

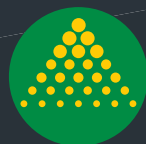
Prairie Pro

Operator's Manual MY19



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GA8701009 REV 4
JUL 2020
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GOLDACRES

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GOLDACRES - RESELLER TERMS AND CONDITIONS OF SALE

Goldacres Goods are only available for purchase upon the terms and conditions set out below.

Interpretation

- In terms and conditions;
- "Goldacres" means Goldacres Trading Pty.Ltd.A.C.N.061 306 732 trading as Goldacres Agricultural Equipment (its successors and assigns) which is the seller of the Goods;
- "Purchaser" means the purchaser of the Goods;
- "Goods" means the products and, if any, the services sold or provided by Goldacres to the Purchaser;
- "GST Act" and "GST" are given the meanings referred to in a New Tax System (Goods and Services Tax) Act 1999.
- "PPSA" means the Personal Property Securities Act 2009 (Cth) (as amended);
- Nothing in these terms and conditions shall be read or applied so as to exclude, restrict or modify or have the effect of excluding, restricting or modifying any condition, warranty, guarantee, right or remedy implied by law (including the Competition and Consumer Act 2010) and which by law cannot be excluded, restricted or modified.

General

- (1) The Goods and all other products or services provided by Goldacres are provided subject to these terms and conditions. These terms and conditions and any terms and conditions incorporated herein by virtue of clause 3 hereto shall prevail over all other terms and conditions of the Purchaser or otherwise to the extent of any inconsistency.
- These terms and conditions may not be modified or amended without the expressed written consent of Goldacres endorsed by the Managing Director of Goldacres Trading P/L.

Additional Terms and Conditions

- From time to time Goldacres may provide additional or extended warranties in respect of certain goods and/or services. Where such additional or extended warranties are provided to a Purchaser in writing they will be incorporated into these terms and conditions provided that in the event of any inconsistency between these terms and conditions and the terms of any additional or extended warranty, the provisions of the additional or extended warranty shall prevail.

Goldacres quotations.

- Unless previously withdrawn, Goldacres quotations are open for acceptance within the period stated therein or, when no period is stated, with 14 days only of the quotation date. Goldacres reserves the right to refuse any order based on any quotation within 7 days of receipt of the order.

Packing

- The cost of any special packing and packing materials used in relation to the Goods shall be at the Purchaser's expense notwithstanding that such cost may have been omitted from any quotation.

Shortage

- The Purchaser waives any claim for shortage of any Goods delivered if a claim in respect thereof has not been lodged with Goldacres within (7) seven days from the date of receipt of the Goods by the Purchaser.

Specifications, etc: Catalogues, etc: Quantities

- All specifications, (including but not limited to: drawings, particulars of weights, volumes, capacities, dimensions, load factors) are approximate only and any deviation shall not be taken to vitiate any contract with Goldacres or form any claim against Goldacres. The descriptions, illustrations, and performances contained in catalogues, price lists and other advertising matter do not form part of the contract of sale of the Goods. Where specifications, drawings or other particulars are supplied by the Purchaser, Goldacres' price is made on estimates of quantities required. Should there be any adjustments in quantities above or below the quantities estimated by Goldacres and set out in a quotation, then any such increase or decrease shall be adjusted on a unit rate basis according to unit prices set out in the quotation.

Performance, Capacities, Chemicals, Liquids, Application Methods, Environmental Effects

- Any performance, volumes, and/or capacity figures given by Goldacres are estimates only. Goldacres shall be under no liability for damages for failure to obtain such figures unless specifically guaranteed in writing and any such written guarantee shall be subject to the recognised tolerances applicable to such figures. The suitability of chemicals and other liquids for any application and the application methods and the environmental effects shall be the sole decision and responsibility of the Purchaser and the user of the Goods. Goldacres gives no warranty as to the suitability of any chemicals or other liquids for any application, nor the application methods nor the environmental effects, which may result from the use of the Goods. Goldacres shall be under no liability for damages arising out of the use of any chemicals, liquids, or mixtures in the Goods nor for any application, nor for the application methods nor for the environmental effects, which may result from the use of the Goods.

Delivery/Service Times

- The delivery times and service times made known to the Purchaser are estimates only and Goldacres shall not be liable for late delivery, non-delivery or delay and under no circumstances shall Goldacres be liable for any loss, damage or delay occasioned by the Purchaser or its customers arising from the late or non-delivery or late installation of the Goods.

Loss or damage in transit

- Goldacres is not responsible for any loss or damage to Goods in transit. Goldacres shall render the Purchaser such assistance as may be necessary to press claims on carriers provided that the Purchaser shall have notified Goldacres and the carriers immediately the loss or damage is discovered on receipt of Goods and shall lodge a claim on the carrier within three days of the date of receipt of the Goods. Insurance of Goods in transit is the responsibility of the Purchaser.

Limit of Liability

- (1) Goldacres liability for Goods manufactured by it is limited to:
 - where the law implies consumer guarantees into these terms and conditions pursuant to Part 3.2 Division 1 of Schedule 2 to the Competition and Consumer Act 2010 (Cth) ("consumer guarantees") which cannot be excluded and Goldacres breaches a consumer guarantee, the loss and damage the Purchaser is entitled to at law which cannot be excluded by these terms and conditions; and, in all other cases
 - making good any defects by repairing the same or at Goldacres option by replacement within a period not exceeding either 1000 hours or twelve calendar months, whichever comes first, after the Goods have been dispatched provided that:
 - the defects have arisen solely from faulty materials or workmanship;
 - the Goods have not received maltreatment, intimation or interference;
 - accessories of any kind used by the Purchaser are manufactured or approved by Goldacres;
 - where applicable, the seals on the Goods remain unbroken;
 - there has been no improper adjustment, calibration or operation;
 - the use of accessories including consumables, hardware or software (not manufactured by Goldacres) has been approved in writing by Goldacres;
 - no contamination or leakage has been caused or induced;
 - any modification to the Goods have been authorised in writing by Goldacres;
 - there has been no inadequate or incorrect use, storage, handling or application of the Goods;
 - there has been no use or operation of the Goods outside of the physical, electrical or environmental specifications of the Goods;
 - there has been no inadequate or incorrect site preparations;
 - there has been no inadequate or improper maintenance of the Goods;
 - it has not been caused by fair wear and tear; and
 - firstly the Goods have been thoroughly inspected and any damage (from whatever cause) to the Goods (and in particular – the structure, welding, seams, bolts, booms) has been repaired prior to the Goods being operated, used driven or moved and on each occasion the tanks are filled; and
 - there has been no failure to comply with the requirements of all present or future laws or regulations relating to the Goods and/or the use and/or the operation of the Goods; and
 - there has been no failure to maintain a record of hours of operation (which record shall contain full details of all inspections, repairs and maintenance) and produce same to Goldacres at the time of the claim;
 - the defective Goods or any damaged part of the Goods are promptly returned free of cost to Goldacres or a representative of Goldacres;
 - all warranty related repairs have been carried out with the prior authorisation of Goldacres;
- If Goods or any part thereof are not manufactured by Goldacres, in particular engines, engine accessories, transmissions, transfer cases, differentials, tyres, tubes, batteries, radios and UHFs, the guarantee of the manufacturer thereof shall be accepted by the Purchaser and is the only guarantee given to the Purchaser in respect of the Goods or that part provided always that this clause does not seek to exclude the consumer guarantees;
- In the case of hydraulic systems, Goldacres shall replace defective parts in accordance with clause 11(I) of these conditions, provided that the failure of the part was not related to contamination within the system. Goldacres shall not be liable for labour in the case of repairing hydraulic system defects;
- Goldacres will not accept liability for damage attributed to fair wear and tear including but not limited to fair wear and tear to nozzles, chains, belts, filters, brake pads, polyethylene bushes and liquid pump valves, valve O-rings, diaphragms and seals;
- Goldacres shall not be liable for and the Purchaser releases Goldacres from any claims in respect of faulty or defective design of any Goods supplied unless such a design has been wholly prepared by Goldacres and the responsibility for any claim has been specifically accepted by Goldacres in writing and in any event Goldacres liability hereunder shall be strictly limited to the replacement of defective parts in accordance with paragraph 11(I) of these conditions provided always that this clause does not seek to exclude the consumer guarantees;
- Except as provided herein, all express and implied warranties, guarantees and conditions under statute or general law as to the merchantability, description, quality, suitability or fitness of the Goods for any purpose or as to design, assembly, installation, materials or workmanship or otherwise are hereby expressly excluded and Goldacres shall not be liable for physical or financial injury, loss or damage or for consequential loss or damage of any kind arising out of the supply, layout, assembly, installation or operation of the Goods or arising out of Goldacres negligence or in any other way whatsoever;
- The benefit of any warranty provided under these terms and conditions shall only be available to the Purchaser and shall not be transferable by the Purchaser;
- The warranties provided under these terms and conditions do not extend to second hand or used Goods that may be sold by Goldacres.
- Goldacres liability for breach of a consumer guarantee is hereby limited (in the case of goods and services not used for personal, domestic or household purposes) to:
 - in the case of Goods, any one or more of the following:
 - the replacement of the Goods or the supply of equivalent Goods;
 - the repair of the Goods;
 - the payment of the cost of replacing the Goods or acquiring the equivalent Goods;
 - the payment of having the Goods repaired; or
 - in the case of services;
 - the supplying of the services again; or
 - the payment of the cost of having the services supplied again.

Prices

- (1) Unless otherwise stated in writing by Goldacres, all prices quoted by Goldacres are inclusive of GST for supplies within Australia and exclusive of GST for exports outside of Australia. Prices quoted are those ruling at the time of quotation or the date the price is given and are based on rates of freight, insurance, customs, duties, taxes, exchange, shipping expenses, sorting and stacking charges, cartage, cost of materials and other charges affecting the cost of production ruling on that date and any alterations thereto either before acceptance of or during currency of the contract shall be to the Purchaser's account.
- For the purpose of 38-185 of the GST Act, the day upon which the seller gives the invoice for the supply shall be the date of the invoice.

Payment

- (1) The purchase price in relation to the Goods and the cost of the service shall be payable without deduction and or set off and payment thereof shall be made on or before the thirtieth day of the month following the delivery of the Goods or performance of the

services unless other terms of payment are expressly stated in writing.

- A decreasing or increasing adjustment and or the issuing of an adjustment note, pursuant to Division 21 and Division 29-C of the GST Act, shall not, in any way, constitute a release, waiver, and/or forgiveness of the debt incurred by the Purchaser.

Interest on overdue payments

- If Goldacres is not paid for any Goods or services on the due date specified in this agreement without prejudice to any other right or remedy, all outstanding money shall bear interest at the rate set, pursuant to the Penalty Interest Rates Act, Victoria, 1986, as such money, together with interest shall be recoverable forthwith from the Purchaser.

Rights in relation to Goods.

- (1) Title to the Goods supplied by Goldacres to the Purchaser shall remain with Goldacres until the total amount due in respect of the Goods and all monies owing to Goldacres have been paid in full (the "Debts"). Risk in the Goods shall pass to the Purchaser upon delivery.
- The Purchaser shall have the right to resell Goods but only as fiduciary agent and trustee for Goldacres by way of bona fide sale at full market value and in the ordinary course of its business.
- Until all the Debts have been paid in full:
 - the Purchaser shall take custody of the Goods as trustee, fiduciary agent and bailee for Goldacres;
 - the Purchaser shall keep the Goods separate from any other goods and properly marked, stored, protected and insured;
 - the Purchaser must hold all of the money it receives ("Proceeds"):
- from the sale of any property into which Goods supplied have been incorporated; and
- from the sale of Goods or provision of services including the Goods supplied by the Goldacres as bailee, fiduciary agent and trustee for Goldacres, but the Purchaser need not hold on trust any money exceeding the amount of the Debts at the time the money is received.
- The Purchaser expressly acknowledges that it is bound by the fiduciary obligation created in the preceding paragraph and acknowledges that:
 - it must hold the Proceeds on trust for Goldacres;
 - it must place the whole of the Proceeds in an account separate from its own moneys (the "Proceeds Account");
 - it must maintain the Proceeds Account separate from its own moneys at all times.
- it must maintain proper records for the Proceeds Account;
- it must not assign or encumber any book debts arising from sales made in circumstances set out in clauses 16(c)(i) and (ii) or do any other act in derogation of Goldacres' legal or beneficial interests; and
- it must account to Goldacres on demand for all moneys standing to the credit of such account.
- For the purposes of identification of different consignments of Goods purchased from Goldacres and receipt of Proceeds, the Purchaser agrees that the principle of "Last In, First Out" shall be applied to any items that cannot be distinguished.
- Goldacres may trace the Proceeds in equity.
- Goldacres may at any time, without notice to the Purchaser and without prejudice to any other rights which it may have against the Purchaser, terminate any contract connected with the Goods and the bailment referred to in clause 16(3) and enter upon any premises owned or occupied by the Purchaser where Goldacres reasonably believes the Goods may be stored, and repossess the Goods without liability for any damaged caused, and subsequently dispose of the Goods at Goldacres' discretion if:
 - the Debts are not paid in accordance with these terms and conditions or any other contract or arrangement between Goldacres and the Purchaser; or
- Goldacres receives notice of or reasonably believes that:
 - a third person may attempt to levy execution against the Goods; or
 - the Purchaser is insolvent (within the meaning of the Corporations Act 2001) or bankrupt; or
 - the Purchaser has entered into any arrangement or composition with its creditors, gone into liquidation, or has appointed a receiver, a receiver and manager or administrator.
- If after repossession under clause 16(4) Goldacres sells the Goods, Goldacres shall account to the Purchaser for any proceeds of sale (less expenses of repossession and sale) that exceeds the amount of the outstanding Debts.
- If any Goods belonging to Goldacres are disposed of by the Purchaser or an insurance claim is made in respect of them, Goldacres shall be entitled to trace the sale or insurance proceeds, which proceeds shall be held by the Purchaser in a separate bank account on trust for Goldacres.
- The Purchaser agrees and acknowledges that in the event it sells Goods to a third party on account, it will include in its terms and conditions of sale a provision under which the Purchaser retains title to the Goods until such time that the total amount due in respect of the Goods and all monies owing to the Purchaser have been paid in full by that third party debtor. The Purchaser also agrees and acknowledges that in these instances, it will register its PMSI in accordance with the PPSA in respect of its security interest in the Goods.

PPSA provisions

- (1) The Purchaser acknowledges that these terms and conditions constitute a security agreement for the purposes of section 20 of the PPSA and that a security interest exists in all Goods (and any associated Proceeds from their sale) previously supplied by Goldacres to the Purchaser (if any) and in all in future Goods (and any associated Proceeds from their sale) that may be supplied to the Purchaser by Goldacres.
- The Purchaser acknowledges that Goldacres has a first ranking purchase money security interest ("PMSI") (as defined in section 14 of the PPSA) in the Goods and the Purchaser must not jeopardise such ranking (whether by act or omission).
- The Purchaser acknowledges that it has received value as at the date of first delivery of the Goods and has not agreed to postpone the time for attachment of the security interest (as defined in the PPSA) granted to Goldacres under these terms and conditions.
- The Purchaser will execute documents and do such further acts as may be required by Goldacres to register the security interest granted to Goldacres under these terms and conditions under the PPSA.
- Until ownership of the Goods passes, the Purchaser must not give to Goldacres a written demand or allow any other person to give Goldacres a written demand requiring Goldacres to register a financing change statement under the PPSA in respect of Goldacres' interest in the Goods.
- The Purchaser must indemnify Goldacres and on demand reimburse Goldacres for all costs and expenses incurred by Goldacres in respect of these terms and conditions including but not limited to Goldacres registering its security interest in the Goods, lodging, discharging or amending any financing statement or financing change statement, or otherwise complying with the PPSA.
- The Purchaser agrees (other than as provided in these terms and conditions) not to sell, lease, mortgage, deal with, dispose of or create or attempt to create any other security interest in or affecting the Goods unless and until the Purchaser's Debts have been satisfied.
- The Purchaser waives its rights under the following provisions of Chapter 4 of the PPSA:
 - to receive a notice on enforcement action against liquid assets (section 121(4));
 - to receive a notice to seize collateral (section 123);
 - to receive a notice of disposal of Goods by Goldacres purchasing the Goods (section 129);
 - to receive a notice to dispose of Goods (section 130);
 - to receive a statement of account following disposal of Goods (section 132(2));
 - to receive a statement of account if no disposal of Goods for each 6 month period (section 132(4));
 - to receive notice of any proposal of Goldacres to retain Goods (section 135(2));
 - to object to any proposal of Goldacres to either retain or dispose of Goods (section 137(2));
 - to redeem the Goods (section 142);
 - to reinstate the security agreement (section 143);
 - to receive a notice of any verification statement (section 157(1) and section 157(3));
- The rights Goldacres may have under the PPSA are supplementary and in addition to those set out in these terms and conditions and do not derogate from the rights and remedies of Goldacres under these terms and conditions or under any other statute or under general law.
- The Purchaser must give 10 business days prior written notice of any proposed change in the Purchaser's name or other identifying characteristics and details.

Purchaser's property

- Any property of the Purchaser under Goldacres' custody or control shall be entirely at the Purchaser's risk as regards loss or damage caused to the property or by it.

Storage

- Goldacres reserves the right to make a reasonable charge for storage if delivery instructions are not provided by the Purchaser within (14) fourteen days of a request by Goldacres for such information.

Returned Goods

- Goldacres shall not be under any obligation to accept Goods returned by the Purchaser and will do so only on terms to be agreed in writing in each individual case.

Goods sold

- All Goods to be supplied by Goldacres shall be described on the purchase order agreed by Goldacres and the Purchaser and the description on such purchase order modified as so agreed shall prevail over other descriptions including any Purchaser's specification or enquiry.

Cancellation

- No order may be cancelled except with the consent in writing and on terms, which will indemnify Goldacres against all losses.

No waiver

- The failure of any party to enforce the provisions of these terms and conditions or to exercise any rights expressed in these terms and conditions shall not be a waiver of such provisions or rights and shall not affect the enforcement of this agreement. The exercise by any party of any of its rights expressed in this agreement shall not preclude or prejudice such party from exercising the same or any other rights it may have irrespective of any previous action taken by that party.

Force Majeure

- If by reason of any fact, circumstance, matter or thing beyond the reasonable control of Goldacres is unable to perform in whole or in part any obligation under these terms and conditions then Goldacres shall be relieved of that obligation under these terms and conditions to the extent and for the period that it is so unable to perform and shall not be liable to the Purchaser in respect of such inability.

Passing of risk

- Risk in the Goods shall pass to the Purchaser upon delivery of the Goods to the Purchaser or collection of the Goods by the Purchaser's agent or carrier as the case may be.

Exclusion of liability

- To the extent permitted by law Goldacres shall not be liable to the Purchaser in contract or in tort arising out of, or in connection with, or relating to, the performance of the Goods or any breach of these conditions or any fact, matter or thing relating to the Goods or error (whether or not it is negligent or a breach of contract) in information supplied to the Purchaser or a user before or after the date of the Purchaser's or user's use of the Goods and Goldacres shall be under no liability for damages arising out of the use of any chemicals, liquids, or mixtures in the Goods, nor for any application, nor for the application methods nor for the environmental effects, which may result therefrom or from the use of the Goods.

Exclusion of representations and arrangements

- To the extent permitted by law the terms and conditions supersede and exclude all prior and other discussions, representations (contractual or otherwise) and arrangements relating to the supply of the Goods or any part thereof including, but without limiting the generality of the foregoing, those relating to the performance of the Goods or any part thereof or the results that ought to be expected from using the Goods.

Place of contract

- The contract for sale of the Goods and the provision of the services is made in the State of Victoria and the Purchaser agrees to submit all disputes arising with Goldacres to the courts of such State and any court competent to hear appeals therefrom.

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Chapter I

INTRODUCTION

Welcome

Congratulations on your purchase of a Goldacres sprayer. The Goldacres brand has been established through more than a quarter of a century of supplying Australian farmers with quality, innovative and technologically advanced spraying equipment - designed in Australia for Australian conditions.

Goldacres not only produce Australia's finest range of spraying equipment - we value the relationship with the owners of our equipment. We are pleased to have you as a Goldacres owner and look forward to making your spray applications as efficient as possible.

Please use this comprehensive resource to gain a full understanding of your equipment, and don't hesitate to contact your Goldacres dealer or Goldacres for further information.



Roger Richards
General Manager

Goldacres Ballarat

Chapter 2

SAFETY

Safety Information

General

The following pages outline important safety information. At Goldacres safety is a high priority. These safety and warning instructions **MUST** be followed to ensure the safe operation of your Goldacres equipment.

Explanation of key terms used in this operator's manual are:

DANGER - You will be killed or seriously hurt if you don't follow instructions

WARNING - You can be seriously hurt if you don't follow instructions

CAUTION - You can be hurt if you don't follow instructions

NOTE - Is used to notify people of installation, operation or maintenance information that is important but not hazard related.

The Operator

All operators of this equipment should be adequately trained in the safe operation of this equipment. It is important that all operators have read and fully understand the operator's manual prior to using this equipment.

All new operators should be trained in an area without bystanders or obstructions and become familiar with the sprayer prior to operation.

Passengers

Do not stand on or carry passengers on the steps or platform when the sprayer is in motion or when the booms are being folded or unfolded.

Warnings

- Always read and understand the operator's manual prior to operation of this equipment.
- It is the responsibility of the operator to ensure that there are no damaged or missing decals on the equipment and that any damaged or missing decals are replaced prior to operation.
- Goldacres equipment either ordered or operated outside the guideline limitations may not be warranted by Goldacres for successful performance. Operators working outside these limitations do so at their own risk, unless specific

advice has been sought from, and provided by, Goldacres in writing.

- Inspect the equipment thoroughly for damage and wear before operation.
- Always read and follow the chemical manufacturer's guidelines for safe application as per the chemical label. Particular attention should be given to the recommended target application rate of the chemical being applied as per the chemical label.
- Goldacres equipment uses several materials that may be harmful to the environment. Potentially harmful waste used with Goldacres equipment includes such items as oil, fuel, coolant and batteries. If these items are disposed of incorrectly the waste can threaten the surrounding environment and ecology. The waste products can leech into surrounding water sources and contaminate the area.
- Certain chemicals may be unsuitable for use with Goldacres standard plumbing designs. Consult your Goldacres dealer if in doubt.
- Do not operate the equipment while under the influence of any drugs, alcohol or if excessively tired.
- Lubricate the equipment as per recommended requirements before operating.
- Make sure that the equipment complies with all relevant road regulations when transporting.
- Flush chemicals from equipment immediately after use.
- When draining fluids from the equipment use appropriate, leak proof containers. Do not use food or beverage containers because someone may consume the contents by mistake.
- Any unauthorised modifications to this equipment may affect its function and create a serious safety risk.
- Keep clear of overhead obstructions – especially power lines as contact can be fatal.
- Never attempt to clean parts, or nozzles, by blowing with mouth.

Continued over page

Safety Information

- Never attempt to siphon chemicals, or substances, by sucking.
- It is imperative that the tow vehicle manufacturer's specifications be checked and all instructions for use when transporting, or towing, be adhered to at all times.
- Care should be taken when transferring liquid into the tank to ensure that the gross weight of the trailer does not exceed the braking and carrying capacity as specified by the tow vehicle manufacturer.

NOTE: 1 Litre water = 1 Kg.

- Water weighs 1kg per litre, however conversion factors must be used when spraying liquids that are heavier or lighter than water. Example: liquid nitrogen has a density of 1.28 kg/L and will therefore be significantly heavier than water if the tank is filled completely. The total weight of a tank full of chemical, should not exceed that of a full tank of water. Machine damage can result if the machine is over weight. See filling instructions in Chapter 8 'Operation' for more information.
- Consideration should be given to both the carrying capacity of the trailer and the gradient of the terrain when determining the speed at which the tow vehicle can be driven safely.
- Ensure equipment is securely fastened or attached to machine at all times.
- Never stand within the radius of the boom wings.
- Never work under any hydraulically raised boom.

Cautions

- A supply of fresh water should be with the equipment at all times.
- Water tanks are not designed for use with diesel fuel or any flammable liquid.
- Do not use this machine in ambient temperatures exceeding 40 degrees Celsius.
- Ensure that all bolts are tightened and secured before operation.
- Always ensure that the boom is securely supported when travelling.
- Centrifugal spray pump: Running the pump dry will cause failure. Care should be not to operate at speeds exceeding 4,400 rpm.
- Diaphragm spray pump: Care should be taken to never overfill with oil or operate at speeds exceeding 540 rpm.
- Do not exceed the maximum spraying pressure of 8 Bar.

Dangers

- Check area to be sprayed for overhead powerlines. Contact between the machine and powerlines can result in serious injury or death. If there are powerlines in the spray area, exercise extreme caution when tilting boom wings.
- Do NOT walk on machine platform when near power lines.

Personal Protective Equipment (PPE)

Always wear close fitting clothing and appropriate safety equipment designed for the job at hand.

- Exposure to loud noise over an extended period can cause permanent hearing impairment or loss. Be active in the conservation of your hearing and wear appropriate hearing protection at all times.
- Chemicals can be harmful to humans, appropriate PPE should be used when handling chemicals.

CAUTION: Always refer to the chemical manufacturers label for guidelines on the appropriate PPE to use with the chemical/s you are using.

Goldacres also suggests that you read and understand the following Australian standards:

- Australian Standard for Chemical protective clothing AS3765.
- Australian Standard for Respiratory protection devices AS1715.

Poisons Information Centres - Call 131 126 (AU)

Cuts, Stabs & Punctures

When Servicing machine, be mindful of sharp edges on parts such as trimmed cable ties, hose clamps, cut reinforced hose and the edges of plates and brackets as they could cause cut, stab or puncture injuries.

Crush Hazard

Never attempt to maintain axles, wheels or components within the vicinity of the wheels with the tow vehicle running or in motion.

Pinch Hazard

When operating moving components such as the boom, access ladder or other components, keep fingers and hands away from potential pinch points.

Burn Hazard

- Avoid contact around all hydraulic lines when at operating temperature

Continued over page

Safety Information

Entanglement Hazard

Rotating drives can cause serious injury or even death when entanglement occurs. Keep hands, feet, hair and clothing away from all moving parts to prevent injury. Never operate this machine with covers, shrouds, or guards removed.

Stored Energy Hazard

Even when the machine is not operating, energy can be stored in components such as hydraulic accumulators, air tanks, tyres, hoses, springs and boom cables. Hydraulically supported components such as the boom center are also a source of stored energy. Before working on the machine, ensure that these parts are relieved of their energy in a safe manner.

Overhead Hazard

BOOM LIFT OR TILT COULD STRIKE POWER LINES. Keep clear of overhead obstructions – especially power lines as contact can be fatal.

Do NOT walk on machine platform when near power lines.

Airborne Particles

- Always stand well clear of equipment during operation.
- Any spray drift is dangerous and may be hazardous to humans and other animals.
- When heating and welding components, ensure that all paint and other such materials are removed. Often hazardous airborne particles and fumes are generated from welding and heating.

Fluids Under Pressure

Fluids escaping from high pressure lines can cause serious injury to skin. Hydraulic oil can easily penetrate human skin. This hazard can be avoided by relieving the pressure in the system.

Do not disconnect any hoses, nozzles or filters while equipment is operating. Disconnecting these components while under pressure may result in uncontrolled fluid discharge which may be hazardous.

Be mindful of the location of pressurised lines in the vicinity of the work area when using equipment such as grinders, oxy torches and welders. The two main risks are that this equipment may easily cut through the lines or the local heat generated near the lines may cause them to rupture.

Ensure that all fittings and lines are fully/tightly secured before re-pressurizing after repairs.

Boom Height Control System

If boom height control system is fitted, keep clear of the boom as it could potentially move without notice.

Lifting Machine

Before raising the machine off the ground:

- ✓ Ensure that the boom is in its closed position.
- ✓ Park up on a flat, level and firm area.
- ✓ Empty the spray tank where possible.
- ✓ Chock all wheels that remain on the ground.
- ✓ Securely lift the machine using a jack and support the machine on work stands.
- ✗ Do not work under the machine when supported solely by a jack.
- ✗ Do not support the sprayer using materials that may crumble.

Changing Wheels & Tyres

An experienced person with the correct equipment should mount the wheels on the sprayer.

When changing a wheel on the sprayer ensure that the sprayer is on firm level ground and the wheels are chocked.

Tyre Maintenance

Maintain correct tyre pressure at all times. Inflation of tyres above or below the recommended pressure exerts additional pressure on the tyre, which may result in tyre damage.

Extreme caution is required during the inflation of tyres. If the tyre is inflated at a rapid rate separation and/or explosion of the rim can occur. This event can inflict serious or fatal injuries to the operator.

- ✓ Always use a tyre inflation gauge.
- ✓ Be proactive and continually check the condition of your tyres.
- ✗ Do not weld, heat or modify the rim.

Machine Operation

- High speed turning places severe stresses on the wheels and axles and should be avoided. It is essential to observe the effects of turning on the open spray boom. Excessive turning speeds transmit great stresses to the spray boom and WILL CAUSE boom damage.
- This machine is designed for a maximum speed of 50 km/h. This speed must only be used on suitable terrain conditions. All components i.e. tyres, brakes, suspension, steering and chassis are designed and built to this maximum speed.

Continued over page

Safety Information

- MAXIMUM SPEED WHEN CORNERING, TURNING AT AN ANGLE GREATER THAN 45° OR DRIVING ON A SLOPE OR UNEVEN TERRAIN IS 5KM/H. When fitted with narrow wheel track and with high centre of gravity, the sprayer may become unstable when turning at excessive speed or when operating on excessively steep terrain.

Collision Prevention & Warning Lights

- Before operating the machine check with the relevant road management authorities for information regarding safe and legal transport on public roads in the state where the machine is being operated.
- To assist in the prevention of collisions with other road users the Goldacres sprayers are fitted with warning lights and signs in accordance with national road regulations.
- The machine can only be taken on public roads during daylight hours.
- Keep lighting and signs in good order and replace any damaged or faulty fixtures.

Working at Heights

Please contact your local government on the restrictions and safety requirements needed to operate at heights.

- There is a risk of falling if a person has "climbed" onto the machine.
- Do not "climb" on machine to get access.
- Use ladder or work platform to get access to parts or areas of the machine above local government restrictions.

Slippery Surfaces

- The surface of the platform has raised portions to stop slipping.
- The platform surface needs to be kept clean of mud and other material to help stop slipping.

Main Tank

- Danger - Confined space do not enter.
- Do not enter the tank for any purpose.

Safe Chemical Usage

The safe use of Agricultural (Ag) chemicals with this equipment is the responsibility of the owner/operators. All operators should be trained in the safe use of Ag chemicals. Goldacres suggest that a relevant course is completed by owners/operators prior to operation of this equipment as a spray unit.

Safety Decals

Understanding safety decals and their purpose assists in the safe operation of your sprayer. Safety decals are there for your protection and it is the responsibility of the owner operator to replace damaged and/or missing safety decals.

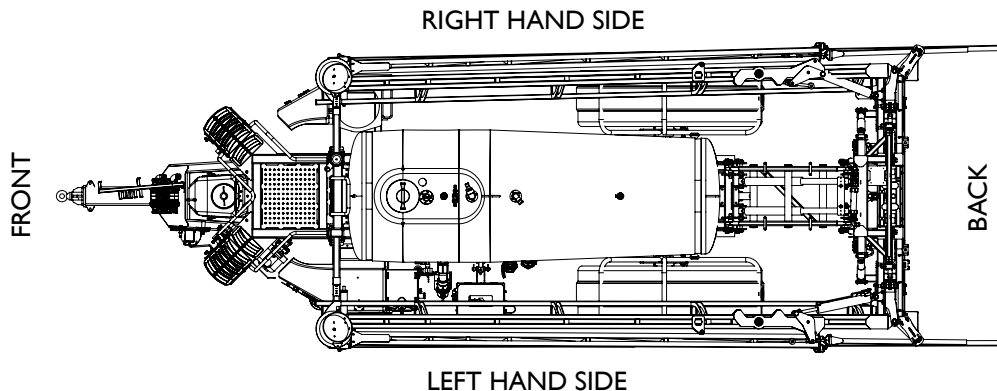
Regularly review safety decals with operators. It is very important to ensure that all new machine components and replacement parts include current hazard identification decals.

Replacement safety decals can be ordered from your Goldacres dealer. Part numbers and descriptions of the decals on this machine can be found in the parts manual supplied.

Chapter 3

GENERAL INFORMATION & SPECIFICATIONS

Machine Orientation



General

Chassis

The chassis is an all steel construction, that is fully welded for superior strength. The chassis is grit blasted, primed and then protected by the Goldacres paint process for excellent chemical resistance and durability.

Paint Codes

Wheels: N23 Neutral Grey
Steel work: G13 Dark Green
Australian Standards AS2700

Tank

All tanks are constructed from UV resistant polyethylene. Polyethylene tanks have a very high chemical resistance. Due to the rotational moulding process, there can be variance in the overall dimensions of the tank which in turn results in 5-10% variation in the tank capacity. For this reason, calibration markings should be used as a guide only.

Agitation

The Supermix agitator is located at the back of the tank and is used to generate increased agitation within the tank. The pressure line to the Supermix agitator from the control manifold passes through a nozzle and then through the barrel into the tank. This causes extra agitation as flow around the agitator is sucked into the barrel and is then passed back into the tank. To increase this venturi effect, the bypass

flow from the electric regulating valve also passes through the barrel, multiplying the agitation effect. The Supermix agitator has an approximate capacity of 300 - 1300 L/min depending of the pump size and operating pressure. For further information refer to Chapter 10 'Lubrication & Maintenance'.

Spray Controller

These sprayers can be supplied with a Raven SCS4400 automatic rate controller; ISOBUS control system; with or without a Raven Rate Control Module (RCM) or a John Deere 2000 ready system. Automatic rate controllers will maintain a user defined application rate automatically as the vehicle speed changes. In order to function, the automatic rate controller relies on a flow meter; speed sensor and control valve. For specific information on the Raven controller please refer to Raven operator's manual supplied and Chapter 6 'Calibration' of this manual.

Boom Nozzle Control

Nozzle control is achieved using the Rapid Fire with Rapid Flow system fitted as standard equipment. Electrically activated air-solenoids control individual boom nozzles and boom section on/off functions. The nozzles have a standard spacing of 500 mm, but 250 mm distances can also be optioned.

Continued over page

General

Filtration

Filtration is a critical part of the sprayer's performance.

As standard, these sprayers are fitted with:

- 1 x Suction filter (32 mesh)
- 2 x Pressure filters (1 x 80 & 1 x 100 mesh)
- Nozzle strainers (50 or 100 mesh)

Spray Pump

There is a choice between two different styles of spray pump on these machines: A centrifugal 400L/min at 8 Bar spray pump and a positive displacement oil backed diaphragm pump capable of 260L/min. PTO drive is standard and a hydraulic drive is optional where a diaphragm pump is fitted. The normal operating range is from 1 - 8 bar which is sufficient for efficient nozzle performance.

- Each individual boom section has a maximum delivery of 35 litres per minute with clean filters fitted.
- The maximum combined flow of all boom sections is limited to 140 litres per minute, or 50% of the pump flow, whichever is the lesser amount with clean filters.
- Centrifugal spray pump: Running the pump dry will cause failure. Care should be not to operate at speeds exceeding 4,400 rpm.
- Diaphragm spray pump: Care should be taken to never overfill with oil or operate at speeds exceeding 540 rpm.
- Do not exceed the maximum spraying pressure of 8 Bar.

Chemical Induction

The method of chemical induction into your sprayer is dependent on the optional chemical induction equipment fitted to your sprayer.

Goldacres chemical induction equipment available includes:

- Chemical Probe
- Chemical Induction Hopper
- 12V Chemical Transfer Pumps
- Direct Chemical Injection Modules

Booms

These sprayers can be fitted with a variety of boom sizes from 24 metres and up to 48 metres in width. TriTech booms feature hydraulic lift, fold and individual wing tilt controllable from the towing machine.

Goldacres TriTech booms feature pitch, roll and yaw suspension in order to provide a superior boom ride and assist in the efficient application of chemical to your target.

Nozzles

As information regarding nozzles is specific to those being used in your application, no specific reference is made to nozzle application rates or nozzle types in this operator's manual. Goldacres suggest the use of a current TeeJet or Lechler nozzle selection catalogue for reference to nozzle sizes, outputs, spray patterns and general spraying information. For more technical information on the function of spray nozzles and factors affecting their performance you can also use the TeeJet 'User's guide to spray nozzles'.

The TeeJet & Lechler nozzle selection catalogue and Users guides to spray nozzles are available from your Goldacres dealer, or as a free download from the TeeJet web site: www.teejet.com

Lechler web site: www.lechler.de

3 Tier System (3TS)

The 3 Tier System (3TS) aims to give a wider range of flexibility around application rate and spraying speed. The 3TS effectively gives the driver a much wider operating band whilst still maintaining optimum droplet size.

The 3TS can be thought of as a three step gearbox. Each nozzle type has an operating pressure band for a given droplet size. As the first nozzle set, or tier, reaches the top of its pressure band, the next larger size nozzle tier is activated.

When the second tier reaches the top of its pressure band, the first tier will be reactivated to spray at the same time. This effectively gives three operating bands.

Machine Limitations

All Goldacres equipment is subject to operating limitations, it is the operator's responsibility to ensure that this equipment is being operated within these limitations and appropriately to the operating conditions at hand.

Goldacres do not endorse use of this machine for spraying at speeds greater than 20 km/hr. Violent speed change WILL CAUSE boom damage. Operating on rough terrain can be harsh on the machine even where a suspension system is fitted. Stop the machine and inspect for damage after impact with gutters, sinkholes, rocks etc.

General

The machine should not be used in ambient temperatures exceeding 40 degrees Celsius or below 5 degrees Celsius.

Custom Built Equipment

Where the owner of this sprayer has requested that custom built equipment or options be fitted to this sprayer it is necessary to understand that custom fabrication and engineering is subject to many variables. Goldacres cannot fully field test all custom built options prior to despatch, and owners of new sprayers fitted with custom built equipment or options need to understand that the functionality of these items may require refining in order to operate as desired.

Hand Wash Tank

A fresh water hand wash tank is located on the left hand side of the machine under the left hand access ladder. It has a bottle with a hand pump that can be filled with a liquid hand cleaner. The main tank can be filled with fresh water for operator use.

Ladder

The ladders are to be used to access to the platform and plumbing fittings on top of the tank. Always face the ladder and retain three points of contact with the ladder at all times when ascending and descending. The ladders should be stowed while the sprayer is operating to avoid personal injury or equipment damage.

Hydraulics

Electric over hydraulic spool valves allow the use of a number of hydraulic functions on the sprayer with only one set of tractor remotes. The hydraulic functions are then controlled from an electric switch box in the cabin. The valve block is located at the rear of the sprayer above the boom valves.

Prairie Pro sprayers can be set up for use on closed centre and open centre hydraulic systems. It is important that you are familiar with the operating system of your tractor prior to connecting your sprayer.

A brief overview of the different hydraulic systems follows below. Further information on your specific system should be supplied by your dealer if required.

Open Centre Systems

Open centre systems have a constant flow of oil from the tractor. Any flow not being used by the hydraulic circuit will be bypassed through the system and sent back to tank.

Axles

Prairie 4000, 5000 & 6500 litre sprayers can be fitted with rigid axles and Air Bag suspension. While 7500 and 8500 litre models are fitted with air bag axles only. Braked axles are available as an option on all models.

The air bag suspension consists of a 12 volt air compressor; a ride height valve, 2 air bags, shock absorbers, axle (used as an air reservoir) and hosing.

The 12 volt compressor is powered up when the ignition is switched on. A fuse is fitted to the ignition relay box to protect the compressor circuit. The compressor, located in the right hand pod, has a pressure cut out switch fitted to it which cuts the power to the compressor when the reservoir recommended pressure is achieved. When the pressure in the reservoir drops below approximately 70 PSI, the compressor will start again. The pressure cut out switch can be adjusted by turning the nut at the end of the spring to apply more or less pressure to the contact spring. The recommended maximum pressure to run in the air bag system is 110 PSI. Optimum pressure is 100 PSI. If the compressor runs continually there may be an air leak present. All hoses and fittings must be checked and repaired if necessary.

Closed Centre Systems - Pressure Compensated

Tractors fitted with closed centre, pressure compensated, hydraulic systems have a variable displacement pump which only delivers flow at the rate necessary to maintain a specified pressure.

Closed Centre Systems - Load Sensing

A closed centre load sensing system is a variation of the pressure compensated system and are commonly designed to reduce hydraulic circuit heat generation.

This system senses a change in flow, and or pressure, and causes the pump to compensate by varying the pump flow. In these circuits no oil is bypassed as only the oil required is being sent to the valve.

The compressor draws its air through a paper element filter mounted on the right hand side boom rest. This filter element must be cleaned daily. In dusty conditions this filter must be cleaned on a more regular basis. Ground conditions, ground speeds and wind conditions can all be factors in determining what measures are necessary to supply clean air to the compressor.

A gauge that displays air pressure is located on the front of the machine.

Further information on air bag suspension and axles can be found in the maintenance and troubleshooting chapters.

Wheels & Tyres

All tyres used on Goldacres sprayers have been designed to carry the maximum loaded weight of the sprayer when travelling at 20 km/h. The load capacity of the tyres decreases as travelling speed increases so it is important to heed this travelling speed limit.

The tyre pressure also needs to be checked regularly (check every 8 to 12 hours of operation) and maintained at the required tyre pressure.

There are many factors concerning the appropriate tyre pressure for a particular tyre and load. For example, the tyre size, rim type, tyre status (driven or free rolling), load, speed, haul length and ply rating all need to be considered when determining the tyre pressure.

The rated pressure and capacity, shown in the chart below, is applicable when the machine is stationary. The cyclic loading pressure & km/hr is applicable for machines that are loaded and moving.

DETERMINING CORRECT TYRE PRESSURE:

- Determine the maximum weight of the sprayer when loaded (do not forget to add the weight of the any other tanks on the sprayer when filled).

- Allow for each tyre to carry half the maximum loaded weight of the sprayer (this does not allow for any load on the tractor pull or cyclical loading, which provides for a safety margin).
- Determine what tyre size and ply is on the sprayer.
- Determine what appropriate tyre pressure will provide the load capacity required by the respective tyre as indicated in the following table.

