

Read this book carefully before operating the sprayer



# *CROP SPRAYERS*

## *OPERATING INSTRUCTIONS*





## **Knight Farm Machinery Limited**

### **UK & EU Declaration of Conformity**

This certificate confirms that the machine described meets the requirements of:

Machinery Directive 2006/42/EC  
Supply of Machinery (Safety) Regulations 2008

#### **Responsible person:**

Knight Farm Machinery Limited  
Wireless Hill  
South Luffenham  
Oakham  
Rutland  
LE15 8NF

#### **Description of Machine:**

Trailed Sprayer / Mounted Sprayer

Serial Number: \*\*\*\*\*

**Date: \*\*/\*\*/2023**

Signed on behalf of responsible person:

**Darren Bentley**  
**Engineering Director**

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## SAFETY FIRST



**Never attempt to operate the sprayer until you have read and understand this book.**



**UK legislation requires that crop sprayer operators be correctly trained in the handling of pesticides. Never use spraying equipment unless you have the appropriate NPTC certificate of competence**



**Always wear the correct protective clothing when working with chemicals.**



**Always read the product label and make sure you understand it.**



**Ensure PTO & other guards are correctly fitted & in good condition.**



**When opening and closing the booms, first take note of any obstructions i.e. overhead lines, other machines or people. The machine must be at least 9m horizontal distance from power cables on wooden poles and 15m horizontal distance from power cables on steel poles.**



**Do not change the configuration of this machine to permit folding above 4.0 metres height!**



**Never place yourself in a situation where hydraulic failure could cause injury.**



**Adjust & test the sprayer with clean water prior to adding the agrochemical mixture.**



**Never operate the sprayer with other people in the working area!**



**Never allow any passengers to ride on the sprayer!**



**When travelling, never exceed 25mph (40 Kph) with the sprayer attached.**



**Never enter the sprayer tank! Doing so puts you at high risk of chemical contamination.**



**Before attempting to work on the sprayer, disconnect the PTO, switch off the tractor engine & remove the ignition key.**



**Ensure the sprayer is thoroughly cleaned, both inside & out prior to carrying out any maintenance work.**
















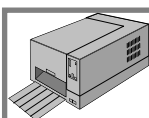
**Always use axle stands or wooden blocks when changing wheels or adjusting wheel track. Never rely on a jack!**



**Remove overalls and wash exposed skin thoroughly after work & before meals.**

## NEW MACHINE CHECK LIST

-  When coupling a new machine to a tractor always check that the PTO shaft is cut to the correct length for all positions of the sprayer relative to the tractor. Failure to do this may cause serious damage to the pump or the tractor.
-  Lubricate the shaft before fitting to the tractor
-  Clean the hydraulic quick release couplings on the sprayer and the tractor before connecting. The sprayer has small restrictors in these lines and they will quickly become blocked if care is not taken to keep connections clean. If your machine has electro hydraulics fitted, serious damage will result if you don't take care to keep the couplings clean
-  Make sure that you connect the electric supply to a good power supply. Most faults with new machines are directly related to a poor power supply. The Power must be taken direct from the tractor battery, not an accessory plug in the cab.
-  The BROWN & BLUE wires MUST be connected to POSITIVE (+) and the YELLOW/GREEN wire MUST be connected to NEGATIVE (-). If the switch box lights up but the sprayer will not work it is almost certainly because you have the connections reversed.
-  The filters on new machines should always be checked for correct installation and cleanliness. If the machine has been drained for frost protection at the factory take care to fit the filters properly. Make sure you do not damage the element
-  Operate the machine with clean water to familiarise yourself with the controls before adding chemical.
-  Check for any blocked nozzles. Small pieces of plastic may block nozzles on new machines. They quickly become dislodged and soon flush out but check the nozzles frequently (especially the ones you cant see from the tractor seat, behind the machine!).
-  Check the level of the oil in the sprayer pump.
-  Check the tension of the V belts where fitted. V belts quickly bed in but will require daily checks for the first week of operation or they will quickly burn out.
-  Check the tyre pressures on trailed machines. *(Never exceed Maximum for the tyre)*
-  Check Wheel Nuts and Axle bolts on trailed machines.
-  Make sure the wheel brakes work on trailed machines.



**Copy this sheet and use it as a check list**

**Read this book carefully before operating the sprayer**



## ATTACHING TO THE TRACTOR

### **All Trailed Sprayers**

- 1 Check the PTO shaft for correct length and then fit. N.B. The length will change as the sprayer is lifted or lowered on the linkage and if the drawbar mode is changed. Remember to couple the guard chain to the tractor PTO cover. When not in use the shaft should be stowed on the stand provided or removed and stored on the walkway.
2. The hydraulics should be connected to a single acting valve for the lift and a double acting valve for the fold. If tilt is fitted to the boom (standard on 24m) another double acting spool valve is required. For electro hydraulic machines see next page.
3. Connect the controller to a suitable electric supply point on the tractor. Direct to the battery is the preferred location. DO NOT connect to an in-cab power socket because they do not provide a suitable output.

### **Trailed Machines With Tracking Drawbar**

1. SELECT POSITION CONTROL ON THE TRACTOR HYDRAULICS
2. The tractor lower links should be coupled into the sprayer link point that allows the sprayer to run level when the tractor lower links are fully raised. This avoids bouncing of the links in rough conditions.
- 3 On some tractors it may be necessary to fit the safety chain from the sprayer to the tractor top link point. This prevents dropping of the linkage when the engine is not running. DO NOT CARRY THE WEIGHT OF THE SPRAYER ON THIS CHAIN
4. Make sure the tractor check chains are TIGHT. On tractors that do not have two check chains it is essential that a second tensioning link is fitted.

