Self-Propelled Crop Sprayers

1800 series

2000 series

2400 series

2500 series

OPERATING AND MAINTENANCE MANUAL

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:

1835 Self Propelled Crop Sprayer

Serial Number: 032******

Date: **//2023**

Signed on behalf of responsible person:

Darren Bentley
Engineering Director

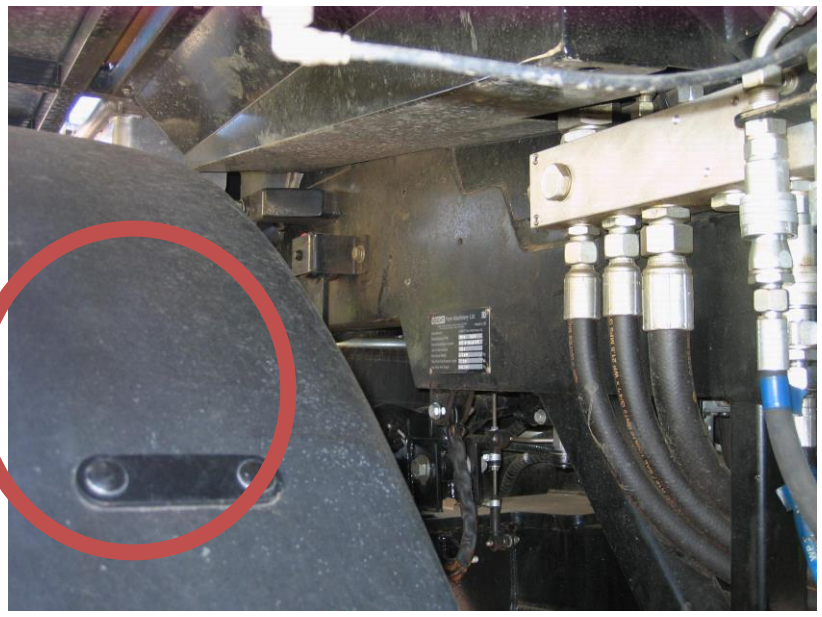
Section 1: Technical Specifications

Identification

Please quote the machine serial number and respective identification number when ordering spare parts or making machine technical enquiries

Machine

The machine identification plate is located on the left hand side of the machine below the engine service bay.

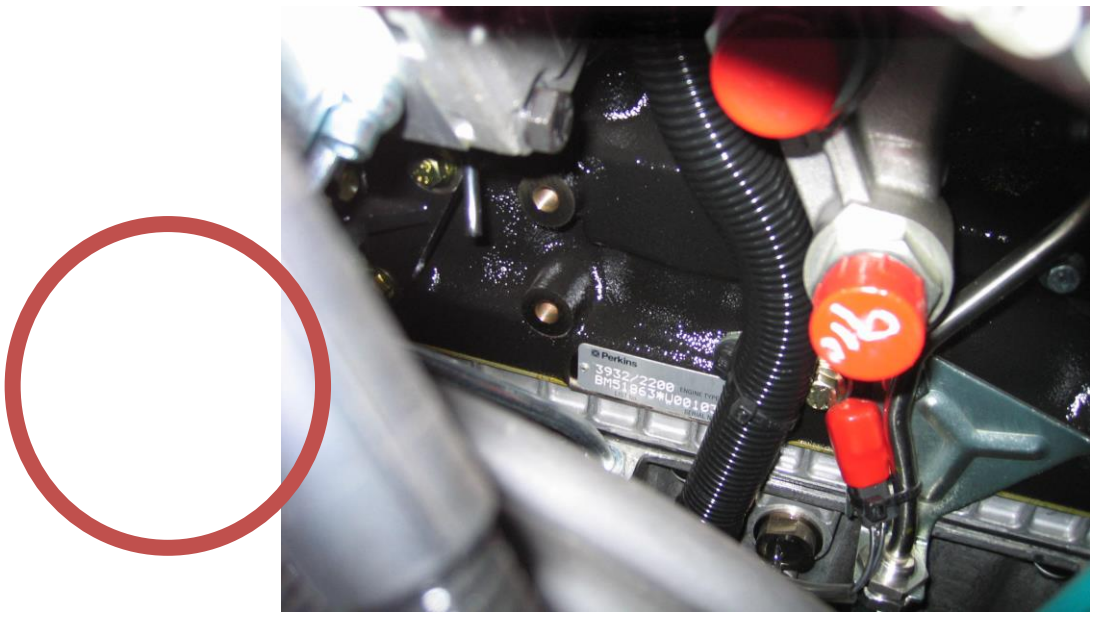


Wheel Motors

The identification plate for each wheel motor is located on the side of each wheel motor

Engine

The engine identification plate is located on the left hand side of the cylinder block to the rear of the front engine mount/ hydraulic steering pump.



Cab

The identification plate is located on the right hand side of the cab below the control panel. Open the emergency exit access on the right hand side of the machine to view.

Dimensions (on 12.4 X 32 Wheels)

(No sprayer)	*Length*	*9 m*
	Width	*2.9 m*
	Height	*3 m*
(24m sprayer)	*Length*	*11 m*
	Width	*2.9 m*
	Height	*3.9m*

Weights & Distribution

(24m sprayer, full 3000-litre tank)

Total	*9500 kg*

Front wheels	*ww kg*
Rear wheels	*ww kg*

Engine & Transmission

Engine type	*Perkins 1206F series*
Wheel motors type	*Poclain*

Refill capacities

Fuel tank	*375 litres*
Hydraulic tank	*200 litres*
AdBlue tank	*24litres*
Engine Sump	*19litres*
Coolant System	*31litres*

Fluids & Lubricants

Engine lubricant: 15W40,

For turbo charged engines which meet or exceed APICF4 standard.

Texaco	*TD 15/40*
	or Ursula Super LA 15/40
BP	*Global C4 15/40*
Shell	*Rimula X 15/40*
Mobil	*Deluac Super 15/40*

Hydraulic fluid: HVI46

Grease points: Multipurpose Grease

Vehicle Filter List

Part Description	Part Number	Quantity
Transmission Oil Filter element	MPCS100P10A	4
Transmission Pressure element (*long*)	MPHP0504A10ANP01	1
Fuel Pre Filter	HI01030	1
Inline Fuel Filter	HIT412017	1
Fuel Filter /Water Separator element	HI3611273	1
Fuel Secondary element (on engine)	HI3611274	1
Crankcase Breather Element	HI3624146	1
Fuel Tank Breather	MPCSAB050A01A	1
Air Cleaner Element (Primary)	HI26510353	1
Air Cleaner Safety Element	HI26510354	1
Engine Oil Filter	HI4627133	1
AdBlue Filter	TBC	1
Dry Air Canister	4324102227	1
Cab Pre Filter	FTV476 x 88	2
Cab Carbon Filter	FTVCB478	2

**** If in doubt check part no of filter fitted to machine**

Wheels & Tyres

Tyre type	Make	Bar
380/85 R34	Continental	1.9
600/60R28 Xeobib	Michelin	1.8

Caution – Due to available specification, tyres may not always be rated for the maximum load and maximum vehicle speed. Always keep tyres inflated correctly and be aware of speed limitations when running at maximum load.

Wheel nut torque settings

M20 X 1.5 stud, 12.9 grade, tighten to 600Nm

**** Check wheel nuts daily**

Section 2: Safety First

Read Before moving off

 Never move the vehicle with a passenger in the cab unless the cab is fitted with an extra seat.

 Always adjust the driver's seat for proper control and comfort. Always fasten the safety belt before moving.

 Make sure that all guards and closures are properly fitted and secure.

 Before first use check the wheel nuts for tightness, then check daily.

 Before starting the engine make sure that the parking brake is on and the transmission control lever is in neutral.

 Do you understand the instructions and warnings conveyed by all the decals on the vehicle? Are all the decals still in place and legible? Replace any decals that become damaged or dirty and illegible.

 Your Knight 1800series self-propelled sprayer has excellent visibility to allow safe operation. Make sure that your windows are clean so that you retain this advantage. Also, keep the cab interior clean, especially the controls.

 Make sure that there are no flammable materials near the vehicle exhaust.

When moving off

 Take extra care when reversing. Always make sure that there is no-one near the machine

 Make sure your way is clear, remember that you are driving a high vehicle.

 Always ensure 2 wheel steering is selected when leaving the field.

 Move off slowly. Never exceed 40 km/h on the road under any circumstances. A lower maximum speed might sometimes be appropriate if special equipment is fitted. Remember that all self-propelled vehicles have a much higher centre of gravity than tractors and must therefore always be driven with more care.

When operating

 Is your working area clear of obstructions, particularly overhead power lines. Remember the height of your vehicle and sprayer.

 Always drive at a safe speed, having regard to ground conditions and the dangers posed by banks, ditches and slopes. Take extra care when cornering when the ground is rough, slippery or sloping.

 Take extra care when working up and down gradients, particularly in the use of the throttle.

 Always bring the vehicle to a controlled halt and engage the parking brake before dismounting from the cab.

When maintaining the vehicle

 Care should be taken when working on the engine as it is fitted with the latest high pressure common rail fuel system and exhaust aftertreatment system.

 Never check the engine fuel lines for leaks when the engine is running or cranking.

 Never loosen the high pressure fuel lines in order to remove air from the fuel system. This procedure is not required.

 Do not work on the engine while it is still running or cranking. Allow 60 seconds after the engine has stopped before commencing any work on the engine. This will allow any pressure in the high pressure fuel lines to be purged.

 All maintenance should be done with the vehicle stationary, with the parking brake engaged, the transmission selector in neutral and the engine switched off. Ensure the engine cannot be started.

 Take care when re-fuelling with a hot engine. DO NOT SMOKE WHEN RE-FUELLING.