For further information on wheels and tyres please refer to Chapter 10 'Lubrication & Maintenance'.

NOTE: If a tyre is replaced with a different brand or size, please contact the supplier for correct air pressures to suit the load carrying capacity of this machine.

NOTE: $PSI = Kpa \times 0.145$

EXAMPLE: $240 Kpa \times 0.145 = 34.8 PSI$

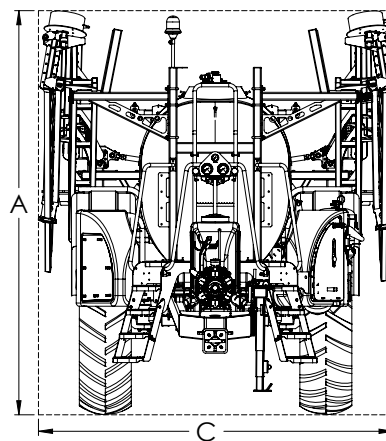
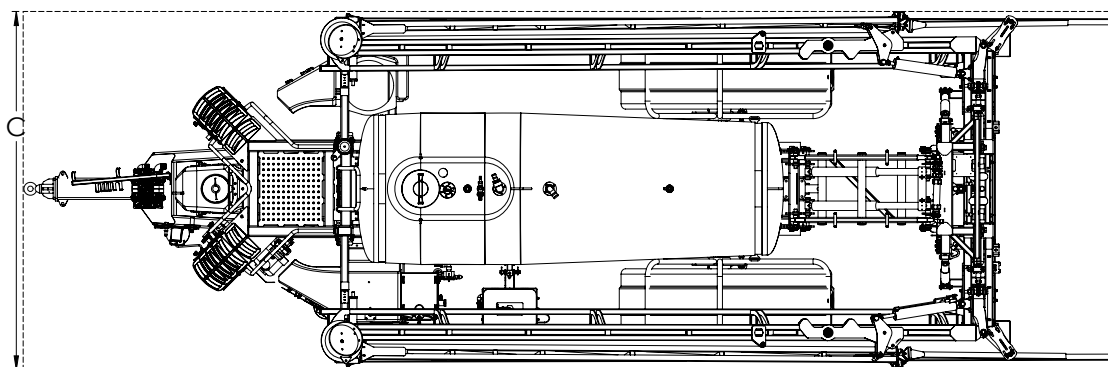
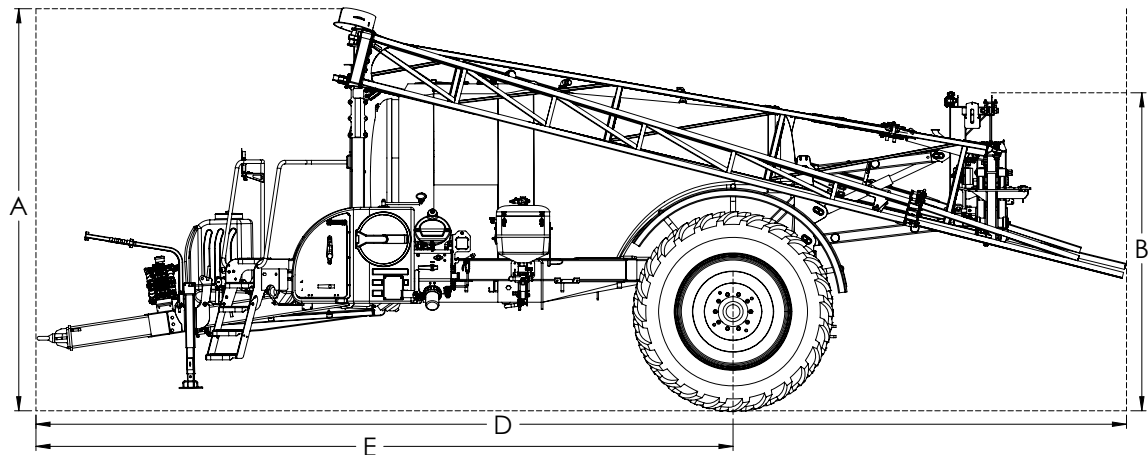
TYRE CHART - PRAIRIE PRO 4000-8500L

TYRE SPECIFICATION	RECOMMENDED PRESSURE
HARVEST 18.4X38 16PR HB45	320 KPa / 46 PSI
HARVEST 520/85R42 169A8 XLOAD	6500L - 220 KPa / 32 PSI
	7500L - 240 KPa / 35 PSI
	8500L - 320 KPa / 46 PSI
HARVEST 480/80R46 158A8 HR45	240 KPa / 35 PSI
HARVEST 710/70R42 179A8 HR45	320 KPa / 46 PSI
HARVEST 520/85R46 173A8/169D	400 KPa / 58 PSI

Dimensions

The following information is provided as a guide only.

Variations in dimensions may occur without notification. To ensure that the dimensions are accurate for your sprayer it is recommended that you measure your sprayer individually.



Continued over page

Dimensions

MODEL	BOOM SIZE	A FRONT HEIGHT	B REAR HEIGHT	C WIDTH	D TOTAL LENGTH	E WHEEL- BASE
4024	24m	2800	3150	3450	8450	5950
4028	28m	3900	3150	3450	8650	5950
4030	30m	3900	3150	3450	9350	5950
4033	33m	4200	3150	3450	9250	5950
4036	36m	4200	3150	3450	9500	5950
5024	24m	2800	3150	3450	8450	5950
5028	28m	3900	3150	3450	9000	5950
5030	30m	3900	3150	3450	9700	5950
5033	33m	4200	3150	3450	9600	5950
5036	36m	4200	3150	3450	9850	5950
6524	24m	3800	3150	3450	9050	6450
6528	28m	3800	3150	3450	9850	6450
6530	30m	3800	3150	3450	9950	6450
6533	33m	4200	3150	3450	9850	6450
6536	36m	4200	3150	3450	9850	6250
7524	24m	3800	3150	3450	9050	6450
7528	28m	3800	3150	3450	10650	6450
7530	30m	3800	3150	3450	10650	6450
7533	33m	4200	3150	3450	10500	6450
7536	36m	4200	3150	3450	10500	6450
8530	30m	3800	3150	3450	11000	6820
8533	33m	4200	3150	3450	10800	6820
8536	36m	4200	3150	3450	10800	6820
8548	48m	4200	3780	4400	9350	6820

Identification & Parts Ordering

When ordering parts or requesting service information for your sprayer it is important to quote the serial number of your machine, and the purchase date, in order to receive accurate information. The location of the serial number plate on your machine is shown in the picture.

NOTE: To identify the exact options fitted to your particular machine, refer to the original quotation and/or build sheet. If needed, a copy of the buildsheet may be obtained by contacting your dealer and quoting your machine serial number as described above.

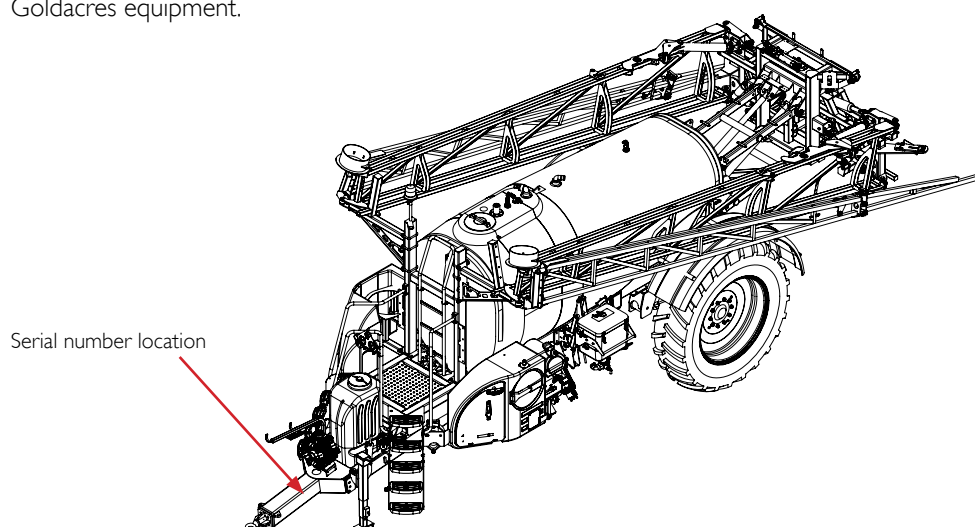
When ordering parts from your Goldacres dealer, please quote:

- Machine serial number
- Part number required
- Part description
- Quantity required

The parts manual supplied with this machine includes all the relevant information that you need when ordering parts from your dealer. When returning parts to a Goldacres dealer for service or repair, all parts **MUST** be cleaned thoroughly before sending them. Dealers cannot expose technicians to the many potentially hazardous pesticides and substances that are in use.

NOTE: Please ensure that all parts are clearly labelled with the owner's details, and a brief description of the fault. Dealers are not liable for the return of any goods to a Goldacres Dealer. The goods must be returned to the point of sale.

Genuine Goldacres parts only should be used on Goldacres equipment.



Chapter 4

CABIN

Not Applicable

Chapter 5

DRIVETRAIN

Not Applicable

Chapter 6

CALIBRATION

General

Spraying is a complex task, that is affected by many variables. It is the responsibility of the operator to be familiar with spraying variables and to understand the spraying process prior to operation.

In general, the operator should know:

- The target application rate
- The required operating (spray) pressure
- The speed of travel
- The desired droplet size

To make the spray application as accurate as possible, it is critical that your spray equipment is regularly calibrated.

The Raven automatic controller is designed to improve the uniformity of spray applications. Raven controllers will monitor and control the determined application volume, but prior calculations will be required to ensure spraying pressures do not exceed operating parameters.

The Raven system comprises a console, flow meter, speed sensor and liquid flow control valve.

As the sprayer is moving, the console records ground speed and then calculates the amount of flow required to maintain the respective application rate at that speed. The console monitors the amount of flow being used via the flow meter and then determines if the flow is correct for that speed. Flow adjustments are made by the control valve which varies the amount (volume) of bypass and thus the volume being applied via the boom is controlled.

When the console is in the automatic mode, as the ground speed increases, the flow to the booms required to maintain the application volume will be increased. This will result in the pressure (as displayed on the gauge) increasing. Conversely, as the ground speed decreases, the required flow to the booms, as well as the pressure, decreases.

When the console is in the manual mode, as the ground speed increases, the pressure and flow will remain constant and the application volume will decrease. Similarly, as the ground speed decreases, again the pressure and flow will remain constant and the application rate will increase.

Record your console calibration information in the table below for future reference:

BOOM CAL	VALUE	BOOM CAL	VALUE	UNIT
1		9		cm
2		10		cm
3		11		cm
4		12		cm
5		13		cm
6		14		cm
7		15		cm
8		16		cm

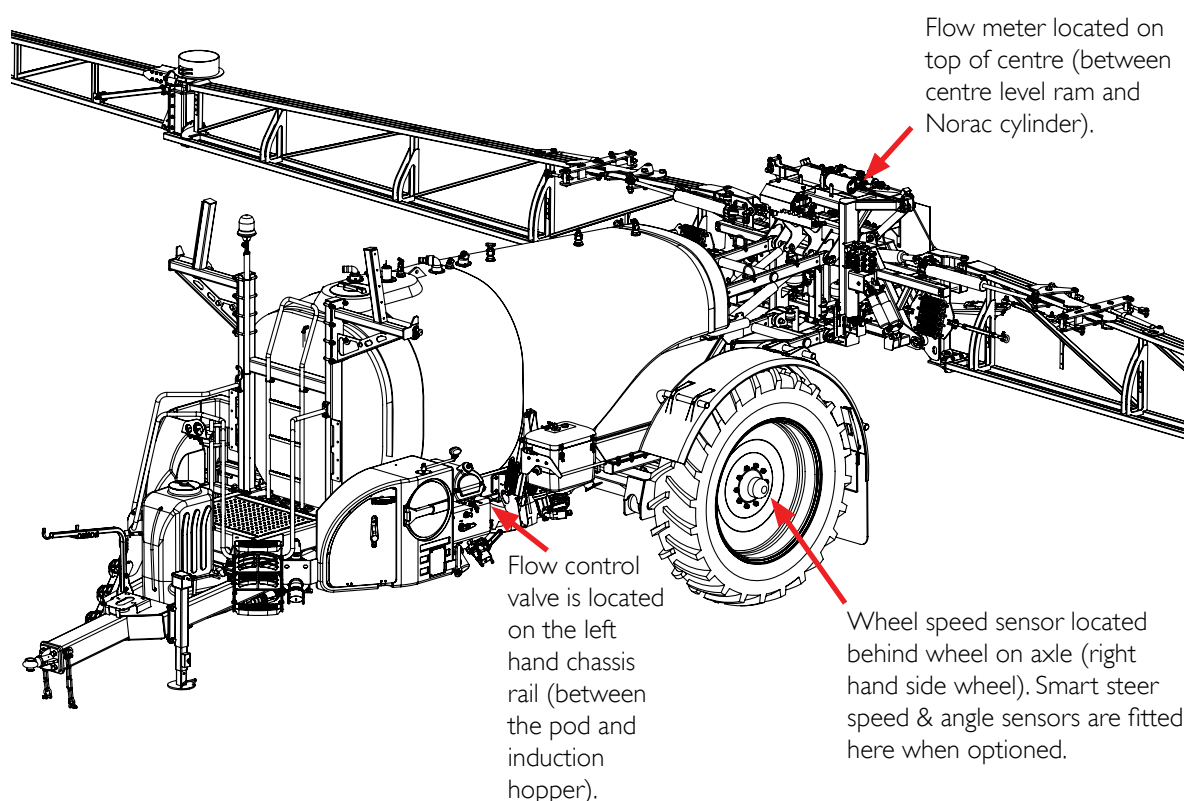
PARAMETER	VALUE	UNIT
Speed Cal		-
Meter Cal		-
Valve Cal		-
Rate 1		L/Ha
Rate 2		L/Ha
Tier 1		L/min
Tier 2		L/min
Tier 3		L/min
Pump Cal		RPM

$$\text{L/min (per nozzle)} = \frac{\text{L/ha} \times \text{km/hr} \times \text{W}}{60,000}$$

$$\text{L/ha} = \frac{60000 \times \text{l/min (per nozzle)}}{\text{Km/hr} \times \text{W (metres)}}$$

$$\text{Km/hr} = \frac{\text{Metres} \times 3.6}{\text{Time (seconds)}}$$

Flow Control, Flow Meter & Speed Sensor Location



Flow Control Valve

The flow control valve regulates the flow going to the boom sections directed via the console. It controls the flow to the boom by regulating the amount of liquid that bypasses back to tank.

The flow control valve is a positive ball valve which means it can control flow infinitely to the boom from 0 L/min to the maximum pump output, dependant on system pressure.

The flow control valve can be operated in manual mode from the console for boom priming, flushing and also troubleshooting.

Rate Control Module (RCM)

The Raven Rate Control Module (RCM) may be fitted as an option. It is mounted to the boom centre if fitted. Consult your Raven RCM operation manual supplied for detailed setup and calibration information.

Continued over page

Speed sensors

Raven automatic rate controllers can utilise a speed reading from:

- Wheel speed sensor
- GPS receiver
- Radar speed sensor

Wheel Speed Sensor

The wheel speed sensor is fitted to the right hand side wheel of the sprayer and uses four magnets (2 north pole (red) and 2 south pole (black)) fitted onto the rim to measure speed.

A north and south magnet must pass the sensor before a pulse is counted. The sensor must be mounted between 12mm & 19mm from the face of the magnet to receive a reading. The magnets must pass directly through the centre of the sensor face.

The speed calibration figure on the console indicates a measurement of the circumference of the wheel as it rolls across the ground. The wheel speed sensor detects when the wheel completes one revolution and the console calculates the distance the wheel travels - therefore giving a km/hr reading.

If the ground speed display reading is incorrect then the calibration and sensor condition must be checked (see Chapter 11 'Troubleshooting').

GPS Receiver

If a GPS unit is fitted, GPS ground speed can be obtained and used in place of the wheel speed sensor.

To receive a speed reading from the GPS unit a **pulsed niema** string must be connected to the speed cable of the console. The console must then be set up to accept GPS speed. This is called radar in the console calibration settings. When using GPS the console speed cal figure is 200 initially and then can be fine tuned from this figure. See "calibration" chapter for further information on console setup.

Radar Speed Sensor

The console can also utilise a radar signal for ground speed reading. A 't-harness' can be fitted to the tractor radar harness to send a pulsed signal to the console speed harness. The console must be setup to receive speed as "Radar."

When using a radar the console speed cal figure is 200 initially and then can be fine tuned from this figure. See 'Console Calibration - Raven SCS4400' section for further information on console setup.

Flow Meter Calibration - Raven 4400

If the sprayed volume from the controller does not match the tank volume that was sprayed out, then the flow meter will need to be checked and a new updated figure input into the 'Meter Cal' in the Raven controller:

- On the flow meter on the sprayer, there will be a calibration number attached to it on a white sticker. The number that is applicable is the one in square brackets, i.e. [185]. Note this number down as this is the number that should be entered as the 'Meter Cal' number.
- The flow meter should be checked at the start of every spraying season and periodically during the season.
- The simplest way to check the accuracy of the flow meter is to fill the tank to a previously determined volume mark (usually top fill marking), while making sure the tank is level.
- On the Raven controller, make sure the 'Total Volume' reads '0'.
- Perform a self test, choose a high speed and high rate so that the tank will empty relatively quickly but make sure the pressure does not exceed 60 PSI.
- When the tank is empty, on the Raven controller press 'Total Volume' to read what the Raven flow meter has output to the boom. Record the reading.
- Check the volume of the tank to see what has been sprayed out to the boom. Record the reading.
- Compare the reading from the controller with the known volume from the tank. If there is a relatively large discrepancy (i.e. more than 50 litres out of a 3000 litre tank), the flow meter should be removed from the sprayer, disassembled and the condition of the turbine checked and cleaned. It should be able to spin freely.
- The flow meter should then be reassembled and replaced on the sprayer. Perform the volume check again and if there is still a discrepancy, the 'Meter Cal' value can be changed

i.e. If volume from the controller reads 3100 litres instead of 3000 litres and the original Meter Cal value is 185, then:

$$\text{New 'Meter Cal' value} = (185 \times 3100) / 3000 = 191$$

Every sprayer should be calibrated regularly to ensure minimal error in the application rate. A nozzle selection chart indicates what application rates are to be expected. Variations due to nozzle wear, ground speed error and pressure irregularities can all add up to result in large application rate errors.

Nozzle Calibration

As part of your daily sprayer calibration, Goldacres recommends you carry out a simple “jug test” to ensure the spray nozzles you are using are delivering the correct amount of chemical, as stated in your nozzle supplier’s rate chart.

Jug Test

The method of carrying out the “jug test” is described below.

You will need:

- A calibrated measuring container that can measure the medium in litres, in 10 ml increments e.g. 0.45 L.
- A timing device that counts seconds.
- A pressure gauge mounted at the nozzle tip to verify the system pressure being delivered at the nozzle. Goldacres part number GA5077983 will enable mounting of a suitable gauge to the nozzle body bayonet fitting (not including gauge).

PROCEDURE:

1. Check the plumbing system for kinked or obstructed hoses and repair or replace any hoses that might restrict the normal flow of the liquid.
2. Start your sprayer and initiate a ‘self test’ procedure on your rate controller console. Set the application rate and speed to the values given in your rate chart that match your desired spray output.
3. Then place the jug under one of the nozzles, for exactly 1 minute and record the volume of liquid collected.
4. Repeat the test over a representative sample of the jets in each boom section.
5. Compare the volume collected from each nozzle to the stated volume in your nozzle supplier rate chart. Variation should be no more than plus or minus 10 %.

In the event that any of your nozzles do not deliver the required volume, a further investigation is required. This may include, but not be limited to;

- Cleaning the nozzles using the method recommended by the nozzle supplier.
- Replacing the nozzles.

- TeeJet advise that nozzles that flow greater than +10% of their stated volume are ‘worn out’ and should be replaced.
- Cleaning nozzle filters.

NOTE: Uneven volumes from individual nozzles will result in variations in the application rate across the width of the boom. Spray efficiency will be reduced. **Crop damage may result.**

If you have any further questions, Goldacres recommends that you contact your nozzle supplier or your Goldacres dealer for additional information.

Download your free copy of ‘A user’s guide to spray nozzles’ from the TeeJet website. Also Lechler nozzle selection catalogue and Users guides to spray nozzles are available from your Goldacres dealer, or as a free download from the TeeJet web site: www.teejet.com or Lechler web site: www.lechler.de

Console Calibration - Raven SCS4400

The following information is a condensed version of the Raven installation and service manual. It is designed to provide sufficient basic information to enable the new unit to be calibrated before spraying is commenced. For more detailed information about console features, consult the Raven installation and operational manual.

It is imperative that the Raven console is correctly programmed, as the system will only work as accurately as the programmed information entered. The Raven 4000 series consoles are very similar however there may be slight differences during calibration - for specific information please refer to the Raven operator's manual supplied with the machine.

NOTE: While proceeding through the initial console programming write down all relevant calibration values for future reference.

The following steps are very important because the system will appear to function properly but be very inaccurate if values are incorrectly entered.

STEP 1 - TURNING THE CONSOLE ON

1. Turn the console 'ON' by momentarily depressing the [POWER] key.
2. Instruction for adjusting the contrast should now be displayed

NOTE: If this is not displayed or if an incorrect entry is made during programming turn the console power switch 'OFF' depress and hold the [CE] key while turning the power switch back "ON". This procedure resets the console.

3. Adjust the screen contrast as directed by depressing and holding the or keys.
4. When the desired contrast is achieved depress the [ENTER] key.
5. The display should now flash the word "CAL" and prompt for a "UNIT OF MEASURE" to be selected.

STEP 2 - UNITS OF MEASURE

1. Momentarily depressing the [CE] key repeatable at this stage toggles the console through the "UNITS OF MEASURE" selection.
2. To operate in litres/hectare ensure "UNITS SI METRIC HECTARES" is display.

3. Then depress the [ENTER] key to lock it in.
4. The console will now prompt for a "PRODUCT TYPE" to be selected.

STEP 3 - PRODUCT TYPE

1. Momentarily depressing the [CE] key repeatedly at this stage toggles the console between "LIQUID" and "GRANULAR" control selections.
2. Sprayers require the selection of "LIQUID CONTROL" to function correctly. (Granular control would be selected when using a fertilizer spreader or air seeders).
3. Ensure "LIQUID CONTROL" is displayed then depress the [ENTER] key to lock it in.
4. The console will now prompt for a "VALVE TYPE" to be selected.

STEP 4 - VALVE TYPE

To select the correct valve type:
Labelling on the side of the flow control valves provides information on the "VALVE TYPE" ("VALVE CAL" information is also on the label and will be required in step 6 below).

Momentarily depressing the [CE] key repeatedly at this stage toggles the console through the various valve types. "FCV" is for SCS4400 (fast close valve).

1. Ensure correct "VALVE TYPE" is displayed as labelled on the valve then depress the [ENTER] key to lock it in.
2. The console will now prompt for a "METER CAL" value to be entered.

STEP 5 - METER CAL

All Raven flow meters are pre-calibrated. The calibration tag is attached to the transducer wire directly adjacent to the flow meter. The metric calibration number is the number in [square brackets] i.e. [185].

To enter the meter calibration figure first:

1. Depress the [ENTER] key.
2. The console will now display "E" enter symbol on the bottom right hand side of the calibration screen.
3. Key in the correct calibration number (i.e. 185).
4. Depress the [ENTER] key again to lock it in.

Continued over page

Console Calibration - Raven SCS4400

5. The console will now prompt for a "VALVE CAL" value to be entered.

NOTE: When entering any calibration figures during the calibration process the [ENTER] key must first be depressed momentarily to display the "E" enter symbol. The "E" indicates the console is ready to accept a calibration figure. After keying in a figure the [ENTER] key must be depressed again to lock the new value in before moving on to the next step.

STEP 6 - VALVE CAL

The [VALVE CAL] value is located on the side of the flow control valve together with the "VALVETYPE" "FAST CLOSE VALVES" have a value of [743].

To enter the value calibration figure:

1. Depress the [ENTER] key to display the "E" enter symbol.
2. Key in the appropriate [VALVE CAL] calibration number as printed on the side of the flow control valve.
3. After keying in the appropriate valve calibration number depress the [ENTER] key again to lock it in.
4. The console will now prompt for a [RATE CAL] number to be entered.

STEP 7 - APPLICATION RATE

[RATE CAL] is the rate (litres/hectare) desired for the particular application

NOTE: Before entering an application rate consult the nozzle application chart (in the operators manual or the Tee Jet catalogue) to ensure the rate is within the speed and pressure capabilities of the nozzles fitted to the boom.

To enter a [RATE CAL]:

1. Depress the [ENTER] key to display the "E" enter symbol.
2. Key in the desired application rate (i.e. 50 L/ha).
3. Depress [ENTER] again to lock it in.
4. The console will now prompt for a "SPEED SENSOR TYPE" to be entered

NOTE: If the console detects the presence of a 2nd product it will automatically interrupt the programming procedure at this point and request values be entered for PRODUCT TYPE, VALVE

TYPE, METER CAL, VALVE CAL, and RATE for this 2nd product. The console will then revert back to STEP 8 if a 3rd product is not detected. If a 3rd is detected the console will automatically request the information be entered for this product before continuing no to STEP 8 below.

For SCS 4400 console connected to a chemical injection pump(s) see separate section on SCS 4400 chemical injection pump programming, in the "DCI" chapter for further details.

STEP 8 - SPEED SENSOR TYPE

Before proceeding in this step first identify which type of speed sensor the console is connected to.

Transmission output or Raven GPS:

1. Momentarily depress the [CE] key repeatedly to toggle through the selection of "SPEED SENSOR TYPES" until "SPEED SENSOR RADAR SP-2" is displayed.
2. Depress the [ENTER] key to lock it in and the console will now prompt for a "SPEED CAL" number to be entered.

STEP 9 - SPEED CAL

Before a [SPEED CAL] figure can be entered a speed calibration value must first be ascertained. The method for calculating a speed calibration figure varies depending on the type of speed sensor the console is connected to

For consoles connected to a transmission output:

Use an arbitrary [SPEED CAL] value of [200]

To enter this value:

1. Depress the [ENTER] key to display the "E" enter symbol.
2. Key in the appropriate [SPEED CAL] number.
3. Depress the [ENTER] key again to lock it in.
4. The console will now prompt for a "BOOM CAL I" number to be entered.

NOTE: This is an arbitrary value only and will require correcting; using the following procedure, once the remainder of the programming procedure is completed.

To recalibrate a [SPEED CAL] value once initial console programming is complete:

1. Accurately mark and measure 100 metres.

Continued over page

Console Calibration - Raven SCS4400

2. With the power switch "on" and all other switches "Off"
3. Depress the [DISTANCE] key.
4. Depress the [ENTER] key to display the "E" enter symbol.
5. Key in a "0" value.
6. Then depress the [ENTER] key again to lock it in.
7. Drive the 100 metres, being careful not to accelerate or decelerate too suddenly.
8. Record the distance that the console displays once the 100 metres has been travelled.
9. The distance should read 100. If it reads between 99 or 101 this calibration value will be correct. If the distance reads any other value perform the following procedure.

NEW [SPEED CAL] VALUE = OLD [SPEED CAL] VALUE X 100

RECORDED DISTANCE

NOTE: Redo the distance check again to confirm the new [SPEED CAL] value is correct.

For consoles connected to a Raven GPS:

Use a Speed Cal figure of [785] (standard speed cal figure for all Raven GPS units).

To enter this value:

1. Depress the [ENTER] key to display the "E" enter symbol.
2. Key in the appropriate [SPEED CAL] number.
3. Depress [ENTER] again to lock it in.
4. The console will now prompt of a "BOOM CAL 1" value to be entered.

This value can be checked once initial console programming is complete by using the same procedure for recalibrating a [SPEED CAL] value for a radar speed sensor above.

STEP 10 - BOOM SECTIONS

The console needs to know the width of each section so it can calculate;

1. The total flow rate required.
2. The area applied.

As boom sections are turned on or off the console

increases or decreases the theoretical width of the boom accordingly in order to calculate the correct flow rate (total L/min to the boom) and the total area sprayed.

To measure the width for each boom section, count the number of nozzles in each section and multiply by the nozzle spacing. i.e. 12 nozzles in one section at 50cm (½ metre) spacings = $12 \times 0.5\text{m} = 6\text{m}$

All Boom Sections must be entered in Centimetres (for example 6m = 600cm) so the correct Boom Cal in this example would be 600.

To enter a [BOOM CAL] figure for boom 1:

1. Ensure boom 1 is displayed.
 2. Depress the [ENTER] key to display the "E" enter symbol.
 3. Key in the boom width in centimetres for boom 1.
 4. Depress the [ENTER] key to lock it in.
- NOTE:** At this point the console does not proceed automatically to boom 2.
5. To proceed to Boom 2 depress the [UP] key momentarily.
 6. Depress [ENTER] and key in the calibration figure for boom 2.
 7. Depress the [ENTER] key again to lock it in.

Depress the key and continue entering the [BOOM CAL]'s in the remaining boom sections. If a boom section is not utilised ensure "0" is entered in that section or the console will fail to function correctly.

INITIAL PROGRAMMING IS NOW COMPLETE.

If the sprayer is fitted with the 3TS option see the separate section on Raven SCS 4400 3TS dual boom operation and programming.

NOTE: Each time the console power switch is turned "on" the products automatically default to the "OFF" mode. Before commencing spraying the product must be changed to the "AUTO" mode.

To change to the "AUTO" mode:

1. Momentarily depress the [PRODUCT ON/OFF] key to turn the product "ON". At this point the console should read "AUTO NOBM" (auto no boom).
2. If it reads "MAN NOBM" (manual no boom)

Continued over page

Console Calibration - Raven SCS4400

momentarily depress the [AUTO/MANUAL] key to switch to the product to the auto mode.

The "NOBM" (no boom) component automatically disappears when the console senses the switching "on" of a boom section.

If you wish to change a calibration figure for Boom Cal, Speed Cal, Meter Cal, Valve Cal or Rate Cal (application rate) at any time simply depress the appropriate key i.e. [BOOM CAL], then the [ENTER] key to display the "E" enter symbol, key in the new calibration number and depress the [ENTER] key again to lock it in.

If you wish to view the Units of Measure, Product Type, Valve Type or Speed Sensor Type depress and hold down the [SELF TEST] key and the console will flash through the various values entered.

If you wish to change the Units of Measure, Product Type, Valve Type or Speed Sensor Type continue holding down the [SELF TEST] key for 20 seconds until the console stops on "UNITS OF MEASURE" and flashes "CAL". Once "CAL" is displayed release the [SELF TEST] key.

At this point repeatedly depressing the [CE] key momentarily will toggle the console through the various options in each step and depressing the [ENTER] key will lock it in and/or move on to the next step. To exit this function at any time continue momentarily depressing the [ENTER] key until the console reverts back to "SELF TEST" and discontinues flashing "CAL".

STEP 11 - PUMP RPM - REQUIRED WHEN PUMP IS HYDRAULICALLY DRIVEN

For RPM to be displayed on the console screen the sprayer must be fitted with a pump RPM sensor.

To activate the pump RPM display on the console screen:

1. Depress the [DATA MENU] key to display the data sub menu at the bottom of the screen. The word "SERIAL" will be highlighted.
2. Depress [DATA MENU] key again and the highlight will move down to "PRODUCT".
3. Momentarily depress the [DOWN] key repeatedly to move the cursor down until page 2 is displayed.
4. Continue momentarily depressing the [DOWN]

key repeatedly until the cursor is adjacent to "PUMP CAL".

5. Depress the [ENTER] key to display the to display the "E" (enter symbol).
6. Key in a value of pulses per revolution (normally one)
7. RPM should now be displayed in the top right hand corner of the screen.
8. Depress a volume or area key to exit the data sub menu and return to the operational screen.

STEP 12 - LOW FLOW LIMIT

This feature, when activated, stops the console controlling the flow rate below an assigned limit to prevent boom line pressure falling too low resulting in fan angle collapse or nozzle check valve closure.

This feature is particularly useful in row crop situations to prevent 'under- application' at the start and end of a row.

In this mode the console effectively defaults to an 'over-application' mode during periods when the sprayer is unable to maintain the minimum speed required for a particular application rate.

NOTE: This feature must not be used with chemicals that have poor crop selectivity and will cause damage to the crop if 'over-applied'. Check with your chemical supplier for more details on chemical/crop selectivity before using this feature.

The SCS 4400 also has the added ability to control to this minimum flow rate value. To activate this feature a minimum flow rate value must be calculated and entered into the console.

To calculate a minimum flow rate refer to the relevant nozzle chart for the nozzle type/size fitted to the sprayer. Nozzle charts can be found in the operator's manual or the TeeJet catalogue.

From the nozzle chart determine the flow rate of the nozzle used at the minimum recommended operating pressure. Multiply this figure by the total number of nozzles fitted to the entire boom line to obtain the "LOW FLOW LIMIT" value.

NOTE: This minimum flow rate value is automatically proportioned as boom sections are turned on and off. Thus a minimum pressure will be maintained regardless of boom section status.

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Console Calibration - Raven SCS4400

ENTERING A LOW FLOW LIMIT VALUE:

1. Depress the [DATA] key to bring up the data submenu at the bottom of the screen. The word "SERIAL" will be highlighted.
2. Depress the [DATA] key again to highlight "PRODUCT".
3. Momentarily depress the key repeatedly to move the cursor adjacent to "LOW LIMIT".
4. Depress the [ENTER] key to display the "E" (enter symbol).
5. Enter the "LOW FLOW LIMIT" value calculated.
6. Depress the [ENTER] key again to lock it in.
7. Depress a volume or area key to exit the data submenu and return to the operational screen.

STEP 13 - TO ZERO INFORMATION WHEN STARTING A NEW LOAD

When starting a new load, the previous Area and Volume data in the console can be reset using the following procedure;

"TANK VOLUME" gives the operator a reference as to the number of litres left in the tank as the load is progressively applied to the field. For this feature to function correctly the estimated volume in the tank must be entered before application of the new load is commenced. A Raven Fill-flow meter can be used to more accurately determine tank volume particularly if using partial tank loads.

1. Depress the [VOLUME TANK] key.
2. Depress the [ENTER] key to display the "E" enter symbol.
3. Enter the volume of liquid actually in the tank at the start of the load.
4. Depress [ENTER] again to lock it in.

NOTE: The console will subtract the litres used (count down) from this value as the load is applied to the field giving the operator a reference as to the number of litres left in the tank.

TO ZERO OUT DATA IN AREA AND VOLUME:

NOTE: Before resetting the Area and Volume functions record any previous data in the console that maybe applicable for future use.

To reset an Area or Volume value:

1. Depress the relevant key relating to the value to be reset. For example [TOTAL AREA], [TOTAL VOLUME], [FIELD AREA] or [FIELD VOLUME].
2. Depress the [ENTER] key to display the "E" enter symbol.
3. Enter a value of "0" to reset the particular function.
4. Depress the [ENTER] key again to lock it in.

The Area and Volume will now count up from zero for the new field.

[FIELD AREA] and [FIELD VOLUME] are generally use as sub-totals for [TOTAL AREA] and [TOTAL VOLUME].

For example if applying several tank loads to the one area [FIELD AREA] and [FIELD VOLUME] can be use to record data for the current tank load while the [TOTAL AREA] and [TOTAL VOLUME] can be used to record accumulative data for the whole area. If [TOTAL AREA] and [TOTAL VOLUME] are used to accumulate data do not reset them until starting a new area.

WARNING: The [self test] feature should never be used with chemical in the tank.

WARNING: Do not use the self test function with the booms in the transport position.

TO SIMULATE A SPEED:

1. Depress the [SELF TEST] key momentarily.
2. Depress [ENTER] key to display the "E" enter symbol.
3. Key in a desired test speed. Note this feature has a decimal point so a "0" needs to be added when entering a whole figure. For example 1, 6 and 0 for 16 Kph.
4. Depress the [ENTER] key again to lock it in.

A desired test speed should now be displayed in the speed window at the lower left corner of the display

Spraying can now be simulated by simply turning on the boom switches.

The [SELF TEST] feature will automatically clear itself when motion is detected from the speed sensor.

NOTE: Some radar and GPS units may sense motion when the sprayer is stationary thus continually clear this function. To counteract this simply unplug the

Continued over page

Console Calibration - Raven SCS4400

speed sensor connection in the fuse box area whilst using this function.

USING THE FLOW METER TO CALIBRATE THE TANK:

1. Enter in the Meter Cal value as given on the white Calibration sticker on the Flow meter.
2. Enter all the other calibration information needed to enable the console to work.
3. Fill the tank to the top mark with water (i.e. 2500 or 3000 etc.). Make sure the tank is level.
4. Make sure the Total Volume reads "0"

Press [TOTAL VOLUME] then [ENTER] Enter "0" then [ENTER]

5. Perform a self-test. (Choose a relatively high speed and high rate so that the tank will empty relatively quickly but make sure the pressure does not exceed 60 psi).
6. When the tank is empty press [TOTAL VOLUME] to read what the Raven Flow meter has output to the booms.
7. If there is a large discrepancy (i.e. the difference between theoretical tank volume and Flow meter volume is greater than 100 litres), alter the Meter Cal value accordingly. For example: If volume reads 3100 litres instead of 3000 litres and the original Meter Cal value is 185.

New 'Meter Cal' value = $(185 \times 3100) / 3000 = 191$

8. Enter in new Meter Cal value and repeat procedure (Step 3 to Step 6). Continue to re-iterate the Meter Cal value until the desired volume accuracy is achieved
9. Write down the appropriate Speed Cal value for future reference.
10. Re-fill the tank to the top mark and perform the self test again. Stop the self test after every 200 litres has been pumped out (read by pressing [TOTAL VOLUME] and check how the water level compares with the appropriate tank calibration mark.

(i.e. After 200 litres has been pumped out there is 2800 left in a 3000 litre tank).

There may need to be extra marks put on tank to indicate where the actual tank calibration levels are.

3TS - Boom Tier Programming

NOTE: Where a Raven RCM has been optionally fitted, it may control the 3TS system. For specific calibration and operating instructions relevant to this system, see Raven RCM operation manual supplied.

NOTE: 3TS boom tier programming can only be carried out if initial console programming has been completed (see Raven SCS4400 Console Calibration section).

For boom tiering to operate, flow rate values (L/min) have to be entered into the console. The console automatically starts on the first tier when the boom master switch is turned "on" but it needs reference points entered to be able to determine when it should change to the second and third tiers. Thus to achieve the three tiers two flow rate value have to be entered.

Before these figures can be entered the maximum flow rate (L/min in total to the boom) for each tier must be calculated.

Using a nozzle chart determine the flow rates (for a single nozzle) at which point you wish the console to change tiers. These points are best determined by ascertaining the minimum pressure and thus the corresponding flow rates at which point you wish the next nozzle to cut in. Care must be taken to ensure these minimum pressure/flow rate settings do not exceed the maximum recommended operating pressure of the preceding nozzle.

For example: If you had XRI 10015 and XRI 10025 nozzles fitted to the sprayer the minimum pressure that the XRI 10025's can cut in at is 1.0 bar. The flow rate for an XRI 10025 nozzle at 1.0 bar is 0.57 L/min.

3TS - Boom Tier Programming

The maximum operating pressure for an XRI 10015 is 4.0 bar; at which point the flow rate is 0.68 L/min, so this combination of nozzles overlap nicely. In actual fact the XRI 10025 would cut in at slightly less than 3 bars if the first set point was programmed at the 0.57 L/min.

To determine the second set point of the 3rd tier, first ascertaining the minimum pressure you wish the combination of the two nozzles to operate at. Then add the corresponding flow rates at this pressure for the two nozzles together to form the second set point.

For example: If you wanted the 3rd tier to cut in at one bar you would add the flow rates for the XRI 10015 and XRI 10025 at one bar together ($0.34 + 0.57 = 0.91$ L/min) Again care must be taken to ensure this minimum pressure/flow rate setting does not exceed the maximum recommended operating pressure/flow rate of the preceding nozzle. At 0.91 L/min the preceding XRI 10025 nozzle would be operating at slightly over 2.5 bars before the 3rd tier would cut in. Again a nice overlap.

NOTE: The flow rate values entered into the console for the tier interchange points must be the sum total of all the nozzles on one entire boom line.

For example: A 30 metre boom with 50 cm nozzle spacings has 60 nozzles on one boom line, therefore $60 \text{ nozzles} \times 0.57 \text{ L/min} = 34.2 \text{ L/min}$ which would be the tier 1 max rate value for the example above.

The tier 2 max rate would be $60 \times 0.91 \text{ L/min} = 54.6 \text{ L/min}$.

NOTE: The above example is based on a 30 metre broad acre boom. Some booms may have different nozzle spacings or layout (i.e. row crop) so it's important to count the total number of nozzles on the first line to ensure the correct Tier Value is calculated and entered.

The pressure figure of one bar is an example only. Other trigger point pressures may be selected.

NOTE: Care must be taken to ensure there is sufficient pressure overlap between the tiers otherwise spray drift or poor efficacy may result.

NOTE: The consoles won't accept tier values containing decimal points so values calculated with

decimal points require rounding off to the nearest whole figure before entering.

TO ENTER THE TIER VALUES:

1. Depress and hold down the [BOOM CAL] key for 5 seconds until "TIER 1 HIGH VOL PER MIN" is displayed.
2. Depress the [ENTER] key to display the "E" (enter symbol).
3. Key in the first tier interchange value and depress [ENTER] again to lock it in.
4. To enter the second tier interchange point depress the key and "TIER 2 HIGH VOL PER MIN" will be displayed.
5. Depress the [ENTER] key again to display the "E" (enter symbol).
6. Key in the second tier interchange value and depress [ENTER] again to lock it in.
7. Depress the key again and "PERCENTAGE TIER DISABLE" will be displayed.

The default setting for this function is "10" which means the tiers will overlap 10% above the entered tier values on the 'up-change' and 10% below on the 'down-change'.

This function is useful if the sprayer is operated at a speed and/or rate that coincides with a tier change point. If this scenario occurs the console will tend to hunt between tiers unless a percentage overlap figure is entered. Maintaining the 10% tier disable value at this point will reduce this 'hunting' tendency.