### **Parking the Sprayer**

1. Position the sprayer on firm, level ground.
2. Lower the sprayer parking legs. Ensure the pins & lynch pins are correctly fitted. Disconnect the Safety chain from the tractor top link point.
3. Using the tractor linkage controls, lower the sprayer gently to the ground.
4. Stop the tractor engine & remove the ignition key. Operate the tractor spool valves to eliminate any pressure still in the sprayer hydraulic circuits.
5. Disconnect the PTO & hang it in the stowage bracket provided. Disconnect the hydraulic & brake connections & stow them in the hanging bracket.
6. Disconnect the controller plug. Protecting the plugs from the elements.
7. Drive tractor away from the sprayer. Take care not to catch the sprayer booms or drawbar whilst pulling away.

### ***Electro Hydraulics***

Machines fitted with electro hydraulics require a high pressure feed supply of oil and a low pressure tank return. The oil supply must be live when the machine is in work. Different makes of tractors use different types of hydraulic system. Modifications to the sprayer may be required depending on the tractor. If you are in any doubt, we recommend that you ask your dealer for advice. The sprayer is normally supplied for use with **open centre** tractor hydraulics and can be easily modified for **closed centre**. Some tractor manufacturers use a **load sensing** hydraulic system. If this is the case your tractor dealer will advise you on selecting the closed or open centre system on the sprayer. If in doubt we recommend that open centre is selected. A load sensing conversion kit is available for the sprayer if preferred.

- 1 Connect the ¾” quick release coupling to a low pressure tank return. If one is not fitted to your tractor then you can change the fitting to ½” and return through a normal spool valve. This should only be regarded as a temporary measure and a correct low pressure return fitted to the tractor as soon as possible.
- 2 Connect the ½” quick release coupling to a spool valve to supply oil to the sprayer. The spool valve will need to be locked into position when the sprayer is in work.
- 3 Set the tractor oil flow between 20 and 40 litre/min.

**N.B. Please note: if the tractor engine labours when the spool valve is engaged you may have a fault in the system and you should consult your dealer.**

## Operating the Sprayer (MAXImizer)



### Sprayer Control Valves

Filling, spraying and cleaning functions of the sprayer are selected using the Sprayer Control valves. Each performs a specific function, as outlined below.

### Suction Valve



The position of the **Suction Valve** determines from where the sprayer pump is supplied with liquid. With the arrow on the handle pointing upwards (as in the illustration) the pump draws liquid from the sprayer tank.

When the arrow on the valve handle faces down the pump is able to pull in liquid from the suction filling hose. The hose should be connected to the camlock coupling directly below the valve. Never try to pump fluid through this fitting using an auxiliary filling pump. The optional Bowser Filling valve should be fitted for this task.

Turning the suction valve to the "WASH" position will draw water from the sprayers on board clean water supply.

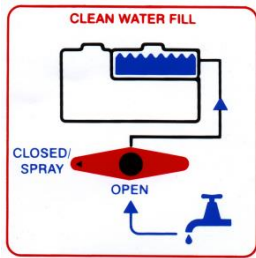
Turning the valve to the "OFF" position should only be done when the pump is not running. This position will stop water flowing out of the tank when cleaning the sprayer filters.



**Never operate the sprayer with the suction valve in the "OFF" position  
Damage to the pump may occur!**

Read this book carefully before operating the sprayer

### Clean Water Valve



The **Clean Water Valve** controls the flow of clean water into & out of the machines onboard clean water tank.

With the handle pointing down, the clean water tank may be filled, by attaching a hose pipe to the small camlock fitting. Mains water pressure is used to fill the onboard clean water tank.

If your machine is fitted with the optional **Wash Down Kit**, connection of the hose reel to the sprayer is made via the Clean Water valve. With the Wash Down Kit suction hose connected to the Clean Water valve filling camlock & the valve handle turned to the filling position

(handle pointing down), clean water is available to the Wash Down pump. You can then wash down the machine with clean water from the machines on board tank.

With the **Clean Water Valve** handle positioned horizontally, the valve is closed & the clean water tank is isolated.



**Never attempt to fill the Clean Water tank with a fast-fill or bowser pump. Damage to the tank may occur!**

### Tank Rinse Valve



1. The sprayer pump must be running at no less than 400rpm
2. Set the pressure to at least 4 bar
3. Press the yellow button to switch on the tank wash heads. The red light above the button will be on when liquid from the pump is directed to the internal tank rinsing heads.
4. Clean water can be used for this task by turning the main suction valve to "WASH"

Please note, the wash heads are automatically disabled during spraying and will not operate if the spray master switch is turned on.



**If in doubt turn the Sprayer Control valves to the positions shown on the respective valve stickers – this is the NORMAL SPRAYING POSITION.**

### **Filling the Spray Tank with Water**

The sprayer uses the main spray pump to fill itself with water. Industry guidelines discourage the use of this method for filling from rivers or other water courses due to the risk of pollution. If you do have to fill from rivers etc. then a separate pump should be used but extreme care should be taken not to over fill.

1. Couple the suction hose to the **Suction Camlock coupling**
2. Engage the PTO (at low tractor rpm).
3. Turn the **Suction Valve** so the arrow is pointing straight down. The sprayer will now fill. Take care not to over fill. If you accidentally overfill then take steps to control the spillage. Remember that chemicals are dangerous!
4. Increase the PTO speed to no more than 540 rpm

### **Filling with chemical**

1. Read the product label and make sure there are no special mixing requirements.
2. Do not add any chemical to the tank until there is sufficient liquid in the tank to provide adequate agitation & mixing.
3. To avoid mixing problems always add chemical through the chemical induction hopper

### **To operate the induction hopper**

1. The sprayer pump must be run at no less than 400rpm but should never exceed 540rpm.
2. The air pressure in the control system must be above 4 bar. This should be increased with the switch on the side of the machine.
3. Lower the hopper to the working position.
4. The hopper comes into operation automatically whenever the sprayer master switch is in the off position.
5. Turn on the “**hopper agitation nozzle**”. Allow the hopper to fill to just above the agitation nozzle. This prevents foam forming in the tank. With the agitation nozzle full on, regulate the level of water in the hopper with the “**Hopper outlet regulating valve**” at the bottom of the hopper. Maintain the water level above the agitation nozzle. Add the chemical to the circulating water and it will then be pre mixed as it is drawn into the sprayer. Soluble bags can be added in exactly the same way (be patient they may take time to dissolve). Use the “**Hopper outlet regulating valve**” valve to regulate the water level in the hopper as the chemical is added.
6. Rinse out the chemical containers with the *press on* can wash valve. Rinse out the hopper bowl with the rinse ring and the small hand “**wash gun**”. Remember that the fluid circulating in the main pump is used for washing. It is preferable to use clean water for container washing during filling.