 Never add coolant to a hot system, allow it to cool first and then take care to protect against scalding when releasing the radiator cap.

 If you are unsure what to do or how to do it, ask for advice. Although the vehicle components are robustly designed to withstand tough operational conditions it is essential that they are properly set up and adjusted or the vehicle may be made unsafe or damaged.

 Take extra care with electrical and electronic components and circuitry. Ensure battery isolator is switched off before any maintenance is performed on the electrical system. Ensure the AdBlue system is purged before disconnecting the battery.

 Make sure that any chemical contaminants are cleaned from any part of the vehicle before attempting maintenance and ensure that the chemical residues are properly disposed of.

 Always use axle stands after jacking up the vehicle. Do not work under the vehicle if supported only on jacks. When jacking, make sure that the vehicle is restrained from moving by suitably placed chocks.

 Take care with hydraulic fluids. They can be harmful to the skin. Use proper protective clothing and wash thoroughly any skin that has contact. Take extra care if searching for hydraulic leaks by feeling or close examination. Hot, high pressure leaks of hydraulic fluid are very dangerous to the skin and eyes.

 Cautiously remove the following parts. To prevent spraying or splashing of pressurized fluids hold a rag over the part this is being removed

- Filer caps
- Pressure taps
- Breathers
- Drain plugs
- Grease fittings

 After maintenance, make sure that all tools are safely put aside, that all guards and closures are fitted and fastened and the vehicle is in a proper operational condition.

 Report all necessary repairs

Engine Electronics

 The engine has a Electronic Control Module (ECM) that monitors the engine operating conditions. If any of the engine parameters extend outside an allowable range the ECM will initiate an immediate action.

 The following actions are used as part of the engine monitoring control

- Warning
- Derate
- Shutdown

 The following monitored engine operating conditions and components can limit engine speed and/or engine power

- Engine coolant temperature
- Engine Oil Pressure
- Engine speed
- Intake Manifold Air Temperature
- Supply voltage to sensors
- Fuel Rail Pressure
- NOx Reduction System
- Engine Aftertreatment System

Section 3: Operation

Figure 1 Inside the cab

Cab Controls

Engine Speed Adjust

Park Brake

P.T.O 1 On/Off

The in-cab colour screen control panel houses many of the vehicle related controls and information, further details of these can be seen in figures 1 & 2.

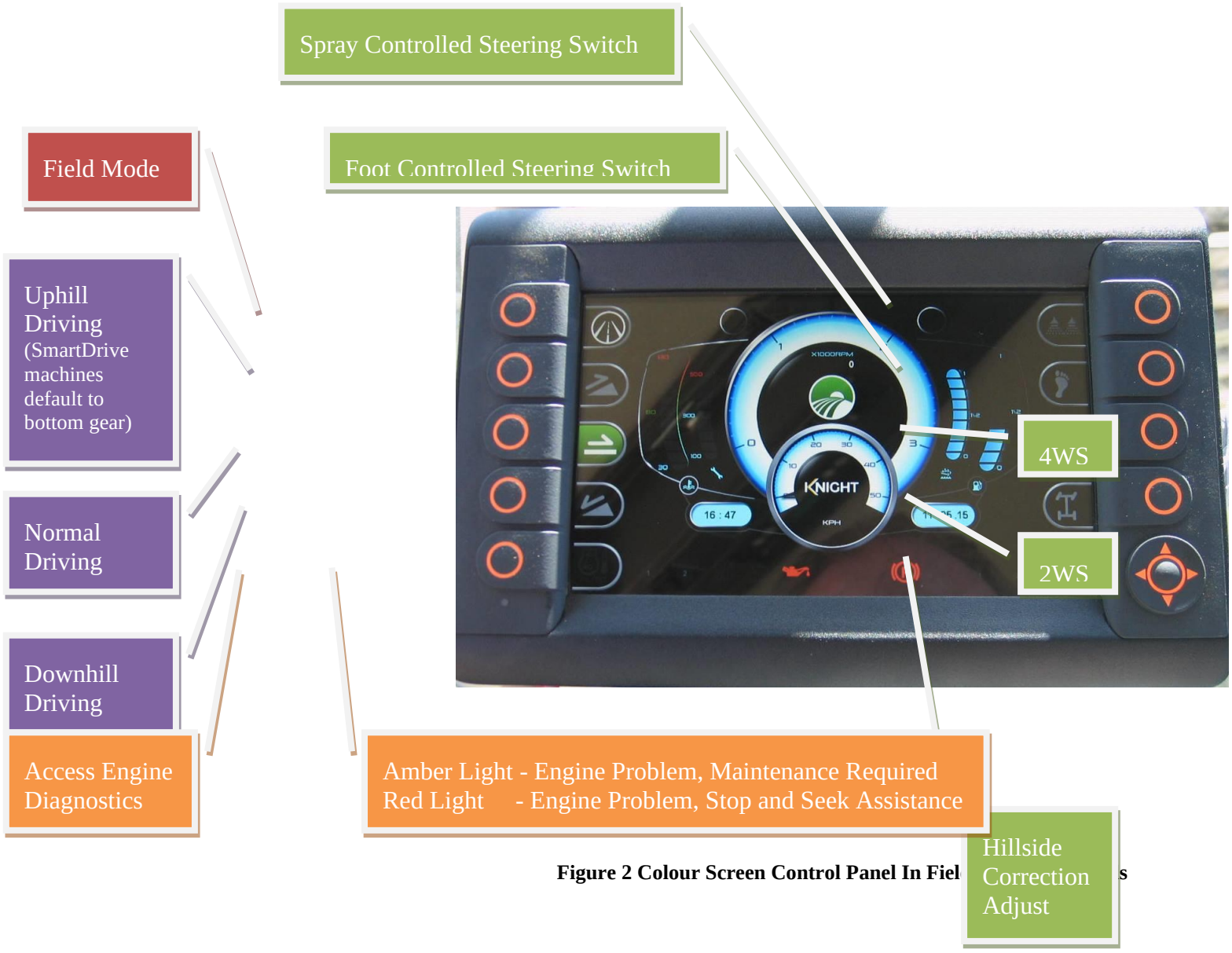


Figure 2 Colour Screen Control Panel In Fiel s

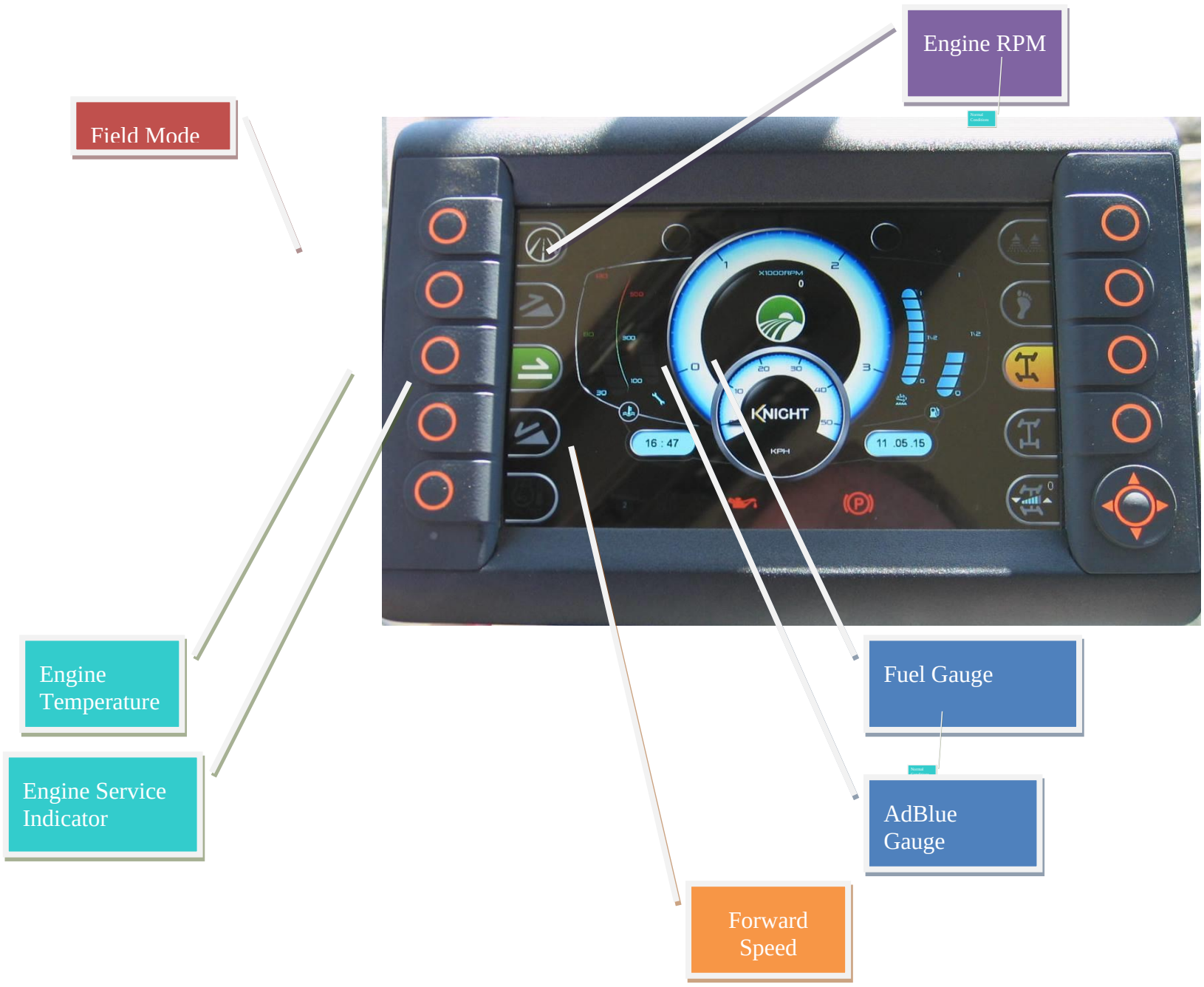


Figure 3 Colour Screen Control Panel In Field Mode - Information

Indicator	Description	Action
	Engine Warning Lamp	Seek assistance at the first available opportunity.
	Engine Stop Lamp	Stop Machine and seek assistance.
	PTO 1 On (Sprayer Pump)	
	PTO 2 On	
	Low Fuel Level Warning	Refill Fuel Tank
	Low AdBlue Level Warning	Refill AdBlue Tank
	Engine Oil Pressure	

	Battery Charge Lamp	
	Emissions Malfunction Lamp	Seek assistance at the first available opportunity.
	Park Brake on	
	Low Hydraulic Oil Level	Stop Machine and Check Hydraulic System for Leaks
	Filter Blockage	Change Twin and Pressure Filter
	Filter Blockage	Change Motor Drain Filter Check Fuse 75

4 Wheel Steering

The 4 wheel steering system on the 2000 series is operated from the colour screen control panel (figures 1+2)

System Logic (read before operating)

The advanced logic of the Knight 4 wheel steering system allows selection of two or four wheel steering regardless of the current steering position. There is no requirement for the wheels to pass through the straight ahead position before a mode is activated.