Keep in mind that the pressures will rise over and fall under the set tier value by the percentage entered. For example if a value of 10% is entered the pressure will rise 10% above the set tier interchange point before a tier 'up-change' will occur and correspondingly fall 10% below the value before 'down- changing'. If using this function ensure the tier interchange points are calculated with this expanded pressure range in mind otherwise the sprayer may operate outside the recommended operating pressure range of the nozzle.

Continued over page

3TS - Boom Tier Programming

If the nozzles or tier values selected allow for very little or no pressure overlap a "PERCENT TIER DISABLE" value of "0" must be selected:

1. To enter a "PERCENT TIER DISABLE" value depress the [ENTER] key to display the "E" (enter symbol).
2. Key in the desired percentage overlap and depress the [ENTER] again to lock it in.
3. Press a volume or area key to exit this function and return to the operational screen.

SCS4400 & 2TS

The SCS 4400 3TS system can be set up to operate in a 2TS mode if the operator wishes to use the same size nozzles in both boom lines.

In the 2TS mode the console will start the sprayer on one line then turn the second line on in conjunction with the first at a predetermined point. It effectively does away with the first tier interchange point of the 3TS system where one boom line is turned "on" whilst the other is turned "off" (obviously this step is superfluous if the same size nozzles are fitted to both boom lines).

TO SET THE CONSOLE UP IN THE 2TS MODE:

1. Depress and hold down the [BOOM CAL] key for 5 seconds until "TIER 1 HIGH VOL PER MIN" is displayed.
2. Depress the [ENTER] key to display the "E" (enter symbol).
3. Key in a value of "1".
4. Depress the [ENTER] key again to lock it in.

By entering a value of "1" the console will automatically proceed and start on the second tier.

To calculate the second tier interchange value:
From the nozzle chart in the operator's manual or the TeeJet catalogue locate the minimum recommended operating pressure and corresponding flow rate (L/min) for the nozzle size and type fitted to the sprayer.

NOTE: If operating the sprayer in the 2TS mode the same size and type of nozzles should be fitted to both boom lines.

Multiply this value by 2 then by the total number nozzle on one entire boom line.

For example: Using a 30 m broad acre boom fitted with XRI 1002 nozzles.

The minimum recommended pressure for an XR nozzle is 1 bar. The flow rate for an XRI 1002 nozzle at 1 bar is 0.46 L/min. Thus the second tier interchange value will be $0.46 \times 2 \times 60$ (2 nozzles/meter) = 55.2.

NOTE: The console will not accept tier values containing decimal points, so round any values calculated with decimal points off to the nearest whole number before entering.

So the value entered in this example would be 55.

Continuing on from above to enter the second tier interchange point:

1. Depress the key and "TIER 2 HIGH VOL PER MIN" will be displayed.
2. Depress the [ENTER] key again to display the "E" (enter symbol).
3. Key in the second tier interchange value and depress [ENTER] again to lock it in.
4. Depressing the again will display "PERCENT TIER DISABLE" (see instruction above on setting this value).
5. Depress and volume or area key to exit this function and return to the operational screen

NOTE: That if either tier value is set to zero then the boom valves will not open.

PRE-OPERATION

Preparing Sprayer For Use

Night Spraying

WARNING: If spraying is to be done at night, ensure that adequate lighting is available around the sprayer and the area to be sprayed.

- The amount of lighting around the sprayer needs to be sufficient for all labels and warnings on the sprayer to be clearly visible to the operator.
- The amount of lighting in the area to be sprayed needs to be sufficient for obstacles in the path of the sprayer to be clearly visible to the operator.

Before Starting Sprayer in Cold Conditions

- If the sprayer has been in a cold environment, always check components to make sure that they have not been damaged and that there is no ice in the system before starting spraying. If the water has frozen in the pump and/or in the lines, wait until it has completely thawed before use.
- Inspect the sprayer to ensure there is no damage or wear which could lead to injury, further damage or reduced performance.
- Check all hoses and fittings for leaks or damage. Check the sprayer to ensure frosts and/or vermin have not damaged the machine, and that the tyres are correctly inflated.
- Check the engine oil, water and fuel.
- Check that all of the lights are working correctly.
- Check all bolts and nuts to make sure they are tight and secure.
- Complete the scheduled lubrication.

NOTE: Proper grease is essential for the sprayer to operate with maximum effectiveness and life-expectancy. It is important to keep the lubricant and lubricant applicator clean. Wipe all dirt from the fittings before use.

Goldacres recommends that multi-purpose grease should be used for all lubrications. Make sure all open-end bearings are lubricated their full length by forcing lubricant into them until it begins to appear at the sides. Protect all surfaces with corrosion inhibitor G15.

- Be sure to adequately clean and flush all chemical handling equipment.
- All spray equipment should be cleaned at the start and end of each spray season including all filters and nozzles.
- Test the pump with clean water: Switch on the pump at the lowest revs possible and then gradually increase revs until the pump reaches its operating speed. Do not exceed 4400 rpm on standard fitment centrifugal pump or 540 rpm on optional fitment diaphragm pump.
- Check nozzle patterns for irregularities. If there are irregularities, clean the nozzles and refit. If the problem persists they could be worn so remove and replace.
- Make sure there is a sufficient quantity of clean water in the rinse water tank in case of a chemical accident.
- Arrange communication with someone who can come to your aid if need be.

Continued over page

Preparing Sprayer For Use

Overhead Power Lines

Check any areas to be sprayed for overhead power lines. If there are any in the area, contact the relevant energy provider for information on safe use of machinery near live lines.

DANGER: Check area to be sprayed for over head power lines. Contact between the machine and power lines can result in serious injury or death. If there are power lines in the spray area, exercise extreme caution when tilting boom wings.

DANGER: Do NOT walk on machine platform when near power lines.

Spray Calibration

Flow meter and spray nozzle calibration should be checked regularly to ensure that correct application rates are maintained. Refer to Chapter 6 'Calibration' for procedures to check and alter calibration if required.

Maintenance

Correct servicing and maintenance of the Sprayer will ensure the most efficient and safe operation possible. Servicing and maintenance should be carried out according to the schedule in Chapter 10 'Lubrication & Maintenance'.

During The First 8 Hours Of Operation - Checks

Torque Settings

- Check the torque on retaining nuts frequently.
- The wheel nuts should be checked to ensure that 320 ft/lb is maintained.

Lubrication & Hydraulic Fluids

- Maintain correct oil levels in the diaphragm style pump.
- Inspect hydraulic lines and connections for leaks.

Tank Retaining Strap Bolts

- The tank retaining strap bolts should be checked to ensure that they have not become loose.

Pump Mounting Bolts

- The pump mounting bolts should be checked to ensure that they are not loose.

Lights

- Check each light around the machine for correct operation.

Drawbar Connections

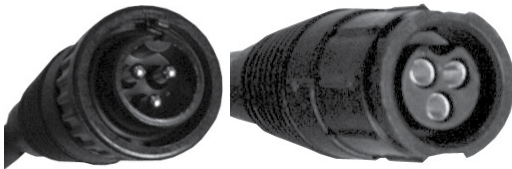
The standard drawbar connections are as shown below. It is important that the dielectric grease (supplied with each sprayer) is applied to electrical connections prior to connection. This keeps the electrical terminals in good condition by preventing corrosion. Electrical conductivity is also maximised which prevents hard-to-diagnose electrical failures.



Raven SCS4400 male & female connectors



Tail light connection (optional)



Raven male and female speed sensor connections



Hydraulic hose connections



Male and female Deutsch connections



Safety chains (optional)



ISOBUS connection



Draw bar connection mounting plate

Tractor Connection

Prior to tractor to sprayer connection, it is important that the operator has read and fully understood this operator's manual.

TRACTOR TO SPRAYER CONNECTION

1. Ensure that the tractor is suitably rated to safely tow the sprayer and that the drawbar pin size matches the hitch on the sprayer. The standard hole size is 50 mm. A replaceable insert (Part number GA4582455) can be purchased to reduce wear if required. A replaceable bush (GA5075075), reduces the size of the hole in the hitch if a smaller pin is to be used.
2. With the sprayer parked on a level surface, use the sprayer jack to raise the sprayer hitch in line with the tractor hitch.
3. Reverse the tractor into sprayer hitch until aligned, and insert drawbar pin (not supplied). Then connect safety chains.
4. With the sprayer securely attached to the tractor, raise the jack until weight is transferred to the tractor. Then raise the jack and store in the transport position.
5. Fit the spray controller and any other switch boxes supplied in tractor cabin. Make sure that all controllers and switch boxes are securely mounted.
6. Connect any power leads from Raven Console directly to battery.
7. If not already done, apply some dielectric grease to the electrical connections. Such as to the wiring loom, speed sensor cable, tail light plug and so on. Then connect them to the appropriate plug at the rear of the tractor.

PTO SHAFT PUMP

1. Fit the PTO shaft (if applicable).
2. Grease the PTO shaft as per the lubrication schedule.
3. Ensure that all safety guards are in place.

IMPORTANT: See PTO shaft setup information in 'Diaphragm Spray Pump - PTO Drive' section.

IMPORTANT: The wide angle joint must be connected to the tractor PTO drive side.

HYDRAULIC DRIVE PUMPS - DIAPHRAGM

1. Connect hydraulic hoses to tractor remote outlets.
2. All hydraulic hoses except two, have a tag zip tied to them that denotes what they are for. Connect the hoses to the appropriate place on the tractor. Ensure that the connection points are clean before fitting to the tractor.
3. The two hydraulic lines that don't have tags on them are the pump lines. The pump can run in either direction so it does not matter which port (pressure or tank) that the hoses go into.

HYDRAULIC DRIVE PUMPS - CENTRIFUGAL

1. Connect hydraulic hoses to tractor remote outlets. The hydraulic hoses for the pump should be marked 'Pressure', 'Tank' and 'Case drain'. These pumps are directional and require correct hose attachment to function.

IMPORTANT: Ensure that the case drain hose is connected so that the pump internal components may be properly lubricated during operation.

IMPORTANT: Case drain MAX pressure is 15 PSI.

IMPORTANT: Do not run the pump in reverse. Running the pump in reverse will cause pump failure. A check valve has been placed in the hydraulic lines to prevent this.

TRACTOR TO SPRAYER DISCONNECTION

Disconnection of the sprayer from the tractor is the opposite and reverse of the above instructions.

Diaphragm Spray Pump - PTO Drive

Wide angle PTO shafts are supplied with this option. When using/hitching a sprayer, especially for the first time, the following critical points concerning the PTO shaft must be considered:

MAXIMUM PTO OPERATING LENGTH

Try to obtain the greatest possible overlap. In its working position, the PTO shaft must not be extended by more than half the profile overlap (P_u) available when fully compressed (L_z). The maximum PTO operating length is shown on the diagram below as ' L_b '.

PTO SHAFT LENGTH ADJUSTMENT

1. Hold the shafts next to each other in the shortest working position and mark them.
2. Shorten the inner and outer guard tubes equally.
3. Shorten inner and outer sliding profiles by the same length as the guard tubes.
4. Round off all sharp edges and remove burrs.
5. Grease sliding profiles before reassembling.

NOTE: It is important that enough travel is allowed in the PTO shaft to ensure that it does not collapse fully when travelling through a ditch or similar and cause damage to the pump. That is, the shaft should not be overly compressed as fitted in the neutral position.

MAXIMUM PTO JOINT OPERATION

Ensure equal joint angles. For wide angle PTO shafts the following are guidelines for operation:

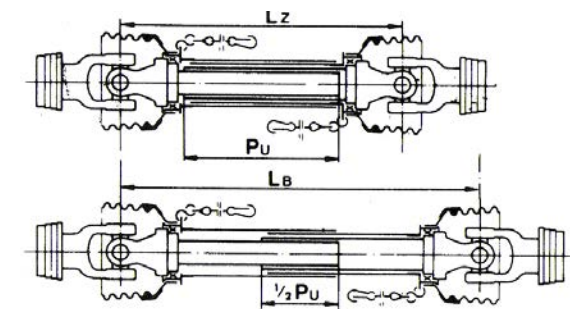
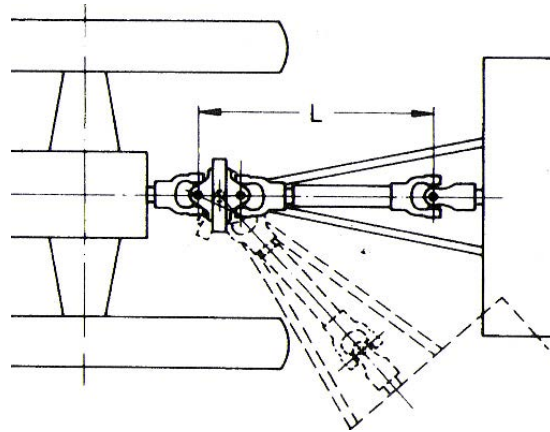
Continuous operation - 25 degrees

Short duration - 80 degrees

Stationary - 80 degrees

PTO SHAFT COUPLING

Press in the locking pin and simultaneously push PTO shaft onto pump or tractor PTO shaft until pin engages. Pull PTO shaft back to make sure pin has engaged and the shaft cannot come off.



Diaphragm Spray Pump - Hydraulic Drive

Diaphragm pumps can also be driven by a hydraulic motor which is bolted directly to the front of the pump.

The oil line to the hydraulic pump is fitted with a needle valve that regulates oil flow to the pump. Many tractors feature hydraulic oil flow regulation in the cabin, however this needle valve can be used to control the flow on tractors that are not fitted with hydraulic oil flow regulation.

Where the tractor has the capability to regulate flow from the cabin, it is recommended to close the needle valve and adjust the hydraulic oil flow from the tractor to set the pump running at 400 - 500 rpm. Do not exceed 540 RPM.

SETTING HYDRAULIC PUMP SPEED

On the Raven 4400 series consoles this must be set up through the data menu. See Chapter 6 'Calibration' for more detailed setup information.

Centrifugal Spray Pump - Hydraulic Drive

The ARAG MSP400 series pumps are the first multistage pumps specifically designed for agricultural spraying purposes.

The use of multiple impellers allowed the development of a pump made with high resistance tecnopolymers, granting an excellent compatibility with spray chemicals.

The design allows high working pressure to be achieved while minimising pump RPM, assuring a longer lifespan of all components.

CHARACTERISTICS

- High efficiency (low oil flow)
- Reduced size
- Flow rate 400 L/min @ 8 BAR - 103 GPM @ 120 PSI (4200 RPM)
- Excellent chemical compatibility

SETTING HYDRAULIC PUMP SPEED

The pump speed is set via the tractor based hydraulic flow controls. A good quality flow control system should be used such that pump RPM does not vary significantly with tractor engine RPM.

IMPORTANT: Do not run the pump faster than 4200 RPM.

IMPORTANT: Do not run the pump dry. Running the pump dry will cause pump failure.

IMPORTANT: Do not run the pump in reverse. Running the pump in reverse will cause pump failure. A check valve has been placed in the hydraulic lines to prevent this.

Control System Mounting

The mounting of the consoles within the cabin of your tractor is a critical part of the set up process. It is important that the consoles are mounted in the cabin in such a way that it cannot cause harm to the operator under any circumstance while also being mounted in a user friendly way.

When the sprayer is removed from the tractor, and the consoles are to remain fitted, please ensure that all consoles remain firmly mounted and cannot become a projectile.

For specific information on mounting the consoles, please refer to the Raven installation and service manual supplied.

If there are mounting holes in the pillars of the tractor, a bracket (GA4522930) is supplied with the console mounting kit to allow the console to be mounted to the pillar:



Above: Optional ISOBUS foot controller can be placed anywhere convenient on the cabin floor.



Above: Console mounted on accessory bar (far left).



Above: Some tractors may have pre-drilled mounting holes on the pillar which can be used with the bracket GA4522930 to mount the rate control console.

Control System Connection

The consoles should be connected according to the electrical schematics following in this chapter. These schematics provide you with a layout of all connections to ensure that the system is properly connected prior to operation.

CONSOLE POWER WIRING

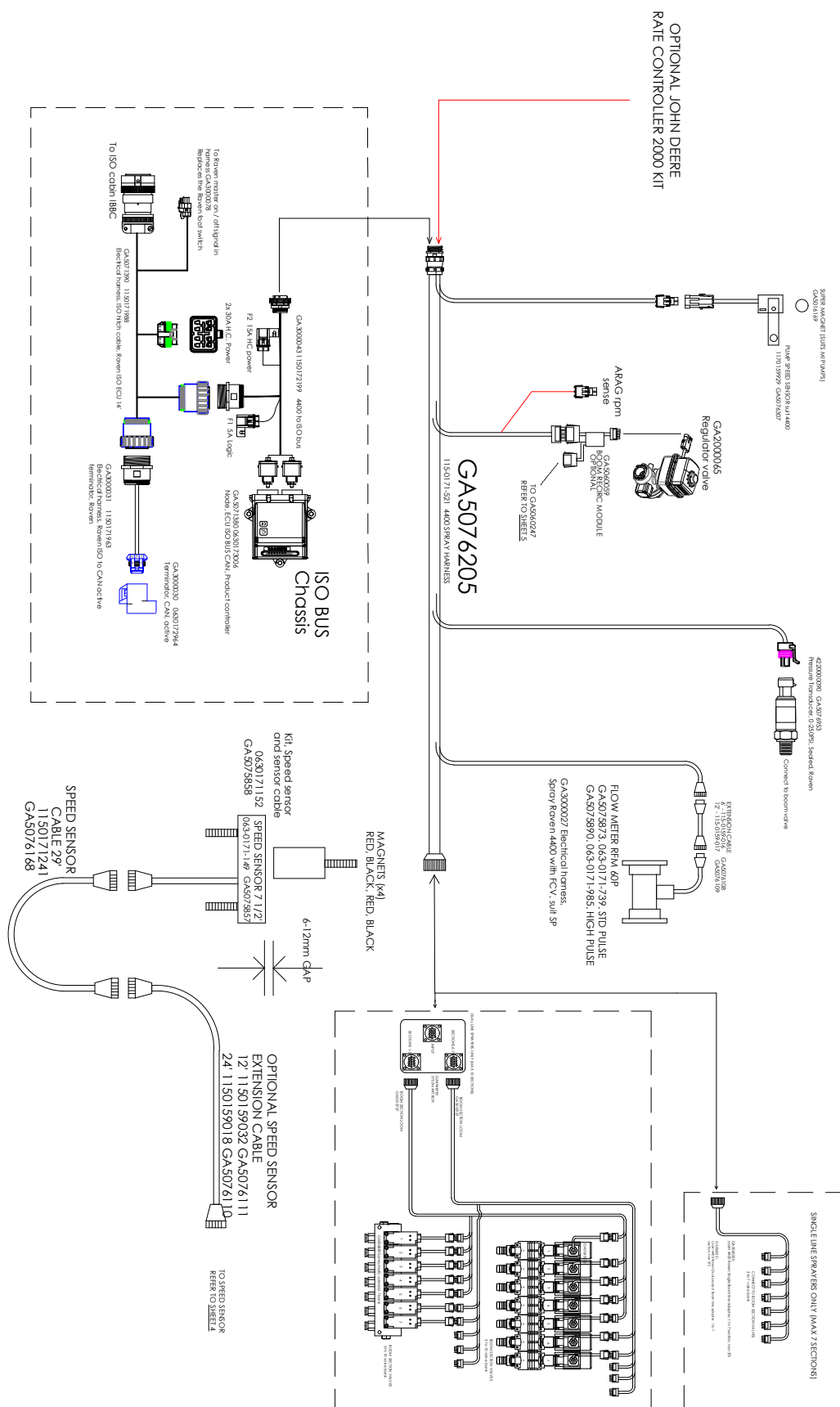
With the consoles mounted in the cabin, turn the power switch to OFF and route the positive red (+) and negative black (-) battery wires to a 12V battery. Attach the black battery wire to a negative terminal and the red battery wire to a positive terminal.

The Blue wire connects into the ignition source and the small black wire connects to earth.

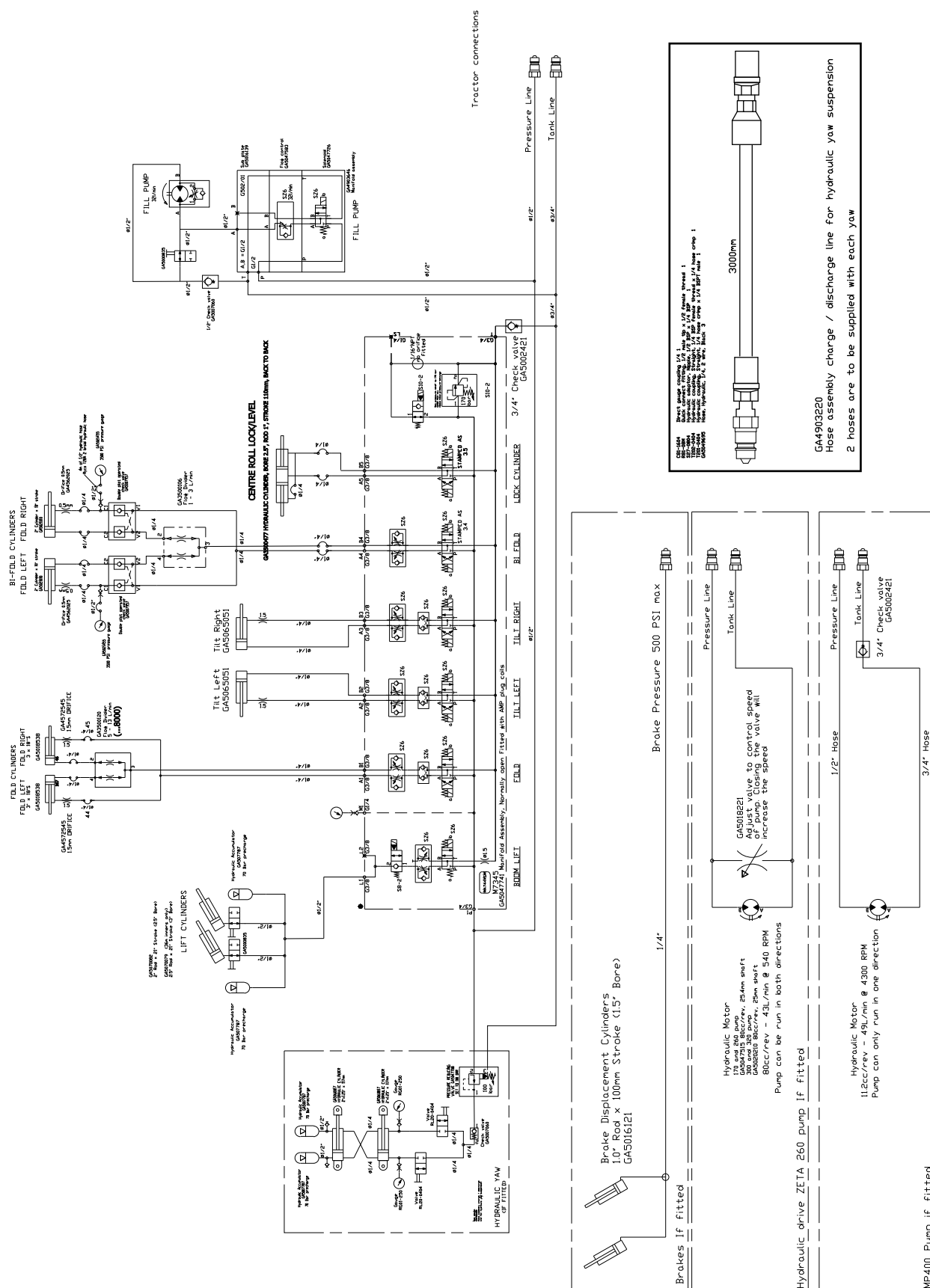
NOTE: The negative should be connected last to prevent the chance of a short.



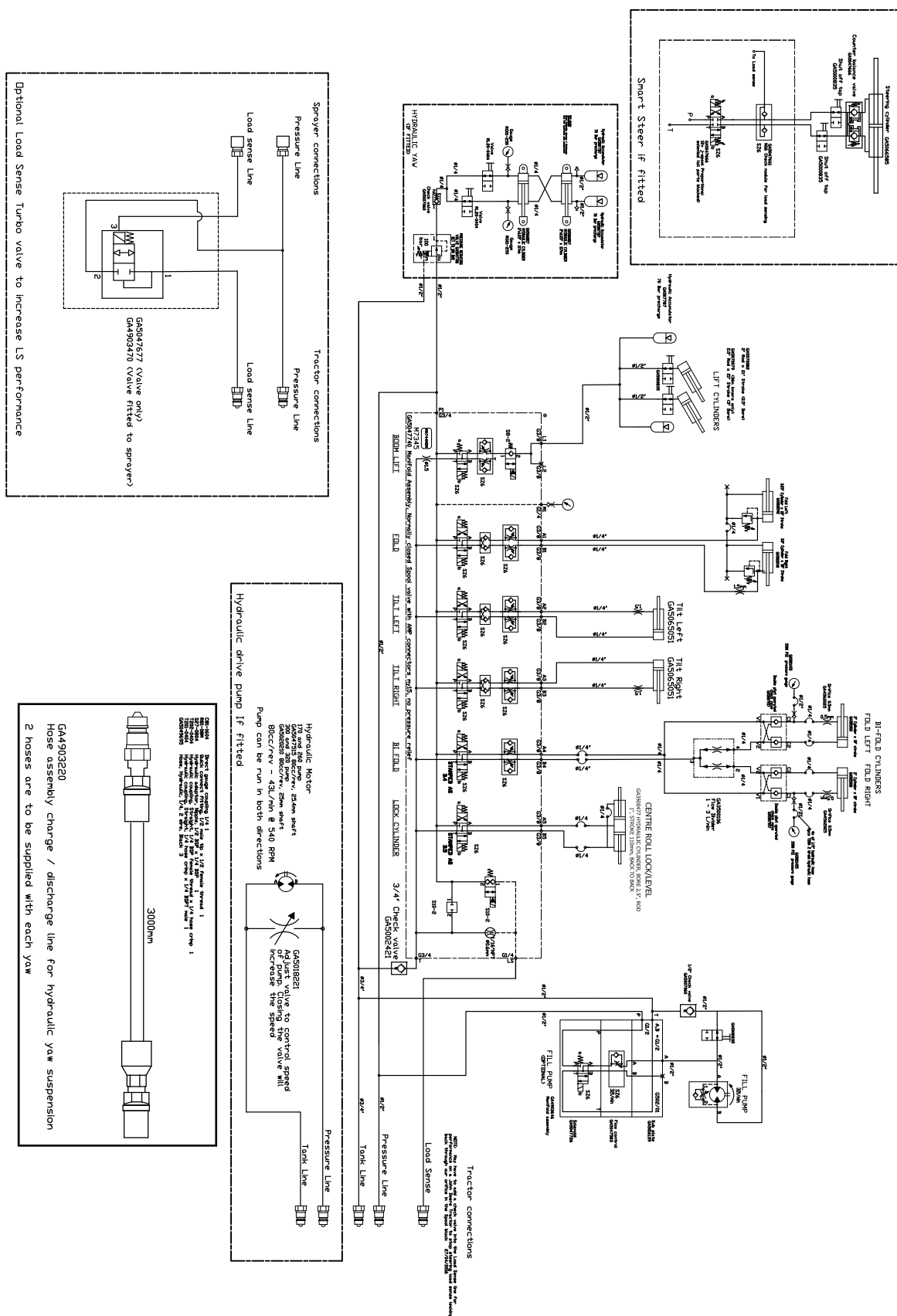
Electrical Layout - Trailer Side



Hydraulic Schematic - Spool Valve - Open Centre



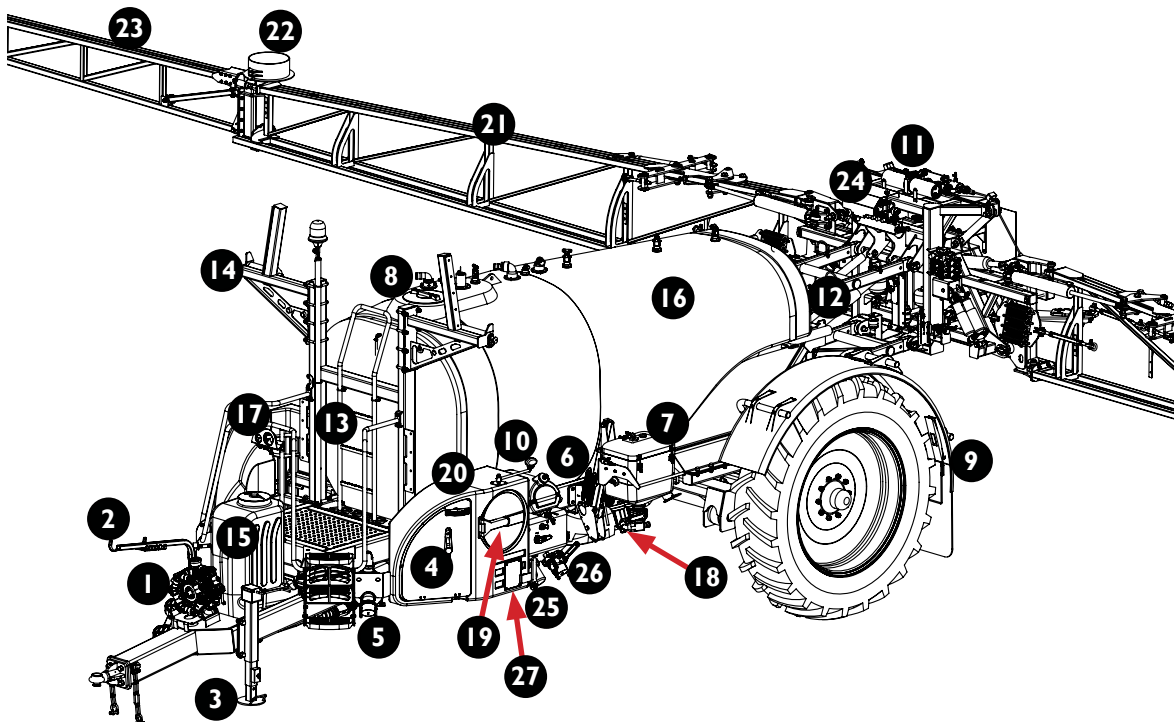
Hydraulic Schematic - Spool Valve - Closed Centre



Chapter 8

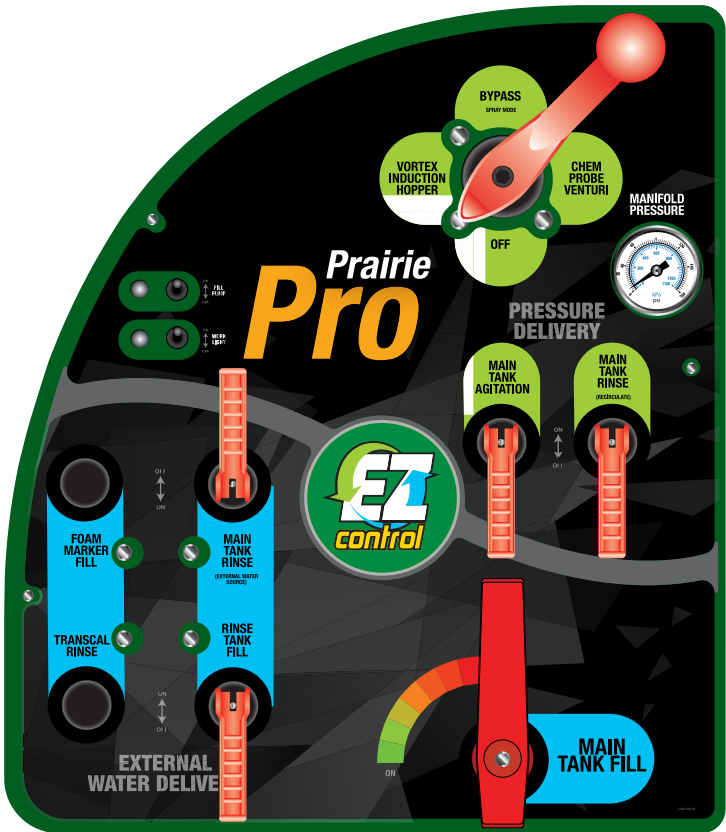
OPERATION

Key Features



NUMBER	FEATURE	NUMBER	FEATURE
1.	Spray pump - Diaphragm Option	15.	Flush water tank
2.	Drawbar connection arm	16.	Main tank
3.	Mechanical jack	17.	Pressure gauges
4.	EZ control	18.	Pressure filters
5.	Fill point (hydraulic pump)	19.	Storage locker
6.	Hand wash tank	20.	Right hand pod
7.	Induction hopper	21.	Boom inner wing
8.	Main tank lid	22.	Boom cable drum
9.	Mudguard	23.	Boom outer wing
10.	Pod work light	24.	Hydraulic spool valve block
11.	Flow meter	25.	Suction filter
12.	Boom paralift	26.	Fill point (direct to tank)
13.	Tank access ladder	27.	Spray pump - Centrifugal Option
14.	Boom rest		

EZ Control Station - Key Functions



EXTERNAL WATER DELIVERY	USE
Main tank rinse (external water source)	Turning on this function allows the use of the tank rinse nozzles with larger quantities of fresh water making it useful for a more thorough flushing/decontamination.
Rinse tank fill	Used to fill the rinse water tank.
Enviro drum coupling rinse	With the micromatic/envirodrum coupling connected to the enviro rinse coupling, having this function ON, will allow fresh water to circulate through the coupling.

NOTE: These functions are only available when external water is being pumped into the system.

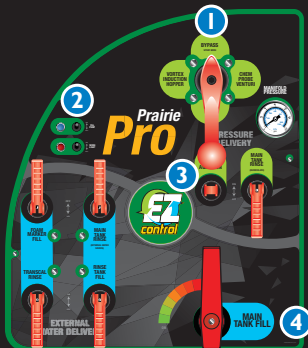
PRESSURE DELIVERY	USE
Vortex induction	Turn ON to use vortex induction hopper
Venturi	Turn ON to use chemical probe or Transcal
Agitator	Turn ON to activate agitator
Bypass	Turn ON bypass when in spray mode
Pressure regulator	The pressure regulator allows the operator to set the relief pressure of the pressure manifold (max 110psi)
Manifold pressure gauge	Indicates the manifold pressure
Main tank rinse (recirculate)	Turning ON allows flow to recirculate through system for a more thorough flushing/decontamination.

NOTE: These functions only available when the main spray pump is operating - pressuring the system.

EZ Control Station - Quick Start Guide

SPRAY MODE

1. Move handle to **Bypass** (SPRAY MODE)
2. Move **Fill Pump Switch** to OFF
3. Move handle of **Main Tank Agitation** to ON
4. Move handle of **Main Tank Fill** to OFF



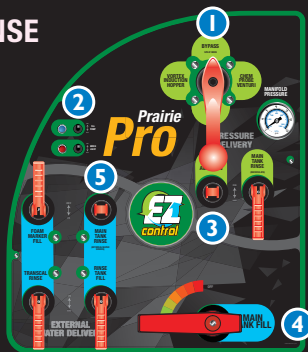
FILL MAIN TANK

1. Move handle to **Bypass** (SPRAY MODE)
2. Move **Fill Pump Switch** to ON
3. Move handle of **Main Tank Agitation** to ON
4. Move handle of **Main Tank Fill** to ON



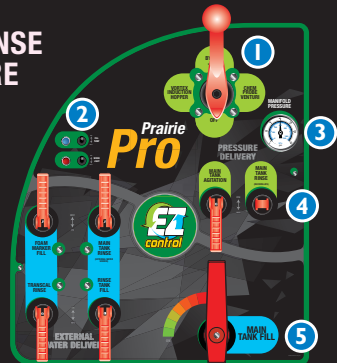
MAIN TANK RINSE FRESH WATER

1. Move handle to **Bypass** (SPRAY MODE)
2. Move **Fill Pump Switch** to ON
4. Move handle of **Main Tank Agitation** to ON
5. Move handle of **Main Tank Fill** to ON
6. Move handle of **Main Tank Rinse** (EXTERNAL WATER SOURCE) to ON



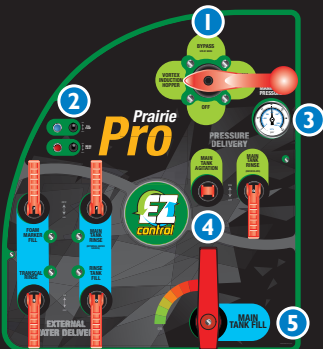
MAIN TANK RINSE HIGH PRESSURE

1. Move handle to **Off** (DO NOT RUN PUMP IN THIS POSITION)
2. Move **Fill Pump Switch** to OFF
3. **Manifold pressure** should read 80psi
4. Move handle of **Main Tank Rinse** (RECIRCULATE) to ON
5. Move handle of **Main Tank Fill** to OFF



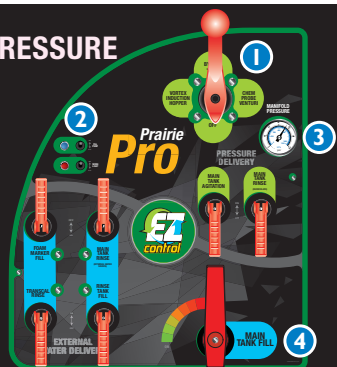
USE HOPPER

1. Move handle to **Vortex Induction Hopper**
2. Move **Fill Pump Switch** to OFF
3. **Manifold pressure** should read 80psi minimum
4. Move handle of **Main Tank Agitation** to ON
5. Move handle of **Main Tank Fill** to OFF



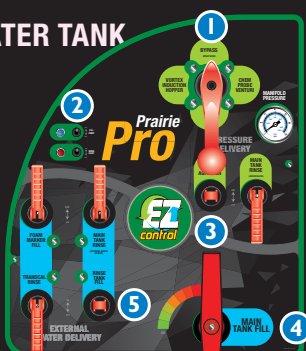
SET SYSTEM PRESSURE

1. Move handle to **Off** (DO NOT RUN PUMP IN THIS POSITION)
2. Move **Fill Pump Switch** to OFF
3. **Manifold pressure** should read 110psi
4. Move handle of **Main Tank Fill** to OFF



FILL FRESH WATER TANK

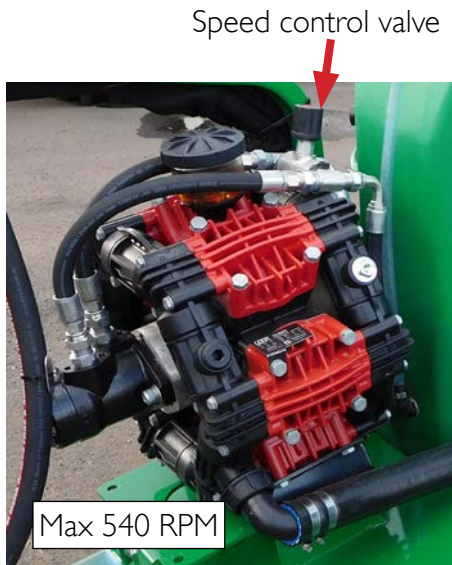
1. Move handle to **Bypass** (SPRAY MODE)
2. Move **Fill Pump Switch** to ON
3. Move handle of **Main Tank Agitation** to ON
4. Move handle of **Main Tank Fill** to OFF
5. Move handle of **Rinse Tank Fill** to ON



Pumps

Spray Pump

Where fitted, the diaphragm spray pump has a needle valve that can be used control the pump speed. The pump can be run in either direction. Do not run it faster than 540 rpm. Where the tow vehicle is capable of controlling oil flow to the pump, this valve should be left all the way open.



Above: The diaphragm pump is fitted with a speed control valve.

Where fitted, the centrifugal pump does not have a valve to control its speed. This must be done from the tow vehicle. The centrifugal pump must only be run in the correct direction and incorporates a check valve in the lines to prevent damage from accidental reverse connection. Do not run it faster than 4200 rpm.



Above: Arag MSP 400 centrifugal pump.

Hydraulic Fill Pump (Optional)

The fill pump is controlled by the valve block mounted on the chassis rail under the right side pod.

There is also an isolation valve for turning the hydraulic flow to the pump on and off at the pump itself.



Chemical Induction Hopper

Overview

The Super Flow Chemical Induction Hopper is an alternative method of transferring chemical into the main spray tank. The hopper can be lowered to a more convenient height for adding chemicals. The chemical can either be in liquid form or granular form and once in the hopper the chemical can then be easily transferred into the main spray tank. The hopper facilitates drum rinsing with fresh water and the hopper itself can be rinsed and all rinsate then transferred into the tank.

The hopper transfers the chemical via venturi effect. Water from the main spray tank is pumped under the bottom of the hopper where it passes through a venturi fitting under the hopper. This causes a suction effect and when the bottom of the hopper is open (via the hopper tank valve) the tank contents are drawn into the flow from the pump passing under the hopper and then transferred into the middle of the main spray tank. This eliminates chemical attack resulting from high concentrations of chemical coming into contact with spray components.

NOTE: The level indicator should be used as a guide only.

NOTE: Never let the hopper run empty or suck air, this may cause foaming in the main tank.

Key Features

NUMBER	FUNCTION
1.	Rinse Tap
2.	Tank Rinse Nozzle
3.	Level Indicator 60 L
4.	Drain Tap
5.	Hopper Tank Ball Valve
6.	Drum Rinse Nozzle
7.	Pressure Water Mixing Jet Valve
8.	Hopper breather



Continued over page

Chemical Induction Hopper

Operation

1. Add at least 500 litres of clean water to the main spray tank. Initially there needs to be a sufficient amount of water in the tank in order for the pump delivery to create the venturi effect via the venturi fitting. This will also ensure that agitation takes place when the remaining water is added.
2. Lower the hopper for convenience. (Check that the delivery hose to the hopper is not restricted or kinked).
3. Ensure that the red handle on the spray pump three-way ball valve is pointing towards 'Suction from main tank'.
4. Turn the 4-way ball valve to Vortex Induction Hopper.
5. Operate the pump at the speed necessary to generate at least 80 PSI delivery pressure (as displayed on the sprayer pressure gauge). Do not run it faster than 540 RPM.

NOTE: The higher the pump delivery pressure, the greater the venturi suction and the quicker the hopper will transfer the chemical. The delivery pressure should not exceed 120 PSI as determined by the pressure relief valve setting.