**Never let the hopper suck air or the tank will froth.**

If the tank is filling faster than you can add chemical, remember that you can use the hopper with the **Suction Valve** set to draw liquid from the main tank. This means water from the sprayer tank is circulated through the hopper instead of water from the filling source. Clean filling water is safer and better for washing cans and circulating in the hopper so you should turn the suction valve to the filling position (pointing down), when possible. Take care not to overfill the sprayer tank before you have added all the chemical.

Always remember to allow time for the chemical to agitate. This should be done at 540 rpm PTO speed and there must be at least 2 bar pressure in the system.

### **Spraying**

1. Check that the **Suction Control Valve** is set in the spray position.
2. Check that the “**Hopper Outlet Regulating Valve**” is closed.
3. Keep the pump running between 400 & 540 rpm, to ensure adequate tank agitation.

### ***Spray Pressure Adjustment***

Achieving & maintaining the correct spray pressure is vital to accuracy in spray application. Your Knight sprayer is fitted with a Ramsay "Pressure Set" constant pressure regulator, which uses an air diaphragm system to maintain spray pressure & compensate for spray section switch-on & shut off.

Adjustment of air pressure within the Ramsay regulator changes spray pressure accordingly. Ramsay air pressure may be adjusted via the in-cab automatic rate controller (e.g. Muller Controller). Air pressure within the Ramsay regulator may be roughly similar to the spray pressure required. A small pressure gauge is fitted to allow monitoring of the Ramsay air pressure.

Actual spray pressure is measured directly from the spray line & displayed on a large gauge.

### ***Manual Pressure Adjustment***

1. Refer to the separate instruction manual for the automatic spray controller.
2. Switch the automatic rate controller into manual pressure control.
3. Operate the manual pressure adjust as described in the controller instruction manual.

### ***Automatic Pressure Adjustment***

1. Refer to the separate instruction manual for the automatic spray controller.
2. Switch the automatic rate controller into automatic.

## Operating the Standard Gullwing Boom

### ***Important Information!***



For booms with independent incline, read that section first



When opening and closing the booms, first take note of any obstructions i.e. overhead lines, other machines or people. The machine must be at least 9m horizontal distance from power cables on wooden poles and 15m horizontal distance from power cables on steel poles.



Folding and unfolding should always be done when the sprayer is stationary and NEVER when the sprayer is moving



For Health and Safety reasons the maximum folding height of the boom is restricted to 4m. The configuration of the machine should not be modified to exceed this.



Keep the boom in the working position during travelling in the field whenever possible. The machine is more stable and the boom is at its strongest.

### ***Opening for work***

- 1) Raise the boom to the indicated opening height. Typically this is just above the transport rests. Note that interlocking may be fitted to reduce the height of boom folding.
- 2) Activate the double acting valve to open the boom. Do not release the lever until the boom is completely open or the folding linkage may be damaged. Make sure the boom is completely open. The last few inches may be slow. When interlocking is fitted, folding will not operate unless the boom is below the restricted height.
- 3) Lower the boom to the required operating height above the crop. This will depend on the type of nozzles in use and will be shown on the nozzle chart.

### ***Closing for transport***

- 1) Raise the boom to the indicated opening height. Typically this is just above the transport rests. Note that interlocking may be fitted to reduce the height of boom folding.
- 2) Activate the double acting valve to completely close the boom. Do not release the lever until the boom is completely folded or the folding linkage may be damaged. When interlocking is fitted, folding will not operate unless the boom is below the restricted height.
- 3) Lower the boom onto the transport rests. Make sure that enough pressure has been released from the lift cylinders to enable the boom to sit properly in the rests. This may take a few seconds due to the nitrogen accumulator in the lift circuit. The boom may ride best with a small amount of pressure retained.

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- 4) Always return the hydraulic lever to neutral. Never leave it in the float position. This is particularly important when height is controlled on a mast system

### **12m Operation of 24m GW Boom**

Raise the boom from the transport rests and open to allow approximately 70mm clearance from the vertical transport rest.

The locking pin can now be removed from the main push rod and inserted through the collar on top of the breakaway pivot into the loose ring on the push rod. The boom will now fold at 12m.

When returning the pin to the push rod for 24m folding, position the boom as before and put the pin back in the rod. You will have to move the outer boom to line up the pin. Always make sure you fasten the ring to the pin by placing the slotted end over the handle and securing it with an "R" clip



Never operate the boom with one side in the 12m position and the other in the 24m position



## 12m Hydraulic Folding Option (Standard Gullwing)

If the sprayer is fitted with hydraulic outer folding this can be fitted to an independent spool valve or to a hydraulic-diverter valve operated by a switch on the sprayer control box.



Read “*Operating the Standard Gullwing Boom*” before the following instructions

### ***Using Two Spool Valves***

#### **Opening for 12m Working**

To open the boom at 12 metres, operate the INNER fold spool valve only and unfold in the normal way.

#### **Opening for Full Width Working**

To open the boom to the full width, operate both folding spools simultaneously. It may be necessary to feather the spools to make the booms fold evenly.

#### **Folding from Full width To Transport Position**

To close the boom from the fully open, operate both folding spools simultaneously. It may be necessary to feather the spools to make the booms fold evenly.