To avoid sudden and dangerous rear axle movement the system incorporates an advanced logic that will only permit a slow creep of the rear axle unless the operator is turning the steering wheel. This provides a very safe and smooth transition form two to four wheel steering. N.B. When changing modes it is useful to remember that the closer you are to driving in a straight line, the quicker the system will synchronise.

The steering system is fitted with a speed interlock. Only 2 wheel steering is available when high speed range is selected.

2 wheel steering (road) - Press the 2WS button on the control panel.

4 wheel steering (field) - Press the 4WS button on the control panel.

Foot Switch – The floor mounted switch located to the right of the steering column can be used to switch between two wheel and four wheel steering. To select this mode of operation press the button indicated by a foot on the main control panel. The system will now toggle between two and four wheel steering when the foot switch is momentarily pressed. The selected mode is indicated by an illuminated symbol.

Spray Related Switching – If you prefer, the system can activate 4 wheel steering when the spray is off and 2 wheel steering when the spray is on. To select this mode, press the button with a picture indicating a spray pattern. The system will now toggle between two and four wheel steering when the spray is turned on and off. The selected mode is indicated by an illuminated symbol.

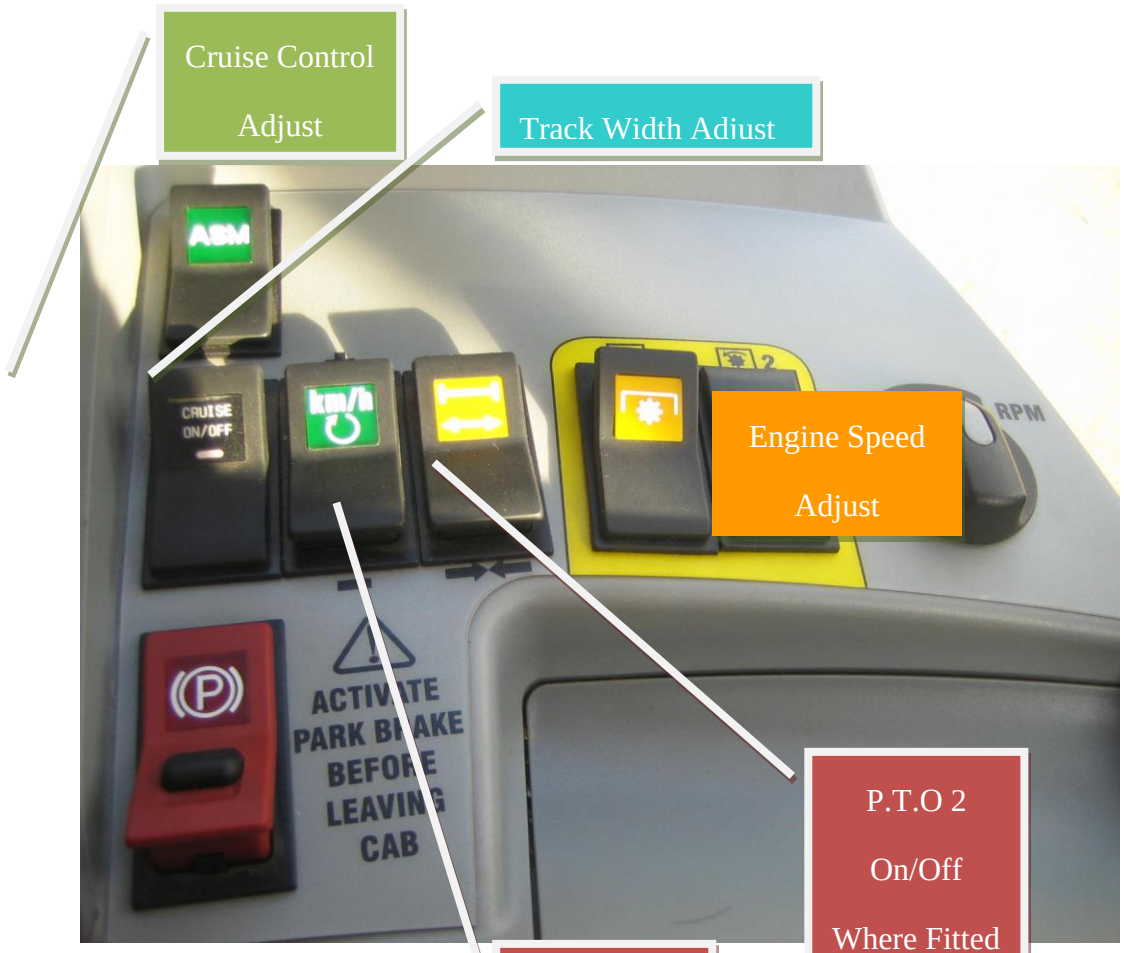
Hillside Control - When spraying on side slopes there is a tendency for the rear of the machine to drift slightly downhill, to compensate for this the Knight 2000 series is equipped with a hillside correction function. This function automatically steers the rear wheels slightly uphill to compensate this drift, the amount of compensation can be adjusted using the hillside correction adjust button. Figure 4 shows this button in use with the setting selected momentarily displayed.

Figure 4 Demonstrating Hillside Correction Adjust

Knight “Smart Drive” Transmission Control

Smart Drive is a sophisticated transmission management system that provides seamless speed control throughout the full speed range of the vehicle. Incorporated within the system is cruise control, slip control* and engine speed management for maximum power or maximum efficiency.

The mode of operation can be selected according to the working conditions. The following instructions should be used as a stage by stage approach to setting the different switch options.



Figur ayout

Suggested Spraying Mode

1. When spraying the engine control must be set to Field mode; this will allow the engine speed to be manually set to provide a constant P.T.O output.
2. The Transmission switch should be set to Normal.
3. Select slip control where fitted*.
4. Set the cruise control to ON

When ready to move off

1. Release the parking brake.
2. Move the main transmission joystick slowly forward until it is in the full forward position. The vehicle will advance forward.
3. Press the cruise control Set/Decrease speed button.
4. Set the forward speed with the cruise control Increase/Decrease switch. This changes the speed in regular steps.

Slowing or Stopping the Vehicle

a. Move the transmission joystick towards the central position or see b
b. Press the brake pedal gently and the forward speed will be reduced. The vehicle will continue at the reduced speed until the transmission joystick is moved backward to match the new speed and then moved fully forward to return to the previously selected cruise speed. Alternatively the set speed can be resumed by pressing the Resume/Increase cruise speed button.

Emergency Stop

Depress the brake pedal to decelerate the vehicle as required; return the transmission lever to the middle position before moving off again.

Suggested Road Mode

1. Select Road mode.
2. Turn off the slip control where fitted.

When ready to move off

1. Release the parking brake.
2. Move the transmission joystick slowly forward to advance the forward speed and engine R.P.M as required. The engine speed and the transmission system operate in parallel to provide the selected forward speed in the most efficient way.

Slowing or Stopping the Vehicle

Move the transmission joystick towards the central position and press the brake pedal gently to reduce the forward speed as required.

Emergency Stop

Depress the brake pedal to decelerate the vehicle as required, return the transmission lever to the middle position before moving off again.

Starting the engine

For safety reasons always ensure that you have completed all the safety checks detailed in Section 2 of this manual before starting and moving off.

Switch the ignition key clockwise to the first ‘ignition on’ position.

Make sure that the parking brake indicator light is showing that the parking brake is engaged.

Make sure that the transmission lever is in the neutral (central) position. A warning will sound if it is not in the correct starting position.

Make sure that the PTO (Power Take-Off) switch (or switches if there is more than one) is/are in the off position.

If the horn sounds, the transmission oil level is low. Switch off the ignition and top up the oil. Check for leaks before and after starting the engine.

Switch the ignition switch clockwise, against the slight pressure of the spring return to the next position to heat up the glow plug. The glow plug will heat as long as the switch is held in this position. For colder engine starts, hold the key in this position for a little longer.

Turn the ignition switch further clockwise to the next position and hold against the spring loaded return. This engages the starter motor. Release as soon as the engine fires. If the engine fails to fire after running the starter motor for 15 seconds, release the ignition switch. Wait for a minute or so before re-trying the starting sequence.

The electronic throttle must be turned to the idle position before increasing the rpm. This is achieved by rotation it to the lowest setting.