7. The wash down hose is also useful for ensuring all chemical is clear of the hopper (only available when fresh water coming into the fill station)
8. Put the required amount of chemical into the hopper (liquid or granular). Wear the necessary protective clothing and use the required safety equipment to avoid exposure to chemicals.
9. Open the hopper tank ball valve at the bottom of the hopper by turning the yellow handle down. The chemical should be now transferring to the main spray tank.
10. Rinse all chemical drums and the hopper as per the rinsing instructions.

When finished using the hopper:

- Close the hopper tank ball valve at the bottom of the hopper by turning the yellow handle so that it is horizontal.
- Rotate the 4-way valve from 'Hopper' to 'Bypass'.
- Ensure that the agitator valve is ON. The sprayer

should always be agitating until spraying begins.

- Raise the hopper to its transport position and replace the retaining pin and 'R'-clip in the mechanism.
- Turn OFF the 'RPM Raise' and the 'Spray Pump' switches.

Rinsing

RINSING FROM EXTERNAL SOURCE

To rinse the Induction Hopper and chemical drums with fresh water from the external water delivery station:

NOTE: Spray pump must also be operating.

1. Lower the hopper. (Check that the delivery hose to the hopper is not restricted or kinked).
2. Make sure that all valves on the EZ control external water delivery station are OFF.
3. Make sure that the Hopper Rinse valve on the top of the hopper is OFF.
4. Connect the fresh water fill hose to the quick-fill coupling.
5. Operate the fresh water pumping system between 70 and 100 PSI.
6. Turn the Induction Hopper valve on the Pressure delivery station ON.
7. Open the hopper tank valve at the bottom of the hopper by turning the yellow handle DOWN.
8. Ensure that the hopper drain tap, also located at the bottom of the hopper, remains CLOSED.
9. To rinse a drum, push the drum over the rinsing nozzle located in the top of the hopper.
10. To rinse the hopper, turn the Hopper Rinse valve on the top of the hopper ON. Close this valve when the hopper has been rinsed.

When the hopper is empty:

- Remove any chemical drums that have been rinsed from the hopper.
- Turn the hopper tank valve at the bottom of the hopper OFF by turning the yellow handle so that it is horizontal.

Continued over page

Chemical Induction Hopper

- Turn the Induction hopper valve on the EZ control Pressure Delivery station to 'Bypass'.
- Drain the hopper of any remaining liquid using the hopper drain tap at the bottom of the hopper.

RINSING OUT THROUGH DRAIN

The hopper can be rinsed and the rinsate emptied through the hopper drain ball valve rather than transferred into the main spray tank.

CAUTION: Spray pump should be turned off.

To do this:

1. Ensure the fresh water filling supply pump system is operating.
2. OPEN the hopper rinse valve on the top of the hopper.
3. OPEN the hopper tank ball valve at the bottom of the hopper by turning up the yellow handle so that it is vertical, removing the rinsate from the hopper.
4. OPEN the hopper drain valve.
5. Once the tank is clean, stop the fresh water supply to the machine.
6. CLOSE the hopper rinse valve on the top of the hopper.
7. Turn the hopper tank valve at the bottom of the hopper OFF by turning the yellow handle horizontal.
8. Close the hopper drain valve.
9. Raise the hopper to its transport position and replace the retaining pin in the mechanism.

NOTE:

- Take proper safety precautions to avoid any contact with rinsate when draining, as it may contain chemical residue.
- Be mindful of where rinsate is deposited as it may contain chemical residue.
- This procedure will not rinse the hose from the bottom of the hopper to the main tank.



*Hopper Drain Tap -
Photo look up from un-
derneath the hopper*

Tank Filling

When filling the sprayer it is necessary to connect to an external water source.

The main tank should always be filled through the quick fill. This line fills through the top of the tank and then through a hose inside the tank so that the water is deposited in the centre of the tank. Water can then be pumped into the system from an external pump, or via a hydraulically driven fill pump mounted on the sprayer (see Chapter 12 'Optional Accessories'). Filling progress can be monitored via an optional fill flow meter (see Chapter 12 'Optional Accessories').

WARNING: Water weighs 1 kg per litre. Conversion factors must be used when spraying liquids that are heavier than water. The total weight of the liquid being sprayed should not exceed the equivalent weight of a full tank of water. Exceeding this weight, can lead to sprayer damage.

For example: Liquid nitrogen has a density of 1.28 kg per litre. The tank size might be 6500 L.

$$6500 \text{ L} / 1.28 \text{ kg} = 5078 \text{ L}$$

This means that the total volume of liquid Nitrogen allowed in a 6500 L tank is 5078 L.

This rule applies for all tanks sizes. If unsure about the density/weight of the chemicals being applied, contact your agronomist or chemical supplier.

Main Tank Fill Procedures

PUMPING WITH EXTERNAL PUMP

1. Connect the fill hose (not supplied) to the quick fill cam lock coupling.
2. Make sure that the 'main tank fill' handle on the EZ control is in the OFF position so that there can be no flow coming out of the tank if it is not already empty and that other fill functions are OFF.
3. Turn the fresh water pumping system on (make sure the pressure does not exceed 75 psi).
4. Turn 'main tank fill' handle on EZ control to ON. The main tank should now be filling.
5. When the required amount of water has been transferred into the main tank, stop the flow by turning the 'main tank fill' to OFF.

PUMPING WITH OPTIONAL HYDRAULIC FILL PUMP

1. Connect the 3" fill hose (not supplied) to quick fill cam lock coupling under the EZ Control Pod.
2. Turn the 'Main Tank Fill' ball valve ON located on the EZ control pod.

NOTE: Do not turn the tank fill ball valve off while the pump is running.



3. With the engine running at low idle, turn the 'Fill Pump' switch ON. The switch is located on the EZ control pod.

NOTE: Do not turn the fill pump switch ON or OFF with the engine above low idle



4. Once the pump is running, turn the 'RPM Raise' switch ON.
5. When the tank has been filled to the desired level, turn the 'RPM Raise' switch to OFF.
6. When the engine has returned to low idle, turn the 'Fill Pump' switch OFF. Close the 'Main Tank Fill' ball valve and remove the water supply from the tank fill fitting.

Continued over page

Tank Filling

EZ Control External Water Delivery Station

The external water delivery station allows several filling functions of the sprayer to be performed simultaneously.

1. With fresh water entering the system as per 'Main Tank Fill' instructions, ensure that all ball valves, including the 'Main tank fill' ball valve, on the external water delivery station are turned to OFF.
2. Turn the desired function ON by selecting the appropriate ball valve as labelled.
3. When the required amount of water has been transferred, turn the appropriate valve to OFF.
4. When all functions have been performed, turn the fresh water pumping system OFF.

Rinse Water Tank Fill

The rinse water tank holds approximately 400 litres. Make sure this tank always has sufficient water in it in case a chemical accident occurs and rinse water is needed to wash chemical from any contaminated persons, clothing or components.

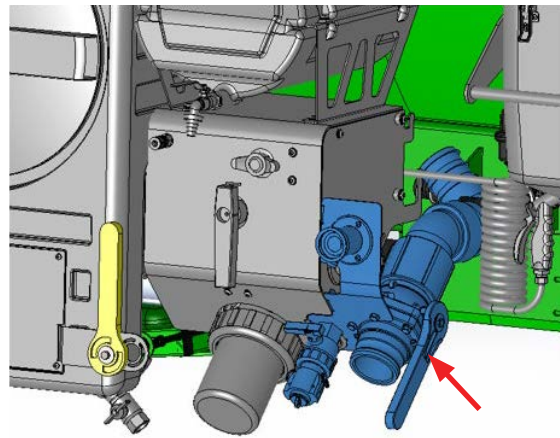
To fill the rinse water tank from the fresh water supply via the quick-fill and fill station:

1. Start by ensuring that all ball valves on the fill station are turned off.
2. Lift the 'Rinse tank fill' red handle on the EZ control 3-way ball valve to the vertical position. This is the ON position.
3. Connect the fresh water fill hose to the quick-fill coupling.
4. Operate the fresh water pumping system (make sure pressure does not exceed 75 PSI). There should now be flow transferring to the rinse water tank.
5. When the required amount of water has been transferred to the rinse water tank, stop the flow by turning off the external water supply and shut the rinse water tank fill valve by flipping it back down.

Separate Side Fill Point - 3"

A 3" separate fill point is standard fitment on 6500-8500L models. It is located on the side of the LHS pod near the suction filter. This point routes straight into the main tank, bypassing the control pod and in doing so, the tank rinse and/or rinse tank filling can not be operated when filling from this point.

The fill times are faster using this point and remote filling can be done from a Goldacres BatchMate unit with pre-mixed chemical straight into the main tank.



Above: The 3" separate fill point is located on the side of the LHS pod near the suction filter.

Suction & Delivery Lines

- Use good quality suction hose and fittings that will not collapse or leak air under suction.
- If pumping water from structures other than storage tanks, we recommend the use of an appropriate sized floating filter equipped with a check valve.
- It is essential that the suction line to the pump is the same size as the suction port (3").

A smaller size delivery line can be used but will reduce pump output.

Agitation

TO AGITATE WHILE STATIONARY

1. Add 20 percent of the main tank's volume in fresh water to the main tank.
2. Add all chemicals.
3. Add the remaining quantity of water required.
4. Turn the agitator on with the pump at operating speed.

NOTE: Check that the super mix agitator is working; there should be a visible circulation of water near the back of the tank near the agitator.

5. If the tank has been filled and the spray mixture has been allowed to settle, agitate for as long as it takes the pump to pump the quantity of water in the tank. For example: with 8500 litres in the tank with a 400 L/min pump agitate for $8500/400 = 21$ minutes.

TO AGITATE WHILE SPRAYING

Have the bypass ball valve and agitator ball valves OPEN.

NOTE: The bypass ball valve must be open while spraying.

Boom Operation

Folding Operation

FOLDING PROCEDURE:

1. Starting with the boom in the working position, use the lever/switch in cabin to raise the boom fully.
2. Use the lever/switch to fold the boom completely in.
3. Lower the boom until the boom just touches the rests
4. Then continue to lower the boom a further 100 mm so as to put sufficient weight onto the rests. The rests need to be positioned high enough to allow the boom to lower 100 mm without the boom resting on the tyres or mudguards.

UNFOLDING PROCEDURE:

The boom unfold sequence is as below:

1. Raise the boom fully to clear the boom rests.
2. Use the lever/switch in cabin to unfold the boom so that the boom is aligned with the centre section.
3. Lower the boom to the desired height above the target.

DANGER: Always check for power lines while folding and unfolding the boom, as contact with lines can be fatal.

NOTE: Booms must not be folded, or unfolded, while the sprayer is moving. When the boom is between fully open and fully closed, there can be large stresses placed on many boom components. If the sprayer is moving and hits a bump, severe damage to the boom can occur.

NOTE: The booms must be folded continuously without stopping and starting during the sequence. Take care not to fold/unfold booms too fast, as damage can be caused.

NOTE: To make the boom fold cylinders extend or compress equally on both sides, continue holding the 'Boom Fold' OUT button or lever once the boom has fully unfolded or hold 'Boom Fold' IN button or lever once the boom has fully folded for a few extra seconds.

Spray Application

After completing the filling process, you are now ready to start spraying. While travelling from the fill station to the field, the pump should be running at 400 - 500 rpm with the agitator running in order to ensure that the chemical mix is adequately agitated prior to spraying.

NOTE: The following information is provided as a guide only. It is the responsibility of the operator to assess the conditions in the field where the spray application is taking place

NOTE: The bypass ball valve must be open while spraying.

1. Enter the field, unfold boom and set the boom to desired height above the target and have pump running.
2. Switch on the console and set to run in self test mode (while stationary). Information on running

in self test mode can be found in the Raven operator's manual supplied.

3. Turn on all boom sections
4. Remain stationary until all boom lines have been completely purged with product from the main tank.
5. Switch off all boom sections.
6. Commence travel on primary swath and engage boom master switch. Auto rate controller will now control application based on the calibration information entered by the operator.
7. To avoid overlap it is recommended that individual boom section switches are used to turn on/off sections as needed.
8. When you have completed the task at hand, please follow the flushing instructions to ensure that all plumbing is flushed.

Suction Filter Cleaning

The suction filter tap is plumbed before the filter housing. The suction filter receives fluid from either the rinse water tank or the main spray tank. Therefore, all fluid to be sprayed or flushed through the system passes through this filter.

NOTE: Running the main spray pump dry will damage it. The main spray pump must be OFF when switching from main spray tank to rinse water tank and vice versa.

Filter Removal

For information specific to your circumstances, the spraying equipment being used and the chemicals being applied, consult your agronomist or chemical supplier.

WARNING: Always wear the recommended personal protective equipment and use caution while working with chemicals.

To remove the suction filter bowl, follow the steps below.

NOTE: A quantity of fresh water will need to be in the rinse tank.

1. Set the tap handle in the OFF position.
2. Loosen the nut holding the filter bowl slowly. Take care as some chemical may dribble out.
3. Suction on the filter bowl can be relieved by briefly OPENING the tap for about 2 seconds and then off again. This will cause the filter bowl

to drop and become loose. Stand clear of bowl and be sure to catch any chemical coming out in a suitable container.

4. Once chemical has stopped coming out of the filter, unscrew the nut fully to remove the filter bowl. Be careful when removing the bowl as there may still be some chemical in it.
5. Clean the screen and the O-rings, then refit and ensure that O-rings are in place.

Right: Filter spanner GA4524995 suits the suction filter.



Filter body
Filter nut
Filter bowl

Above: The suction filter is mounted in the left hand side pod.

Pressure Filter Cleaning

There is a pressure filter in the spray pressure line that traps the minute particles that are not collected by the main suction filters.

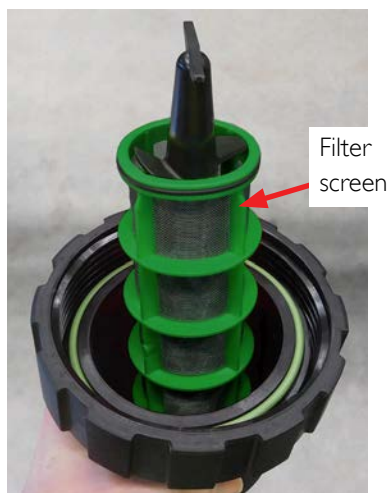
WARNING: Always wear the recommended personal protective equipment and use caution while working with chemicals.

Unscrew the fly nut and allow the chemical in the filter to dribble out into a suitable container. Avoid environmental contamination and personal contact. Clean or replace the filter screen with the same mesh size as necessary and then refit the filter body.

Right: Filter spanner GA4525000 suits the pressure filter.



Above: Pressure filter located on left hand side chassis rail and behind the induction hopper.



Above: Clean or replace the filter screen with the same mesh size as necessary.

Flushing

The following information is provided as a general guide for flushing your sprayer following a spray application.

For more specific information regarding flushing, and decontamination, specific to the products that you are applying, it is recommended that you consult the chemical label or your chemical supplier.

To use the flush water tank to flush pump & boom only:

1. Turn pump off.
2. Turn 3 way ball valve to draw from flush water tank rather than main product tank.
3. Set Raven console into manual mode.
4. Switch all boom sections to ON.
5. Hold increase button for 15-20 secs. This will ensure that fast close valve is fully open to direct all flow to booms (This will eliminate bypass from the booms to main tank).
6. Turn pump ON. The pump will now draw water from the flush water tank and direct all flow to the booms.
7. Keep boom switches on until the contents of the flush water tank has been run through the booms.

NOTE: If the pressure gauge increases dramatically, slow down pump RPM.

To flush entire system (pump, boom & tank):

1. Drain the main tank.
2. Connect to external water source (to provide fresh water supply).
3. Turn main tank fill tap OFF to direct external water supply to the fill manifold under pressure.
4. Engage tank rinse nozzles with the lever on EZ control and allow rinsate to drain out through the main tank drain.
5. Close main tank drain.
6. Add a quantity of fresh water (a minimum of approximately twice the pumps capacity) to the main tank (as per instructions under filling).
7. Turn on pump with agitator and bypass open to allow fresh water to circulate.
8. Turn off all taps to allow the pressure relief valve to blow off and purge the "relief to tank" line.
9. Operate induction equipment (if fitted), with a quantity of fresh water in order to flush venturi system.
10. Once complete drain chemical induction hopper delivery hose externally.
11. Now follow the instructions for boom flushing as above - keep ball valve drawing from main tank.

Controller - Raven SCS4400

The Raven SCS 4400 Auto Section Controller

- Simple operation
- Low-limit function
- Digital boom pressure read-out
- Supports a variety of flow meters and control valves
- Audible alarms
- Self-test function
- Rate bump features

For more information please see your Raven operation manual.



ISOBUS System

Sprayer cabins can get pretty busy with the vast range of systems requiring individual control consoles. The ISOBUS standard brings all the systems together into the one display, called a universal terminal (UT).

ISOBUS is an international standard communication system which links tractors and implements together, enabling data to be transferred quickly and simply.

Essentially each system contains the brains, while the UT is simply the interface between the two. This means only one operator console is required. Numerous leading UT displays are supported with the Raven CR7 being one of them, and is available as optional fitment on these machines.

Features like 3TS, pump speed readout, ultrasonic boom levelling plus sprayer steering tasks can all be monitored on the UT.

The ISOBUS system can be fitted with an optional 6 section switch box which can be programmed to control the 16 sections in any combination of groups or individually.

Before using the ISOBUS system the following calibration values are required to accurately control product application:

- Total width of implement
- Number of sections & section widths
- Control type
- Meter Cal or spreader constant & product density
- Valve type & Cal
- Rate Cal

When optional, the Raven RCM is mounted to the rear of the boom centre section.

Please see Raven RCM operator's manual for further information on calibration and setup.



Above: An optional Raven CR7 universal terminal (UT) can be fitted to interface with the RCM over the ISOBUS system. Many other UTs by other manufacturers are also compatible to be used.



Above: An optional Raven 6 section control box can be programmed to control the 16 sections in any combination of groups or individually.

Controller - Raven Rate Control Module



Raven Rate Control Module (RCM)

The RCM can be optioned and uses Raven's innovative control algorithms to make it the most precise application controller on the market today. Sixteen-section control eliminates expensive skips and overlaps during spraying.

The RCM is incredibly user friendly. We've simplified the setup, introduced integrated help content, and added advanced diagnostic information to quickly identify issues and reduce costly downtime. Customizable user interfaces give the operator the flexibility to see and control what fits their needs. The RCM is compatible with many ISOBUS universal terminals on the market, including the CR7 from Raven.

The Raven Rate Control Module is the ultimate advancement in precision and efficiency, and the next solution for your operation's success.

- Easily navigate and manage tallies and sensor data
- Diagnostic tests and reading to easily calibrate, tune, and troubleshoot system
- ISOBUS compliant CAN channel, plus 3 available CAN subnets
- Compatible with ISOBUS Universal Terminal and Task Controllers
- Integrated Bluetooth 4.0LE providing long range line-of-sight wireless connectivity for control, monitoring, and diagnostic features
- Multi-language support including English, French, Russian, Spanish, and Portuguese
- IP 67 environmental rating for the harshest of environmental conditions
- Integrated magnet mount option to easily attach and detach with any metal frame
- Dynamically configure run screen based on operator preferences to show most relevant data during operation

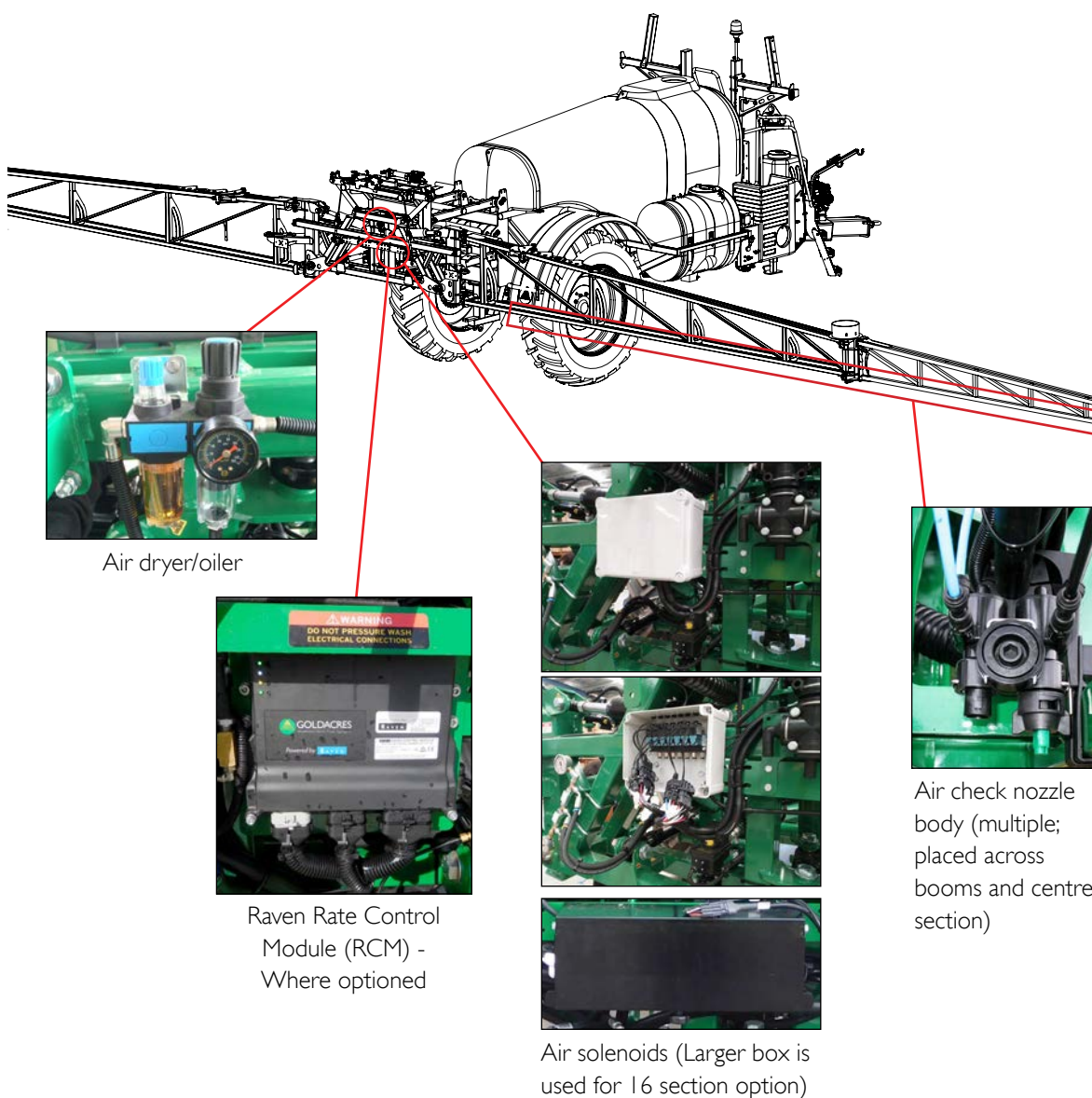
For more information please see your Raven operation manual.

RapidFire

Overview

The RapidFire system provides instantaneous, individual nozzle shut off that is controlled by air operated solenoids at each nozzle. This system replaces the boom valves and standard check valves that shut off the boom sections and nozzles. This provides greater flexibility in changing boom section widths and faster shut off at the nozzle.

The RapidFire system reduces the amount of plumbing on the sprayer and allows for the fitting of a boom recirculation system. The ability to have more boom sections also works perfectly in conjunction with AccuBoom shut off systems.



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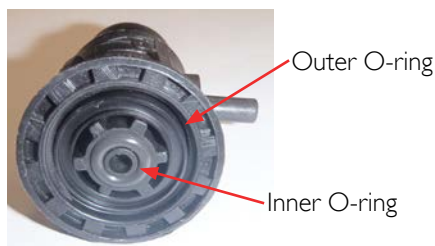
RapidFire

Nozzle and Air Check

The air check nozzles allow for instantaneous response at the nozzle tip. The lines can be at spraying pressure and when switched on or off, the nozzle responds quickly with no dribbling, as pressure builds up or subsides.

The air checks close under a spring tension of 140 PSI. This traps the liquid in the spray line at the same pressure that it was being applied. When the booms are turned on, air pressure acts against the 140 PSI springs instantly opening flow to the nozzle allowing the trapped boom line pressure to apply the liquid at the rated pressure and droplet size with a full fan angle.

The air check valve is located on the side of the nozzle, it has 2 O-rings in it. Over time, the O-ring may swell or be damaged. This may result in the nozzle dripping or being slow to shut when it has been turned off. If the nozzle leaks the outer O-ring requires replacement. If the air shut off has poor or delayed response the inner O-ring requires replacement.



To remove the air check from the nozzle, the air supply must be removed. Ensure that all the air pressure is vented from the system. Ensure that all liquid pressure has been removed from the boom lines.

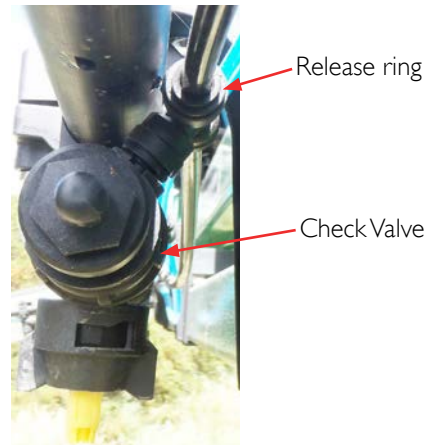
To remove the air hose from the check valve, push down on the release ring on the air fitting and at the same time, pull the hose.

Unscrew the air check valve from the main body. Replace the O-rings that are in the air check valve.

Screw the air check valve back onto the main nozzle body. When re-fitting the hose, simply push it into the fitting.

On dual or quad nozzle bodies, the body is a fixed unit and the multi spray nozzle body will need to be removed from the clamp around the pipe.

See the parts book for more detail.



Air Dryer & Oiler

The air supply to the RapidFire system has a dryer, oiler and pressure regulator fitted in the circuit.

The dryer removes all the moisture from the air supply and traps it in a clear bowl. This must be drained daily to prevent moisture entering the rapid fire system.

The oil lubricates the air as it passes through to the RapidFire system. In turn, this lubricates the RapidFire seals and O-rings. Only a bare minimum amount of oil is required for the system to function well. The oiler must be checked weekly and serviced at approximately 250 hours or when required. The amount of lubricant drawn into the air supply can be increased or decreased depending on requirements. This setting should generally be kept low as excess oil can clog the breathers in the master air solenoid valves and prevent them from operating correctly.

The pressure regulator is used to set the maximum pressure available to the rapid fire system. This should be set to 80 PSI. The black knob located above the water trap is used to set the air pressure. To unlock it, lift the black knob. Looking from above, turning the knob clockwise will increase pressure. Turning anti-clockwise will decrease pressure.

To release air from the system for maintenance, turn the knob anti-clockwise until the pressure on the gauge reads zero. Drain the water trap to release any residual pressure.

Once adjustments have been made or maintenance carried out, reset the pressure as above and push the black knob down to lock it in place.

Continued over page

RapidFire

The moisture trap should be checked on a daily basis while the sprayer is in use. It must not be allowed to fill up totally. If it does, moisture will be sent through the lines to the nozzle check valve and this may cause problems with its operation.

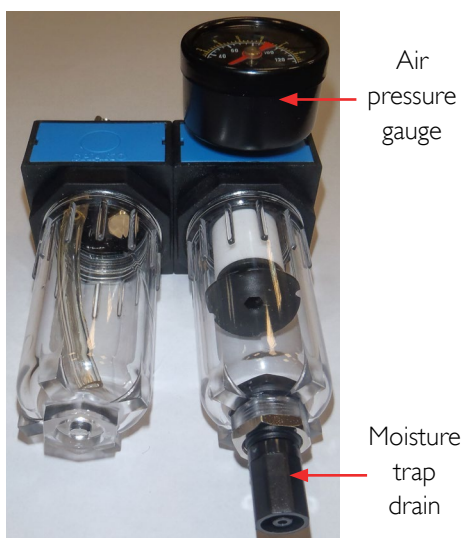
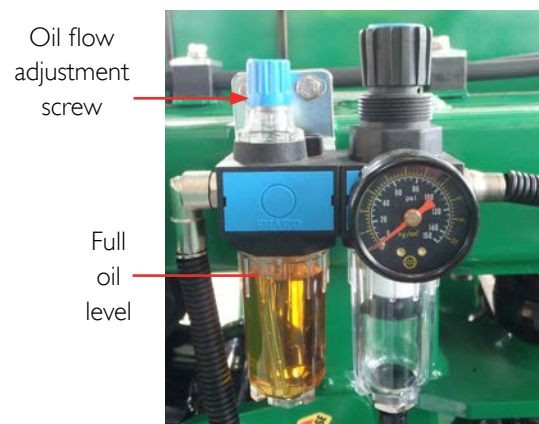
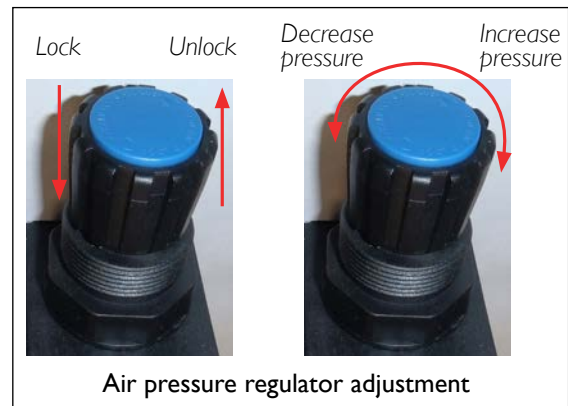
To drain the trap, turn the black knob at the bottom of the clear bowl and push it up. Air and moisture will be expelled from the bowl. Keep the knob pressed up until all the moisture has been released. Once finished, release the knob and turn it back until it stops. Ensure correct safety equipment is worn and in place as air will be displaced at high pressure.

The oiler slowly releases oil into the air to keep the check valves, seals & O-rings lubricated.

Fill the oil to within 5 mm of the top of the oil bowl. Use an air tool oil or equivalent.

To ensure the correct flow of oil into the air, the oil flow adjustment screw may need to be adjusted to suit the conditions.

The screw can be adjusted by turning the blue regulator knob as shown. Turning the knob clockwise and in will reduce the amount of oil being supplied to the RapidFire. Turning the screw counter clockwise and out will increase amount of oil. To set the oil flow, wind the knob all the way in, then turn the knob anti-clockwise half a turn. The oiler requires regular inspection and topping up every 250 hours or when required.



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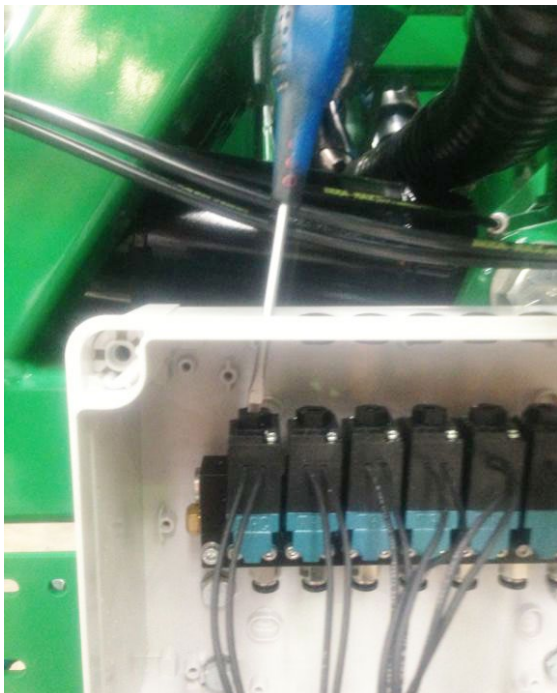
RapidFire

Solenoid Valves

The machine can be fitted with 16 nozzle sections. This will require Raven RCM control. The solenoid valves are, electrically, turned on and off to control the flow of air to the nozzles.

For troubleshooting purposes or in the event of an electrical problem, the solenoid valve can be manually overridden.

Remove the black plug from the white box in the position above the valve that is to be overridden. Insert a flat head screw driver in through the top of the box and find the screw in the top of the solenoid valve. Push down on the screw driver and turn the screw a 1/4 turn in either direction.



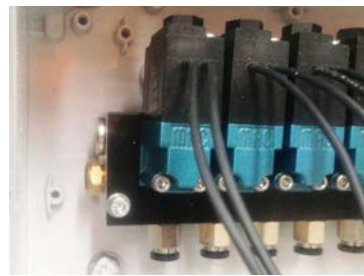
The valve should now be allowing air to flow out to the nozzle and if there is fluid in the lines, it should be coming out of the nozzle.

To shut off the valve, turn the screw driver 1/4 turn in the opposite direction to when it was overridden. The screw in the top of the solenoid is spring loaded, it will pop up when returned to its original position and shut off the flow of air.

On the solenoid bank there are two exhaust ports. These must be kept clean so that the air can expel from these when the RapidFire nozzles are turned off.

If these ports are blocked the air can not release from the air checks, through the solenoids to atmosphere and the nozzles will continue to spray.

The ports can become blocked when working in dusty environments. To clean the exhaust ports, remove them from the air solenoid manifold and rinse them in solvent. Blow out with compressed air and refit.

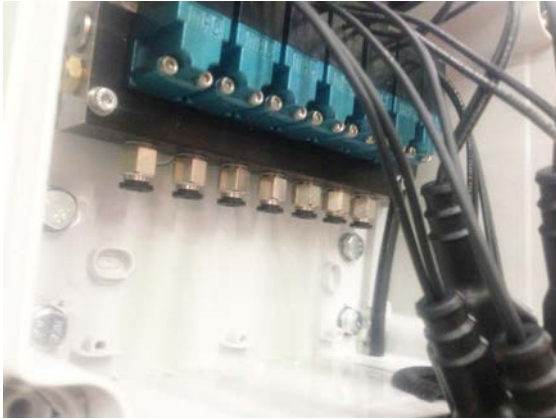


Exhaust port;
one located on
each end of the
manifold.

If a section of the boom will not turn on, it may be because that section has a large air leak, in the supply air to the check valves on the nozzles. To find the air leak, spray soapy water on each of the connections along that section. Replace any component that is leaking air. If the air leak can not be found on the section of the boom line, check to see if the air is leaking out of the air solenoid manifold exhaust port. These should not leak air when the boom sections are turned ON. If they do then a solenoid is stuck. To find the stuck solenoid turn all the boom sections OFF. Remove the hoses from the under side of the air solenoid manifold.

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RapidFire

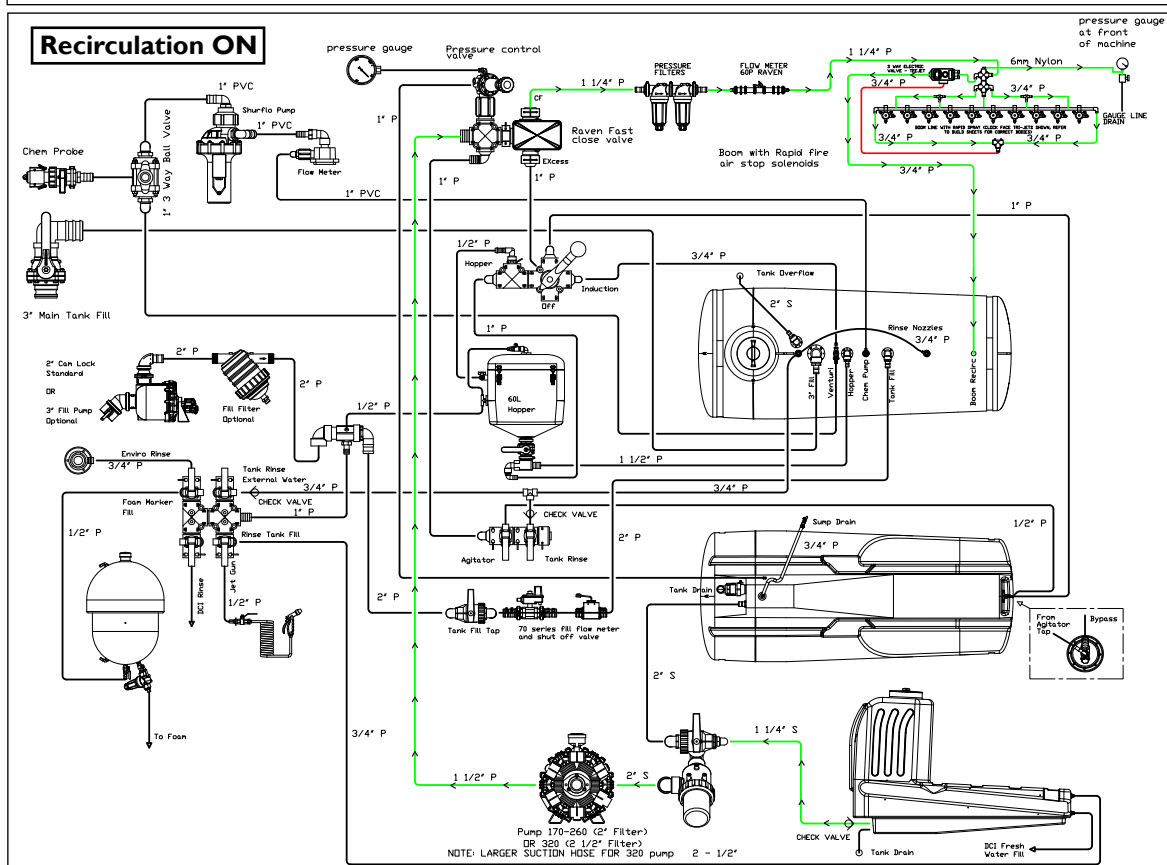
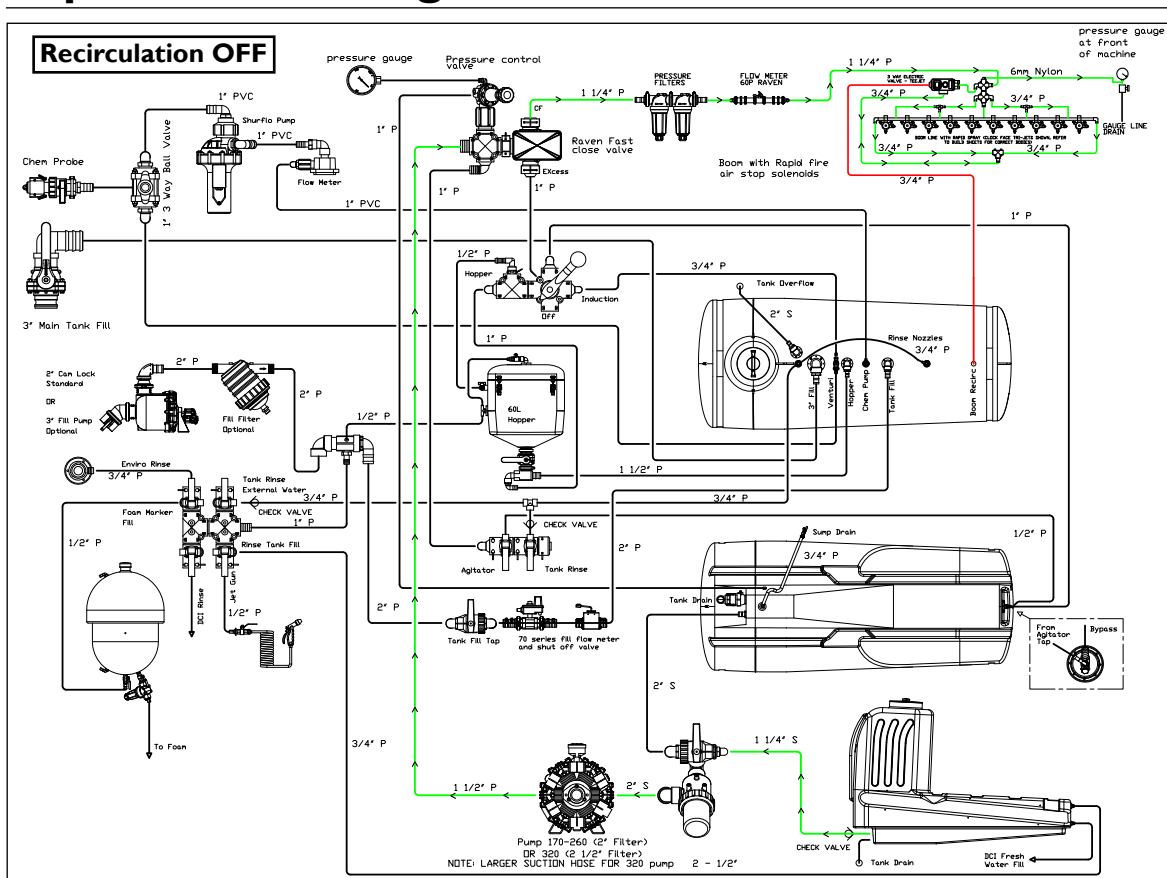


If there is air coming out from any of the ports then that is the solenoid that is stuck and it should be replaced.



The air solenoids have two wires going to them, one power and one earth. The wire in pin B of the plug is the earth and pin C is the power. The solenoids operate on 12 volts supplied from the section switches on the console.

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Decontamination

Decontamination of your spraying equipment is important when changing chemicals or application methods.

Information specific to your circumstances, the spraying equipment being used and the chemicals being applied should be provided by your agronomist or chemical supplier.

Always wear the recommended personal protective equipment and use caution while working with chemicals.

BASIC DECONTAMINATION

1. Fill the main spray tank with approximately 1000 L of fresh water.
2. Lower the induction hopper and put the appropriate amount of decontaminating agent into it.
3. Turn on the agitation jet on the hopper and allow it to fill the hopper to the top. Once full, turn the jet off and leave the hopper to sit for a few minutes. This is to ensure that the decontaminating agent fully neutralises any of the chemicals that were in the hopper.
4. Use the venturi to induct the contents of the hopper into the main spray tank.
5. Recirculate the decontaminating agent through the system while the main tank rinse nozzles are running (pressure supplied from the main spray pump e.g. pressure delivery manifold).

6. Turn off all taps to allow the pressure relief valve to blow off and purge the 'relief to tank' line.
7. Operate induction equipment (if fitted), with a quantity of fresh water in order to flush venturi system.
8. Once complete, drain chemical induction hopper delivery hose externally.

NOTE: Lower the hopper and open the lid to allow it to drain completely.