#### **Folding from full width to 12m Working**

To close the boom to 12 metres, operate the OUTER fold spool valve only and fold in the normal way.

#### **Folding from 12m Position to Transport**

To close the boom from the 12m position, operate the INNER folding spool. It may be necessary to operate the outer spool to ensure the outer booms are firmly closed.

### ***Using Hydraulic Diverter Valve***

#### **Opening for 12m Working**

To open the boom at 12 metres, move the switch to the INNER fold position before unfolding the boom in the normal way with the spool valve.

#### **Opening for Full Width Working**

To open the boom to the full width first open as for 12 metres and then change the switch on the control panel to OUTER fold to unfold the boom to the full working width.

#### **Folding from Full width To Transport Position**

The selector switch should be in the OUTER position. Fold the outer boom in to 12 metres. Change the switch to INNER and operate the spool valve to close the boom in to the transport position. Make sure that the boom is folded tightly before moving off

Read this book carefully before operating the sprayer

### **Folding from full width to 12m Working**

Move the selector switch to the OUTER position and the end sections will fold when the spool valve is operated. Make sure the boom is folded in tightly on the stops so that it is correctly supported when operating at 12 metres

### **Folding from 12m Position to Transport**

Make sure the selector switch is in the INNER position and then fold the boom using the spool valve in the normal way.



Folding and unfolding should always be done when the sprayer is stationary and NEVER when the sprayer is moving

## Folding with Independent Incline (Standard Gullwing)

(Not "4" series booms)



For booms fitted with independent inclination it is important to remember, the boom must be fully inclined before opening or closing.

### Opening For Work

- 1) Pressurise the incline cylinders to make sure the booms are at maximum incline when raised clear of the transport rests.
- 2) Raise the booms to just clear the transport rests. Where interlocking is fitted to reduce the fold height, folding will be restricted if you lift the boom too high.
- 3) Activate the double acting valve to open the boom. Do not release the lever until the boom is completely open or damage may be caused to the folding linkage. Make sure the boom is completely open. The last few inches may be slow
- 4) If the boom is fitted with hydraulic outer fold, lower the incline cylinders before unfolding the outer sections. Where interlocking is fitted to reduce fold height, folding will be restricted if the boom is too high
- 5) Lower the incline cylinders until they are fully extended for normal work or alternatively, to the angle required. (USE FULLY LOWERED AT ALL TIMES WHERE POSSIBLE)
- 6) Lower the boom to the required operating height above the crop. this will depend on the type of nozzles in use and will be shown on the nozzle chart

### Folding

- 1) Raise the boom to just clear the transport rests. Where interlocking is fitted to reduce fold height, folding will be restricted if you lift the boom too high.
- 2) If the boom is fitted with hydraulic outer fold, fold in the outer sections before inclining the boom
- 3) Fully Incline the boom (BEWARE OF OVERHEAD CABLES!)
- 4) Activate the double acting valve to completely close the boom. Do not release the lever until the boom is completely folded or damage may be caused to the folding linkage
- 5) Lower the boom onto the transport rests. Make sure that enough pressure has been released from the lift cylinders to enable the boom to sit properly in the rests. This may take a few seconds due to the nitrogen accumulator in the lift circuit. The boom may ride best with a small amount of pressure retained
- 6) Always return the hydraulic lever to neutral. Never leave it in the float position. This is particularly important when height is controlled on a mast system.



When opening and closing the booms, first take note of any obstruction i.e. overhead lines, other machines or people. The machine must be at least 9m horizontal distance from power cables on wooden poles and 15m horizontal distance from power cables on steel poles.

**Read this book carefully before operating the sprayer**

## Operating the “4” Series Boom

### General Description

The Series 4 is an advanced heavy-duty boom designed for large-scale farmers, contractors & root crop growers. The figure 4 design combines great structural integrity with operational flexibility & a high degree of nozzle protection. Hydraulic half-width folding is standard, independent inner & outer fold, or independent inclination can be optionally fitted.



When opening and closing the booms, first take note of any obstructions i.e. overhead lines, other machines or people. The machine must be at least 9m horizontal distance from power cables on wooden poles and 15m horizontal distance from power cables on steel poles.



Spraying with the boom in the fully raised position is not recommended. The suspension system may be isolated and damage will result



Folding and unfolding should always be done when the sprayer is stationary and NEVER when the sprayer is moving



For Health and Safety reasons the maximum folding height of the boom is restricted to 4m. The configuration of the machine should not be modified to exceed this.



Keep the boom in the working position during travelling in the field whenever possible. The machine is more stable and the boom is at its strongest.

### Opening the boom for work

Wherever possible, always try to open & fold the boom on level ground. Never open or fold the boom whilst moving. Adherence to these basic principles will help to ensure a long working life for your boom.

- 4) Raise the boom to the indicated opening height. Where interlocking is fitted to reduce the height of boom folding, it may be just clear the transport rest tubes!
- 5) Operate the hydraulic service to open both INNER boom sections fully. In this position the boom is ready to operate at the half boom width (e.g. 12 metres for a 24 metre machine).
- 6) Lower the boom until the interlocking system allows folding of the outer boom sections then operate the hydraulic service to open both OUTER boom sections fully, (if required).
- 7) Raise or lower the boom to the desired working height above the crop – this may be determined by the crop, nozzle or product to be applied. If in doubt, consult the relevant nozzle chart or product label.

### **Folding the boom for transport**

1. Level the boom using the Tilt/Lock Beam (see below).
2. Lower the boom until the interlocking system allows folding of the outer boom sections. Operate the hydraulic service to close both OUTER boom sections. Ensure both sections are fully closed before proceeding further.
3. Raise the boom to just clear the transport rest tubes. If too high, the interlocking will not allow folding.
4. Operate the hydraulic service to close both INNER sections. Take care to ensure both sections close fully & clear the transport rest tubes correctly.
5. Lower the boom onto the transport rests tubes. Ensure the booms settle correctly onto the rest tubes – this may take a few seconds.