Allow the engine to warm up before operating any engine-driven facilities. This is best done by running the engine un-loaded for a few minutes at about 1200 rpm.

Using the external controls when filling the sprayer

Note that manual adjustment of the engine RPM can only be accomplished when the engine control is in field mode – manual control. It will not operate when road mode is selected.

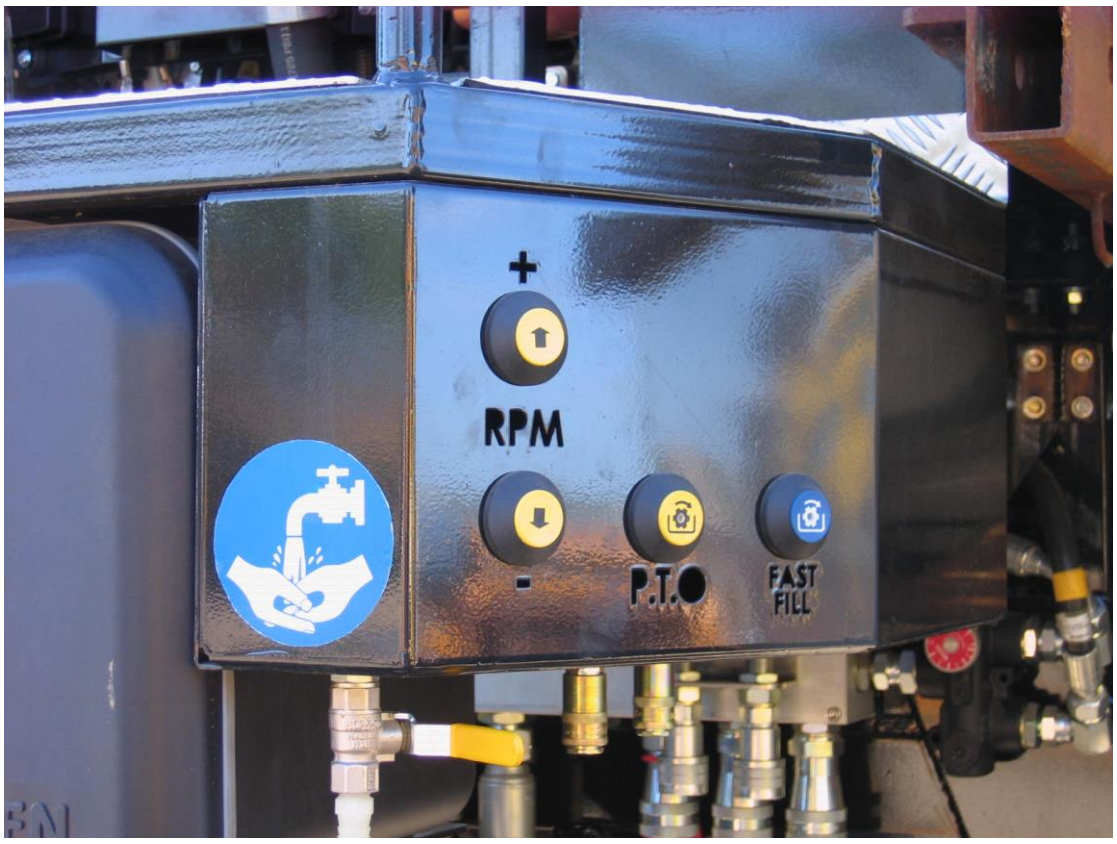


Figure 6 External Vehicle Controls

Jump starting

The vehicle cannot be tow-started because the wheels and engine are connected hydraulically. DO NOT attempt this or damage may result.

If the battery is flat, the vehicle can be started with a jump start from a fully charged battery on another vehicle. Before attempting this observe the following safety precautions.

 Never try jump starting if the battery has been left discharged in freezing temperatures. In this condition the battery electrolyte may be frozen solid and the battery could explode as the starting current passes through it. Also, never smoke when working near batteries. Batteries generate flammable gasses, which can be ignited explosively.

Make sure that all the cab switches are in the ‘off’ position except the parking brake switch, which must be in the ‘on’ position.

Connect the flying leads (these must be leads designed for this purpose) from the charged battery to the flat battery, positive-to-positive and negative-to-negative.

Work through the engine starting sequence (See above in this Section)

When the engine starts remove the flying leads.

Engine Diagnostics

In the event that the engine warning light shows amber (figure 1) this signals an engine problem, in this case the vehicle can still be driven but assistance should be sought at the first convenient time. If the red engine light shows then the machine should be stopped as soon as safely possible to avoid damage to the engine.

It is possible to access the diagnostics for the engine by holding down the engine diagnostic button for 10 seconds. The diagnostic screen is shown in figure 5, for more information relating to this please contact the Knight service department.

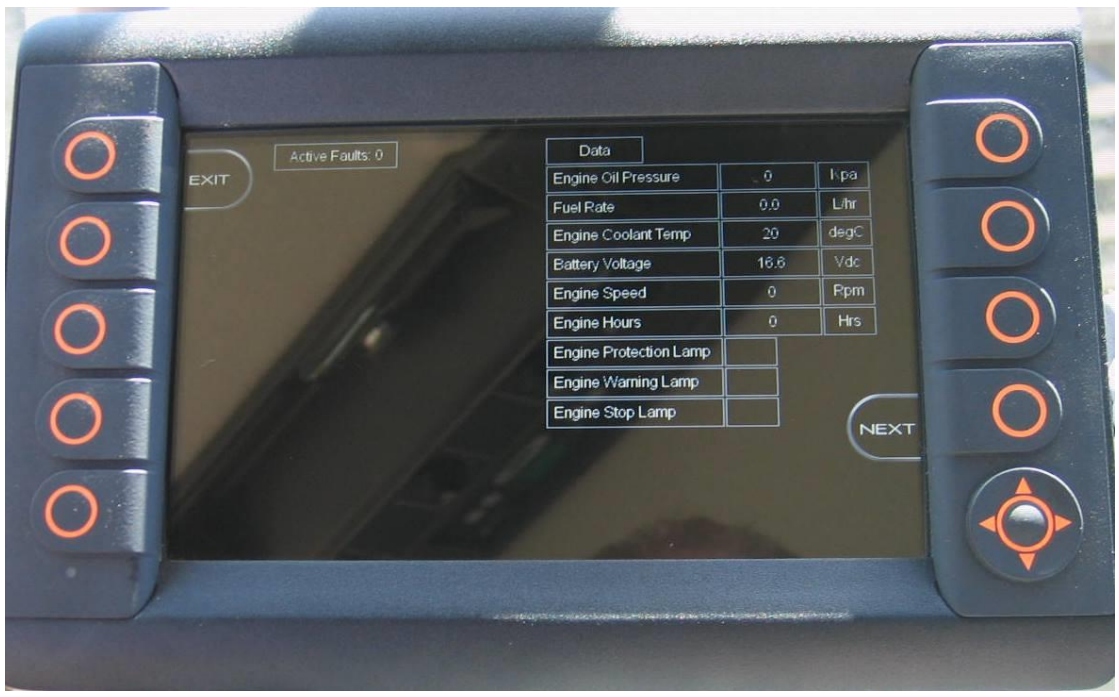


Figure 7 Showing The Engine Diagnostic Screen

Cab Access

The step access to the cab is linked to the parking brake. When the parking brake is applied the step is pneumatically lowered as the cab door is opened. When the cab door is firmly closed and the parking brake released the step is raised.

The parking brake will operate and the step will lower, independently of the position of the parking brake switch when the engine stops.

Towing

The vehicle must only be towed using a rigid tow bar, with the engine stopped.

Before attempting to tow, the parking brakes fitted to the rear wheels need to be mechanically released. You should contact the Knight service department if you wish to do this.

Lights and visibility

The normal road lights (side lights dip beam and rear side lights) are controlled through the left hand rotary switch in the ceiling mounted switch bank, (figure 6) this switch has three positions.

1. Side lights.
2. Dip beam (Main beam activated using the steering column control stalk).
3. Front lower lights on, roof lighting becomes active.

A second rotary switch controls the cabs work lights, it has three positions.

1. Cab front top lights.
2. Cab rear facing lights.

The windscreen wiper and the windscreen wash/wipe facility are switched with the left hand indicator stalk on the steering column.

A third rotary switch situated in the ceiling mounted switch bank controls the amber warning beacons on the cab roof as well as those on the rear of the sprayer.

Air Conditioning

The air conditioning system is equipped with automatic climate control, the controls for this are situated above the lighting control panel (figure 6). For further information and setting for the air conditioning please refer to the attached air conditioning manual.

Figure 8 Showing The Lighting And Air Conditioning Control Panel

Steering

The steering column has two points of adjustment, the entire column can be tilted towards the operator using the foot pedal to the left of the column. Further rake adjustment can be achieved using the handle located at knee height on the left of the column.

The vehicle has a foot operated floor mounted switch to the right of the steering column which toggles between two wheel steering (front wheels only) and four wheel steering – see 4 wheel steering section of this manual..

Engine speed ranges and transmission control

The basic engine speed control is the hand operated throttle control switch. The engine speed can be seen on the rev. counter in the colour screen terminal. Run the engine at speed high enough to give the required power. Excessive RPM is wasteful and inefficient.

The main hydrostatic control lever mounted on the right hand armrest controls the amount of oil flowing in the system and therefore the forward speed of the vehicle. In the mid position the vehicle will remain stationary. If forward the vehicle will accelerate forwards. If moved rearward the vehicle will accelerate rearward. The lever must be in the mid position to start the engine.

Section 4: Vehicle Maintenance

Safety First

Make sure that you have read and understood the Safety First Section (Section 2) of this manual and the additional Safety First issues highlighted in this Section.