9. Turn on boom recirculation to flush all boom lines back to main tank.
10. Once the main tank has emptied, flush the system again using fresh water to ensure the decontaminating agent is removed from the system.
11. Once the main tank is empty, the hose between the tank and the suction filter also needs to be drained. Close the valve on the Suction Filter.
12. Remove the suction filter bowl and clean as per 'Suction Filter Cleaning' instructions earlier in this chapter.
13. Return switch to main chemical tank. Stand clear of the filter when turning the valve to main chemical tank as chemical will be coming out. Catch all of the chemical in a suitable container so it can be disposed of in the correct manner.

Sprayer Transportation

1. Make sure the tractor has sufficient towing and braking capacity to tow the sprayer.
2. All relevant transport regulations must be adhered to when transporting the sprayer: (ie: speed regulations, oversize signs, flashing light, etc.) It is the operator's responsibility to know the relevant regulations.
3. Make sure the sprayer is securely hitched to the tractor.
4. Ensure that the boom is securely supported when travelling and that the isolation ball valves on the hydraulic lift cylinders are closed.
5. Where a road pack has been installed connect tail light plug.

CAUTION: Take care when reversing with the sprayer attached. If driver visibility is restricted, use another adult with a clear view to the rear of the sprayer to give reversing directions.

CAUTION: It is the operator's responsibility to know the tare weight and gross weight of the sprayer. If any alterations are made to the sprayer, it is the operator's responsibility to know the tare weight and the gross weight of the modified sprayer at all times.

End of Day

At the end of the spraying day: Follow the flushing and decontamination procedure as per previous instructions.

1. Unfold the boom in an area convenient to dispose of residual chemical (an area where chemical can not run-off into above ground or sub surface water courses).
2. Clean all filters.
3. Clean all nozzles.
4. Wash down unit
5. Drain main tank

CAUTION: If the sprayer is left attached to the tractor when parking the sprayer; make sure the tractor park brake is applied, the engine turned off and the sprayer is securely hitched to the tractor:

If the sprayer is to be disconnected from the tractor:

1. Ensure the main tank and any other tanks are empty.
2. Lower the jack and wind up until weight is taken off tractor:

3. Remove drawbar pin.
4. Remove safety chains.
5. Disconnect all drawbar connections between the sprayer and the tractor (i.e. tail lights, foam marker lines, electric controls etc.)
6. Where fitted, remove the PTO shaft from both the sprayer and the tractor.
7. Protect hydraulic hoses and electrical connections.

NOTE: Store the sprayer in a suitable location to prevent freezing. If the sprayer is to be left where freezing may occur; cover the pump and flow meter with a material bag and empty pump and flow meter of all water (run the pump dry for 15-20 seconds). It is also suggested that a small quantity of anti freeze be added to the main tank and circulated through the sprayer to minimise the chance of freezing.

IMPORTANT: Make sure any ice has thawed before using sprayer.

End of Program

If the sprayer is to be stored for a long period of time without use, there are several tasks that need to be performed.

- Clean the sprayer thoroughly as described under 'End of Day' tasks.
- With the sprayer attached to the towing vehicle, carry out a thorough observation to determine if there is any damage to the sprayer.
- Park the sprayer in a position where it will not be affected by frosts, and preferably out of direct sunlight.
- Ensure the main tank and any other tanks fitted are empty.
- Lower the jack and wind until weight is taken off tractor.
- Remove drawbar pin.
- Remove safety chains.

- Disconnect all drawbar connections between the sprayer and the tractor (i.e. tail lights, foam marker lines, electric controls etc.)
- Where fitted, remove the PTO shaft from both the sprayer and the tractor and store with the sprayer.

If necessary, remove consoles from cabin and store in a safe and secure location. Protect hydraulic hoses and electrical connections.

Chapter 9

BOOM

General

All booms present a number of safety hazards due to their operation - the operator should read and fully understand the safety instructions in this manual prior to operation.

Goldacres TriTech booms have been designed and built to ensure many years of trouble free service. Aluminium outer boom sections reduce the overall weight of the boom and aid in providing a superior boom ride and longevity.

CAUTION: Goldacres do not endorse use of this machine for spraying at speeds greater than 20 km/h.

CAUTION: Before adjusting the boom alignment, the hydraulic fold circuit must be free of air. Hydraulic circuits that contain air can make the boom appear that it is too far forward. Adjustment of the boom without bleeding air out of the hydraulic circuit first will result in a boom that quickly reverts to hanging out of alignment to the back.

CAUTION: All chemicals have corrosive properties to some degree. Prevent damage to the machine by always consulting the chemical MSDS or the chemical supplier for advice concerning the corrosive properties of the chemical. It is the responsibility of the operator to carry out preventative and ongoing maintenance to the machine, particularly while applying chemicals with highly corrosive properties. Machine components should be coated with a suitable protectant prior to use, and then washed down, thoroughly, immediately after every

application. Consult the supplier of the substance if you require specific advice about the effectiveness of any particular protectant to prevent premature degradation of machine components.

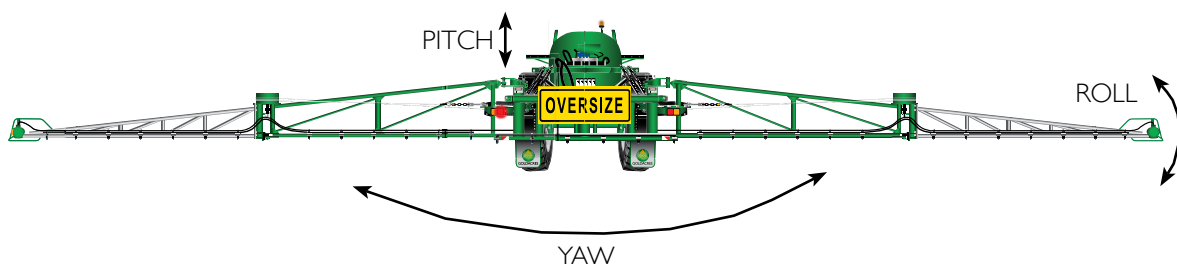
TriTech booms feature a unique patented boom suspension system.

This system provides suspension in three directions:

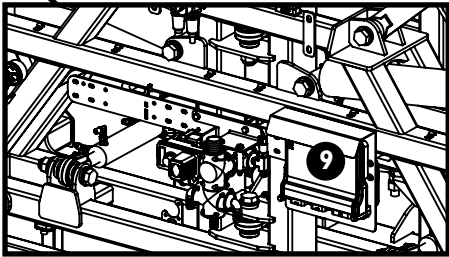
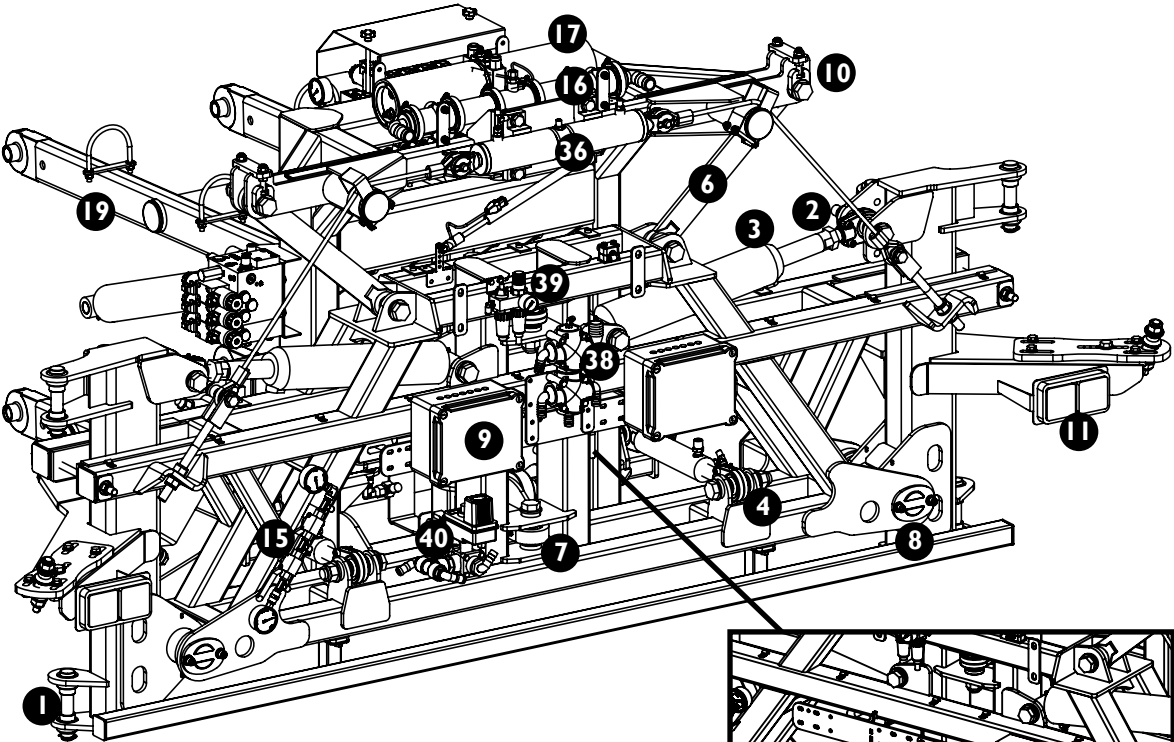
PITCH Hydraulic cylinders connected to nitrogen filled accumulators dampen the vertical boom movement encountered over rough ground conditions.

ROLL Shock absorbers help maintain constant boom height over sloping and uneven ground.

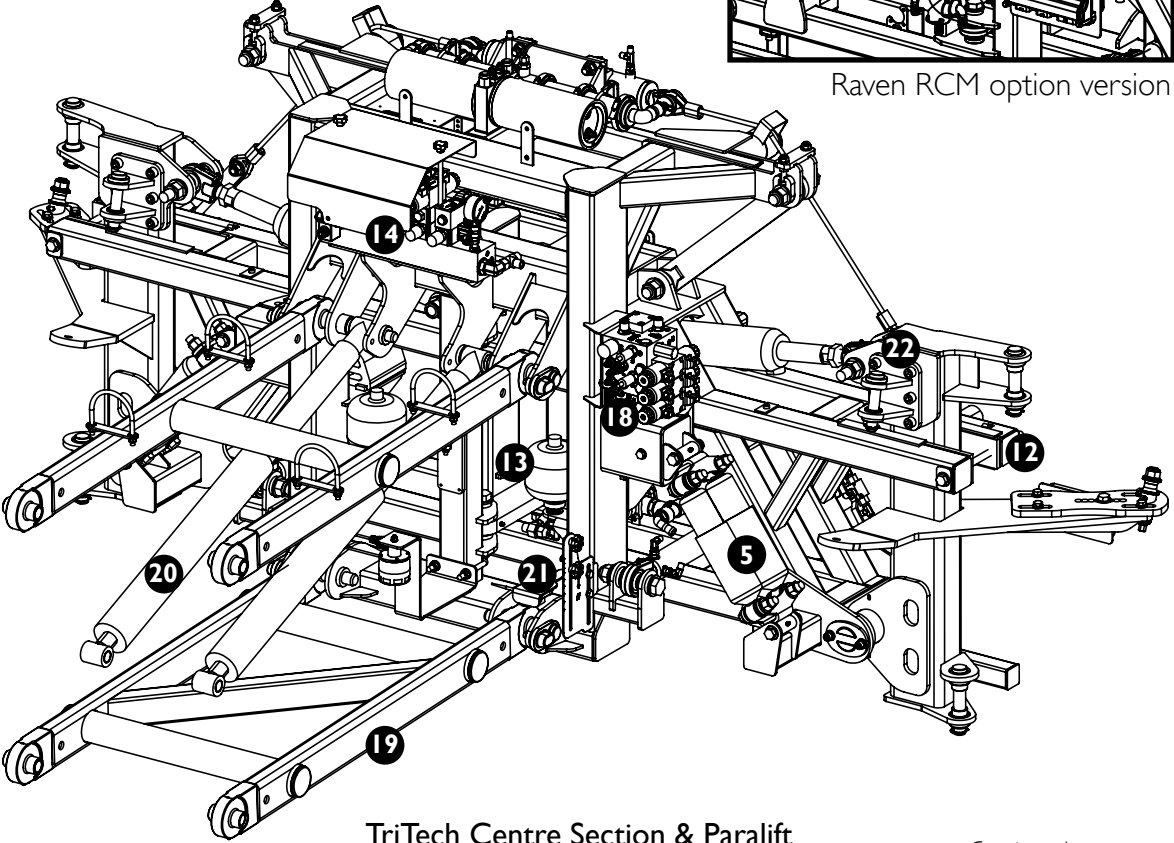
YAW Hydraulic cylinders connected to nitrogen filled accumulators overcome any erratic whipping movement, which creates undue stress on the boom frame and might otherwise cause uneven spray application.



Boom Overview - 30-36 m



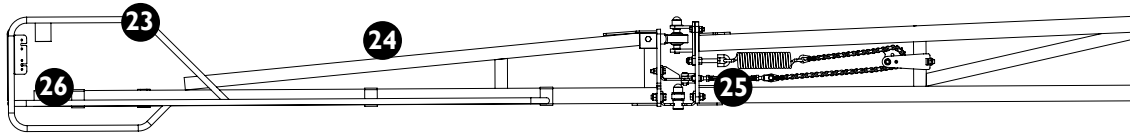
Raven RCM option version



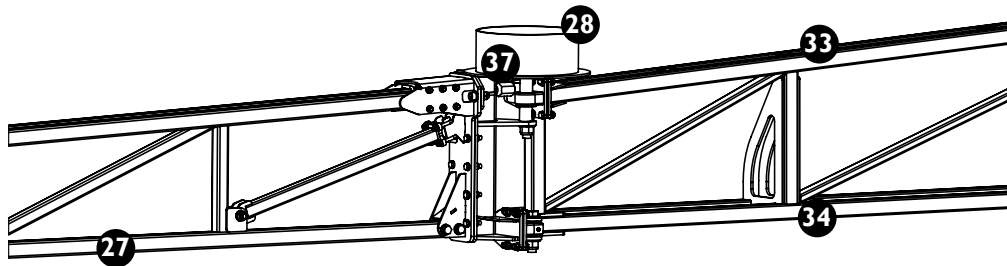
TriTech Centre Section & Paralift

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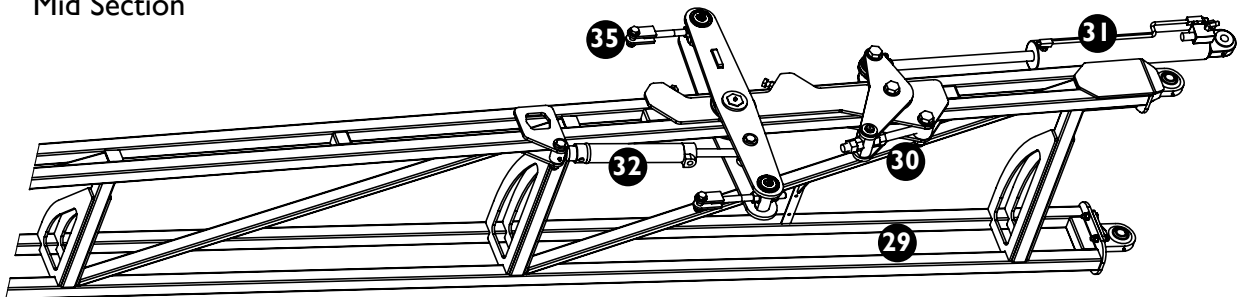
Boom Overview - 30-36 m



Breakaway End



Mid Section

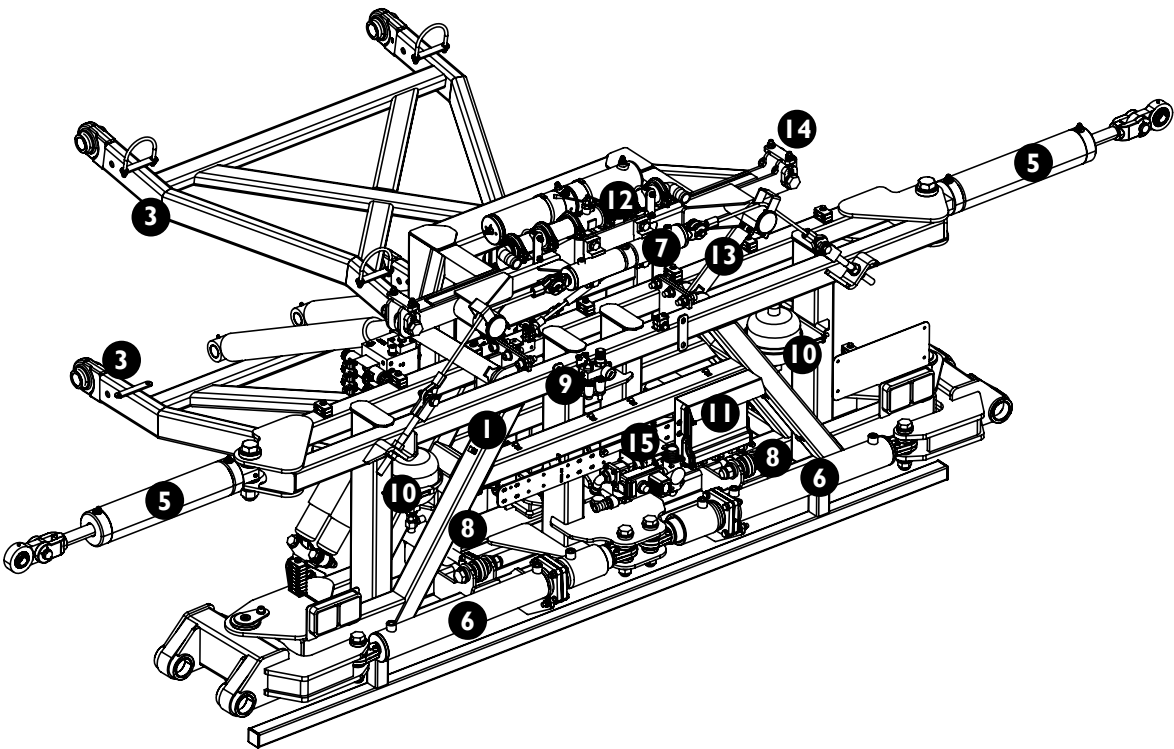


Inner Boom Wing End

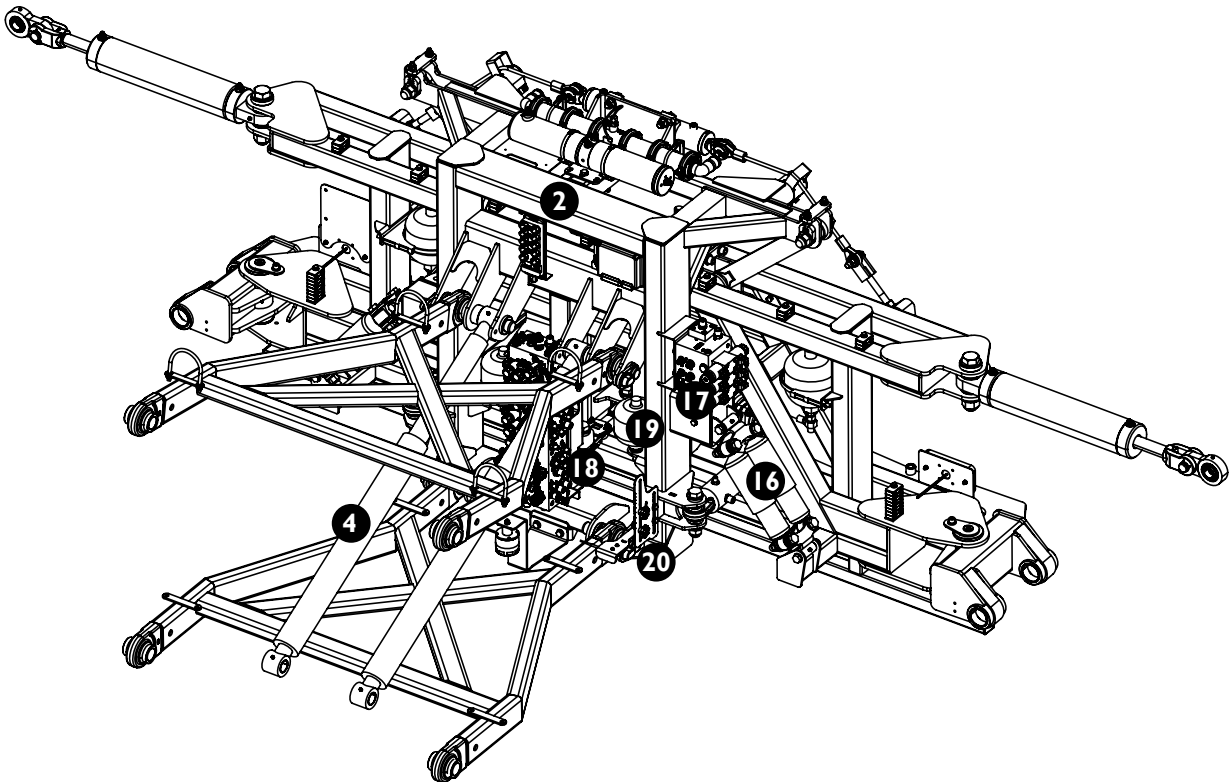
NO.	FEATURE
1.	Boom rose end
2.	Tilt arm adjuster
3.	Tilt cylinder (Optional)
4.	Yaw cylinder mount
5.	Roll shockers
6.	Diagonal delta links
7.	Lineal delta links
8.	Tilt pin (60 mm)
9.	Rapidfire boxes or RCM (Optional)
10.	Boom alignment adjuster
11.	Tail light
12.	Tilt arm wear strips
13.	Hydraulic yaw accumulators
14.	Hydraulic spool valves
15.	Hydraulic yaw controls
16.	Flow meter
17.	Norac cylinder (Optional)
18.	Norac valve block (Optional)
19.	Paralift arms
20.	Lift cylinders

NO.	FEATURE
21.	Boom lower limit switch
22.	Bolt on fold cylinder mount
23.	Boom end protector
24.	Boom wing tip
25.	3D breakaway mechanism
26.	Fence line jet
27.	Boom aluminium outer
28.	Boom cable drum
29.	Boom steel inner
30.	Adjuster for fold cylinder
31.	Boom fold cylinder
32.	Bi-fold cylinder (Optional)
33.	Boom top chord (RHS)
34.	Boom bottom chord (RHS)
35.	Cable adjuster
36.	Centre Leveling system (Bi-fold only)
37.	Boom stopper bolt (Opposite side)
38.	Rapidfire flow distributor
39.	Rapidfire oiler & dryer
40.	Rapidflow valve

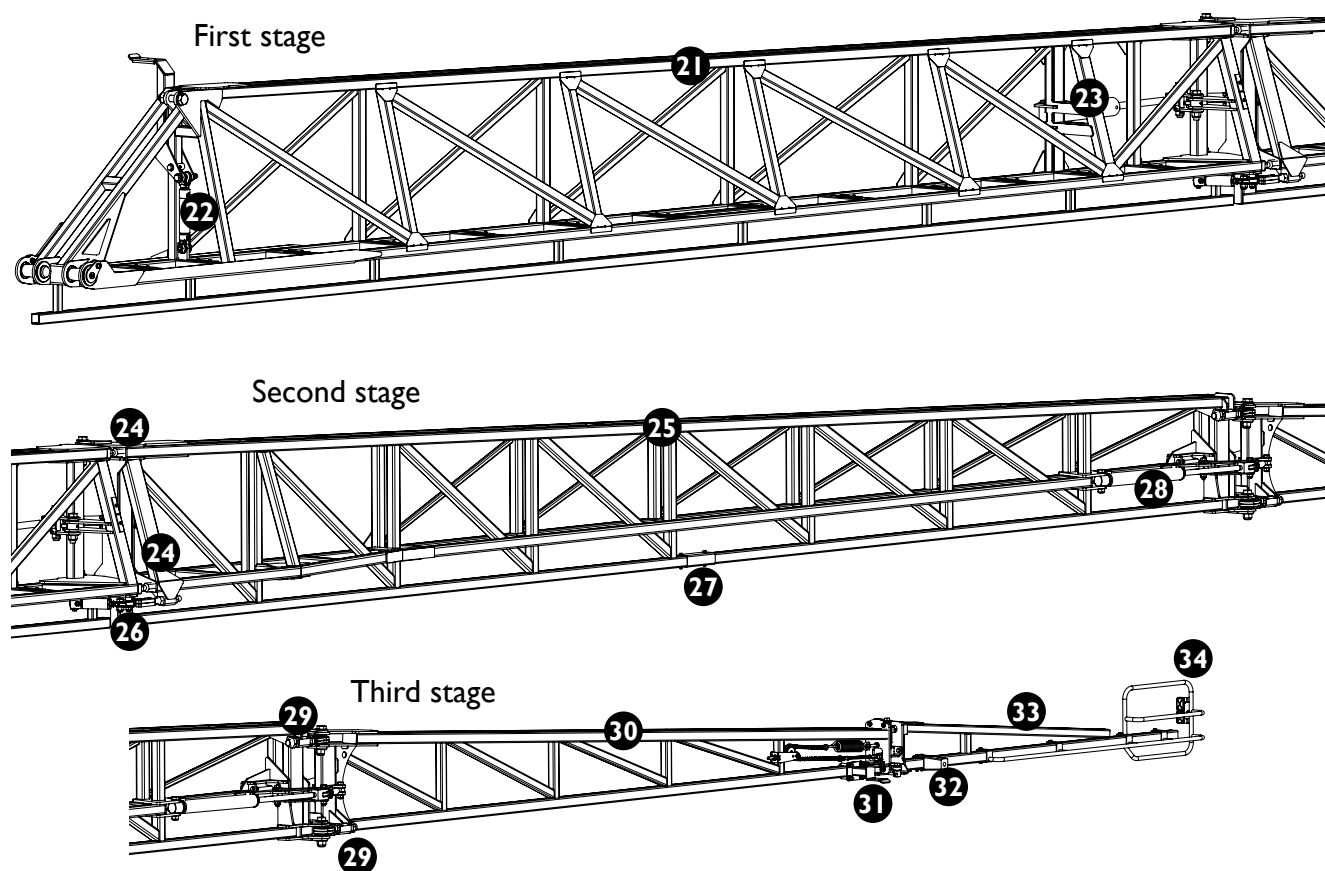
Boom Overview - 48 m



TriTech Centre Section & Paralift



Boom Overview - 48 m



NO.	FEATURE
1.	Boom centre
2.	Paralift rear
3.	Paralift arms
4.	Paralift rams
5.	Tilt rams
6.	First stage fold rams
7.	Centre level ram
8.	Yaw rams
9.	Rapidfire Oiler/Dryer
10.	Boom fold accumulators
11.	Raven RCM
12.	Flow meter
13.	Diagonal delta links
14.	Boom roll alignment adjuster
15.	Rapidflow valve
16.	Roll shockers
17.	Norac hydraulic block (Optional)

NO.	FEATURE
18.	Hydraulic spool block
19.	Yaw accumulators
20.	Boom lower limit switch
21.	First stage boom
22.	Hydraulic catch - Manual operated
23.	Second stage fold ram
24.	Stopper bolts
25.	Second stage boom
26.	Hydraulic catch - Automatic
27.	Boom protector
28.	Third stage fold ram
29.	Clevis adjustment threads
30.	Third stage boom
31.	Saddle bracket
32.	Boom stopper
33.	Breakaway tip
34.	Boom protector

Boom Features

Centre Section

The TriTech centre section is made up of two components, the Paralift rear and the boom centre section. The two are held together by delta links. These links allow the boom to be suspended in order to provide roll and yaw suspension.

Roll suspension is when the boom pitches up and down at the tips. Yaw suspension is when the boom moves fore and aft at the tips. If the boom did not feature yaw suspension there would be excessive stresses exerted on the booms and centre section when cornering or corrections of line are made. The yaw suspension allows the chassis of the sprayer to move left and right without any movement being transferred to the boom. The Paralift rear will move with the sprayer while the boom centre section will remain static or level as it rotates around the delta links connecting it to the Paralift rear.

Two hydraulic cylinders with individual nitrogen filled accumulators connected to each, centre and dampen the yaw movement.

Hydraulic Raise & Lower

The paralift enables the boom to be raised and lowered to maintain a consistent boom height above the target.

The paralift rear uses two hydraulic cylinders to perform the lift, while also acting as a vertical suspension component. Each hydraulic cylinder has a nitrogen charged accumulator which also assists in improving the boom ride. The boom limit height switch allows the operator to adjust the minimum ride height of the boom. Boom maintenance information can be found in the Chapter 10 'Lubrication & Maintenance'.

The hydraulic lift also enables the boom to be raised prior to folding and then used to lower the boom onto the boom rests.

Hydraulic Fold

The booms have a hydraulic fold feature, allows the boom to be opened and closed from within the cabin.

Hydraulic cylinders with flow dividers are used in the folding operation of the boom. This ensures that both sides of the boom are synchronised and open and close together so that the weight distribution is the same for both sides of the boom.

The outer fold cylinder has an adjustable cushion at the end of the retraction stroke which can be adjusted using the needle valve in the cylinder body.

See Chapter 11 'Troubleshooting' for help with calibrating the boom folding action.

Boom Balance

The boom suspension system causes the boom to adopt the same plane as the spray tanker. If one side is heavier than the other, the boom will tend to hang lower on the heavy side, so both sides need to be balanced for the boom ends to be of the same height.

To achieve this, boom drum weights can be included on the boom and placed strategically so that it compensates and balances the boom. The boom can have more weight added and/or be moved to balance the boom correctly.

Before adding any boom weights, it is advised that the boom is adjusted correctly. As per the instructions following in this chapter:

Boom Cables (30-36m)

Boom cables are a critical part of the booms and it is important to ensure that boom cables are correctly adjusted prior to operation.

Loose boom cables can cause boom damage by allowing the outer boom section to "break away" too easily. This can shorten the sprayers life by placing unnecessary stresses on the boom, lift and chassis. The cable tension can be checked by inspecting the cable springs. Further information on boom adjustment and alignment can be found in this chapter.

Boom Protection Brackets

Stainless steel boom protectors are fitted on the boom to protect the boom when resting on the boom rests for transport. It is important to ensure that the boom protection brackets are fitted correctly.

Boom End Protector

Boom end protectors are fitted to the breakaway tips to help prevent damage to the boom from ground strike or from hitting an obstruction. They also help to keep the boom from becoming entangled when spraying close to fence lines.

Continued over page

Boom Features

Breakaway Bumper

Ensures that the wing opens instead of the breakaway mechanism. The breakaway bumper also holds the wing straight when in the folded position as long as they are properly adjusted first.

Brace Bar

The brace bar is fitted to the aluminium outer wing. It is designed to hold the vertical weight of the boom and is adjustable.

Nozzles

The standard nozzle spacing on Goldacres booms is 500 mm. Nozzles are mounted on brackets that are adjustable for different nozzle types. Nozzles are mounted so that they are protected from strikes should the boom make contact with the ground, obstructions or crop.

As information regarding nozzles is specific to those being used in your application, no specific reference is made to nozzle application rates or types in this operator's manual. Goldacres suggest the use of a current TeeJet or Lechler nozzle selection catalogue for reference to nozzle sizes, outputs, spray patterns and general spraying information. For more technical information on the function of spray nozzles and factors affecting their performance you can also use the TeeJet 'User's guide to spray nozzles'.

The TeeJet & Lechler nozzle selection catalogues and 'User's guide to spray nozzles' are available from your Goldacres dealer; or as a free download from:

TeeJet web site: www.teejet.com

Lechler web site: www.lechler.de

Three Dimensional Breakaway

TriTech booms feature the unique three dimensional breakaway hinge which allows the tip to "break" forward, backward and upward if an obstruction is hit. The 3D breakaway hinge aims to eliminate any further damage to the remainder of the boom should an obstruction be hit.

It is important that the 3D breakaway hinge is properly adjusted when in operation. Just tightening the spring will not help with the function of the breakaway. Instructions on how to properly adjust the breakaway can be found later in this chapter.

Hydraulic Yaw Suspension

Hydraulic yaw suspension is designed to control the yaw movement of the boom centre section. Two hydraulic cylinders with individual nitrogen filled accumulators connected to each, centre and dampen the yaw movement. The two hydraulic cylinders and accumulators are charged with hydraulic pressure and then closed off to create a separate circuit which acts as the yaw suspension.

The overall yaw travel is limited by rubber bumpers mounted to the Paralift rear. If the boom centre section yaws excessively the centre section will contact these and cushion the travel by collapsing the block. If the block collapses totally the yaw travel will be stopped. If the boom is continually yawed excessively this block will wear out and require replacement.

Hydraulic Boom Wing Tilts

The boom tilt function allows the individual boom sides to be raised independently when in the working position. This serves to provide greater variability of boom height control to compensate for undulating ground conditions. Boom tilts are operated from switches in the cabin.

RapidFire & RapidFlow

The RapidFlow system is complimentary to RapidFire and is fitted at the same time. The RapidFire system provides rapid, individual nozzle shut off that is controlled by air operated solenoids at each nozzle. This system replaces the boom valves and standard check valves that shut off the boom sections and nozzles. This provides greater flexibility in changing boom section widths and faster shut off at the nozzle.

The RapidFire system reduces the amount of plumbing on the sprayer and allows for the fitting of a boom recirculation system. The ability to have more boom sections also works perfectly in conjunction with AccuBoom shut off systems.

In order to ensure that boom lines are charged and ready to spray, a standard sprayer plumbing system will require the boom lines to be purged with chemical mix prior to spraying. RapidFlow allows an agitated chemical mix to be run through the boom lines prior to spraying - pre-charging them and eliminating waste.

Boom Options

Fence Line Jets

Goldacres offer manually and electrically operated fence line jets. The 'fenceline' jet is designed to enable the operator to spray right up to the boundary fence without having the boom too close to the fence.

This should prevent operators from putting the boom into the fence, especially important when the operator is not familiar with the width of the boom. The fenceline jet should be turned off after the end of the first lap and this can be done either manually via a tap or remotely via an optional electric solenoid (controlled via the tractor cabin).

Bi-fold (30-36m)

TriTech booms can incorporate a hydraulic bi-fold option which allows the boom outer sections to be folded in to make the entire boom smaller.

For example a 36 metre TriTech boom fitted with the bi-fold option would fold back into 18 metres swathe width for easier spraying in tight situations.

A centre leveling system is fitted only to sprayers with bi-fold optioned. The centre leveling system holds the centre section level with the sprayer chassis when fold or bi-fold functions are activated. This helps with the even folding of the wings.

See the section at the end of this chapter for information on adjusting booms fitted with bi-fold.

Three Tier System (3TS)

The Three Tier System (3TS) consists of two complete and totally separate boom lines on the same boom frame. As an example a conventional 30 metre boom has one boom line with 60 nozzle outlets (2 per metre) across its width. A 3TS boom replicates this first line with a second line also consisting of 60 nozzles giving a total of 120 nozzles for both lines.

In simple language, the 3TS gives you the capacity to vary application rates and speeds by switching extra nozzles on and off. The 3TS allows a range of speed changes without the spray quality being compromised – the correct droplet size is maintained.

Importantly you can use the nozzles you want to use - including air induction nozzles. That means higher speed spraying without the limitations of large droplet size.

Typically nozzles on the first line may flow at 015 flow rate and the nozzles on 3TS's second line at 025. When spraying, the first nozzles automatically switch off when they reach full operating pressure allowing the second line nozzles to commence spraying. As speed increases again and the second line nozzles reach their maximum operating pressure, the first line nozzles will switch on again.

Thus, the flow rates of 015, 025 and 040 can be achieved while maintaining the optimum droplet size and spraying pressure. The 3TS delivers everything needed for precision application at variable speeds.

Boom Height Control - Norac

Boom Height Control systems maintain the boom at a preset height by monitoring field contours and making responsive boom adjustments. Using data from either 3 or 5 ultrasonic sensors, the Boom Height Control systems makes responsive height adjustments allowing booms to automatically follow the contours of the land. Maintaining spray nozzles at the recommended spray tip height allows chemical to be applied using an optimum spray pattern providing even application and reducing drift.

Boom Height Control reduces the need for the operator to move their head back and forth to monitor changes in field terrain, thereby reducing stress and fatigue.

This allows the operator to focus on machine operation and safety. Manual operation of a sprayer in uneven field terrain may require reduced operating speeds for continual boom adjustments.

Ultrasonic sensor hardware and software is designed specifically for height control applications. The ultrasonic signals can distinguish the difference between the ground and standing crop or field residue. Boom height is controlled by choosing Soil Mode (senses the soil surface), Crop Mode (senses the top of the crop), or Hybrid Mode (technology that calculates a virtual top of the crop for more accurate control).

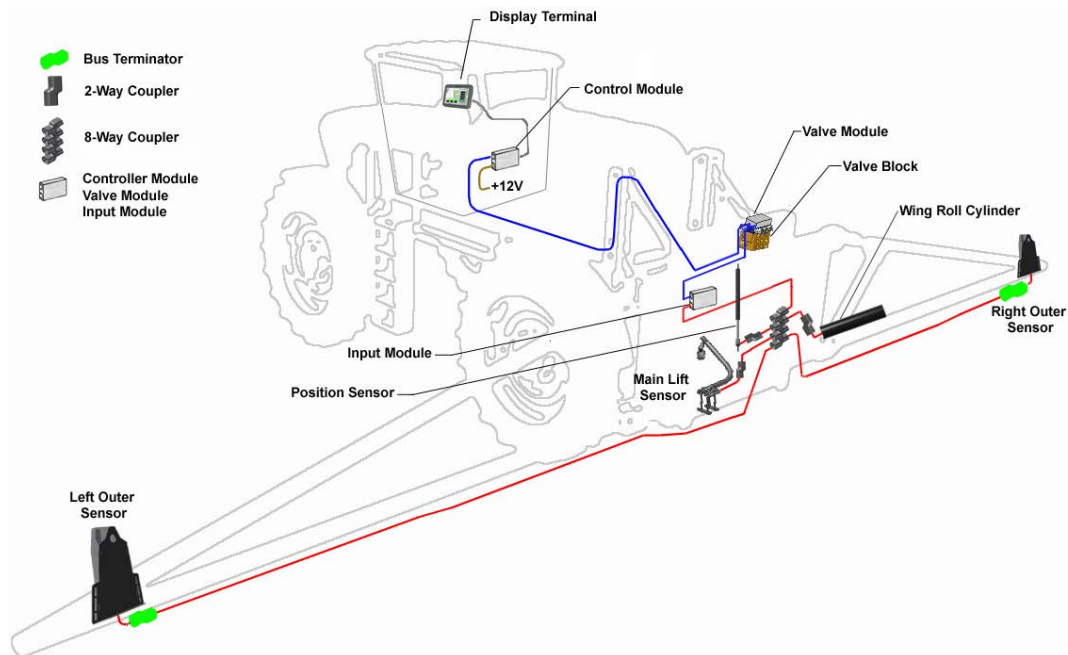
Refer to manufacturer's manual(s) for detailed information about this system.

Boom Options

WWW.NORAC.CA

PRECISION DEFINED

Goldacres UC5 Active Wing Roll



Boom Adjustment - 30-36 m

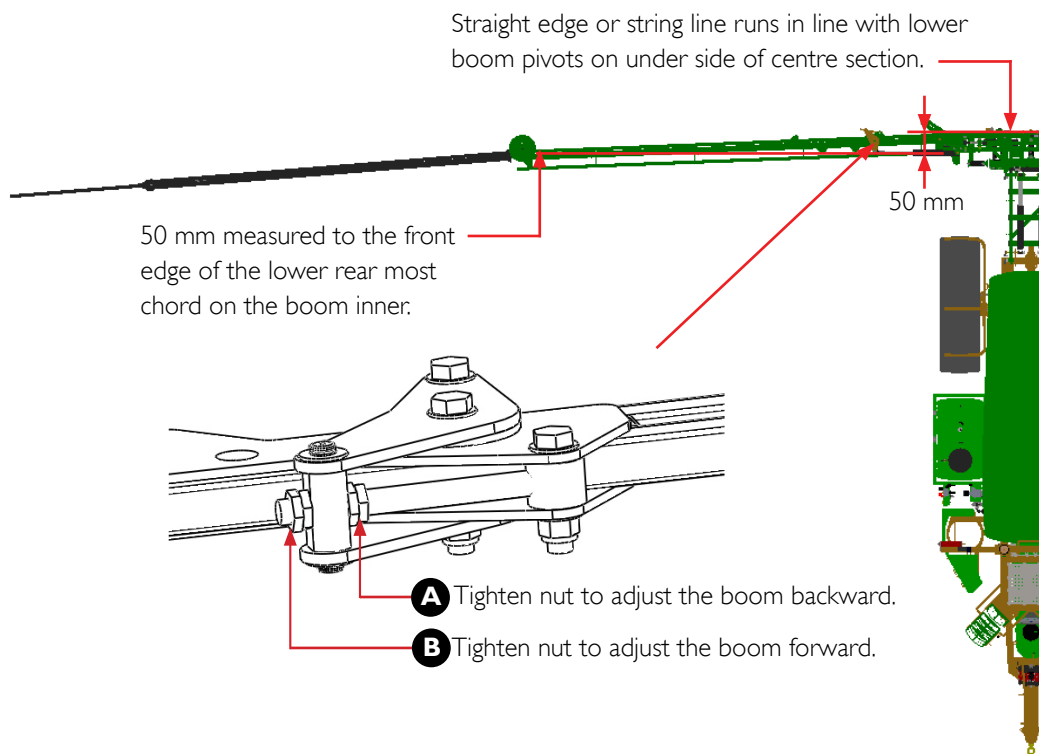
Inner Steel Boom Alignment - Unfolded Position

1. Open the boom fully into the working position.
2. Continue to press the unfold button or hold the hydraulic remote open to ensure the fold cylinders are phased completely.
3. Look along the inner booms between the cable drums to assess the alignment.

All booms must be 50 mm forward of the centre section at the cable drums. A string line can also be used for measuring the lead of the inner boom (see below).

4. If adjustment is required, loosen the two lock-nuts on the boom fold adjuster bolt at the rear of the boom.
5. To adjust the boom forward, tighten the outer adjuster nut. To adjust the boom rearward, tighten the inner adjuster nut.
6. When the boom is in the required position, tighten both locknuts to hold in place.
7. Follow this process for both inner booms.

NOTE: It is important that both wings are adjusted the same. If one wing is adjusted further forward or back than the other, the boom may not sit level.