### **Hydraulic boom levelling**

*The boom can be levelled by means of a heavy duty Tilt/Lock Beam. Movement of the beam adjusts the tension of the boom suspension springs, allowing the boom to be levelled in work. Moving the beam to the each extreme of its travel brings an aeon rubber damper into contact with the boom centre frame. This prevents the boom falling during one-side folded operations.*

*Booms equipped for one-sided operation have separate fold controls for left & right booms.*

### **Levelling the boom in work**

- 1) Open the boom & adjust working height as outlined above.
- 2) Operate hydraulic service to bring boom to correct level above crop or ground contours.

### **Locking the boom for one-side operation**

- 1) Establish which side boom it is necessary to fold.
- 2) Operate the hydraulic service to bring the end of the Tilt/Lock Beam nearest the side, that is to remain folded into contact with the boom centre frame. The Tilt/Lock Beam will then support the boom when the opposite side is opened.
- 3) Lift the boom to just clear the transport rests & operate hydraulic services to open the appropriate inner &/or outer boom sections, as required. It may be necessary to adjust the Tilt/Lock Beam during opening to keep the boom level.
- 4) Adjust the Tilt/Lock beam & the boom height control to position the boom for working. Take care – it is not possible operate the boom with one side fully folded below transport rest height.
- 5) Before folding for transport, fully open boom (if possible) & level using Tilt Lock beam.



**Keep the boom in working position during travelling in the field whenever possible. The machine is more stable and the boom is at its strongest**

## Operating the Triple Fold Boom

### General Description

The triple fold boom is designed for operating widths up to 36m. The first fold stage opens the boom to 12m. The second stage opens to 24m and is protected by a unique trip mechanism that releases pressure in the fold cylinder if an obstacle is encountered. The third stage of the folding operation opens the boom to 36m (or maximum width). When fully open, the boom is protected by a conventional breakaway at the tip.



When opening and closing the booms, first take note of any obstructions i.e. overhead lines, other machines or people. The machine must be at least 9m horizontal distance from power cables on wooden poles and 15m horizontal distance from power cables on steel poles.



Folding and unfolding should always be done when the sprayer is stationary and NEVER when the sprayer is moving



Always engage the locking mechanism before folding or unfolding any part of the boom. Remember to unlock before moving the sprayer



For Health and Safety reasons the maximum folding height of the boom is restricted to 4m. The configuration of the machine should not be modified to exceed this.



Keep the boom in the working position during travelling in the field whenever possible. The machine is more stable and the boom is at its strongest.

### Opening the boom for work

Wherever possible, always try to open & fold the boom on level ground. Never open or fold the boom whilst moving. Adherence to these basic principles will help to ensure a long working life for your boom.

1. Engage the boom fold locking mechanism. This is hydraulically operated. Hold the switch for about 5 seconds to make sure the cylinder is fully extended and therefore locked. A bleeper will activate to remind you the lock is engaged and warn people nearby.
2. Raise the boom to the indicated opening height. Where safety interlocking is fitted to reduce the height of boom folding, this may only be just clear of the transport rest tubes
3. Operate the hydraulic service to open both INNER boom sections fully. In this position the boom is ready to operate at 12m. (go to 7)
4. Operate the hydraulic service to open both MIDDLE boom sections fully. A hydraulic lock will engage to hold the boom open. In this position the boom is ready to operate at 24m – NOTE the inner and middle sections can be folded simultaneously for a more efficient operation.

5. Operate the hydraulic service to open both OUTER boom sections fully. In this position the boom is ready to operate at its maximum width.
6. Raise or lower the boom to the desired working height above the crop – this may be determined by the crop, nozzle or product to be applied. If in doubt, consult the relevant nozzle chart or product label.
7. Disengage the boom fold locking mechanism. This is hydraulically operated. Hold the switch for about 5 seconds to make sure the cylinder is fully retracted and therefore unlocked. The warning bleeper will stop.

### ***Folding the boom for transport***

1. Engage the boom fold locking mechanism. This is hydraulically operated. Hold the switch for about 5 seconds to make sure the cylinder is fully extended and therefore locked. . A bleeper will activate to remind you the lock is engaged and warn people nearby.
2. Lower the boom until the interlocking system allows folding of the outer boom sections Operate the hydraulic service to close both OUTER boom sections. Ensure both sections are fully closed before proceeding further.
3. Raise the boom to just clear the transport rest tubes. If too high, the interlocking will not allow folding.
4. Operate the hydraulic service to close both MIDDLE boom sections fully.
5. Operate the hydraulic service to close both INNER sections. Take care to ensure both sections close fully & clear the transport rest tubes correctly. – NOTE the inner and middle sections can be folded simultaneously for a more efficient operation.
6. Lower the boom onto the transport rests tubes. Ensure the booms settle correctly onto the rest tubes – this may take a few seconds.
7. Disengage the boom fold locking mechanism. This is hydraulically operated. Hold the switch for about 5 seconds to make sure the cylinder is fully retracted and therefore unlocked. The warning bleeper will stop. NB the booms are held in the folded position with a latch that engages when the lock is released. It is therefore important that the lock is released before the sprayer is moved.

### **Levelling the boom in work**

1. Open the boom & adjust working height as outlined above.
2. Operate hydraulic service to bring boom to correct level above crop or ground contours. If the levelling system fails to move the boom, check that the boom lock is fully disengaged.



**Keep the boom in working position during travelling in the field whenever possible. The machine is more stable and the boom is at its strongest**



## Automatic Spray line Agitation

Your sprayer is fitted with the Knight **MAXImizer** plumbing system. This ensures efficient and accurate operation from the instant spraying commences. There is no need to purge the spraylines with chemical before spraying commences. After spraying is complete the spray lines can be washed out with clean water without spraying from the nozzles. This keeps environmental pollution to a minimum and reduces the volume of water used for cleaning.