General Care and Maintenance

Keep the machine clean. Many of the chemicals that are used by the sprayer can damage the vehicle and sprayer if not cleaned off regularly. Hose down (or pressure wash) to remove fresh dirt. Brush off dried dirt. Keep the cab steps, floor and controls clean.

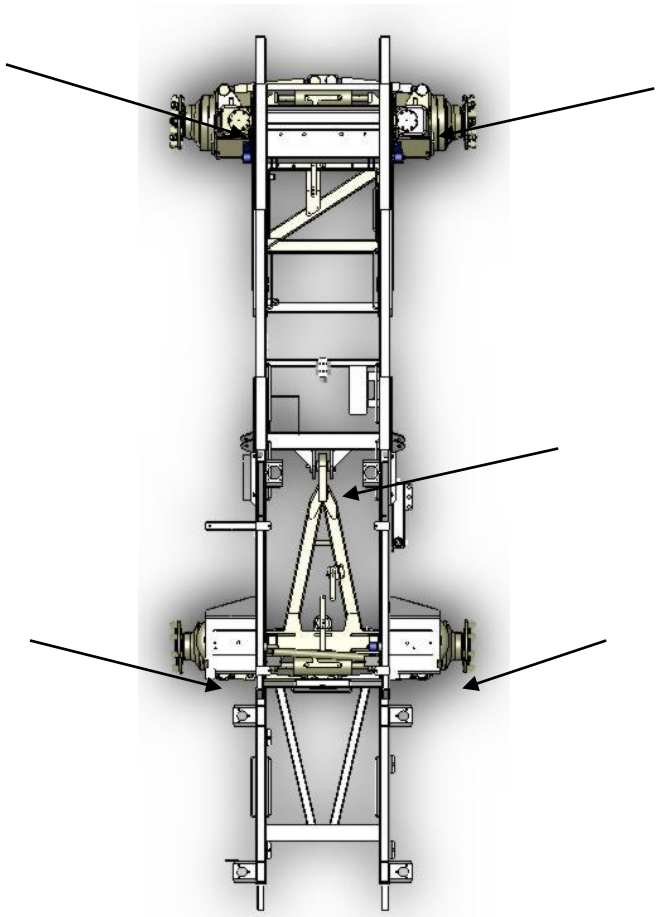
 Do not use harsh abrasives or strong alkaline cleaning agents.

 Make sure that you re-grease after washing down.

 Make sure that any washings are disposed of responsibly.

Figure 9 Filter Layout in Service Bay

Figure 10 Fuel and AdBlue Tanks



Grease the vehicle king pins and front axle pivot as indicated every 50 hours

Figure 11 Important Grease Points

Maintenance Schedules

The maintenance schedule below includes many elements of engine maintenance which have been summarised from the Perkins engine operating manual, a copy of which is included with this document. If in doubt always refer to the more complete Perkins engine operating manual.

Care should be taken when working on the engine as it is fitted with the latest high pressure common rail fuel system.

Never check the engine fuel lines for leaks when the engine is running or cranking.

Never loosen the high pressure fuel lines in order to remove air from the fuel system. This procedure is not required

Do not work on the engine while it is still running or cranking. Allow 60 seconds after the engine has stopped before commencing any work on the engine. This will allow any pressure in the high pressure fuel lines to be purged.

Do not bend or strike the high pressure fuel lines as this may cause point of weakness and potential failure.

Make sure that the maintenance schedules below are carried out at the appropriate intervals by a competent person and that the work is recorded, signed and dated in the maintenance log provided as part of this Section of the operating manual. Obvious lack of maintenance could jeopardise a warranty claim.

Before starting any maintenance schedule make sure the vehicle is parked on level ground, that the engine is stopped with the ignition key removed. Always chock the wheels if you are going to work under the vehicle.

Always use the recommended grades of engine oil, hydraulic oil and grease. Use of unauthorised materials could jeopardise a warranty claim.

Always fit manufacturers' replacement parts and components. Use of unauthorised parts or components could jeopardise a warranty claim.

Make sure that the engine coolant has adequate anti-freeze added to prevent freezing in winter conditions.

 Take care to keep your clothes and your person as clean as possible when carrying out maintenance activities. Use appropriate protective clothing and especially gloves or barrier cream on the hands. When finished wash your skin with soap and water and special hand cleansers. Never use petrol, diesel or paraffin to clean your skin. Dispose of any oily rags or waste. Remove any dirty clothing and wash before re-use.

 Oils and lubricants are generally flammable materials and must be identified, stored and handled with respect. Always dispense these materials using appropriate, clean utensils or equipment. Dispense the materials carefully to prevent spillage. Clean up any spillage immediately. Dispose of any used oils and lubricants responsibly. Never pour into sewers, drains or on the ground.

 In the case of eye contact with oils and lubricants, flush thoroughly with water and seek medical attention. In the case of swallowing, do not induce vomiting, seek medical attention.

 Do not try to extinguish an oil fire with water. Use a fire extinguisher. Carbon dioxide, dry chemical and foam type extinguishers are all effective.

The schedule which follows must be applied at the intervals (Hours or Months) which occur first.

Daily maintenance (or every 8 hours)

 Only release the radiator cap if the engine is cold. The cooling system is pressurised when the engine is warm or hot and severe scalding is a real risk if the radiator cap is released when the engine is warm or hot.

Check (Engine stopped)

Engine coolant level. (Cold engine only)

Engine oil leaks.

Engine oil level (dip stick).

Hydraulic oil level (sight gauge).

Hydraulic oil system leaks & condition of hydraulic hoses.

Hydraulic oil filter sensors – Visual check for filter blockage indication

Fuel System Primary Filter/Water Separator Drain.

Wheel nut tightness (see Section1 for torque settings).

Tyre pressures and tyre conditions (see Section1 for recommended pressures).

Check radiator matrix and remove any adhered debris.

Check windscreen wash bottle level.

Clean

Empty air cleaner dust filter

Check (Engine running)

All instruments, warning lights and controls are functioning properly.

Engine running smoothly, sounds OK and is not emitting excessive exhaust smoke.

50 hours (or Weekly)

Do the daily maintenance, plus:-

Check (Engine stopped)

Tensions and conditions of all belts.

Security and condition of axle securing bolts.

Grease

Front and Rear swing arm pivots.

King pins.

500 hours (or Yearly)

Do all the preceding maintenance, plus:-

Clean

Battery terminals.

Check (engine stopped)

Check for water in the diesel pre-filter

Level of battery electrolyte.

All air hoses, hydraulic hoses, electrical wiring for condition, chafing

Change

Engine oil and filter

Engine fuel system filter and primary filter (Water separator)

1000 hours (Yearly)

Do all the preceding maintenance, plus:-

Check (engine stopped)

Check concentration of coolant

Condition, including fixing of exhaust system.

Security of engine mounting bolts.

Wheel alignment (see Section1 for settings).

Headlight alignment.

The king pin anchors for condition and security.

The swing arm pivot pins for condition and security.

Clean and or Replace if necessary

Hydraulic tank suction strainer.

Clean the sediment chamber and strainer in the fuel lift pump

Change

Hydrostatic pressure filter and return filter elements.

Cab carbon filter.

Hydraulic tank breather.

5000 hours

AdBlue Filter – Clean/ Replace

Injector (AdBlue) - Repalce

Test / Replace

A sample of the hydraulic oil should be tested each year and replaced if necessary. Regardless of the condition of the oil it is recommended to replace it every two years.

Hydraulics

 Always handle hydraulic fluids with care. Make sure you are familiar with the manufacturer's handling instructions.

 The hydraulic systems must be kept completely clean to function reliably. Always take great care when any part of the system is open that no contamination takes place.

The hydraulic system is fitted with filters to trap any contaminants that might have been accidentally introduced. These filters must be serviced at the intervals recommended in the Maintenance Schedules.

There are filters (strainers) fitted inside the hydraulic tank. These are accessed through the top of the tank, after removing the hydraulic tank cover. They must be cleaned annually.

There are four other filters fitted near the hydraulic tank. Three of these (see photo) are in the hydraulic return lines, the other, mounted immediately below the other 3 is the transmission circuit filter. These filters are fitted with a pressure sensor which measures the hydraulic pressure difference across the filter and triggers the warning light on the instrument panel on the steering column if the pressure difference becomes excessive, indicating a blocked or partially blocked filter. There is a single indicator light for the return line filters and a separate light for the transmission circuit filter. If an indicator light is on, the problem must be diagnosed and rectified immediately, most probably by replacing the appropriate filter. Otherwise the filters must be replaced as recommended in the Maintenance Schedules. Unscrew the filter body and replace the filter. **Note** The filter warning pressure switches are fitted with visual indicators as a fail safe to the warning light in the cab. Visually check these as part of the daily maintenance program.

The breather fitted to the top of the hydraulic tank has a filter. This must be changed as recommended in the Maintenance Schedule. The filter is accessed by unscrewing the breather cap.

The hydraulic oil tank is fitted with a level sensor which will illuminates a light on the control panel and sounds the vehicle horn if the oil level is dangerously low. If this condition occurs, stop the vehicle as quickly and safely as possible and stop the engine immediately. Failure to do this will result in serious damage to the transmission system.

Replenishing the hydraulic fluid

 During the warranty period only genuine Knight Hydrostatic Transmission Oil should be used. You must always use hydraulic fluid that conforms to the Specification ISO HVI46 and is suitable for Hydrostatic Vehicles. Using incorrect fluids can seriously damage your machine.

The hydraulic fluid sight gauge is mounted on the near side of the hydraulic tank. When the gauge indicates that the hydraulic fluid needs topping up (Below ½ a glass of oil), or to re-fill the tank after draining the system, replacement fluid must be added via the return manifold. This necessitates using a pump (usually a hand pump or small electrically powered pump feeding from a tank or barrel of hydraulic fluid). The oil passes through the return line filters ensuring that no contamination gets into the hydraulic system. You must only use hydraulic fluid that conforms to ISO HVI46.