Boom Adjustment - 30-36 m

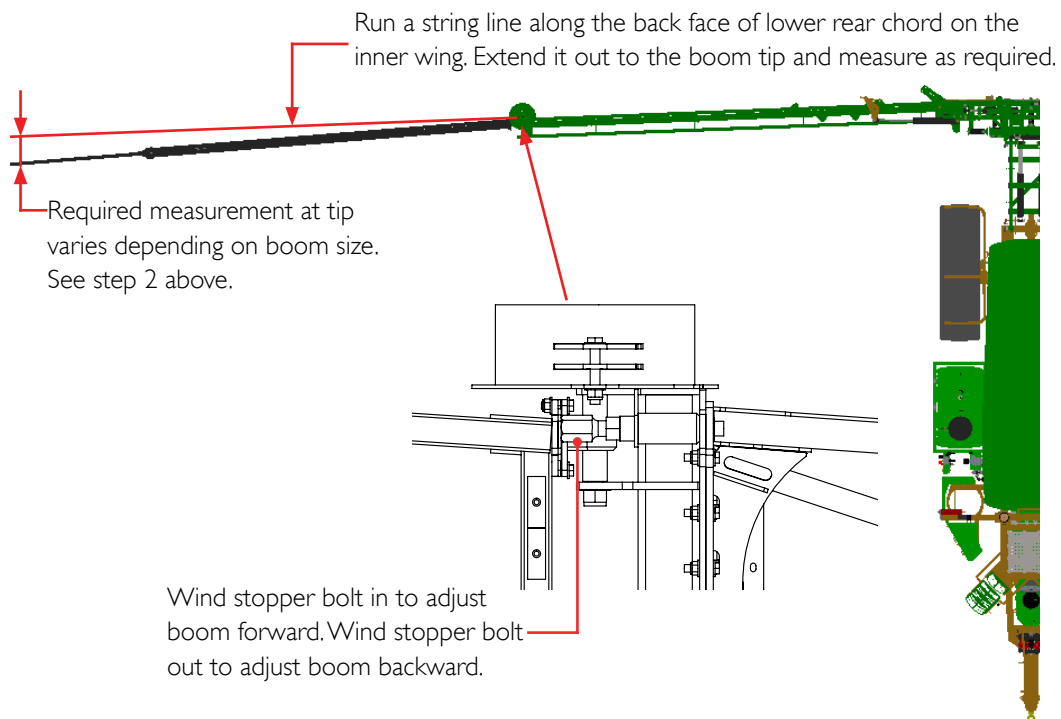
Outer Boom Wing Alignment - Unfolded Position

1. When adjustment of the inner booms is complete the outer booms can now be aligned.
2. 24-30 m Tritech booms must be 30-50 mm and 33-36 m booms must be 50 mm forward of the inner booms. Use a string line to assist with achieving the correct measurements.
3. To align the outer booms, the cable adjusters and boom stopper bolt are used. To pull the outer boom forward, wind in the boom stopper bolt. The turnbuckle that is connected to the cable damper springs at the front of the boom must also be shortened to maintain cable tension. At the same time the rear turnbuckle must be lengthened.
4. To adjust the outer boom rearward, wind out the boom stopper bolt. The rear turnbuckle must be shortened and the turnbuckle at the front lengthened.
5. Once correct alignment has been achieved the cable spring tension must be set so there is a 3 mm gap between the coils.

NOTE: It is advised that all threads are lubricated prior to making adjustments.

NOTE: If cable adjustments run out on the turnbuckles, it is advised that you should contact your dealer and purchase new cables.

NOTE: It is important that both wings are adjusted the same. If one wing is adjusted further forward or back than the other, the boom may not sit level.



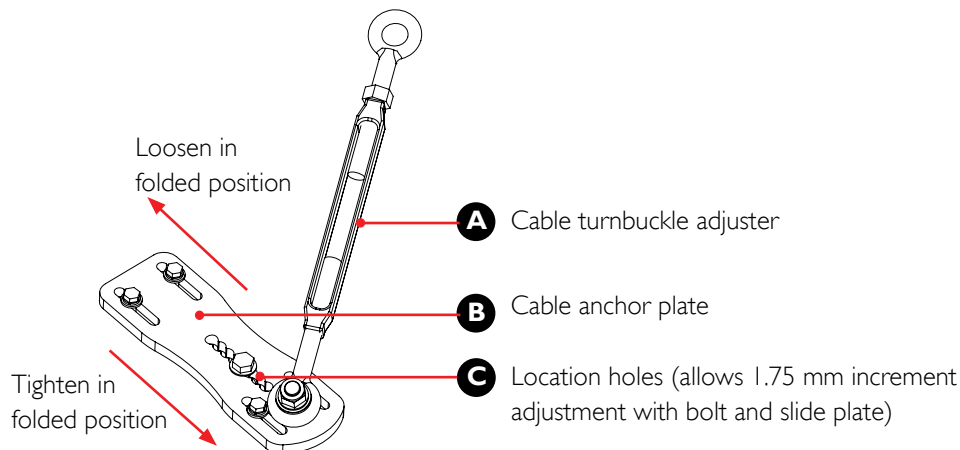
Boom Adjustment - 30-36 m

Outer Boom Wing Alignment - Folded Position

- The eyebolt cable adjuster aligns the outer boom arm in the working position; the adjustment plate is designed to adjust the outer boom arm in the folded position.
- The eyebolt adjuster will follow the same orientation as the boom when folding and unfolding. For example, when the boom is in the operating position the eyebolt adjuster should be horizontal in line with the boom. With the boom folded, the eyebolt adjuster should be pointing forward in a raised position, again following the line of the boom.
- Fold in the boom. If the outer boom arm does not come in all the way against the inner boom arm and contact the bump stop then the adjustment plate will need to be moved out. If the outer boom arm contacts the bump stop too early and places too much tension on the cable then the adjustment plate needs to be moved inwards.

- To adjust the plate the boom has to be in the working position. Have someone pull back on the outer boom arm to release the tension on the cable whilst you make adjustments to the plate. When adjustment is completed ensure the outer boom arm is released carefully so it does not spring forward dangerously. Re-adjust the cable eyebolt to realign the outer boom arm whilst still in the working position before folding the boom and re-checking the alignment in the folded position.
- Repeat the procedure if necessary until the outer boom arm assumes the correct alignment in both the working and folded positions. When this has been achieved install the bolts (C) and tighten.
- Spring tension may be altered slightly when this plate is moved. Check there is a 3 mm gap in the spring coils and adjust if required.

NOTE: If the outer boom arm contacts the bump stop too early and too much tension is placed on the cable, then the hydraulic cylinder may fail to bring both arms all the way in, or damage the boom arms and cable



Boom Adjustment - 30-36 m

Vertical Boom Alignment - Unfolded Position

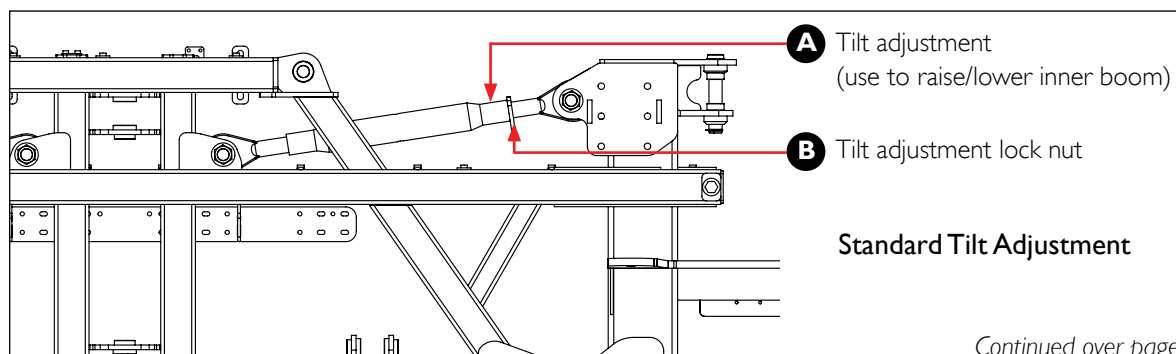
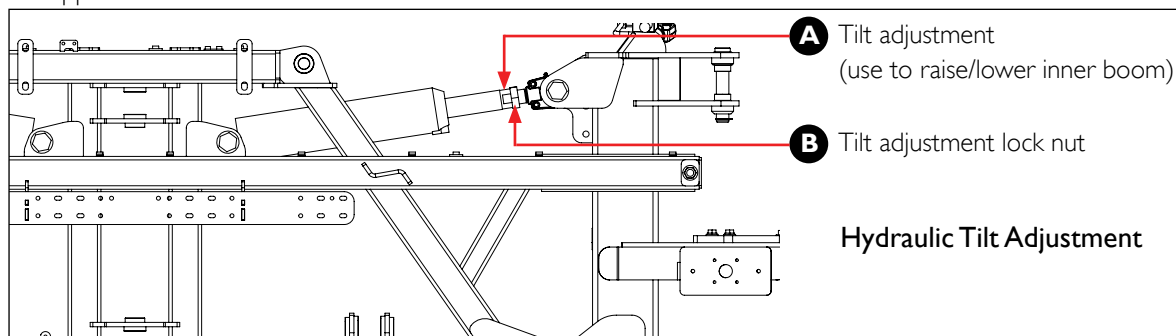
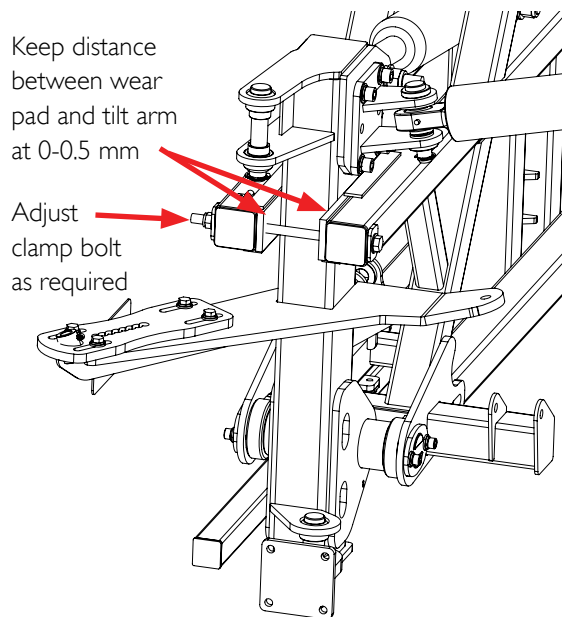
When the boom is in the working position, the inner and outer boom should be level or slightly increasing in height from the centre section to give a consistent and even spray application height. A new boom may be susceptible to stretching or sagging as the components are worn in. Several adjustment may be required in the first 12 months of operation until the boom settles.

INNER BOOMS

- The boom centre section must be level with the chassis before any boom adjustments are made. The centre of the centre section should line up with the centre of the paralift when look from the rear. This can be done by either shortening or lengthening the centre section adjuster bolt at the top delta links, or by adding weight discs to the boom tip.
- The inner booms must be adjusted first so they are the same height as the centre section or slightly increasing in height from the centre section (to allow for boom stretch) .These adjustments are made by lengthening or shortening the tilt adjusters on the tilt cylinder.
- To lengthen or shorten the tilt adjusters, the weight of both the booms will need to be supported.

- When any adjustments are completed, Ensure the lock nuts are tight.

The tilt arm guide arms are fitted with wear strips. It is important that these strips are maintained and that the gap between them and the tilt arm is kept between 0-0.5 mm either side. This ensures the tilt arm cannot twist, prolonging the life of the product. To adjust the clamp pressure tighten or loosen the clamping bolt.



Boom Adjustment - 30-36 m

OUTER BOOMS

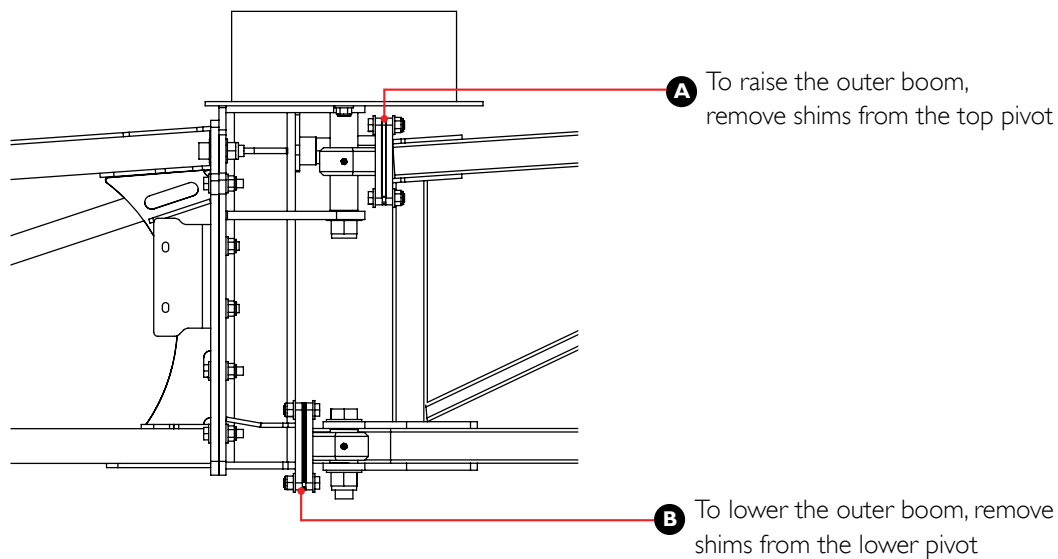
- The height of the outer booms in the working position are adjusted by adding or removing shims at the cable drum.
- The cable drum mounts are assembled in manufacturing with 6-7 shims at the upper and lower bearing blocks.
- If the outer boom hangs lower than the inner boom, remove shims from the upper mount until the booms are level. If the outer boom is too high remove shims from the lower bearing block. Re-tension the retaining bolts to 65 Nm when all adjustments are complete.
- The boom cables may need to be loosened to enable easier removal of the shims.

24-30 m booms:

1 shim added = 10-20 mm @ boom end

33-36 m booms:

1 shim added = 20-30 mm @ boom end



Boom Adjustment - 30-36 m

Vertical Boom Alignment - Folded Position

When the booms are folded up in the transport position, the full weight of the booms must be supported by the inner boom. The outer aluminium boom may sit on the boom rest rubber but must not support any weight.

INNER BOOMS

- If the boom sits level in the working position but when folded up, one side is lower than the other, there is one adjustment that can be made.
- Shims can be placed at the bottom boom mount of the lowest boom - refer to diagram A. This will lift the boom in the open position.
- If the boom is not level in the working position, the most likely cause is if this is an out of balance boom. Refer to previous boom adjust information.

NOTE: This process should not be required as once they are set in manufacturing, they should not change

When the booms are folded up in the transport position, the outer boom must saddle onto the inner boom. If this alignment is out the outer boom will

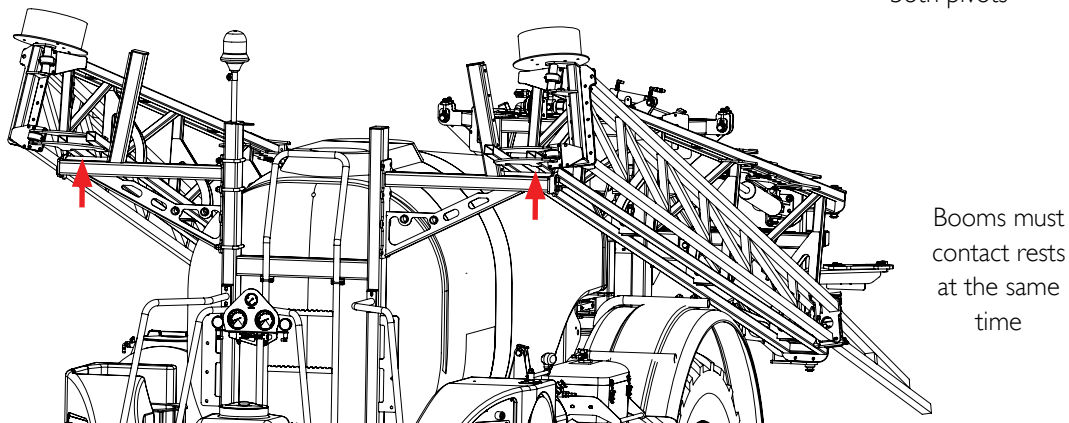
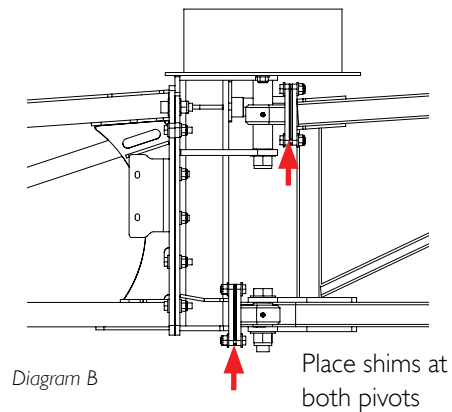
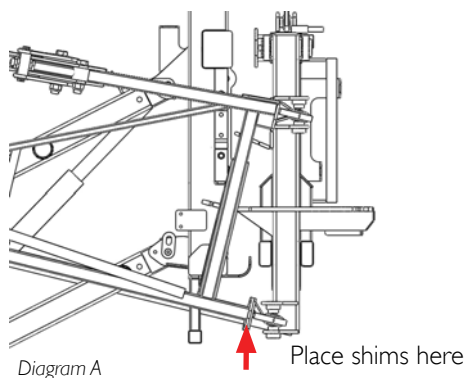
not saddle correctly and will not be supported in transport.

The boom support saddle is bolted to the outer boom and when folded, couples to the inner boom. This saddle must slide onto the inner boom freely to prevent damage to the booms.

NOTE: This process will be required in the first 6 months of operation as the booms stretch and wear in.

OUTER BOOMS

- If the outer boom hangs too low in the folded position, shims must be added to the cable drum pivots. To raise the outer boom, add shims to both the upper and lower pivots. This adjusts the angle of the pivot axis causing the outer boom to fold up higher. By adding shims to both the upper and lower pivots, the outer boom height is not affected in the working position.
- To lower the outer boom in the folded position, remove shims from both the upper and lower pivots.
- 1 x 1 mm shim at the upper and lower pivots equals approximately 15 mm change in height.



Boom Adjustment - 30-36 m

Aluminium Outer Wing

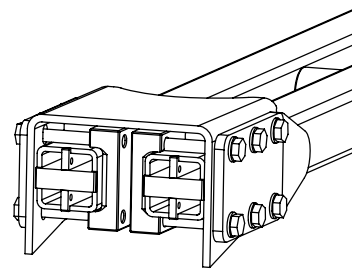
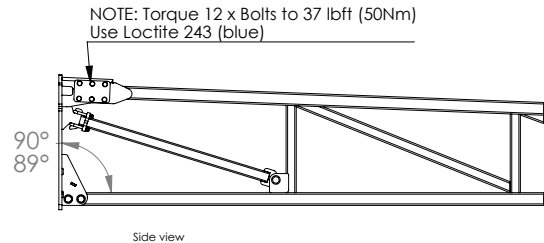
When the booms are fitted at the factory, they are made level or slightly increasing in height from the centre section. Under working conditions the aluminium outer booms will need to be checked at every 50 hour intervals as per the Maintenance Schedule.

If the aluminium outer boom is not level in the working position, then a likely cause of this may be sagging or stretching.

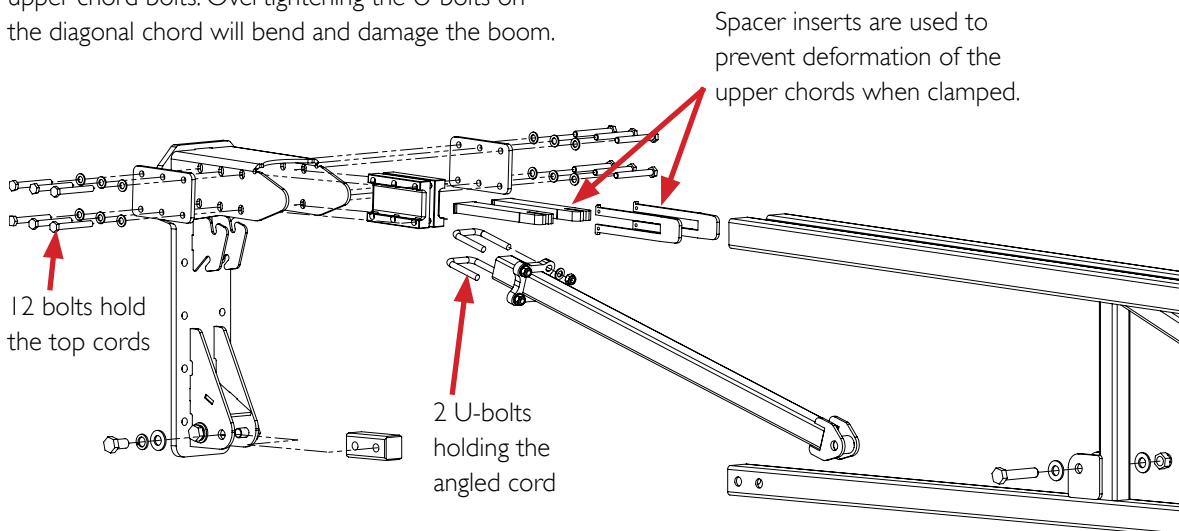
Shims may need to be placed or removed at the fold hinge bearing blocks to get the booms level. Refer to Vertical boom alignment - working position.

If the aluminium top cords around the bolts show any signs of movement, then the bolts will need to be tightened.

Adjustments should be performed with the boom in the lowered working position. Check that the end plate to cords are at 89-90 degrees to each other. If the angle is too large then the wing is sagging. Set the angle correctly using the top bolts and re-tighten to 37 lbft / 50 Nm. The U-bolts should be done up just tightly enough to hold the position set by the upper chord bolts. Overtightening the U-bolts on the diagonal chord will bend and damage the boom.



Above: Cross section of top chord mounting. Note orientation of spacer inserts.



Boom Adjustment - 30-36 m

Hydraulic Yaw Setup

The hydraulic yaw suspension system uses hydraulic cylinders and nitrogen filled accumulators to dampen and control the back and forth sway (yaw) of the booms.

The hydraulic yaw system is a closed hydraulic circuit. The base of the right hand yaw cylinder is connected via hydraulic hoses to the rod end of the left hand cylinder. A nitrogen charged accumulator (70 bar for 36 m booms) is connected via a t-piece into the cross over hose. The base of the left hand cylinder is connected via hydraulic hose to the rod end of the right hand cylinder. A second nitrogen charged accumulator (70 bar for 36 m booms) is connected via a t-piece into the other cross over hose.

If the boom yaws to the left, the right hand cylinder will try to compress. This will push oil out of the base of the right hand cylinder into the rod end of the left hand cylinder also into the accumulator against the precharge pressure (70 bar for 36 m booms). Because the hydraulic yaw is a closed circuit the oil movement is restricted by the precharge pressure in the accumulator. This precharge pressure is what resists the boom yaw movement and pushes it back to the centered position. If the boom yaws to the right the opposite action occurs.

The circuit precharge needs to be monitored and maintained. Gauges on the centre section display the closed loop hydraulic yaw pressure. This pressure should be maintained at 100 bar.

NOTE: When the hydraulic yaw system is installed or any components are replaced, the closed loop hydraulic circuit needs to be bled of any air. The maximum pressure needs to be set, the system charged and the booms aligned.

BLEEDING YAW CIRCUIT

When the hydraulic yaw system is installed or any components are replaced, the closed loop hydraulic circuit needs to be bled of any air; the maximum pressure set, system charged and the booms aligned.

1. Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
2. Open the boom into the working position and lower to the minimum working height. (Ensure there is ample room in front and behind the boom as it will be required to oscillate.)



3. Isolate the boom lift cylinders by rotating the Paralift cylinder ball valves to the OFF position.
4. Remove the covers from the in-line test point on the accumulators.
5. Connect the bleed hose (supplied in the sprayer kit) to in-line test point on the accumulators.
6. Couple the bleed hose quick connect end to an external hydraulic source, such as a tractor.
7. Using the external hydraulic source, oscillate the boom back and forth ensuring to hold the boom at its extremities for approximately 30 seconds in each direction. Start by activating the hydraulic source in one direction. The boom will oscillate forward and stop when the hydraulic cylinder is fully extended.

Hold the hydraulic supply in position for at least 30 seconds to ensure that the hydraulic cylinder is fully extended. Move the hydraulic source in the opposite direction until the opposite cylinder is fully extended, again hold in position for 30 seconds to ensure the cylinder is fully extended. Repeat this at least 15-20 times to bleed any air from the system.



Continued over page

Boom Adjustment - 30-36 m

- When oscillations are complete move the boom into a perfect centred position as shown below:



- Check that the pressure gauges in the hydraulic yaw circuit are reading below 100 bar.
- Close the hydraulic yaw charge ball valves.
- Disconnect the bleed hose from the tractor or external hydraulic source, and then remove the hose from the in-line test points. Replace the cover on the test point.
- Next, see 'Charging Yaw Circuit'.

CHARGING YAW CIRCUIT

When the hydraulic yaw system is installed, or any components are replaced, the closed loop hydraulic circuit needs to be bled of any air, the maximum pressure set, system charged and the booms aligned.

- Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
- Open the boom into the working position and lower to the minimum working height.
- Isolate the boom left cylinders by rotating the Paralift cylinder valves to the off position.
- Open the hydraulic yaw charge ball valves.
- Activate the boom lift circuit and maintain constant pressure for 30-60 seconds. This will generate maximum hydraulic oil pressure in the sprayer hydraulic circuit.

NOTE: The pressure reducing valve in the circuit limits the main hydraulic pressure to 100 bar entering the hydraulic circuit.



Left: Yaw charge ball valves in the OPEN position.

- After 30-60 seconds release the lift circuit and isolate the hydraulic yaw charge ball valves by rotating them to the OFF position. The pressure gauges in the hydraulic yaw circuit should be reading 100 bar:



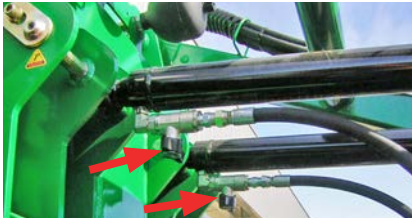
Left: Yaw charge ball valves in the CLOSED position.

- Ensure that the boom is sitting level and aligned correctly. If one side of the yaw is sitting forward of the other; OPEN the charge ball valves and push the boom around to centre the boom and cylinders. Once aligned CLOSE the charge ball valves. Check the pressure gauges are still at 100 bar:

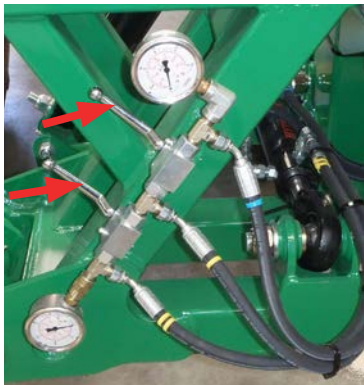
Boom Adjustment - 30-36 m

RECENTERING BOOM

1. Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
2. Open the boom into the working position and lower to the minimum working height. Ensure that there is ample clear space in front and behind the boom for it to oscillate in.



3. Isolate the boom lift cylinders by rotating the Paralift cylinder ball valves to the OFF position.



Left: Yaw charge ball valves in the OPEN position.

4. Open the hydraulic yaw charge ball valves.



5. Oscillate the boom by hand to bring the boom and cylinders into the desired center position.
6. The pressure gauges in the hydraulic yaw circuit should be reading 100 bar.

7. Close the hydraulic yaw charge ball valves.

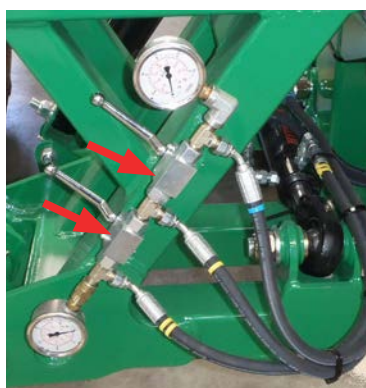


Left: Yaw charge ball valves in the CLOSED position.

Boom Adjustment - 30-36 m

SET PRESSURE REDUCING VALVE

1. Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
2. Open the boom into the working position and lower to the minimum working height.
3. Isolate the boom lift cylinders by rotating the Paralift cylinder valves to the off position.
4. Open the hydraulic yaw charge ball valves.



5. Identify the pressure reducing valve.

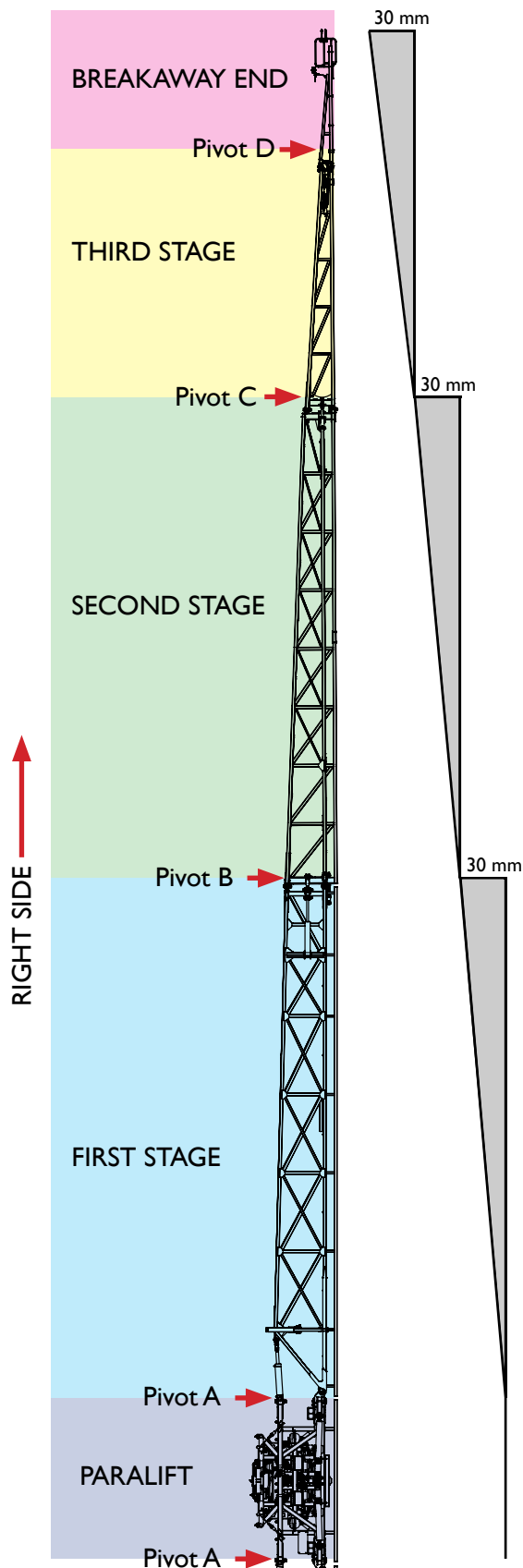


6. Loosen the adjustment lock nut and turn the set screw counter clockwise 3 rotations.
7. This will generate minimum hydraulic oil pressure in the sprayer hydraulic circuit.
8. With the hydraulic circuit engaged turn the set screw IN (clockwise) until the hydraulic yaw pressure gauges indicate 100 bar (1500 PSI). If the pressure is exceeded the closed loop circuit must be "cracked" to bleed off any excess pressure. The Tilt Out can be used to generate pressure in the hydraulic system.

CAUTION: Take care when working with hydraulic oil under pressure. Ensure that excess oil is drained into a container.

9. Once the set screw is set to the correct pressure, tighten the lock nut. Ensure that the set screw is held firmly in position to prevent the pressure fluctuating.
10. When the pressure is set correctly, charge the circuit as described in next section 'System Charging'.

Boom Adjustment - 48 m



Above: Top view of boom & tilt angle adjustment.

Alignment - Tilt

The boom is divided up into three stages and a breakaway end. These stages need to have their alignment angles adjusted at each pivot area except for the first stage.

BEFORE YOU BEGIN

- Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
- Start with the boom in the working (unfolded) position.

NOTE: It is important that both wings are adjusted the same. If one wing is adjusted further forward or back than the other, the boom may not sit level.

TILT ANGLE ALIGNMENT PROCEDURE:

FIRST STAGE

- The first stage tilt angle is hydraulically controlled by the operator and does not require specific pre-alignment.

Continued over page

Boom Adjustment - 48 m

SECOND STAGE

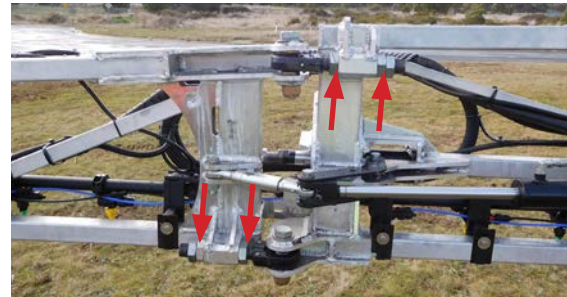
- The second stage tilt angle is adjusted using the clevis joint threads at pivot B.



- The second stage fold should be adjusted so that it is angled 0.2° higher than the first stage. The alignment will be ideal when the second stage just touches the keeper of the first stage when folding closed.
1. Loosen the locknuts on the upper and lower clevis joint threads ($1 \frac{7}{8}$ " inch spanner).
 2. Winding the top clevis closer to the first stage will cause the second and remaining stages to sit higher in the open position. When folded it will sit lower than before. If angled up too much when open, it will sit below the keeper when folded and not be able to close properly. Some trial and error will be required to check that the boom is vertically aligned correctly in both the open and closed positions.
 3. Once the correct alignment has been obtained, re-tighten the locknuts on the upper and lower clevis joint threads ($1 \frac{7}{8}$ " inch spanner).

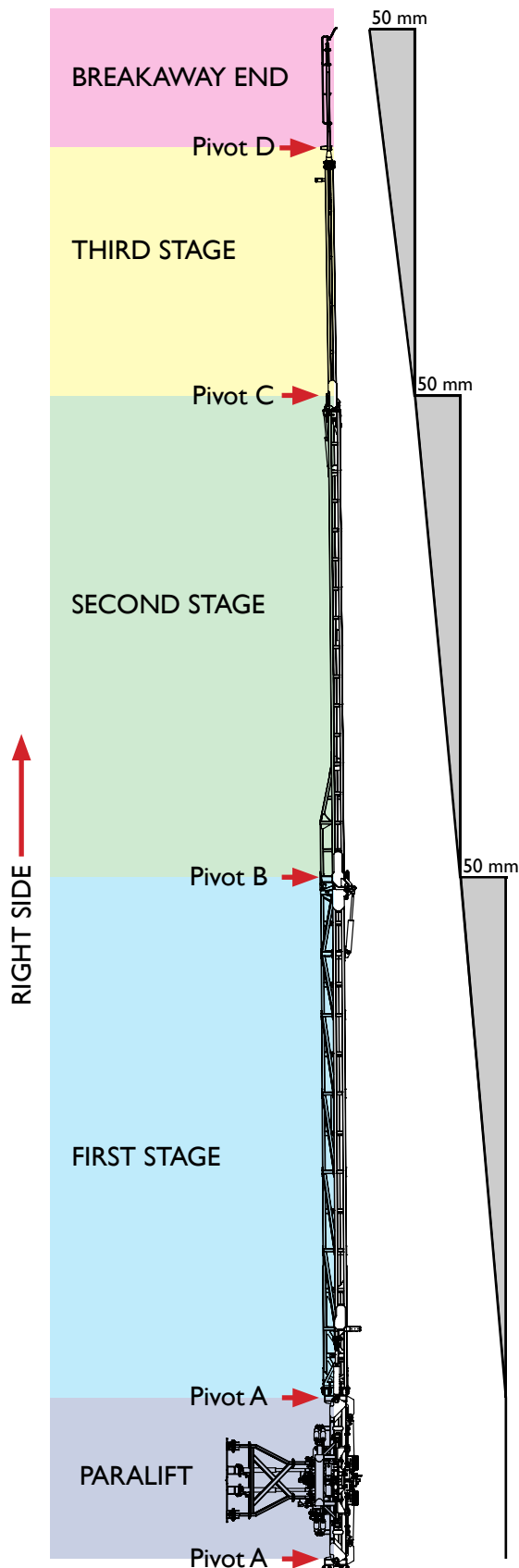
THIRD STAGE

- The third stage tilt angle is adjusted using the clevis joint threads at pivot C.



- The third stage fold should be adjusted so that it is angled 0.2° higher than the first stage. The alignment will be ideal when the third stage is closely parallel with the second stage when folded closed.
1. Loosen the locknuts on the upper and lower clevis joint threads ($1 \frac{7}{8}$ " inch spanner).
 2. Winding the top clevis closer to the second stage will cause the third stage and breakaway end to sit higher in the open position. When folded it will sit lower than before. Some trial and error will be required to check that the boom is vertically aligned correctly in both the open and closed positions.
 3. Once the correct alignment has been obtained, re-tighten the locknuts on the upper and lower clevis joint threads ($1 \frac{7}{8}$ " inch spanner).

Boom Adjustment - 48 m



Above: Top view of boom & yaw angle adjustment.

Alignment - Yaw

The boom is divided up into three stages and a breakaway end. These stages need to have their alignment angles adjusted at each pivot area.

BEFORE YOU BEGIN

- Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
- Start with the boom in the working (unfolded) position.

NOTE: It is important that both wings are adjusted the same. If one wing is adjusted further forward or back than the other, the boom may not sit level.

YAW ANGLE ALIGNMENT PROCEDURE:

FIRST STAGE

- The first stage yaw angle is adjusted by adding or removing shim plates from the fold rams mounted on the centre section at pivot A.



1. Loosen and remove the top two bolts, nuts and washers holding the fold ram and dampers together (18 & 19 mm spanner/socket). Loosen the lower two sets but do not remove them; the shim plates will need to rest on them.



Continued over page

Boom Adjustment - 48 m

2. The first stage yaw angle should be adjusted such that it points 50 mm forward of the centre section. A string line can be used as a guide. Alternatively, it may be helpful to observe the boom from underneath as the bottom chords are 50 mm wide all along the stages and provide a visual reference for the offset amount.
3. The two open slots in the shim plates should be facing downward when inserted to sit on the loosened but not fully removed bolts. Insert or remove shims by trial and error until the 50 mm offset has been achieved. Replace and tighten all nuts, bolts and washers (18 & 19 mm spanner/socket).



SECOND STAGE

- The second stage yaw angle is adjusted using the two stopper bolts and catch at pivot B.



1. Loosen the lock nuts on the upper and lower stopper bolts. Back the stoppers off so that they are not touching the second stage (1 1/2" inch spanner).
2. The catch position should be extended or retracted to place the end of the second stage 50 mm in front of the end of the first stage. Loosen the lock nut on the catch on the side to be shortened and tighten the nut on the side to be lengthened (1 1/2" inch spanner).
3. Once the catch is in the desired position, wind out the upper and lower stoppers to touch the second stage. Check that the catch hooks are just barely touching to ensure smooth operation of the mechanism.
4. Re-tighten the lock nuts on the stoppers (1 1/2" inch spanner).

THIRD STAGE

- The third stage yaw angle is adjusted using the stopper bolt on the end of the damper at pivot C.



1. Loosen the lock nut on the stopper. Wind the stopper out to push the third stage forward or wind it in to let it come backwards (1 1/2" inch spanner).
2. Once the position has been adjusted such that the end of the third stage sits 50 mm in front of the end of the second stage, re-tighten the lock nut on the stopper (1 1/2" inch spanner).

Boom Adjustment - 48 m

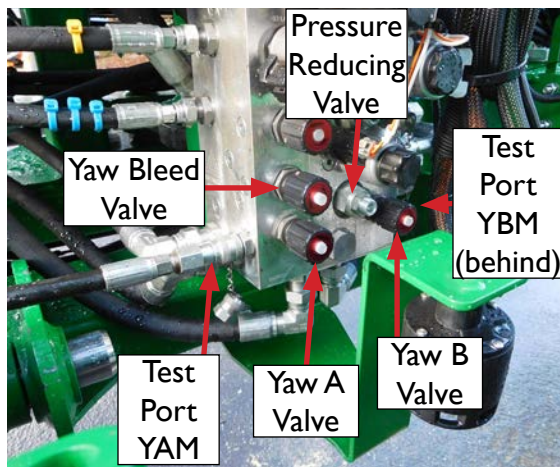
Hydraulic Yaw Setup

Boom yaw is controlled by a pair of hydraulic rams and accumulators. Oil in these circuits flows through the spool block mounted on the back of the boom centre.

BEFORE YOU BEGIN

- Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
- Start with the boom in the working (unfolded) position.

YAW ANGLE ALIGNMENT PROCEDURE:



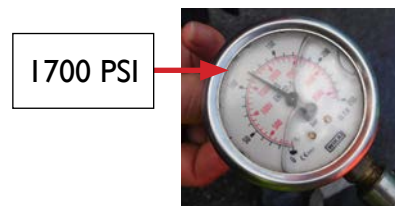
1. Wind out (counterclockwise) both the 'Yaw A' and 'Yaw B' valves to open them fully.
2. Move the boom around by hand until it is sitting perpendicular to the chassis of the machine.
3. Wind in (clockwise) both the 'Yaw A' and 'Yaw B' valves to close them fully. The default yaw position is now set.

YAW LINE AIR PURGE PROCEDURE:

- This procedure is typically only necessary when the hydraulic yaw circuit has been opened, such as when replacing a component e.g. hose.
1. Wind out (counterclockwise) the 'Yaw Bleed' valve to open it fully.
 2. Start the engine and then move the boom around by hand for a minute or so to help force air out of the hydraulic yaw circuit.
 3. Wind in (clockwise) the 'Yaw Bleed' valve to close it fully.
 4. Shut down the engine.