### ***Starting a New Chemical Mix***

1. Refer to the ***Operating the Sprayer*** section of the instruction book and fill the sprayer with water and chemical in the normal way.
2. After filling is complete make sure the **Suction Valve** is in the **SPRAY** position. Master spray switch should be in the **OFF** position and the pump must be running. Make sure the pressure regulator is set above 2 bar.
3. It will take approximately one minute to ensure that the spray lines contain chemical at the same dilution as the sprayer tank.

### ***Further use through the Day***

Continue to use the sprayer in the normal way. Each time the sprayer is filled with the self filling hose the spray lines will be flushed with clean water. As soon as the suction fill valve is turned to the Spray position the lines will be automatically purged with the contents of the spray tank. The system will ensure that the spray lines remain free from sedimentation.

### ***Washing out the Spray lines for Overnight Storage***

When the sprayer is finished with for the day it is possible to purge the lines with fresh water and store the residue in the spray tank. This avoids the need to spray from the nozzles in order to clean out the lines.

1. With the sprayer pump running, turn the main **suction valve** to the **wash** position
2. Draw approximately one third of the clean water tank into the sprayer. This will automatically pass through the spray lines.
3. Remember that a very small amount of chemical is always trapped behind the diaphragm check valve in the nozzle. If you wish to remove this you must spray out a small volume of water.
4. Stop the sprayer pump. This avoids re-mixing of the spray tank contents into the spray lines.

### ***Washing out When Changing Chemicals***

1. Adopt the same procedure as **Washing out the Spray Lines for Overnight Storage**
2. Put the **suction valve** into the **wash** position and draw another 1/3 of the wash tank into the sprayer

3. Return the **suction valve** to the **spray** position.
4. Use the **tank rinse valve yellow press button** to turn on the internal tank rinse jets. These should be run for approximately 5 minutes.
5. Turn off the rinse jets.
6. Spray the washings onto the field where the sprayer has been working.
7. Put the **suction valve** into the **wash** position and draw in the remaining clean water from the wash tank
8. Return the **suction valve** to the **spray** position.
9. Circulate water through the filling hopper agitation and rinsing circuits.
10. Incorporate cleaning water through the hopper.
11. Allow approximately five minutes for the internal rinse jets to clean the tank and then turn them off.
12. Dispose of washings by a recognised disposal process.
13. When changing chemicals it is recommended that you thoroughly clean the sprayer with the appropriate cleaning product after the full rinsing procedure has been completed.

***ALL WASHINGS AND RINSINGS***

***MUST BE DISPOSED OF SAFELY***

Use the correct cleaning product for the chemical you are washing from the system.

Follow all safety precautions on the cleaning fluid to be used.

For machines fitted with Fingertip Fluid Control refer to that section of your Muller Controller manual.

## CROP SPRAYER CALIBRATION

In order to obtain the best results from the chemical you are to apply it is most important that you read the product label, paying particular attention to the type of nozzle to be used and the pressure it should be operated at.

*For example:-*

Application rate 250 Lt./Ha  
Pressure 3-4 Bar  
Spray quality Medium  
Type of nozzle Flat fan 110 degree

Firstly you will need to know at what speed you are going to be spraying. Select a suitable gear and engine speed to give a suitable ride, boom stability, and maintain approximately 540 PTO r.p.m. Having found a suitable gear for spraying you need to know exactly how fast you are travelling. To calculate this, mark out a 100 metre run on a typical field surface. ( use a tape measure for this purpose, pacing is not accurate enough) with the sprayer tank half full of clean water, time how long it takes to travel the 100 Metres in the same gear and rpm you have selected. Repeat this procedure three times, recording all the results to calculate the average time,

*For example:-*

1st . Run 43 seconds  
2nd. Run 46 seconds  
3rd. Run 45 seconds  
Average 44.6 seconds

**Use this formula to calculate speed:-**

$$\frac{360}{\text{time in seconds}} = \frac{360}{44.6} = 8 \text{ Km/Hr}$$

Now that you know how fast you will be spraying and how many Ltr./Ha you need to be applying you can use the following formula to calculate the output from each nozzle of your sprayer to achieve the required application rate.

$$\frac{\text{Volume (Lt./Ha)} \times \text{Speed (Km/Hr)} \times \text{Nozzle spacing Metres}}{600}$$

= Nozzle output (Lt./Min)

therefor:-

$$\frac{250 \text{ Lt./Ha} \times 8 \text{ Km/Hr} \times 0.5}{600} = 1.66 \text{ Lt./Min}$$

*Now you can select the appropriate nozzle from your nozzle selection chart to give:-*

- 1.6 Lt./Min
- 3-4 Bar pressure
- Medium droplet size

You can see that the Lurmark 04F110 Nozzle will give 1.6 Lt./Min at 3 Bar.

Fit these nozzles to your sprayer and set the small pressure gauge to 3 Bar pressure. Use an air line or hand pump to inflate with compressed air.

Run the sprayer pump at 540 rpm and turn all the boom sections on.

With a 2 Lt. measuring jug, measure the output from a selection of nozzles for one minute each. Record these results and calculate the average output. If this result is as calculated, I.E.:- 1.6 Lt./Min, your sprayer is correctly calibrated, if not adjust the pressure accordingly and recheck. This is achieved by either increasing or decreasing the pressure in the small gauge by the valve on the bottom of the gauge unit. It is important to understand that the main spray gauge will not always read the same as the small gauge but this does not matter as the gauge is only an indicator. Always read application pressure from the large sprayline pressure gauge.

**Record for future use:-**

- |                 |                       |
|-----------------|-----------------------|
| a) Tractor Used | f) Application volume |
| b) Tyre size    | g) Pressure           |
| c) Speed        | h) Nozzle             |
| d) Gear         | i) Nozzle output      |
| e) Engine RPM   | j) Spray quality      |

Calibration should be checked regularly, as the nozzles wear.