Engine

Your Knight vehicle is fitted with the latest engine from Perkins, compliant to Tier 4 final/ Stage IV emissions. Care should be taken when working on the engine as it is fitted with the latest high pressure common rail fuel system. A separate operators manual for the Perkins engine has been supplied with your Knight vehicle. Please refer to this for all aspects of safety, trouble shooting and maintenance of the engine.

This is also available at

Cab air conditioning drive belts

 The air conditioning system is a closed pressurised system containing refrigerant fluid. Any repair or maintenance work on this system must be done by a qualified refrigeration engineer.

Cab air conditioning carbon filter element

Figure 12 Showing Position Of The External Cab Filters

Raise the panel above the left cab door to reveal the cab filter.

Once the filter has been unlocked and removed any dust should be removed by gentle taping or utilising a vaccum cleaner or compressed air where available.

Figure 13 Front In Cab Filters

In cab recirculation filters are situated above the plastic grills in the cab roof lining, there is one of these behind each front speaker and a third below the hazard warning light switch console.

These filters should be removed and vacuumed, or compressed air used to remove any dust. It is important that damaged filters and sealing strips be replaced by new ones.

Greasing

Follow the greasing schedule as recommended in the Maintenance Schedule. Use a high quality grease such as HMP Lithium grease.

Greasing points:-

Front and Rear suspension pivots.

Front and Rear steering rams and pivots.

Also apply grease occasionally to all cables where the inner cable is exposed from the outer sheath.

Steering adjustment

The steering can be changed from 2 wheel steering to 4 wheel steering and vice-versa using the switch panel or the foot operated switch. The change-over process is completely automatic. The two wheel steering alignment is pre-set at the factory and should not normally need adjustment. However provision for adjustment has been made. Call Knight Farm Machinery service department for details (0870 4210234).

Electrical System

The electrical system is a 12v negative earth system. The battery is located behind the front right wheel under the battery cover. If there is an electrical fault, check to see if a fuse has blown. Replacing the fuse may correct the problem. If the fuse blows again, locate the fault before replacing the fuse again

Fuses

There are 4 sets of fuses:

1. In the main PCB found under the maintenance cover to the right side of the drivers seat.
2. There is a small secondary fuse board located on the relay board in this maintenance compartment.
3. There is a second PCB containing fuses which is accessed using the panel above the left cab door.
4. There are fuses located in the engine service bay.

Fuses in the main PCB

Fuse No.	Protecting	Rating (amps)
50	Muller Computer System	20
51	Steering Computer System	20
52	Tri-fold Warning Buzzer	10
53	Camera Feed	7.5
54	Foot Changeover Switch	3
55	Charge Warning Light	3
56	Brake Lights	15
57	Speed Sensor	5
58	P.T.O / Track Adjust Switching	10
59	Park Brake	7.5
60	Seat Compressor	15
61	Cooling Box Power	10
62	Speed Change Relays	10
63	Relay Board Lamp	7.5
64	Socket (B-Column)	10
65	Step Raise	7.5
66	Spare Connector (+15)	15
67	Vehicle base module (VBM) - Power	25
68	Vehicle base module (VBM) - Power	10
69	Vehicle base module (VBM) - Road Travel	10
70	Vehicle base module (VBM) - Power	10
71	Vehicle base module (VBM) - Power	10
72	-	
73	Work Light Back-up Fuse	15
74	Oil Level Horn	5
75	External P.T.O Switch	10
76	Oil Level Horn	5
77	ECU	10
78	-	
79	Steering Computer System	15
80	Steering Computer System	15
81	Muller Computer System	15
82	Socket 12V (front left)	10
83	Useful Signal Backup Fuse	7.5
84	-	
85	Socket 12V (cigarette lighter)	15
86	Socket 12V (high current)	25
87	Ignition Lock (+ 30)	7.5
88	-	
89	Start Aid	10
90	Start Aid	10
91	-	
92	Neutral Start	3
93	-	
94	-	
95	-	
96	Electrical Starter Motor 2	10
102	Back-up fuse Of Roof Mounted Central Terminal Compartment	125
103	Back-up Fuse Of Basic Central Terminal Compartment.	80

Relays in the main PCB

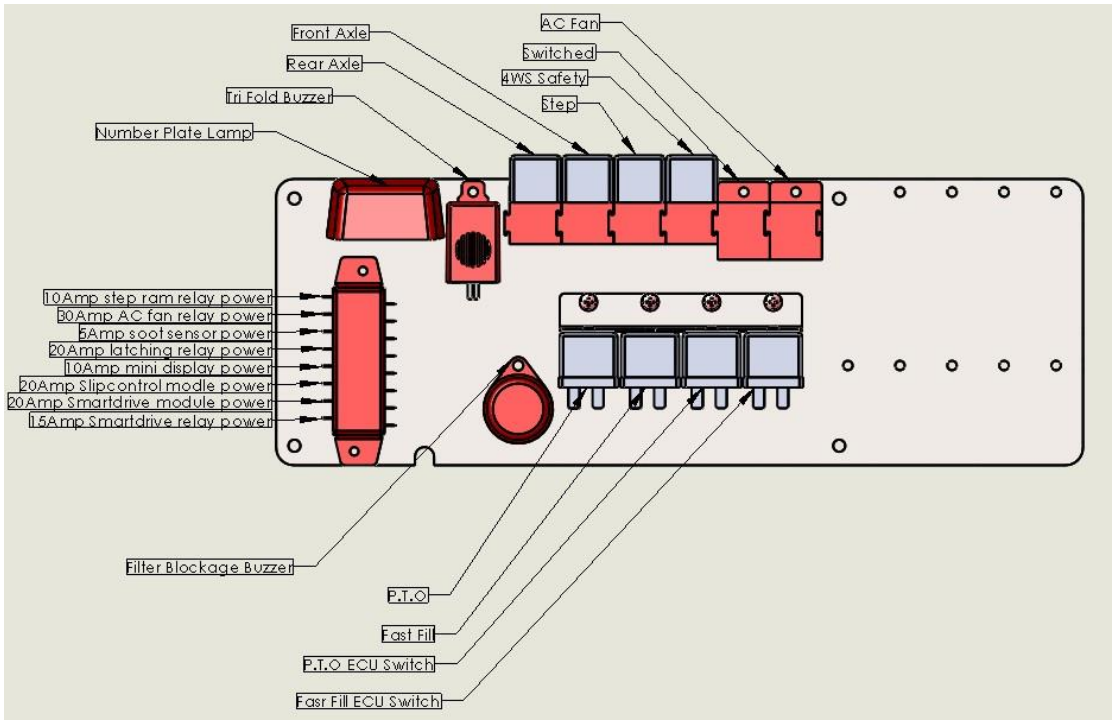
K020	CPU off / CPH off
K021	-
K022	Ground Speed Control Lever Neutral Relay (Safety Start)

K023	Main Drive Relay (Safety Start Switch)
K031	-
K032	Start Aid
K033	Oil Level Horn
K050	Electric Starting Motor Relay
K051	50a to PLD 2
K061	Time Relay

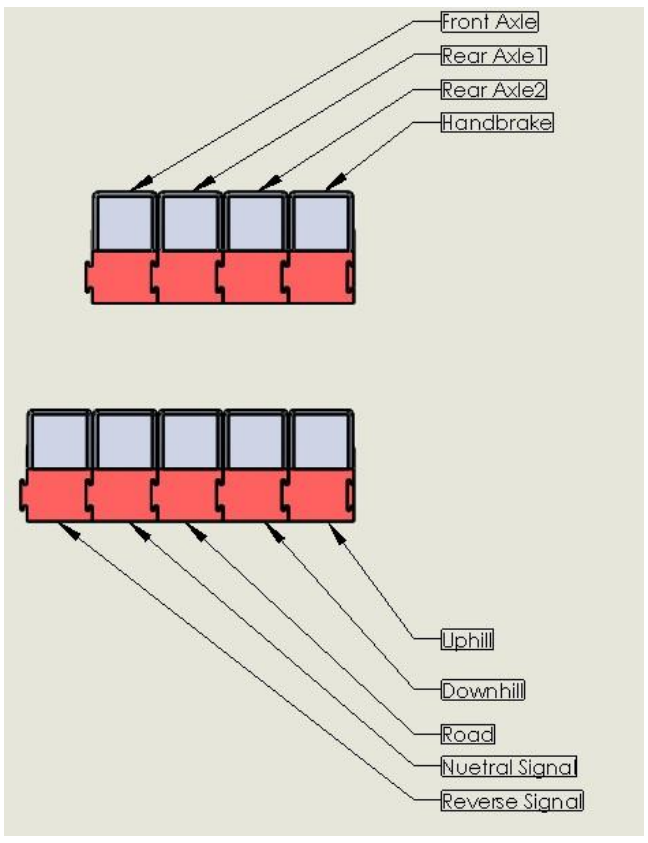
Fuses on secondary relay board.

1	Step Raise	10
2	AC Fan	30
3	Smart Drive Mini Display (Smart Drive Only)	15
4	Slip Control Power (Smart Drive Only)	20
5	Smart Drive Power	20
6	Speed Change	15
7	Start Relay	30
8	Spare	-

Relays on secondary relay board.