YAW LINE PRESSURE SETTING PROCEDURE:

- The hydraulic yaw pressure setting determines the effective stiffness of the yaw damping.
 - A test port gauge capable of reading up to 3000 PSI comes fitted with the boom functions hydraulic block. It can be switched from test port 'YAM' to test port 'YBM' on the left and right hand sides of the block depending on which side is being tested individually. When testing the yaw line circuit pressure as a whole, the gauge may be connected to either test port.
1. Check that the test port gauge is connected to either test port 'YAM' or test port 'YBM'.
 2. Follow the 'Before You Begin' instructions and start the engine.
 3. Wind out (counterclockwise) both the 'Yaw A' and 'Yaw B' valves to open them fully. The yaw bleed must be fully closed (clockwise).
 4. The hydraulic system will build pressure when a function is activated. Preferably engage 'Stage 1 Fold' OUT as the boom is already folded out and will not move in a hazardous way.
 5. Once pressure has built up fully, use the pressure reducing valve to set it higher or lower as necessary. Target pressure for 48 metre boom is 1700 PSI. Loosen the lock nut first and then wind it in to increase pressure or wind it out to decrease pressure.



- NOTE:** If the pressure is too high then wind out (counterclockwise) the 'Yaw Bleed' valve to reduce it in addition to the pressure reducing valve. Then, close the 'Yaw Bleed' valve and check the maximum pressure achieved again. Pressure will not decrease on the gauge if only the pressure reducing valve is wound out.
6. Re-tighten the lock nut on the pressure reducing valve once the pressure is set.
 7. Follow the 'Yaw Angle Alignment Procedure'.
 8. Shut down the engine and disconnect the pressure gauge.

Three Dimensional Breakaway - 30-48 m

Initial Setup

1. Open the boom fully into the working position and lower to a good working height.
2. Close the ball valves on the two hydraulic lift cylinders for safety purposes.
3. The lower pivot plates need to be in line with each other (fig. A).
4. If the rose end is removed for any reason, anti seize should be applied to the thread before it is screwed into the boom tip. The rose end should be screwed into the breakaway tip so that it measures 52 mm from the boom tip face plate to the centre of the rose end (fig. B). Apply Loctite 243 thread lock to the grub screw and fasten.
5. The small hole in the sprocket must align with the hole in the side of the pivot plate. This is adjusted by tightening or loosening the turnbuckle (fig. C).
6. The spring tension must be adjusted so there is a 1-2 mm gap between the coils. This applies the ideal amount of resistance when breaking away. The spring tension can be adjusted by tightening or loosening the eye bolt.

TO ADJUST TURNBUCKLE

Pull the boom tip back until the large hole in the sprocket aligns with the hole in the pivot side plate, put a pin through the holes and release the tip.

Make adjustments to turnbuckle. Pull tip back and remove the pin. Release the tip and check alignment of small hole in sprocket with pivot plate.

Repeat previous steps until the small hole in the sprocket and hole in the side plate align.

Maintenance

There are several things that need to be done to ensure that the breakaway will be functioning properly.

- There are two main things that are critical to the breakaway functioning correctly. The small hole in the sprocket needs to align with the hole in the side of the pivot plate (see step 5 - Initial Setup) and the spring tension. Check these on a regular basis and adjust as required.
- The spring will stretch over time and will lose tension. A spring is worn and should be replaced when there is no tension on the spring and it doesn't fully retract.
- To ensure the smooth and long lasting operation of the breakaway mechanism, it must be lubricated on a regular basis. The sprocket pivot, chain and lower rose joints should be oiled with a wet lubricant every 8 hours. The upper rose joint should be greased every 8 hours.

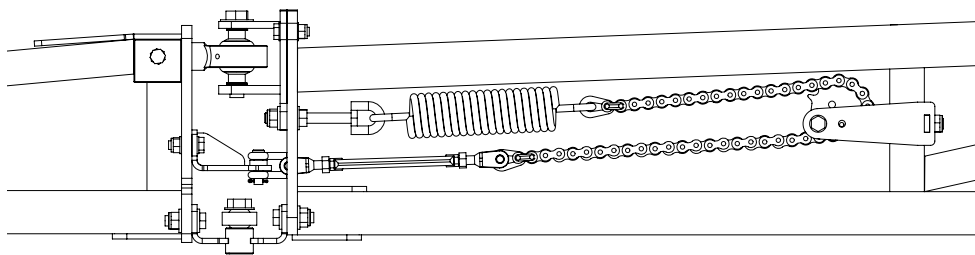


Figure A

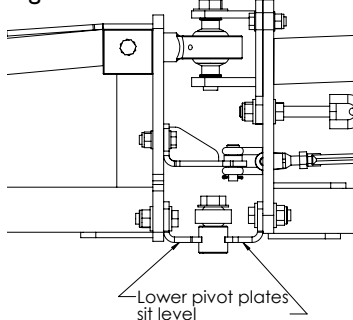


Figure B

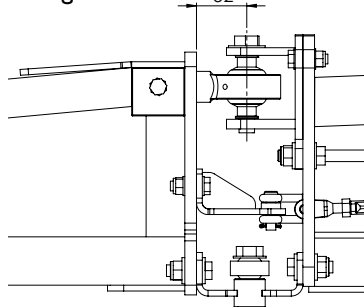
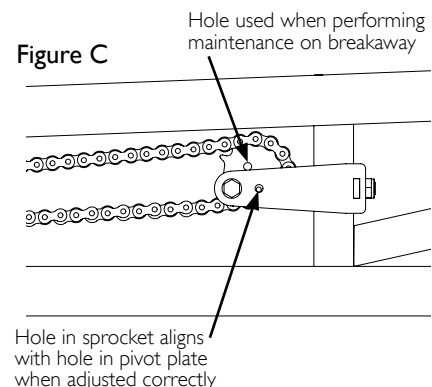


Figure C



Bi-fold - 30-36 m

The following are boom adjustments that are specific to bi-fold booms. All other adjustments on a bi-fold boom can be made as stated above for a regular boom.

Alignment - Outer Aluminium Boom - Unfolded Position

1. When adjustment of the inner booms is complete the outer booms can now be aligned.
2. 24-30 m Tritech booms must be 30-50 mm and 33-36 m booms must be 50 mm forward of the inner booms.
3. To align the outer booms, the cables must be adjusted. To move the boom forward the front adjuster bolt must be shortened. At the same time the rear cable adjuster bolt must be lengthened.
4. To adjust the outer boom rearward the rear cable adjuster must be shortened and the front cable adjuster lengthened.
5. If there is insufficient travel in the bi-fold cylinder to completely unfold the outer boom, the bi-fold stopper bolt will require adjustment. Wind the bolt in to allow the cylinder to travel more and fold out the wing further. Make small adjustments when winding the bolt and fold the outer wing each time to check the adjustments made.

The bolt must be in contact with the fold pivot plate stop when the wing is in the working position.

NOTE: The cable should be tensioned so that there is a 50 mm deflection in the cable when a force of 15 kg is applied to it.

NOTE: It is advised that all threads are lubricated prior to making adjustments

NOTE: If cable adjustments run out, a new cable should be purchased as the old one has stretched beyond specification.

Alignment - Outer Aluminium Boom - Folded Position

1. When the outer boom folds up into the transport position it must saddle firmly against the inner boom. If it is too loose, the outer boom may be damaged in transport.

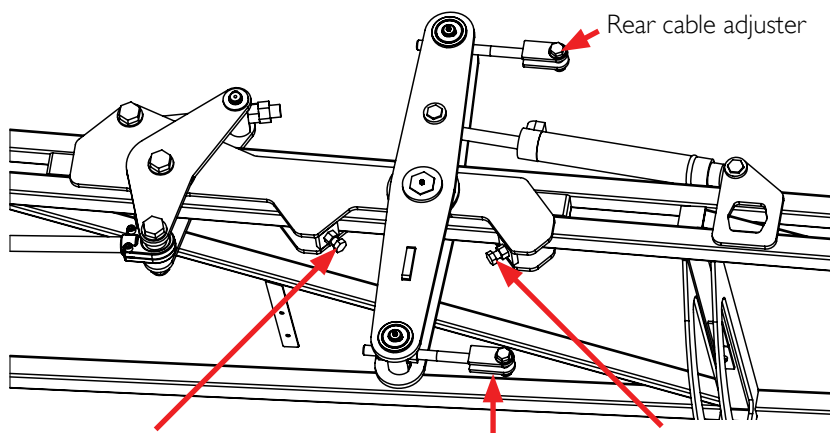
2. To increase the fold pressure of the outer boom, the bi-fold stopper bolt must be shortened. This will increase the travel of the bi-fold cylinder allowing the outer boom to fold around tighter.

3. If the outer boom folds up too tight damage can also be caused to the boom.

4. To loosen the fold pressure, the bi-fold arm stopper bolt must be screwed out, reducing the fold travel of the outer boom.

NOTE: It is advised that all threads are lubricated prior to making adjustments

NOTE: If cable adjustments run out, a new cable should be purchased as the old one has stretched beyond specification.



Wind the bi-fold stopper bolt in to allow the bi-fold cylinder to travel further and unfold the wing fully. Wind it out to limit the travel.

Front cable adjuster

Wind the bi-fold stopper bolt in to make the outer boom fold in tighter. Wind it out to decrease the fold travel of the outer boom.

Bi-fold - 30-36 m

Hydraulic Adjustments

The pressure in the Bi-fold circuit will vary depending on what size boom is fitted, up to a maximum pressure of 1700 PSI.

BOOM SIZE	BI-FOLD PRESSURE
24 m	1500 PSI
28 m	1550 PSI
30 m	1600 PSI
33 m	1650 PSI
36 m	1700 PSI

The bi-fold pressure is shown on the gauges located on the hand rail on the sprayer pull.

The bi-fold pressure is adjusted at the spool block. See Chapter 10 'Lubrication & Maintenance' for more information on the spool block.



Bi-Fold pressure reducing valve

With the boom fully folded out, check the bi-fold pressure on the gauges at the front of the sprayer. Note if the pressure needs to be increased or decreased. Bi-fold the boom so that only the outers are folded in. The bi-fold pressure should now be reading zero.

Locate the bi-fold pressure reducing valve on the spool block mounted on the centre section. Winding the knob in will increase the pressure, winding it out will decrease pressure. When adjusting the pressure, only make small changes. Fold the boom out and check the pressure reading on the gauges. If not reading correct, bi-fold the boom in again and make another adjustment. Always make adjustments while the boom is bi-folded in and re-check when the boom is fully folded out. When the correct pressure is reached, tighten the lock nut on the pressure adjusting screw on the spool block.

If the bi-fold loses pressure while operating, the check valves may be leaking. If they are leaking, they should be replaced.

The check valve for the right hand side is located closest to the paralift; the left side check valve sits on top of it.



Above: Bi-fold double pilot operated check valves.

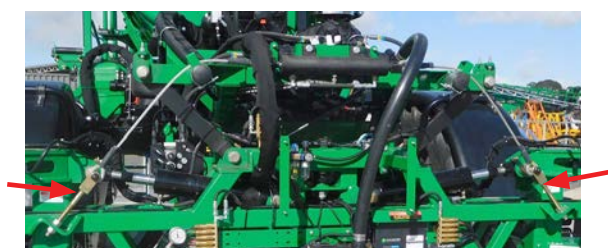
WARNING: Working with hydraulics can be very dangerous. While operating the boom, all people and objects should be clear of the boom wing fold radius. Nobody should be on or near the centre section, while hydraulic functions are operated.

Centre Level Adjustment 36-48m

The centre levelling system is designed to help the booms fold evenly. If the centre and the booms tilt excessively during folding, the centre level cables may need to be adjusted.

To check how the booms fold, have somebody stand behind the sprayer and out of the boom reach, and watch which side the booms are tilting excessively towards when folding.

Then unfold and adjust the cables to compensate for the tilt. Then repeat procedure until the booms are level when folding the bi-fold.



Above: Centre level cable adjusters (36-42m Boom)



Above: Centre level cable adjusters (48m Boom)

Chapter 10

LUBRICATION & MAINTENANCE

Maintenance Schedule

FREQUENCY	MAINTENANCE TASKS
8 hour	Check pump oil level & condition
8 hour	Check tyre pressure
8 hour	Check wheel nuts are torqued correctly to 320 ft/lb
8 hour	Grease tilt arm pivot pins
8 hour	Grease cable drum bearing block pivots
8 hour	Clean pressure and suction filters if blocked
8 hour	Clean airbag and foam marker compressor air filter
8 hour	Clean direct chemical injection air filter (where fitted)
8 hour	Grease pump PTO shaft universal joint nipples
25 hour	Grease cable adjuster pivots
25 hour	Grease wheel bearings
50 hour	Grease pump PTO shaft inside safety cover
50 hour	Grease boom mount rose ends
50 hour	Grease all delta links on centre section
50 hour	Grease paralift arm rose ends
50 hour	Towing eye
50 hour	Grease boom lifting cylinders
50 hour	Check Rapid fire oil, re-fill if required. Reservoir has 50 ml capacity. Air tool oil (1L - GA5053550) (5L - GA5054345)
50 hour	Check Aluminium outer boom bolts
150 hour	Check wheel bearings for sideways movement
300 - 350 hours	Change pump oil
3 months	Check bolts on axle bearing caps
3 months	Check the condition of the brakes extensively
3 months	Grease jack
3 months	Grease braked axle cam shaft bearing lightly
Yearly	Clean wheel bearings, inspect, re-grease and set rolling torque
Yearly	Carry out a complete decontamination of the sprayer
Yearly	Check pump air accumulator pressure is at an equal pressure to the spraying pressure

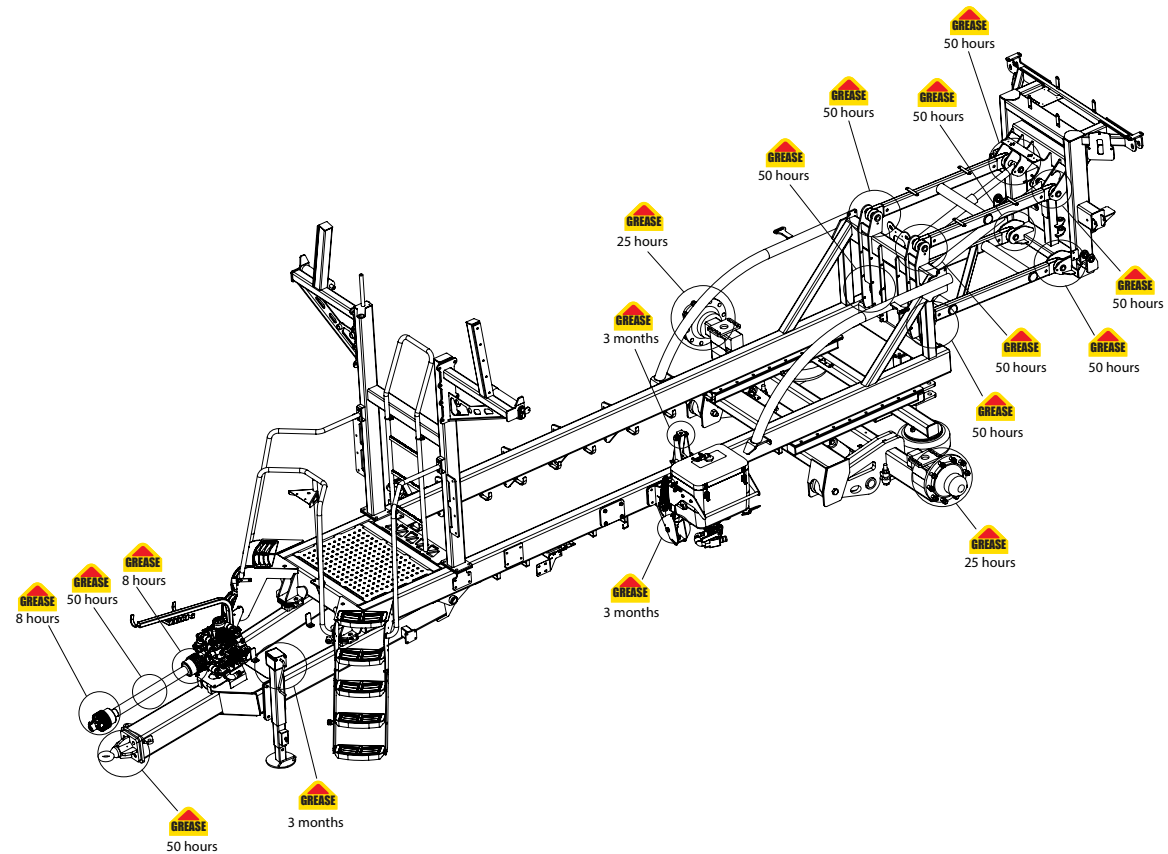
Lubrication

Goldacres recommend that a quality multi purpose grease should be used when lubricating your equipment.

A SAE 30W40 engine oil should be used in the diaphragm pump.

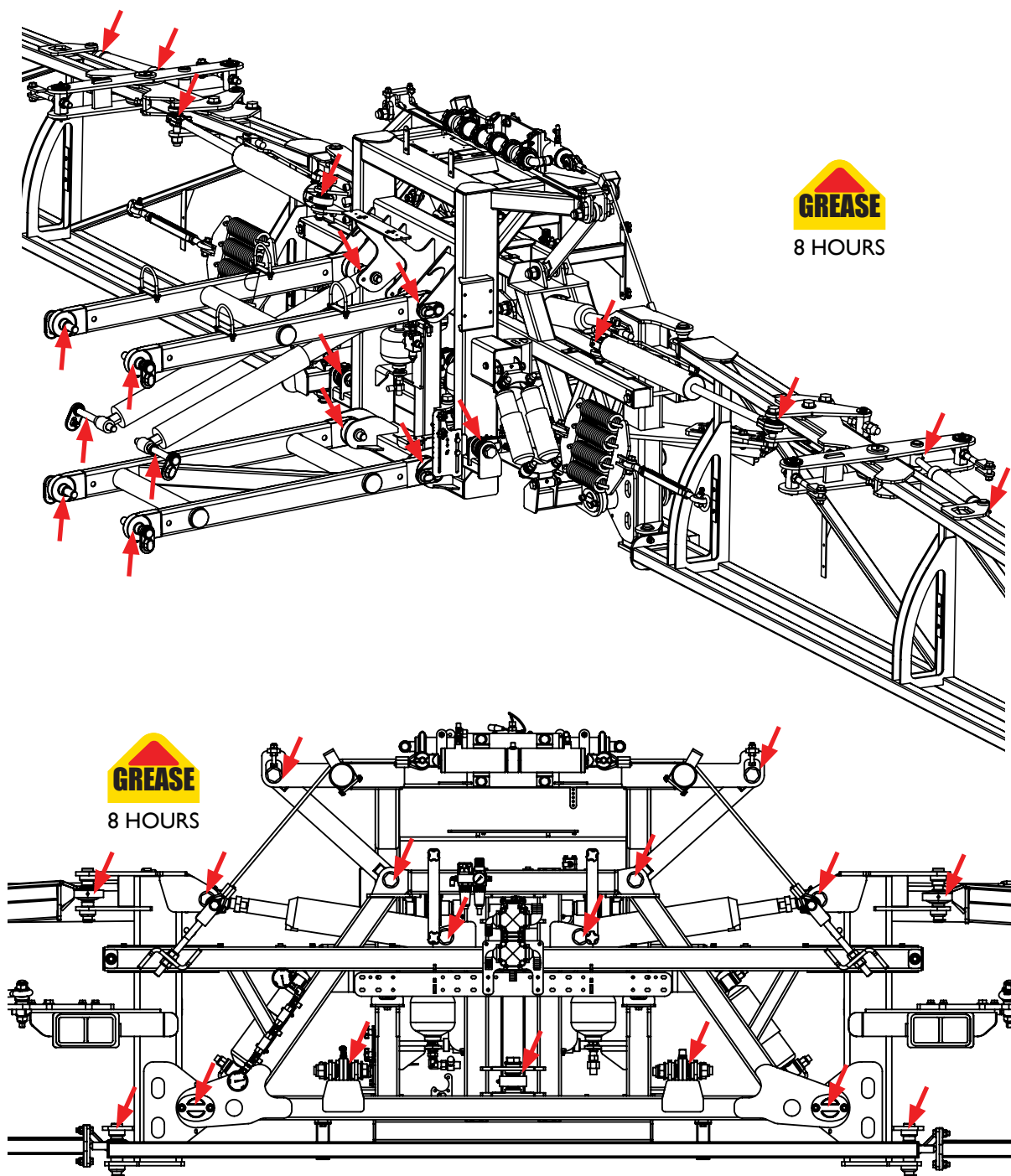
The pictures below outline key lubrication points. All hydraulic cylinders (excluding wing tilt cylinder) have grease points on the clevis ends.

Lubrication Points - Chassis & PTO Shaft



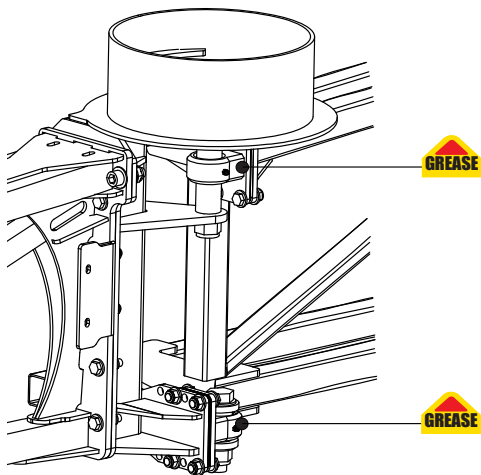
LOCATION	GREASE INTERVAL
PTO Shaft universal joints	8 hourly
Wheel bearings	25 hourly
Hitch	50 hourly
PTO telescopic shaft	50 hourly
Paralift arm rose ends	50 hourly
Jack	3 monthly
Induction hopper pivots	3 monthly

Lubrication Points - Centre Section



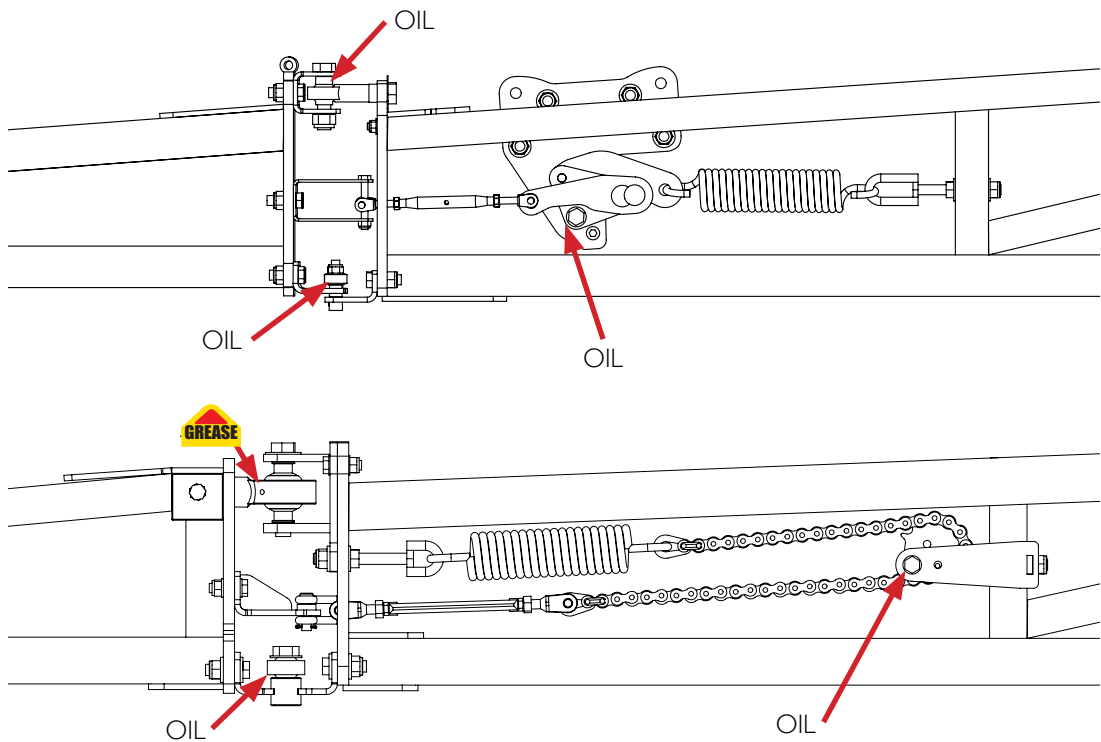
LOCATION	GREASE INTERVAL
Boom rose ends	8 hourly
Hydraulic cylinder ends (wing tilt, lift, fold, hydraulic yaw)	8 hourly
Tilt pins	8 hourly
Diagonal delta link pins	8 hourly
Lineal delta link pins	8 hourly
Paralift pins	8 hourly

Lubrication Points - Cable Drum



LOCATION	GREASE INTERVAL
Cable adjuster pivots	8 hourly
Cable drum bearing block pivots	8 hourly
Tilt arm pivot pins	8 hourly
Cable adjuster pivots	25 hourly
Boom mount rose ends	50 hourly
Delta links	50 hourly
NOTE: The drawing above does not show hydraulic cylinders. Each hydraulic cylinder has a grease nipple located at each end. These points should be greased on a 8 hourly basis.	

Lubrication Points - 3D Breakaways



LOCATION	GREASE/OIL INTERVAL
Pivot points on 3D breakaways	8 hourly
Tip rose ends	8 hourly

Maintenance - General

Pressure Relief Valve

The pressure relief valve provides relief when the pressure exceeds a pre-determined value. Altering the adjusting stem will affect the setting at which the relief valve will come into operation. Turning the stem clockwise will increase the pressure relief setting. Goldacres pre-sets the pressure to approximately 110 PSI and this should not be altered. To check or alter this setting, turn the pump OFF and turn relief valve counter clockwise. Turn the solenoids OFF, and then close all control manifold ball valves so that all flow passes through the relief valve. Run the pump at maximum operating speed (540 RPM) and slowly turn the relief valve clockwise until the pressure is achieved. Tighten the nut on the adjusting stem so that this setting is maintained. If the relief setting is too low, excessive flow will be allowed to bypass back to the tank and it will limit the maximum obtainable pressure.

Spray Pump - Diaphragm

8 HOURS

Check pump oil level and condition.

50 HOURS

Pump oil should be changed after the first of 50 hours of operation.

Pump oil level should be between the two level markers on the oil reservoir. If the oil level continually gets low or is turning milky, there is possibly a split in a diaphragm. The oil will need to be drained and all the diaphragms replaced. Use SAE 15W40 oil. Rotate the pump manually (by hand) to remove any air locks while filling. Do not over fill.

Grease pump PTO shaft; shaft universal nipples and telescope nipple must be greased every 8 hours. The cover must be greased every 40 hours to ensure it spins freely on the shaft.

250 HOURS

Change Pump oil; pump oil should be changed every 250 hours. Use SAE 15W40 oil. The oil drain plug is located between the two pump mounts on the underside.

SEASONALLY

Check pump air accumulator (where fitted). The air pressure in the air accumulator must be maintained to the correct pressure (approximately half of

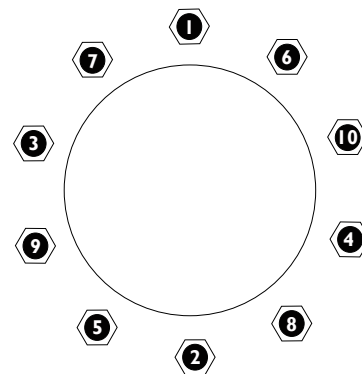
the spray pressure). If the accumulator constantly loses pressure, the valve or diaphragm may need replacing. To recharge the accumulator, charge it to approximately half of the spray pressure then run the pump at normal operating RPM. Looking at the pressure gauge, release some pressure until there is as little pulsation as possible. This will ensure a very even and constant pressure delivery.

Chassis, Wheels, Tyres & Axles

8 HOURS

Check tyre pressure; it is very important to maintain correct tyre pressures to optimize sprayer stability and the load rating. To determine the required tyre pressure, refer to the tyre specification chart in the general information section of the operator manual. If the tyre has a constant leak, the valve may be loose or need replacing, or the tyre may have a puncture.

Wheel nuts must be checked every 8 hours and re-torqued to 320 ft/lb if required. Follow the sequence below to ensure an even torque distribution.



Above: Follow this tightening sequence to ensure even wheel nut torque distribution (320 ft/lb).

25 HOURS

Grease the wheel bearings; grease is applied to the ADR axle via a grease nipple on the front of the hub.

150 HOURS

Check wheel bearings for sideways movement; to check the wheel bearings for free play, jack up that side of the sprayer until the wheel can spin freely. Rock the wheel from side to side. If there is any movement the bearings will need to be tightened or replaced.

Continued over page

Maintenance - General

3 MONTHS

Grease the jack; there are two grease nipples on the sprayer's jack. One on the winding mechanism and one on the jack swing pivot. Both need to be greased every three months to ensure easy operation.

Check bolts on axle bearing caps; bearing caps must be regularly checked and tightened if required. If dust is able to enter the axle bearings it could cause the bearings to fail. If the gasket on the dust cap is damaged or not sealing properly it must be replaced.

Checking Brake System & Servicing Braked Axles

The brakes should be tested before using for the first time and after the first laden journey. Check the actuator and return spring mountings, check the actuator stroke and return travel and check they operate and release correctly.

Tighten the screws and nuts (covers, fulcrum, etc), check the cotter pins, pins, circlips, etc.

Check for hydraulic fluid and air leaks. Check brake clearance and wear. Check and test the brakes before intensive use and every 3 months.

Check the brake wear and the clearance between the brake linings and the drum visually through the inspection hole in the dust cover at the rear of the drum. It is probable that the linings are worn when the actuator travel has increased significantly.

Check the thickness of the brake shoe linings (minimum allowable 5 mm). The brake shoes should be replaced as soon as the minimum lining thickness is reached.

Check that the brakes are clean. Clean them if necessary. Do not clean with compressed air as it contains small amounts of oil.

Lubricate brake cam shaft bearings lightly with grease to avoid grease deposits forming on the brake linings and drums.

FIXED LEVER BRAKE ADJUSTMENT

Take up the slack when the actuator stroke reaches about two thirds of the maximum travel. To take up the slack, turn the lever by one or more splines, ensuring that the brakes are not touching when released (to prevent overheating the brakes).

Never change the linkage position for the actuator on the lever without authorization from the vehicle manufacturer as the vehicle will have been tested with the actuator at this position (the brake operating levers have several holes, always use the original hole).

For braking systems with a yoke, the yoke must remain parallel with the axle especially when the brakes are fully applied. This means that the stroke of the levers on the brakes at each side must be identical.

ADJUSTABLE LEVER BRAKE ADJUSTMENT

Take up the slack when the actuator stroke reaches about two thirds of the maximum stroke. To take up the slack, turn the adjustment screw on the lever to adjust the relative position of the cam and the lever.

The actuator brakes by pushing the lever to turn it in a particular direction. The screw must be adjusted so that the cam moves in this direction to take up the slack.

The direction in which the screw must be turned depends on the configuration.

Ensure that the brake shoes are not contacting the hub when released to prevent overheating and wearing out the brakes prematurely during normal operation.

Never change the linkage position for the actuator on the lever without authorization from the vehicle manufacturer as the vehicle will have been tested with the actuator at this position. The brake operating levers have several holes; always use the original hole.

SEASONALLY

Clean wheel bearings, inspect, re-grease and set bearing pre-load:

If the axle bearings have become worn or damaged and need replacing, the following procedure should be followed. Remove the wheel as per instructions.

Remove the bolts from the bearing dust cap and clean out as much grease as possible.

Remove the split pin and castle nut and washer.

Slide the outer bearing and hub off the axle. Bearing puller may be required. Remove the inner bearing. Remove the seal too if it is to be replaced during this service.

Continued over page

Maintenance - General

Clean all existing grease from the axle and the hub and wash in solvent. Insert new rear seal.

Pack the two new bearings with grease prior to fitting on the axle. Ensure grease has penetrated completely through the bearing.

Slide new inner bearing onto shaft. Place hub back onto axle and fill cavity with grease. Insert new outer bearing. Fit washer and do nut up firm.

Perform the pre-load test on the hub to determine how tight to set the nut. Grease the hub until grease emerges from the seal.

The pre-load needs to be 12 Kg. This test is performed by tying string or rope to a stud and wrapping it around the outside of all the studs. With a set of tension scales connected to the rope, pull the scales. The hub should begin to rotate at 12 Kg. Tighten or loosen the nut to achieve the required setting. Fit split pin and bolt the bearing dust cap in place.

Changing Wheels

REMOVING A WHEEL

- The sprayer must be hitched to the appropriate towing vehicle.
- The engine of the towing vehicle must be turned off and the park brake applied.
- Chock the wheel(s) that is/are not to be removed with an appropriate item to prevent the sprayer from moving.
- With a wheel nut wrench, loosen all the wheel nuts on the wheel that you wish to remove (Do not remove wheel nuts until the tyre is off the ground).
- Place a jack on level, firm and stable foundation under the sprayer axle and between the two axle bolts near the wheel to be removed. The jack may need to have a large piece of timber or steel placed under it so that the jack will not sink.
- Use the jack to raise the sprayer axle such that the wheel is off the ground.
- Place an auxiliary jack block under the sprayer so that if the jack fails the sprayer will not fall.
- Remove all wheel nuts and remove wheel from sprayer. Be careful that the wheel does not fall on any person and cause bodily harm.

- Ensure that the sprayer is stable when being left for an extended period of time.

REFITTING A WHEEL

- Make sure the sprayer is stable when supported with the jack and the jack block in place and hitched to the appropriate towing vehicle.
- Make sure the wheel is in a satisfactory condition to use and that the tyre is inflated to the correct tyre pressure.
- Clean the surface between the wheel and the hub.
- Carefully lift repaired/new wheel up so that the holes in the rim centre go over the wheel studs on the wheel hub.
- Carefully put the wheel nuts on and tighten them finger tight.
- With a wheel nut wrench tighten wheel nuts alternately and evenly to a torque rating of 320 ft/lb.
- Remove the jack block from under the sprayer.
- Carefully lower the sprayer slowly with the jack until the tyre touches the ground.
- Retighten the wheel nuts to the required torque rating.
- Let the jack completely down so that all weight is taken off the jack and remove jack (and any supports placed under the jack) from under the sprayer.
- Remove wheel chocks that were placed to the front and rear of the opposite wheel (to prevent it from moving).
- Check tyre pressure before moving sprayer.
- Retighten wheel nuts to the required torque rating: One hour after fitting the tyre, before filling main spray tank, after the first tank load.

Continued over page

Maintenance - General

Booms

8 HOURS

- Grease tilt arm pivot pins.
- Grease cable drum bearing block pivots.

25 HOURS

- Grease cable adjuster pivots.

50 HOURS

- Grease boom mount rose ends.
- Grease all delta links on centre section.
- Grease paralift arm rose ends.

ADJUSTING PARALIFT BOOM RIDE HEIGHT SWITCH

The ride height switch is used to adjust the minimum boom height. The switch is located on the bottom of the left hand side of the boom paralift.

To adjust the switch:

1. Loosen the two adjustment knobs on ride height bracket
2. Lowering the switch lowers the minimum boom height. Raising the switch raises the minimum boom height.
3. Each notch gives approximately 100 mm of boom height adjustment.
4. Tighten knobs once adjusted. The hydraulic cylinders must have 50 mm of travel remaining.

Filters

CAUTION: Read and heed the chemical label warnings regarding PPE before cleaning any filter.

If in-line filters have been fitted to replace nozzle filters, always unfold and lower the boom before attempting to unscrew any filter.

It is essential to maintain all filters and filter screens in good condition. Filter screens that are not regularly cleaned can severely impede liquid flow and delivery pressure. If the screens are in anyway damaged, they can allow foreign material into the pumping system which can result in damage to the pump, solenoids, valves and cause blockages in nozzle tips. Also, if the screens are not properly fitted, air can enter the pumping lines which will reduce pump performance.

Filter screens are best cleaned with a soft brush in clean water or by compressed air after washing.

SUCTION FILTER CLEANING

CAUTION: Wear gloves and other recommended protective clothing.

1. Ensure that the pump is turned OFF and the pump three-way ball valve is turned OFF to prevent flow to the filter.
2. Carefully unscrew filter nut and remove bowl.
3. Remove screen and clean.
4. Check for damage to screen, bowl, body and O-ring.
5. Place screen back in position.
6. Make sure O-ring is in position for proper seal.
7. Replace bowl and screw nut on. Do not over-tighten nut.

PRESSURE FILTER CLEANING

CAUTION: Wear gloves and other recommended protective clothing.

1. Ensure that the pump suction is turned OFF and the pump 3-way ball valve is turned OFF to prevent flow to the filter and pump.
2. Ensure that the supermix agitator ball valve is OPEN (will release any residual pressure. Also remove small cap on bottom of pressure filter to relieve pressure)
3. Carefully unscrew filter nut and remove.
4. Remove screen and clean.
5. Check for damage to screen, bowl, body and O-ring.
6. Place screen back in position.
7. Make sure O-ring is in position for proper seal.
8. Replace bowl and screw nut on. Do not over-tighten nut.

Airbag Suspension

The airbag suspension consists of a 12V air compressor; one ride height valve, two airbags, shock absorbers, an axle (used as the air reservoir) and the axle frame.

The 12V compressor is powered up when the ignition is switched on. The electrical system is protected by a blade fuse which is located in the ignition relay box in the cabin harness.

System Pressure Adjustment

The compressor has a pressure cut out switch which regulates the pressure to cut in at 70-75 PSI. The cut out pressure can be adjusted by compressing the contact spring to achieve the required maximum pressure. It is recommended that a cut out pressure of 90-95 PSI is set.

NOTE: The compressor has a recommended duty cycle of 10 minutes. If there is an air leak in the system or the cut out pressure is set too high the compressor may run for an excessive period of time causing the compressor to wear prematurely.

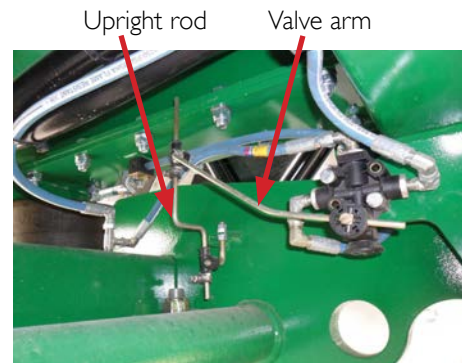


Ride Height Adjustment

The ride height valve is used to regulate the air pressure within the airbags to achieve a consistent ride height.

The ride height valve is located in the inside of the left hand suspension arm.

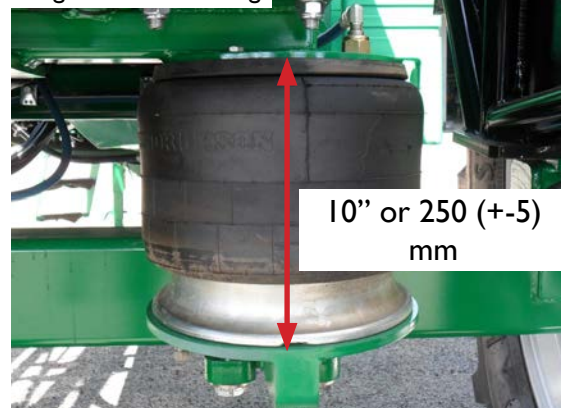
The ride height can be adjusted by loosening the clamps attached to the upright rod on the ride height valve linkage. Slide the valve arm up or down the upright rod to either raise or lower the ride height. The recommended ride height is 100 mm from the fully deflated position. The upright rod must be kept as close to vertical. Should the upright rod be too far forward or backward the ride characteristics will be affected considerably.



Above: The ride height valve is located on the left hand side axle mounting under the chassis.

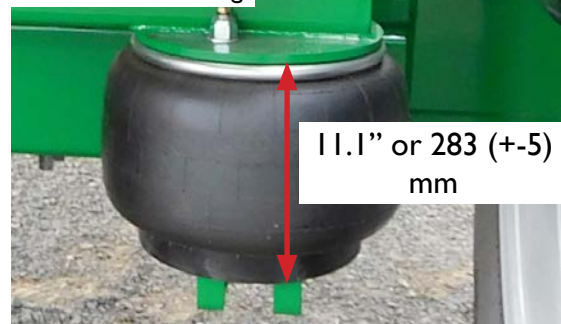
The ride height valve has a dead band position where the valve will not let air in or out of the airbags. Over time the seals in the ride height valve may wear causing this dead band to decrease. If this is the cause the ride height valve will require readjustment or possibly replacement.

Single Air Stud Airbag



10" or 250 (+-5) mm

Dual Air Stud Airbag



11.1" or 283 (+-5) mm

Above: Dual air stud airbags have more travel than the single air stud versions and require a taller ride height setting. Measure from bottom of upper mount plate to bottom edge of airbag.

Hydraulics

Hydraulic Spool Block

The above is the layout for the electric over hydraulic spool valves. The spool block is located on the centre section at the rear of the sprayer.

To adjust the boom function speed remove the orange cap from the flow control valve. Using a 10 mm spanner and a 5 mm Allen key, adjust the hydraulic flow until the required speed is achieved. Screw in to slow down, out to speed up. Only small adjustments of a quarter or half a turn should be made before checking the speed of the function being adjusted.

WARNING: DO NOT operate the hydraulic functions while adjusting the flow. All people and objects should be clear of the boom wing radius while operating the hydraulic functions.

Due to the crush hazard that exists from working on the centre section, hydraulic functions should NOT be overridden at the spool block.

CV - Check valve

FC - Flow control

PR - Pressure reducing valve

P - Pressure inlet

T - return to tank

LS - Load sense

RV - Relief valve

BL - Boom lower

BR - Boom raise

F - Boom fold

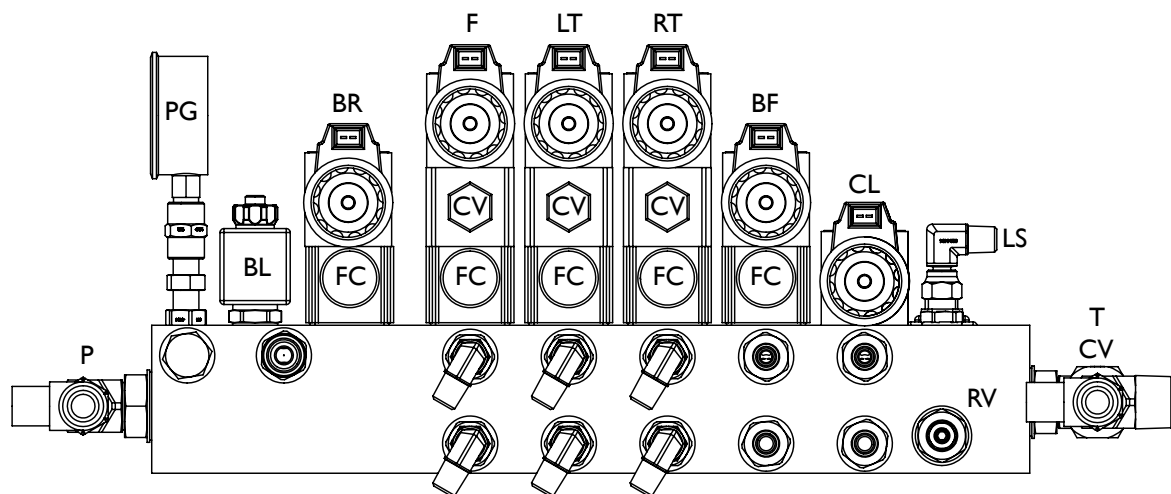
LT - Left tilt

RT - Right tilt

BF - Bi-fold

CL - Centre lock

PG - Pressure gauge



Above: Spool block shown with cap removed from flow control valve.