**When you become familiar with the operation of your crop sprayer you may discover there are certain variations between calculated and actual calibration which can be easily adjusted for.**

## CLEANING & STORAGE

*When changing chemicals or when a job is completed, wash the sprayer out thoroughly with clean water. Always dispose of rinsing liquid legally & sensibly.*

*Your machine is equipped with a clean water tank, which may be used for washing out in the field – disposing of the washings on the previously treated crop. This may be achieved as follows:-*

### **Washing out the tank**

1. Spray until the tank is empty
2. Turn the **Suction Valve** the **Wash** position as indicated on the label. Water will now be sucked from the wash tank into to the sprayer tank.
3. When sufficient water has been incorporated turn the **Suction Valve** to the **“SPRAY”** position (as the valve sticker)
4. Circulate water through the filling hopper. Incorporate cleaning fluid through this route if required.
5. Use the **Tank Rinse valve** (the electric switch positioned below the sticker) to turn on the internal rinse jets.
6. Allow approximately five minutes for the washing jets to rinse the tank and then turn them off.
7. Dispose of the tank washings correctly. The best way of doing this is to apply them to the crop you have just treated – provided this is allowed for your current product & the maximum recommended dose rate is not exceeded.

Drain the tank via the Pressure filter by fully opening the flushing valve & removing the flushing line camlock (with the pump running). This facility is designed to enable you to pump the chemical into your soak-away or storage container as safely as possible. Some machines are equipped with a pump out point usually for returning liquid fertiliser to a storage tank. This is also a useful way of emptying excess water into the appropriate disposal facility.

**ALL WASHINGS AND RINSINGS MUST BE DISPOSED OF SAFELY  
WHERE SULFONYLUREA HERBICIDES HAVE BEEN USED IT IS RECOMMENDED  
THAT DUPONT ALL CLEAR BE USED AS PER MANUFACTURERS INSTRUCTIONS.**

**Follow all safety precautions on the cleaning fluid to be used.**

## **FROST PROTECTION**

During frosty weather the sprayer must be protected. Unless a frost-proof store is available, the easiest way to protect a sprayer is with anti-freeze. A small amount of diluted solution should be pumped through the system and out of the nozzles until it is empty. Alternatively, drain all the water from the machine by removing the filters, jet caps and boom end caps (store them in the filter basket in the tank top). Disconnect the pipes to the pump and run the pump to expel all water. It may be necessary to remove some of the pipe work.

## FAULT FINDING

For Service hotline dial 0870 421 0234

### ***Boom Sections Fail to Operate***

1. Check that the Spray Control valves are set for spraying
2. Check the boom isolator valves are turned on. These valves are located on the rear of the boom in the centre and are used to isolate the boom from the rest of the sprayer during maintenance.
3. Check for air leaks on the boom. Low air pressure will prevent the nozzle valves from opening.
4. Drain water from the air tanks. Don't forget the one on the boom that feeds the section switching air valves.
5. Check that the compressed air system is delivering air. You should be able to hear when the compressor is working and when the unloading valve activates to unload the compressor.

### ***Air in the system***

1. Check that the suction filter is correctly fitted and that the sealing "O" ring is in place.
2. Make sure the inlet hose to the pump is correctly coupled and that the "O" ring is in place.
3. Check for fractures in the pipe work.
4. Air leaks into the suction system can sometimes be detected by stopping the pump and watching for water leaking out.

### ***Low operating pressure***

1. Make sure you have set the correct pressure
2. Check for "Air in the system"
3. Make sure the pressure filter is clean. Do not rely on the flushing valve, take the filter off and inspect it properly. Make sure you refit it correctly.
4. Check for blockages in the suction line.
5. Check for any burst plumbing.
6. Make sure the pressure gauge is working correctly. They can be easily damaged by frost.
7. Check the diaphragm pressure regulator for air leaks.
8. Check the diaphragm in the regulator and replace if worn.
9. Check the pump for damaged diaphragms or damaged valves and replace where necessary.
10. Make sure the operating pressure and speed are correct.

11. Calibrate the sprayer.
12. Replace the nozzles with a new set.

***Water in pump/pump uses oil***

1. Replace the diaphragms.

***Boom does not fold properly***

1. Refer to the section “OPERATING THE BOOM”
2. Make sure the hydraulic cylinders are working over their full stroke and are not being affected by a blockage in the pipes or restrictors (fitted in the cylinders)
3. Check the threaded ends on the cylinders and make sure they have not vibrated out of adjustment.
4. Make sure the tractor is delivering oil at the required rate (20 to 40 l/min). Do not set the rate too high.



## CLEANING THE FILTERS



### Suction Filter

Liquid is drawn into the pump via a suction filter. For normal spraying, a 30-mesh size replaceable filter element should be fitted. The element should be removed daily & inspected for dirt, residue or damage.

### Suction Filter Element – removal & replacement

- 1) Turn Suction valve so that handle is horizontal, & master spray switch is “OFF”. This prevents possible flow back from the sprayer tank.
- 2) Unscrew the retaining ring & remove the filter bowl & element. Inspect sealing o-ring & element for dirt or splits.
- 3) Apply a little silicon grease to sealing o-ring & re-fit o-ring, filter bowl & element.



### Pressure Filter

Your machine is fitted with a constantly flushing Pressure filter, with replaceable filter element. The mesh size of the filter element should be matched to the size & type of nozzles being used –please refer to a nozzle chart or manufacturer for the correct size required.

A flushing valve is fitted to the filter base, which allows a variable amount of liquid to flow back to the main sprayer tank, flushing dirt from the filter element in the process. This dirt is then recirculated whilst spraying continues.

It is good practice to fully close the flushing valve whilst applying the day's last tank of liquid –dirt is then caught in the pressure filter, ready to be disposed of when the filter is cleaned & checked.