Relays on secondary relay board – Smart Drive



Roof Mounted Fuses

1	AC Compressor	15
2	Maintenance Light	15

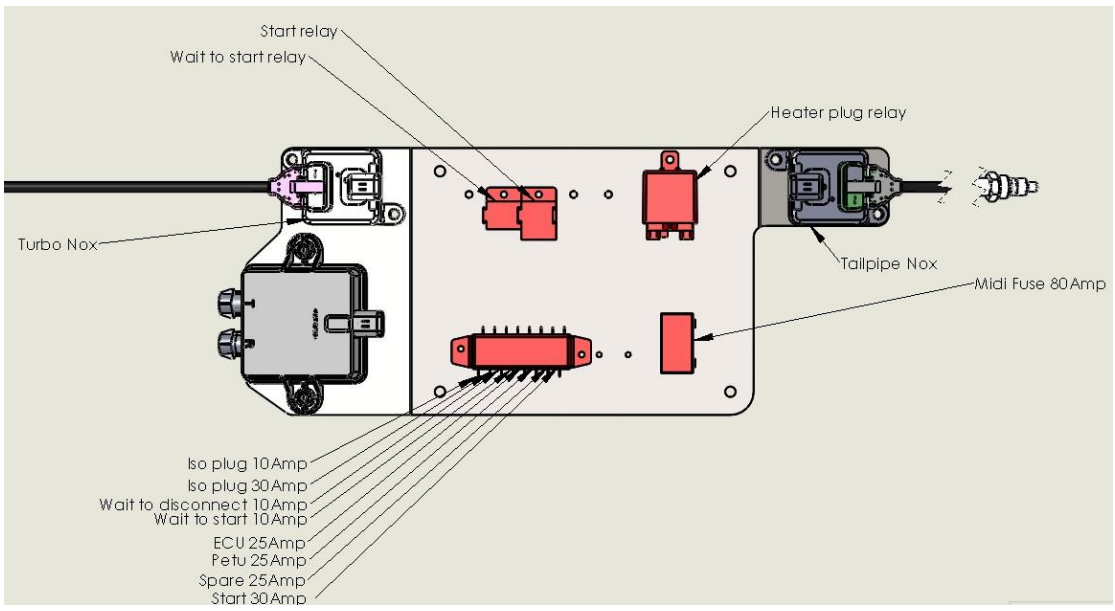
3	-	7.5
4	Left Side Light	7.5
5	Right Side Light	7.5
6	Front Windscreen Wiper Supply	15
7	-	-
8	Left Windscreen Wiper	10
9	Vehicle Light Control	15
10	-	-
11	Spare	15
12	Cab Platform Work Light	15
13	-	-
14	-	-
15	Low Beam, Right	15
16	Low Beam, Left	15
17	Left Main Beam	15
18	Right Main Beam	15
19	-	-
20	-	-
21	Rear Lights	20
22	Outer Front Roof Lights	15
23	Front Left Work light	20
24	Front Right Work Light	20
25	Bottom Right Work Light	20
26	Bottom Left Work Light	20
27	Rear Windscreen Wiper	10
28	Fan Supply	30
29	Mirror Supply	10
30	Warning Beacon Relay Output	20
31	Safety Switch	3
32	-	-
33	Right Windscreen Wiper	10
34	Radio 15	7.5
35	Indicator	15
36	Radio 30	15
37	Radio 30	15
X49	Fuse Test	Open

Roof Mounted Relays

K001	High beam relay
K002	Outside Rail Work Light
K003	Maintenance Light
K004	-
K005	Rear Work Lights
K006	-
K007	Work Light For Area Ahead Relay
K008	Stubble Lighting
K009	Cab Platform Work Light
K010	-
K011	Warning Beacon
K012	Brake Light
K013	AC Clutch
K014	Drive Light
K015D	Ignition Relay
K015DD	Ignition Relay
K016	Additional Drive Light
K017	Railing-mounted Work Lights
K047	USA Indicator
K048	Europe Indicator

Engine Bay Fuses

No	Protecting	Rating (Amps)
1	Muller ISO Plug	10
2	Muller ISO Plug	30
3	Wait to disconect	10
4	Wait to Start	10
5	Engine ECU	25
6	AdBlue Tank Power (PETU)	25
7	Spare	25
8	Start aid relay	30



Before installing any 3rd party electrical equipment please consult the Knight Farm Machinery service department (01780 722208). Failure to do so may invalidate any outstanding warranties.

Wheels and tyres

 Never oil wheel nuts or studs. Check daily for tightness. Be certain to check regularly for tightness if a wheel has recently been removed.

 Your Knight vehicle has been supplied with the correct tyres for the specified work. Always replace tyres with tyres of the same rating.

 Always keep tyres inflated to the recommended pressures. Over or under-inflation is dangerous and will result in excessive tyre wear.

 Wheels and tyres are heavy and awkward to handle. Use appropriate care when storing or moving them.

Torque settings

		Torque	
Fitting	Bolt	Nm	lbs ft
Axle retaining bolts	M24 x 140	800	590
Kingpin retaining bolts	M12 x 30	100	73
Wheel motor mounting bolts	M22 x 120	900	665
Wheel centre bolts	M22 x 1.5 Stud	695	512.6
Wheel rim bolts		300	221

Maintenance log book

	Remarks
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By	

	Remarks
At hrs	
Date	
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Section 5: Sprayer Operating Instructions

Operating the Muller/Knight Integrated Control System

Figure 14 Muller Terminal

All sprayer functions are operated from the Muller controller figure 12 (Console may vary dependant on machine spec). Detailed operation is explained in the separate Muller instruction book.

Fluid Control Pro

General Description

Fluid control Pro is the advanced computer interface that controls the cleaning and rinsing of the sprayer tank, [illegible]g and spray lines. Filling of the sprayer tank is also controlled by this system. All features are operated from a user interface located at the sprayer filli[illegible]n. Many of the features are duplicated on the in cab sprayer terminal. On Self-propelled sprayers engine speed control is also available.

Finding your way around

An operator interface screen is located at the sprayer filling station. The main screen can be reached on the in cab sprayer terminal by pressing the Fluid Control Pro key

Main functions

Fill sprayer tank from external liquid supply

Turn on sprayer tank wash heads

Draw water from sprayer clean water tank

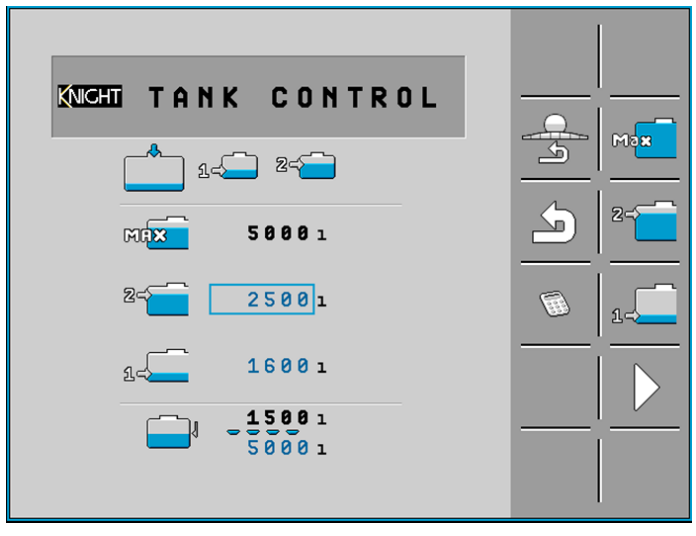

Turn on sprayer induction hopper

Filling the sprayer

There are two ways the sprayer tank fill volume can be set. These are accessed by selecting the tank volume section of the screen. Once the fill method has been selected FILL must be selected on the main screen to begin the fill process

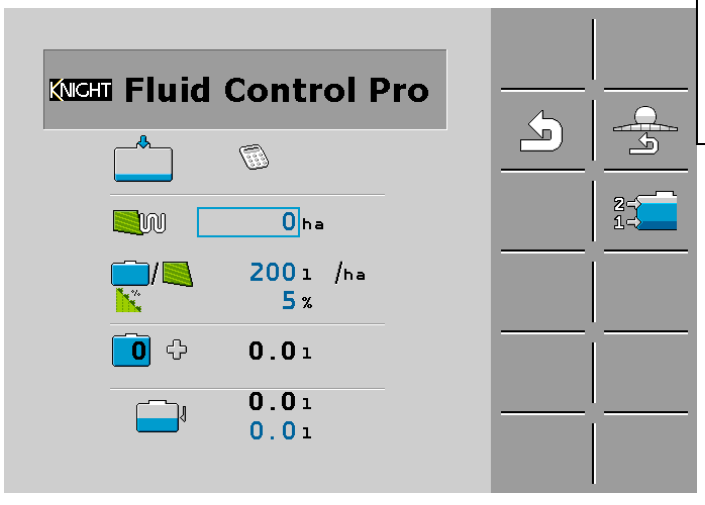
Fill limits


This method is used fill the tank upto its maximum volume. Additionally part tank fill volumes can be defined if required. After filling has stopped at each stage FILL must be selected to start filling to the next defined limit.



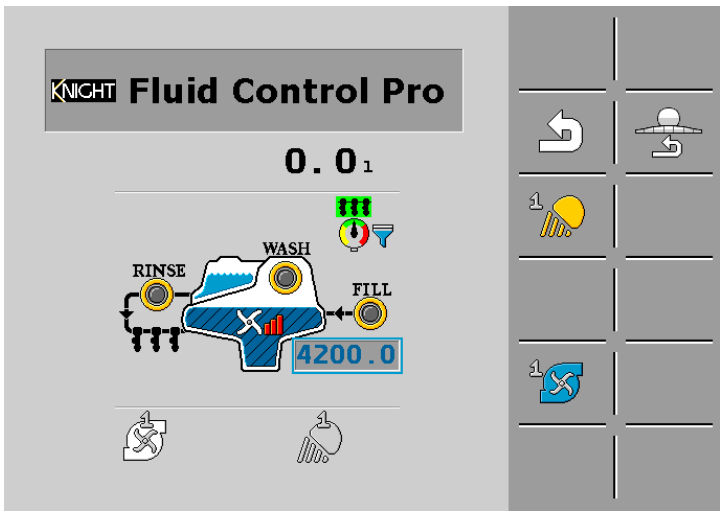
Fill to empty


This method automatically calculates the total volume of product required to spray a specified area at a defi lication rate.



