

Sprayline "Purge" has been designed for priming clean spray-lines with chemical prior to operation, or flushing spray-lines with clean water after work if it is not possible to wash out in the normal way, i.e. There is still chemical in the spray tank.

The "purge" tap has three positions;

1/ Off - this should be used when spraying is in progress as it ensures a quick response to sections being turned on or off.

2/ Chem - in this position after chemical has been mixed in the spray tank it is possible to prime the spray-lines with chemical prior to spraying. For best results turn both the suction & pressure control taps to "Spray" and the purge control tap to "Chem". Now with p.t.o engaged the pressure gauge will be reading a negative/-pressure, i.e, vacuum. Maximum vacuum can now be achieved by selecting manual on the RDS monitor spray screen, and closing the pressure-adjusting valve using the  arrow key.

For best results turn the master and all section controls off, then working through the boom sections, turn each one on individually for **at least 60 seconds**. Also the speed of the purge is dependant on chemical viscosity and ambient temperatures so on cold days with a "gluey" product be aware that this may take longer.

The boom will also purge with all sections on at one time, but results can be varied, as shorter lines will circulate more quickly. When you are satisfied that the spray-lines are fully primed, turn the purge tap "Off". Spraying may now commence.

3/ Clean water - (Be sure the clean water tank mounted above the engine is full for this operation). With the purge tap turned to "Clean water", operate the spray controls as in section 2 above. Clean water will now be drawn through the spray-lines and returned to the spray tank. Please note that when performing this process, it must be remembered that any remaining chemical product in the spray tank will be diluted with the addition of the clean water.

Important note: When flushing spray-lines between incompatible chemicals or crop changes, it is advisable to additionally flush spray-lines in the conventional way using a suitable neutralising agent. i.e. perform a full tank wash process and spray clean water/cleaner out fully to ensure there is no trace of chemical residue trapped in the spray-lines.

If in any doubt seek advice from your chemical supplier, remember it is the responsibility of the operator to make sure the system is clean!