Daily maintenance includes inspecting the filter element for residue &/or splits, & adjusting the filter flushing valve.

### Pressure Filter Element – removal & replacement

- 1) Screw in red Flushing valve fully, to prevent potential flow-back from the spray tank. Ensure that master spray switch is “OFF”.
- 2) Unscrew retaining ring & remove filter base, filter element & sealing o-ring.
- 3) Inspect element & sealing o-ring for damage or dirt – replace if required.
- 4) Apply a little silicon grease to sealing o-ring & refit element, o-ring & filter base.
- 5) Adjust red Flushing valve to approximately 1 turn open.

**Read this book carefully before operating the sprayer**

## DEMOUNTING THE SPRAYER

*Knight Demount series sprayers can be quickly & easily removed, releasing the tractor for other duties or essential maintenance.*

*Try to find a level site to demount your sprayer – this makes the operation easier & safer. Never try to demount a machine with liquid in the sprayer tank.*

### **All Sprayers**

1. Assemble and fit the demount legs into the sockets on the sprayer.
2. Disconnect the sprayer electrical & rear light connections from the tractor. Some machines may have air couplings or other extra electrical connections to disconnect.
3. Release the oil pressure in all the hydraulic services by operating the control levers or switches with the tractor engine switched off. Pay particular attention to the boom raise and lower function - the accumulator that allows boom flotation takes approximately 30 seconds to discharge. Unplug the quick release couplings. Ensure hydraulic hoses are kept out of the way when demounting.

### **NOW PROCEED TO THE INSTRUCTIONS FOR YOUR MACHINE**

#### **Multidrive**

4. Using a spanner, release the 2 turnbuckles securing the rear of the sprayer & remove the pins from the lower turnbuckle ends. Swing the turnbuckles clear of the securing lugs.
5. Screw down the two back demount legs until the rear of the sprayer is about 5mm clear of the skid frame (this remains permanently fixed to the tractor).
6. Drive the tractor forward about 200mm to disengage the front mounting bullets from the skid frame front plate.
7. Raise the front legs until the sprayer is approximately 5mm clear of the skid frame.
8. Raise the rear legs until the sprayer sump is clear of the chassis & drive the tractor clear.

#### **JCB Fastrac**

4. Using a spanner, release the 2 turnbuckles securing the rear of the sprayer & remove the pins from the lower turnbuckle ends.
5. Screw down the two back demount legs until the rear of the sprayer is about 5mm clear of the skid frame (this remains permanently fixed to the tractor).
6. Drive the tractor forward about 75mm to disengage the front mounting bullets.
7. Raise all four legs until the sprayer is well clear of the tractor. It is important to check that you have raised the sprayer enough to clear the tank sump and the sump plug. Now you may drive the tractor clear of the sprayer.

**Read this book carefully before operating the sprayer**



Refitting the demount sprayer to the tractor is a simple matter of reversing the steps above. Ensure the securing turnbuckles are tight & locked off. It is recommended that you check the turnbuckles daily.

Before refitting the hydraulic connections, check that the quick couplers are clean, to reduce the ingress of dirt to the hydraulic system.

## LUBRICATION & MAINTENANCE

### ***Daily Checks***

- ◆ Check pump oil level. Top up with 20-W30 motor oil. Note:- If a significant amount of oil is required daily or oil has turned white the pump may need attention
- ◆ Grease tracker bearings, king pins & steering ram ends.
- ◆ Grease mast rollers, lift cylinder chain rollers.
- ◆ Grease slide plates on back frame.
- ◆ Grease boom fold linkages and latches
- ◆ Grease boom fold pivot and latch mechanism (Gull Wing boom)
- ◆ Grease top pivot pin and slot, turnbuckle pin slot.
- ◆ On air boom machines check the oil level each day you use the machine. Make sure the oil is in the top 1/2 of the sight gauge. Top up with the correct grade of oil. **Universal oil SHOULD NOT be used.**
- ◆ Make sure to lubricate the PTO shaft on a daily basis. This is very important on Air Boom machines because the shaft carries a lot of power and will quickly become worn if not correctly lubricate
- ◆ Check the tension of the V belts that drive the sprayer pump on Air boom and some demountable machines.
- ◆ Clean the suction and the pressure filter. Even though the pressure filter is self flushing it is still recommended that you remove it daily until you assess how quickly the mesh will block with fine particles. This will vary with the chemical and water supply you are using

### ***Weekly Checks***

#### ***Conduct as daily including the following***

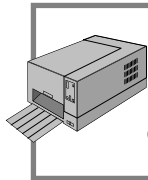
- ◆ Grease PTO shaft and splines, tubes, and universal joints.
- ◆ Grease boom tilt mechanism and cylinder pivots.
- ◆ Oil brake linkage, handbrake quadrant, cross shaft (trailed models only)
- ◆ Lightly grease transport rest tubes and vertical tubular supports.
- ◆ Oil screw jacks (Trailed and Demounts)
- ◆ Oil mounting pins (Tracker/Mounted)
- ◆ Grease centre pivot, Back frame/Centre frame.

- ◆ Grease back frame boom pivot pins.
- ◆ Grease chemical induction hopper pantograph arm pivots
- ◆ Grease anti yaw damping pivot.
- ◆ Grease the boom lock pivot.
- ◆ Grease pivot pins on boom support arms.
- ◆ Grease all cylinder ball ends.
- ◆ Grease boom inner to outer pivot pins.
- ◆ Check the oil level in the compressor (use SAE 30 oil)

***Annually***

***Conduct as daily and weekly including the following.***

- ◆ Grease legs and slides (Tracker/Mounted/Demounts)
- ◆ Grease wheel bearings (Trailed)
- ◆ Demount skid frame, locating pins and hold down links (Demounts only)
- ◆ Change the oil in the air compressor (20-W30)
- ◆ Change the air inlet filter on the air compressor



Copy this sheet and use it as a check list

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**Read this book carefully before operating the sprayer**