Additional Controls

Other sprayer functions can be controlled from outside of the cab.



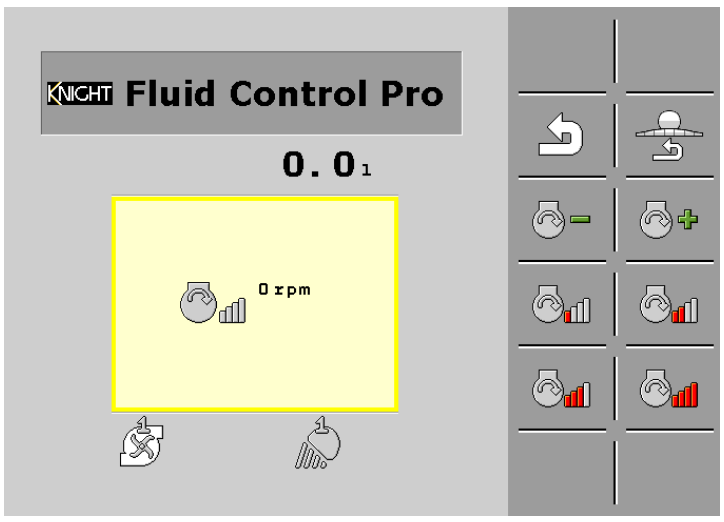

External control of hydraulic drive pumps; ie Sprayer pump on off


External control of fill station lights


Control of other optional sprayer functions

Engine Speed Control (SPV Only)

On the Self-propelled sprayer engine speed during filling can be controlled from the external display.



Filling the Spray Tank with Water

The sprayer uses the main spray pump to fill itself with water. DEFRA 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. Switch on the sprayer pump. This can be done from the in cab switch or from the external switch mounted at the rear of the engine cover near the filling hopper.
3. Press the “Fill” button on the control panel in the cab or on the side of the sprayer. When the light is illuminated the self fill system is engaged and the tank will fill.

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.

To operate the induction hopper

1. The sprayer pump must be run at no less than 400rpm but should never exceed 540rpm.
2. Lower the hopper to the working position.
3. The hopper comes into operation automatically whenever the sprayer master switch is in the off position**.**
4. Turn on the **“hopper agitation nozzle”.** Allow the hopper to fill to above the agitation nozzle. This prevents frothing. 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.
5. 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 sprayers main pump is used for washing. It is preferable to use clean water 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 when circulating water from the sprayer tank by pressing the “Fill” button until the light goes out. 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. Use the hopper when filling with clean water whenever possible. Take care not to overfill the sprayer tank before you have added all the chemical or you may run out of capacity!

Always remember to allow time for the chemical to agitate. This should be done at normal operating RPM

Spraying

1. Check that the “Hopper Outlet Regulating Valve” is closed.
2. Keep engine RPM above 1800 to ensure adequate tank agitation.

Clean Water Valve

The Clean Water Valve controls the flow of clean water into & out of the machine’s 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 at the bottom left of the valve cover. 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!

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 is regulated by the automatic spray volume controller (e.g. Muller Spray 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, highly accurate gauge.

The maximum Ramsay pressure achievable is <u>5.5 bar!</u>

To select the correct application rate read the instructions for the Muller controller (or other controller as fitted)

CROP SPRAYER CALIBRATION

In order to obtain the best results from the chemical you are to apply it is most importa[illegible]t 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.

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

therefore:-

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

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 ether 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 `
b) Tyre size
c) Speed
d) Gear
e) Engine RPM
f) Application volume
g) Pressure
h) Nozzle
i) Nozzle output
j) Spray quality

Calibration should be checked regularly, as the nozzles ware.

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.

Operating the "4" Series Boom

General Description

The Series 4 is an advanced heavy-duty boom designed for large-scale farmers, contractors & crop growers. The figure 4 design combines great structural integrity with operational flexibility & a high degree of nozzle prote 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 me 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.

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 tubesl

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).

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).

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

Level the boom using the Tilt/Lock Beam (see below).

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.

Raise the boom to just clear the transport rest tubes. If too high, the interlocking will not allow folding.

Operate the hydraulic service to close both INNER sections. Take care to ensure both sections close fully & clear the transport rest tubes correctly.

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 by 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

Open the boom & adjust working height as outlined above.

Operate hydraulic service to bring boom to correct level above crop or ground contours.

Locking the boom for one-side operation

Establish which side boom it is necessary to fold.

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.

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.

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.

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

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TRIPLE FOLD BOOM

Operating the Triple Fold Boom

General Description

The triple fold boom is designed for operating widths up to 36m. The first fold stage opens [illegible]m to 12m. The second stage opens to 24m and is protected by a unique trip mechanism that releases pressure in the fold cylinder [illegible]stacle 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 me 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 spryer 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

SPRAYER 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 Spray Lines

1. Press the "Rinse" button on the control panel. (spray pump must be operating)
2. Draw the required volume from the wash tank.
3. If you want to leave the lines with clean water in them stop the spray pump. Alternatively proceed to "washing out the tank"

Washing out the tank

1. Spray until the tank is empty.
2. Ensure the plug is securely fitted in the Suction Filling Camlock.
3. Press the "Rinse" button on the control panel to transfer clean water from the clean water tank to the main sprayer tank.
4. Press the "Wash" button on the control panel to turn on the tank wash heads.
5. When 1/3 of the wash tank has been drawn into the main sprayer tank press the "Rinse" button to stop the transfer and circulate the cleaning water.
6. Allow approximately five minutes for the washing heads to rinse the tank and then spray the washings onto the field.
7. Repeat the above process twice more with the remaining 2/3 of the wash tank contents.

You may 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.

Cleaning the filters

Pressure Filter

Clean water tank fill valve

Suction Filter

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) Press the "Fill" button on the Fingertip control panel until the light illuminates. 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.

2) Press "Fill" button on the control panel until the light illuminates. This prevents possible flow back from the sprayer tank.

3) Unscrew retaining ring & remove filter base, filter element & sealing o-ring.

4) Inspect element & sealing o-ring for damage or dirt – replace if required.

5) Apply a little silicon grease to sealing o-ring & refit element, o-ring & filter base.

6) Adjust red Flushing valve to approximately 4 turn open.

Blocked Nozzles

The Nozzle tip is the "business end" of the spraying machine. Good results depend upon correct nozzle selection & condition. Blocked nozzles are a perennial problem for the sprayer operator, though care & attention to sprayer cleanliness will reduce the incidence of nozzle blockages considerably. A few other pointers to help reduce blocked nozzles are:

1) Filter Mesh size - ensure the correct mesh size filter is fitted for the nozzles being used. Consult your nozzle chart or manufacturer for the details of the right size. As a general "rule of thumb" the smaller the nozzle output, the finer the filter.

2) Filter Condition – inspect the filters daily. Split filter elements may let large particles through to the nozzles.

3) The Product – Use a quality product which is free of lumps or particles. Try to add the chemical in a way that avoids the formation of lumps (for instance pre-creaming some powdered formulations) or allow settlement of the chemical in the tank. Avoid leaving unsprayed product in the tank overnight.

Cleaning Blocked Nozzles

It is good practice to carry several new or cleaned nozzle tips in the sprayer locker, or tool box, for replacing blocked nozzles in the field. This avoids unnecessary downtime & reduces the possibility of operator contamination.

Clear blocked or dirty nozzle with a soft brush & plenty of clean water. Alternatively, if a compressor is available, blowing clean with compressed air works well. Make sure nozzle tips are not damaged during the cleaning process.

NEVER attempt to blow through blocked nozzles with the mouth!

NEVER use wire or similar to try to push dirt or particles out of blocked nozzles – damage to nozzle tips may occur. Use a nozzle brush.


Always wear the correct protective clothing when working with agrochemicals!

DEMOUNTING THE SPRAYER

The sprayer supplied as part of your Knight self propelled crop sprayer can be quickly & easily removed from the back of the vehicle for essential maintenance or to allow the vehicle to be used with other Knight demount packages.

Always 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.

Demounting

1. Assemble and fit the demount legs into the sockets at the front of the sprayer
2. Assemble and fit the rear support to the rear of the sprayer.

3. Connect the feet of the demount legs to the rear support with the chains and D shackles provided.
4. Release the oil pressure in all the hydraulic services by operating the control levers or switches with the vehicle 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.
5. Disconnect the sprayer electrical and pneumatic connections from the vehicle. It is also necessary to disconnect the rear lights of the vehicle temporally but these should be reconnected once the sprayer is removed. Some vehicles may have extra electrical connections to disconnect - ensure these are disconnected as necessary.
6. With sprayer tanks with two sumps ensure the pipe connecting the two tank sumps is disconnected via the cam loc connectors.
7. Using a spanner, release the 2 turnbuckles securing the front of the sprayer and remove the pins from the lower turnbuckle ends. Swing the turnbuckles clear of the securing lugs.
8. Screw down the two back demount jacks until the rear support begins to take the weight of the sprayer.
9. Raise the front legs until the sprayer rotates clear of the vehicle chassis and wheels.
10. It is important to check that you have raised the sprayer enough to allow the vehicle to clear under the tank sump and sump fittings. Once the sprayer is clear of the vehicle chassis it is now safe to re start the vehicle engine and drive out from underneath the sprayer.

Refitting

Refitting the sprayer to the vehicle 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.