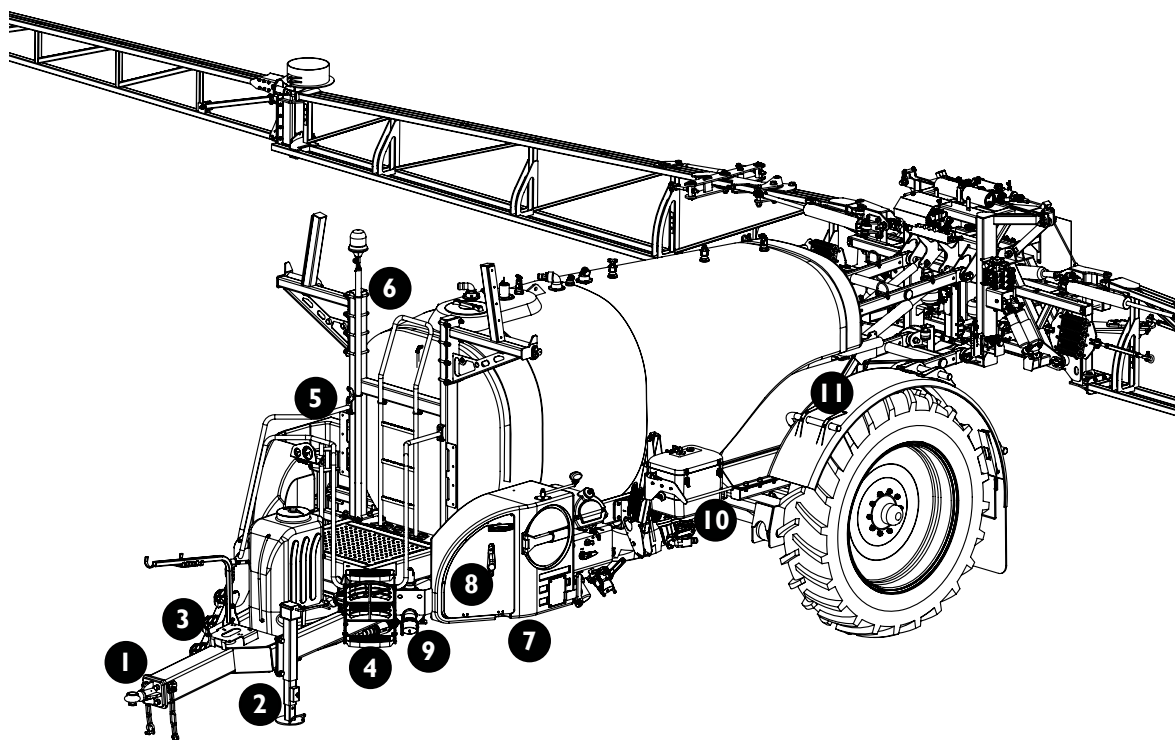
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Corrosion Prevention

Goldacres are applying G15 anti corrosion spray to all fasteners (bolts, washers and nuts) and zinc plated components at the time of manufacture.

G15 should also be applied to the sprayer pre and post season.

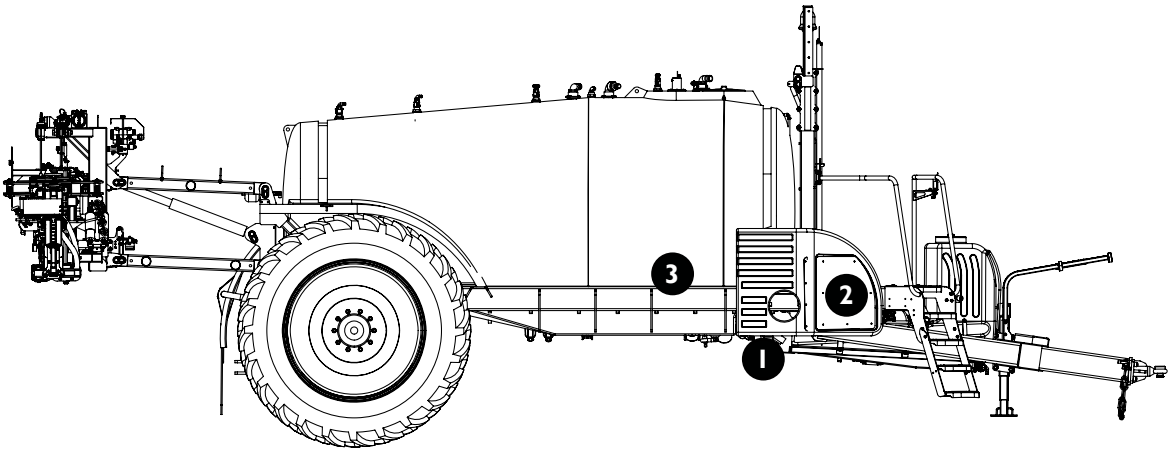
Use the following as a guide for areas to spray with corrosion inhibitor. This guide is not necessarily comprehensive and the amount of corrosion protection necessary will ultimately depend on local and operating conditions.



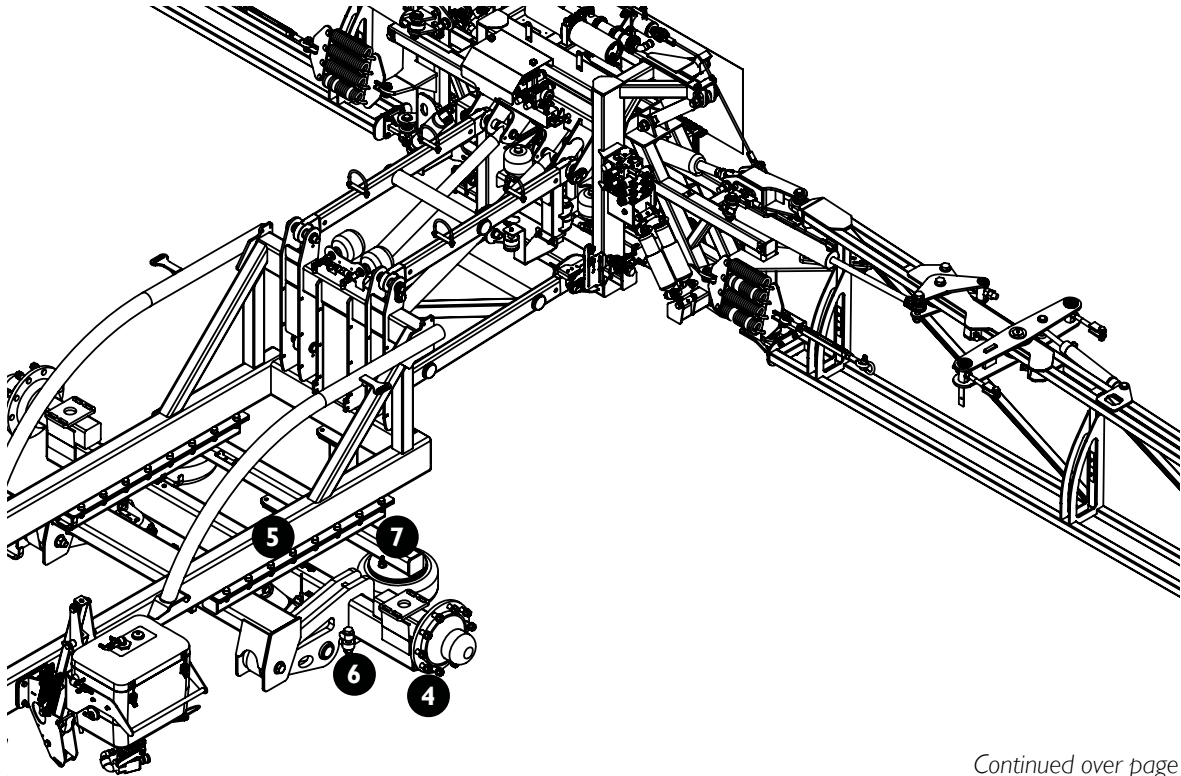
NO.	DESCRIPTION	NO.	DESCRIPTION
1.	Towing eye bolts	7.	LH pod frame mounting bolts
2.	Jack mounting bolts & locking pins	8.	LH pod covers
3.	Spray pump	9.	Hydraulic fill pump
4.	Steps & hand rails	10.	Induction hopper bolts & latches
5.	H-frame & handrails	11.	Mudguard mounting bolts
6.	Boom rests		

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Corrosion Prevention

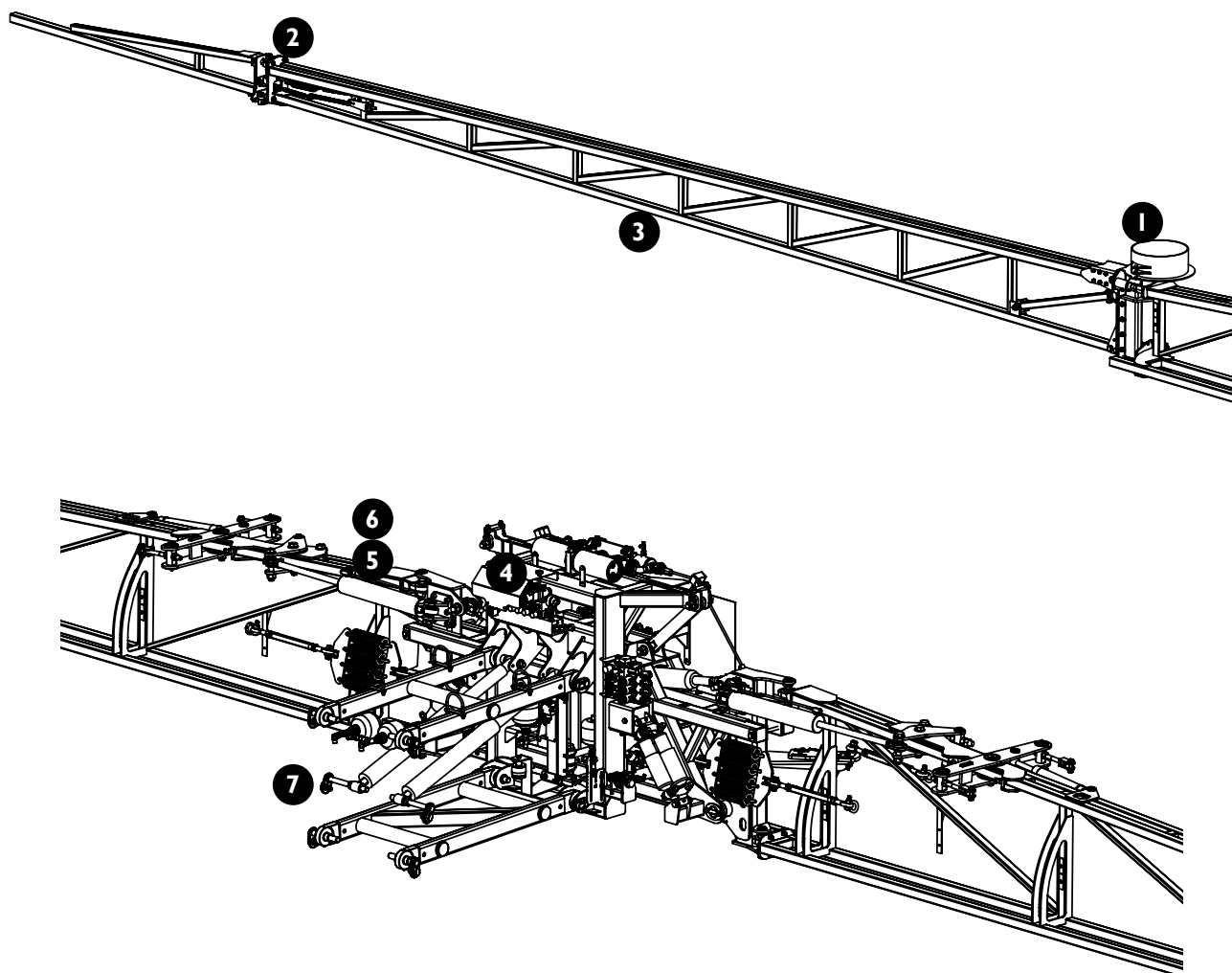


NO.	DESCRIPTION
1.	RH pod frame mounting bolts
2.	RH pod covers
3.	Drum storage or DCI module (Optional)
4.	Wheel nuts
5.	Fixed axle frame mounting bolts
6.	Axle airbag frame mounting bolts
7.	Airbag hose fittings



Continued over page

Corrosion Prevention



NO.	DESCRIPTION
1.	Cable drum bolts
2.	Breakaway hinges & boom end protectors
3.	Nozzle bracket bolts
4.	Hydraulic manifold
5.	Hydraulic cylinder fittings
6.	Hydraulic hose crimp fittings on all hoses
7.	Centre section paralift rear pins & bolts

Service Parts - Lubricants

SERVICE ITEM	SERVICE SPECIFICATION	CAPACITY (L)	PART NO.
Hydraulic oil	Components are prefilled with Universal Tractor trans, 10W 30 hydraulic oil.	Consult your tractor operator's manual.	-
General grease points	Multi-Purpose Grease	-	-
Steering pivot points	Molybdenum Based Grease	-	-
Spray pump	SAE 15W40	2.68L for Zeta 260	GA5012457 (20L)
Remote greasing system	EPO	-	-
Rapidfire oiler	Air Tool Oil	50ml	GA5053550 (1L) GA5054345 (5L)

- Ensure that lubricants are stored in a place where the lubricants are protected from contamination (such as dirt and moisture). Always use clean containers when handling lubricants.
- Do not mix lubricants. Proper lubrication may be affected by differences in chemical composition.
- Seek advice from your petroleum dealer on the correct use of lubricants and additives.
- At the time of manufacture, GI5 anti-corrosion spray is applied to all fasteners (bolts, washers and nuts) and zinc plated components.
- GI5 should also be applied to the sprayer both pre and post season.
- As a guide, application to following areas are recommended but not limited to; Pump mounting bolts, boom rests, left hand pod, mudguard mounting bolts, induction hopper bolts & latches, hydraulic manifold, boom hinge bolts, airbag hose fittings and hydraulic hose crimp fittings etc.

Chapter II

TROUBLESHOOTING

General

The following troubleshooting information is provided as a reference when your sprayer is not functioning correctly. To ensure that you receive the best possible service, it is recommended that you exhaust all applicable troubleshooting solutions

shown in this chapter prior to calling your dealer, or Goldacres, for service advice

Parts information and schematics can be found in the parts manual supplied.

Spray Pump - Diaphragm

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Pressure and flow rate are too low	Pump	Check suction line for air leaks.
		Suction filter may be blocked.
		Check pump speed is between 400 - 540 RPM
		Check oil for colour change. If the oil appears milky, a diaphragm will be damaged and needs to be replaced.
		Check valves in pump
		Turn the pressure station ball valve to off, if the pressure increases on the pump gauge there is a problem with the control valve.
		Measure the flow per minute coming out of one nozzle and check the nozzle chart for the corresponding flow.
		Check the regulator valve is rotating the full 90 degrees when the boom valves are switched off.
		Check tank sump and suction line blockages.
	Excessive bypass on pressure manifold	Verify console calibration settings.
	Supply to pump is restricted	Check the pressure relief valve setting on pressure manifold.
	Bypass line is restricted or blocked.	Verify console calibration settings. Check for restriction in bypass line. Check pump speed is not too fast. Check if Bypass valve is turned on

Continued over page

Spray Pump - Diaphragm

PROBLEM	COMMON CAUSES	COMMON SOLUTION
The pressure on gauge is higher than the nozzle flow indicates	Blocked filters of nozzles	Check and clean all pressure and nozzle filters
	Flow loss due to resistance in lines, valves and filters.	Re-calibrate console to allow for pressure loss
The flow rate is correct but my pressure is too low or high.	Nozzles	Check nozzle chart for correct nozzle size.
Pressure fluctuation	Air leak on suction side of pump	Check suction pump for air leaks.
	Incorrect pump speed	Adjust speed to 400 - 540 RPM range
	Faulty pump valves	Replace pump valves
Pump pressure pulsating	Air accumulator pressure is incorrect (if fitted)	Reset the pressure in air accumulator
	Air accumulator diaphragm has a leak (if fitted)	Replace air accumulator diaphragm
	Incorrect pump speed	Adjust speed to 400 - 540 RPM range
	Air leak on suction side of pump	Check pump suction for air leaks
Pump oil is becoming milky	Cracked diaphragm	Replace all diaphragms
Pump is noisy	Low oil level	Refill or replace oil
	Damaged pump valves	Replace pump valves
	Pump suction line has air leak or is restricted	Clean suction filter and check for leaks in suction lines
Pump housing or mounting cracked.	Extremely cold weather can cause liquid in the pump to freeze	Check for ice in the pump and let defrost if required
Damaged universal joint	The shaft is too long	Shorten shaft
	PTO shaft is inadequately lubricated	Lubricate PTO shaft and uni joints
PTO shaft bent or vibrating excessively	PTO shaft is too short	Replace PTO shaft

Spray Pump - Centrifugal

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Pressure and flow rate are too low	Pump	Check suction line for air leaks.
		Suction filter may be blocked.
		Check pump speed is between 4000 - 4200 RPM
		Turn the pressure station ball valve to off, if the pressure increases on the pump gauge there is a problem with the control valve.
		Measure the flow per minute coming out of one nozzle and check the nozzle chart for the corresponding flow.
		Check the regulator valve is rotating the full 90 degrees when the boom valves are switched off.
		Check tank sump and suction line blockages.
		Rotors clogged - Check and clean rotors
		Rotors seizure due to dry running - Replace
	Excessive bypass on pressure manifold	Verify console calibration settings.
	Supply to pump is restricted	Check the pressure relief valve setting on pressure manifold.
Pressure and flow rate are too high	Bypass line is restricted or blocked.	Verify console calibration settings. Check for restriction in bypass line. Check pump speed is not too fast. Check if Bypass valve is turned on
The pressure on gauge is higher than the nozzle flow indicates	Blocked filters of nozzles	Check and clean all pressure and nozzle filters
	Flow loss due to resistance in lines, valves and filters.	Re-calibrate console to allow for pressure loss
The flow rate is correct but pressure is too low or high.	Nozzles	Check nozzle chart for correct nozzle size.
Pressure fluctuation	Air leak on suction side of pump	Check suction pump for air leaks.
	Incorrect pump speed	Adjust speed to 4000 - 4200 RPM range
Pump pressure pulsating	Air accumulator pressure is incorrect (if fitted)	Reset the pressure in air accumulator
	Air accumulator diaphragm has a leak (if fitted)	Replace air accumulator diaphragm
	Incorrect pump speed	Adjust speed to 4000 - 4200 RPM range
	Air leak on suction side of pump	Check pump suction for air leaks
Pump is noisy	Low oil level	Refill or replace oil
	Pump suction line has air leak or is restricted	Clean suction filter and check for leaks in suction lines
Pump housing or mounting cracked.	Extremely cold weather can cause liquid in the pump to freeze	Check for ice in the pump and let defrost if required

Tanks, Chassis & Wheels

PROBLEM	COMMON CAUSES	COMMON SOLUTION
The drawbar of the sprayer has become noisy and loose	Worn, or missing, plastic insert in towing eye	Replace plastic insert

Induction Hopper

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Induction hopper is not performing as well as it should	Insufficient flow to venturi in the hopper bottom	Check the pressure supplied to the hopper bottom is around 550 kPa (80 PSI).
	Air leaks on induction system	Check all hoses, clamps, and cam lever fittings are sealed

Plumbing

PROBLEM	COMMON CAUSES	COMMON SOLUTION
No water at boom.	No Tier valve entered or is at 0	Enter value greater than 0

Brakes

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Sprayer is stopping inconsistently	Grease or oil on the brake shoes	Clean the shoes with a clean cloth and methylated spirits.
	Braking linkage is damaged	Inspect braking system and repair as necessary
The brakes are screeching or squealing.	Insufficient friction material on brake shoes.	Inspect brake shoes and replace immediately if worn beyond wear indicators.

Hydraulic & Pneumatic

PROBLEM	COMMON CAUSES	COMMON SOLUTION
All hydraulic functions are unresponsive	Unloader(s) malfunction or disconnected	Check electrical connection to spool block unloader and Norac unloader if fitted. Check that power is present at connector to spool block unloader and Norac unloader if fitted. If no power then check fuses. Check for physical malfunction to unloader(s) and replace as necessary.
No hydraulic pressure	Low hydraulic oil level	Check the oil level in the hydraulic reservoir and top up if necessary
	Fill pump is engaged	Switch the hydraulic fill pump off
The air bags are not inflating	Low system pressure	The bags will not inflate until the pressure in the system is above 75 PSI, check system pressure.
	Compressor not working properly	Check that the compressor is working correctly

Flow Meter & Controller

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Application rate is inaccurate, unstable or zero	Incorrect console calibration	Re-calibrate console
	Inconsistent ground speed reading	Check cabling
	Inconsistent flow meter reading	Replace flow meter
	Faulty control valve	Replace control valve Check using manual increase/decrease flow control
Speed sensor display is inaccurate, unstable or zero	Incorrect speed calibration	Re-calibrate console speed
	Faulty cable	Test cable as per instructions following
Volume display is inaccurate, unstable, zero or not changing	Meter calibration is incorrect	Reset meter calibration
	Flow meter cable pins are corroded	Replace flow meter plugs & pins
	Flow meter is pointing the wrong way	Disconnect flow meter and reinstall in the correct orientation
	Faulty cable	Manually test the cable
Flow meter appears not to be working	Flow meter is seized or blocked	Remove and clean any foreign materials so the turbine spins freely
	Faulty cable	Test cable as per instructions following
	Calibration figure is incorrect	Reset meter calibration
Application rate or pressure will not alter	Faulty control valve	Test valve manually and replace if required
Control valve has failed	Faulty cable Faulty valve	Replace control valve
		Temporary solutions: Remove the motor from the 3 way ball valve and manually adjust the flow by turning the shaft with a spanner
Raven Console not working	No power supply	Check loom connection at the back of the console
		Check connection to battery terminals
		Check the fuse in the back of the console
		With a multi meter; check the voltage potential across pins 1(-) and 16(+) on the 16 pin plug going into the console (Should be at least 12v)

If the flow meter fails to give accurate readings, the following actions should be taken:

- Adjust the spraying pressure by putting the flow control switch into manual and using the increase decrease switch to adjust to the desired pressure as shown on the pressure gauge on the sprayer.
- Drive the sprayer at a constant speed in order to apply the required application volume as determined by the nozzle selection chart.
- The sprayer should then be operated to empty the tank. Once the sprayer is empty of chemical, partially fill the tank with fresh water so that test can be performed in order to correct the problem. Repair or replace the flow meter as soon as possible.

Continued over page

Flow Meter & Controller

Use the following procedures to manually override the boom valves and control valve if the Raven console has failed or is otherwise not able to operate them:

RAPIDFIRE AIR VALVE OVERRIDE

1. Disconnect console from console cable.
2. The air valves located on the centre section. Turn the small screw on the solenoid to turn them on.
3. To start and stop spraying through the nozzles, start and stop the pump.

For more information on overriding the rapid fire solenoids, see 'Rapid Fire' section in Chapter 8 'Operation'.

NOTE: Care should be taken because there is no agitation while the nozzles are not spraying.

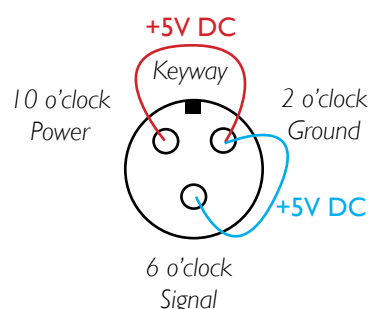
FLOW CONTROL VALVE OVERRIDE

- Remove electric motor from three way fast close valve, and manually rotate valve until desired spraying pressure is achieved.
- Drive the sprayer at a constant speed in order to apply the required application volume as determined by the nozzle selection chart.

The sprayer should then be able to be operated in order to empty the tank. Once the sprayer is empty of chemical, partially fill the tank with fresh water (no chemical) so that testing can be performed in order to correct the problem. Repair or replace the console as soon as possible.

Testing Raven Flow Meter Cable

1. Change meter Cal number to 1 with the [Meter Cal] key.
2. Press [total volume] key and place boom switches ON.
3. With a jumper wire e.g. paper clip, short between 6 o'clock and 2 o'clock sockets with a "short" then "no short" motion. Each time contact is made the [total volume] should move up in increments of 1 or more.
4. If total volume does not count up, perform test at the next connector closer to the console. If this next test works, the previous section of cable must be faulty and should be replaced.
5. Perform the voltage checks shown below.
6. Change [Meter Cal] number back to previous number.



Voltage Readings

2 o'clock - 6 o'clock (+5V DC)

10 o'clock - 2 o'clock (+5V DC)

Chemical Probe

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Chem probe is not working or is working too slow	Air leak in the vacuum system	Check all hose clamps and fittings are tight
	Lack of pressure to venturi in top of tank	Check there are no kinked hoses and the water pressure is about 100 PSI

ISOLATING POSSIBLE AIR LEAKS

Step 1: Check the operation of the chemical probe. If this will transfer water at a minimum of 30 L/min then this part of the system is okay.

If not check for air leaks at:

- Cam lever fitting at the probe
- Hose fittings
- Venturi – the venturi can suck air (less vacuum) where the black drop-pipe connects to the orange venturi
- The venturi may also suck air where the 'lay flat' hose joins the bottom of the black PVC drop pipe

Step 2: If probe works correctly but envirodrum will not operate, check for air leaks in envirodrum fitting (this must be thoroughly cleaned after each use) and check interior pipes in the envirodrum for air leaks or damage.

In Summary:

First: Check the flow of water into venturi.

Then:

1. Check the probe only.
2. Check probe and envirodrum section.

NOTE: Tests must be done with water because the speed of the transfer is affected by the increased viscosity of the chemical.

Spray Nozzles

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Streaky pattern coming from nozzle	Nozzle tip blockages.	Check for blockages by removing the nozzle, rinsing thoroughly with water and cleaning with compressed air. DO NOT clean by blowing into nozzle with mouth.
	Nozzle worn or damaged.	Visually inspect nozzle for damage or wear; conduct a jug test if necessary.
No spray coming from nozzle	Nozzle tip blockages.	Check for blockages by removing the nozzle, rinsing thoroughly with water and cleaning with compressed air.
	Check valve blockages.	Remove the check valve and clean as required.

Boom

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Inner and outer wing are not in line with each other when the boom is unfolded	Stopper bolt holding out the boom	Adjust the boom stopper bolt
Booms will not fully fold to the boom rests	Insufficient lubrication	Lubricate all boom pivots
	Fold cylinder mounts have moved	Adjust fold cylinder mounts
Boom unfold unevenly	Air trapped in the hydraulic lines	Unfold booms completely and hold switch for a few seconds. Then, fold booms completely and hold switch for a few seconds. Do this multiple times as necessary to purge any air out of the hydraulic lines.
Outer boom does not line up with the inner wing when unfolded	Incorrect boom adjustment	Fold the boom out and note the position the outer boom is in. Fold the boom in to transport position and note position outer boom is in. Follow the table below to adjust boom so it sits level in the out (work) position and to have the bottom chords sitting parallel in the folded (transport) position
Booms are showing signs of bending components and welds cracking	Folding or unfolding of booms is too fast	Reduce the hydraulic flow to the folding cylinders
	Folding or unfolding of booms while the sprayer is still moving	Do not fold or unfold the boom while the sprayer is still moving
	Tilt operation	Tilt operation should be kept to a minimum. If the tilt operation is too fast, reduce the oil flow

NOTE: By nature, booms fitted with flow dividers don't fold 100% evenly. Hold the boom fold switch for a few seconds after the first boom has folded completely to give the other boom the chance to match the fully folded position.

SHIM ADJUSTMENT

The shim adjustment at the cable drum will affect the position of the outer boom when unfolded and when in the folded position. Use the table below to add or remove shims. The table below shows the position of the boom and the adjustment necessary to get them level.

OUTER WING POSITION (UNFOLDED)	OUTER WING POSITION (FOLDED)	TOP PIVOT SHIM ADJUSTMENT	BOTTOM PIVOT SHIM ADJUSTMENT
Up	Up	NIL	Remove Shims
Up	Down	Add Shims	NIL
Level	Up	Remove Shims	Remove Shims
Down	Down	NIL	Add Shims
Down	Up	Remove Shims	NIL
Level	Down	Add Shims	Add

Smart Steer

PROBLEM	COMMON CAUSES	COMMON SOLUTION
The red warning light is permanently on	The centre calibration figure is not set correctly	Re-calibrate the centre position on the console
When the system is on, the sprayer wheels react erratically	Wheel speed sensor may not be operating correctly	Jack up the sprayer and rotate the wheel. There is an LED light on the sensor that should pulse if working correctly.
The wheels do not return to exact centre position	The steering angle sensor may be loose	Tighten sensor and linkages
	The minimum coil current may be set too low	Consult your Goldacres dealer
The sprayer doesn't follow the tractor wheel tracks accurately	The yaw sensor connectors may have moisture in them	Disconnect yaw sensor. Clean and dry connector.
	The yaw sensor could be faulty	Replace yaw sensor

SMART STEER DIAGNOSTIC TOOL

The smart steer system has a built in diagnostic tool that can tell the operator if a problem has occurred and what the problem is. Next to the steer axle calibration switch is a small red light. This light is what gives the operator feedback about the steering status. If an error occurs the light will flash a certain number of times in quick sequence. The number of times it flashes corresponds to the error code. Once complete, there will be a pause before the sequence repeats again.

NO. OF FLASHES	DESCRIPTION OF ERROR
1	Sprayer steering angle sensors either open or short circuit.
2	Tractor mounted yaw sensor out of range. Check connections.
3	Can't drive steering solenoid A. Check hydraulic spool valve.
4	Can't drive steering solenoid B. Check hydraulic spool valve.
5	Sprayer steering angle sensor is out of range for centre position. Must be no more than +/- 4.5 degrees. Adjustment of steering sensor linkage is required.

Chapter 12

OPTIONAL ACCESSORIES

General Information

The following pages provide information on Goldacres optional accessories available on this equipment.

NOTE: These options may not be fitted to your sprayer unless ordered.

Chemical Induction Probe

Overview

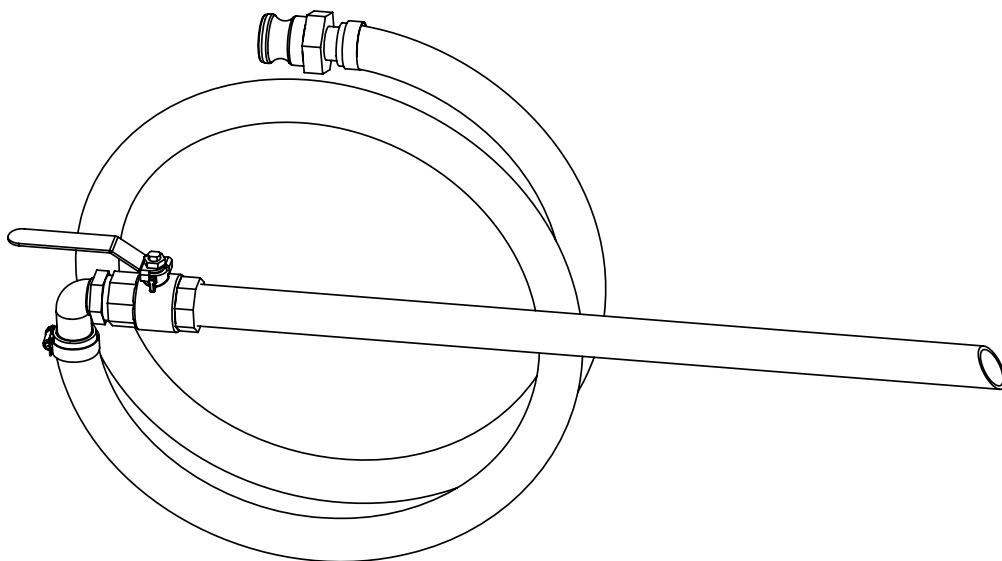
A simple method of transferring chemical into the sprayer tank is via the chemical probe. The chemical probe enables the chemicals to be transferred with minimal exposure to the operator. The probe is used in conjunction with the Venturi filler (located on the top of the tank) which creates the required suction on the pressure side of the pump.

The viscosity of the chemical being transferred will affect the rate of suction flow and hence the amount of time required to transfer the chemical. Water and air have low viscosities whereas molasses is an example of a highly viscous liquid. The higher the viscosity of the liquid, the longer it takes to transfer

via the chemical probe. If the viscosity of a chemical is such that it takes too long to transfer, dilute the chemical with water, which will reduce the viscosity, and then transfer the solution.

The chemical should be transferred after about 20-50 % of the required water quantity has been added to the sprayer tank. This will ensure that agitation takes place when the remaining water is added.

The end of the probe is not flat so that the probe, when placed flat against the bottom of the container, will not restrict the flow of chemical.



Continued over page

Chemical Induction Probe

Operation

WARNING: It is critical that the chemical probe venturi continues to operate for a minimum of 30 seconds following use. This will ensure that no chemical is left in the line prior to the probe being disconnected.

NOTE: This item is intended for the induction of liquid chemicals only.

Once chemical has been transferred into the main spray tank the sprayer should always be agitating until spraying begins.

CHEMICAL PROBE OPERATION

1. Add 20 percent of the tank's volume of clean water to the main spray tank. Initially there needs to be a sufficient amount of water in the tank in order for the pump delivery to create the venturi effect via the venturi filler.
2. Ensure that the red handle on the pump 3-way valve is pointing towards the suction hose coming from the main tank sump.
3. Connect probe via cam lever fitting. Close all ball valves and set pressure to 110 PSI.
4. OPEN the venturi and agitator valves.
5. Close the bypass and induction hopper valves.
6. Operate the pump at the speed necessary to generate at least 85 PSI delivery pressure (as displayed on the pressure gauge mounted on the side pod). Do not run faster than 500 RPM. The higher the pump delivery pressure, the greater the venturi suction and the quicker the probe will transfer the chemical. The delivery pressure should not exceed 100 PSI as determined by the pressure relief valve setting.
7. Place probe in chemical.
8. OPEN the valve on the probe.
9. The chemical should be now transferring to the sprayer tank via the venturi filler.
10. When all of the chemical has been transferred, rinse the chemical container with water and transfer the rinsate to the sprayer tank via the probe. This should ensure that the entire chemical is transferred and that the probe, venturi filler and connecting suction hose are cleaned. Induct clean water to rinse probe vacuum hose.
11. When finished, CLOSE the valve on the probe and venturi valve. OPEN the bypass valve. Keep the agitator valve OPEN and disconnect probe.

Chemical Transfer Pump

Overview

The chemical transfer pump is used to transfer chemical to the main tank, in place of the venturi chemical probe. Combined with a SHURflo FM-1100 flow meter, it's an accurate way of measuring chemical being transferred into the main tank.

The chemical transfer pumps are designed for maximum practical corrosion protection with a wide range of thin liquids at low pH. However, chemical compatibility should always be assessed first between liquids pumped and the pumps wetted parts before using.

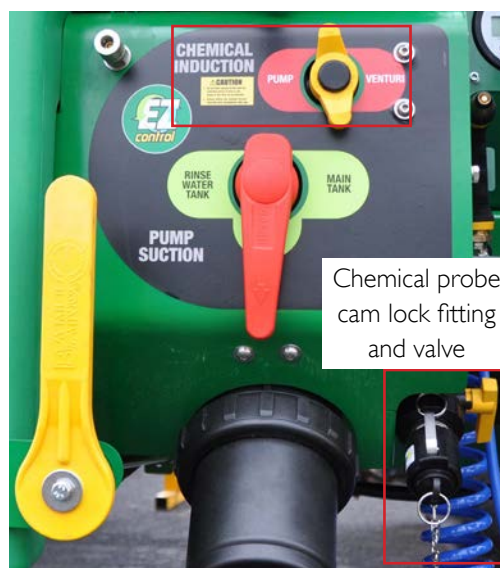
WARNING: Do not use the pump to transfer flammable petroleum products.

Operation

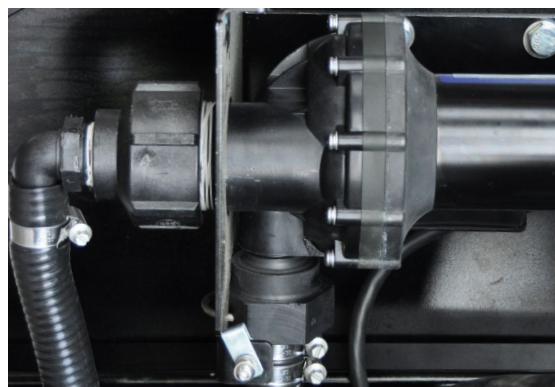
CAUTION: Exposure to chemical can cause serious injuries, always wear proper protective clothing and devices when transferring chemical. Refer to and follow chemical manufacturers instructions.

1. Connect chemical probe to cam lock fitting on sprayer.
2. Put other end of probe into the chemical to be transferred.
3. Turn Chemical Induction handle to PUMP.
4. Turn pump ON and OPEN valve on chemical probe and valve just behind cam lock fitting.
5. Transfer desired amount of chemical. Pull probe out of chemical and let the pump run until all chemical has been sucked from lines.
6. When all of the chemical has been transferred, rinse the chemical container with water and transfer the rinsate to the sprayer tank via the probe. This should ensure that the entire chemical is transferred and that the probe, pump and connecting suction hose are cleaned. Induct clean water to rinse probe vacuum hose.
7. Turn pump OFF and CLOSE both valves and disconnect chemical probe.

NOTE: Do not use the pump with fluids that have a flash point lower than 37 degrees C (100 degrees F).



Above: Chemical induction controls and fitting.



Above: Chemical transfer pump

Maintenance

CAUTION: Exposure to chemicals can cause bodily harm. Thoroughly flush pump with water before disassembling. Gloves and proper eye protection should be worn.

CAUTION: Do not over tighten plastic connections, breakage can occur resulting in fluid exposure.

NOTE: On all pipe connections, Teflon tape is the recommended pipe thread sealant.

Chemical Transfer Flow Meter

The FM-1100 Flow Meter is a positive displacement fluid metering unit.

SPECIFICATIONS

- Accuracy: +/-0.5%
- Flow Range: 9-136 L/min
- Maximum Pressure: 410 kPa (60 PSI)
- Maximum Total: 9999
- Auto Shut Off: 3 minute
- Auto Wake Up: With Flow

Operation

CAUTION: Exposure to chemical can cause serious injuries, always wear proper protective clothing and devices when transferring chemical. Refer to and follow chemical manufacturers instructions.

The FM-1100 flow meter will start working automatically when flow is detected.

The LCD display will show the following:

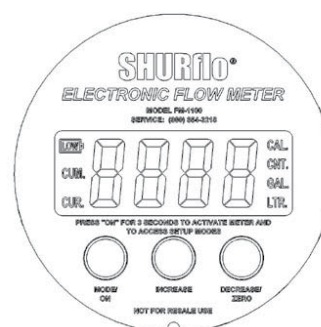
- LOW - Low battery indicator
- CUR - Current Total indicator
- CUM - Cumulative total indicator
- GAL - Gallons indicator
- LTR - Litre indicator
- CNT - counts indicator
- CAL - Calibration indicator

The meter displays and stores:

- A resettable CURRENT TOTAL (CUR)
- A non-resettable CUMULATIVE TOTAL (CUM)
- A COUNTS calibration value (CNT)



Above: SHURflo chemical transfer flow meter.



The FM-1100 Series Flow Meter has three push buttons:
1 MODE or "ON" button 2 INCREASE (up arrow) button 3 DECREASE (down arrow) or "ZERO" button



Above: SHURflo chemical transfer flow meter - controls.

Chemical Transfer Flow Meter

The MODE button performs the following functions:

1. If the display is off, press MODE button to display current total (CUR).

2. Use MODE button to cycle between CURRENT TOTAL (CUR) and CUMULATIVE TOTAL (CUM).

NOTE: After approximately 30 seconds, display will automatically switch from CUMULATIVE TOTAL (CUM) back to CURRENT TOTAL (CUR).

3. Press and hold MODE button for 3–5 seconds to show Volume Unit Selection. Press INCREASE or DECREASE buttons to cycle through volume units. When desired units are flashing, press MODE button to save selection and return to CURRENT TOTAL (CUR).

Volume Unit Selection choices are: GALLONS (GAL), LITERS (LTR), or COUNTS (CNT).

NOTE: To reset CURRENT TOTAL (CUR) to Zero, press and hold DECREASE button for 2 seconds or more while CURRENT TOTAL (CUR) is displayed.

NOTE: Meter will not enter Volume Unit Selection mode if pump is running.

NOTE: CUMULATIVE TOTAL CANNOT BE RESET - EVEN BY REMOVING THE BATTERY.

- The flow meter display will turn on whenever flow is detected.
- The flow meter and display will turn off after a 3-minute period of button or flow inactivity. Any unsaved changes will not be saved.

Calibration

- Calibration procedures are the same for both the 90° and in-line meters.
- To ensure accuracy, purge all air from pump/ meter system before calibrating.

TO CALIBRATE (CAL) METER:

1. Press MODE button to turn meter on.
2. Press and hold MODE button for 3–5 seconds to show Volume Unit Selection. Press INCREASE or DECREASE buttons to select desired Volume Units.

3. Press and hold MODE button again for 3–5 seconds to enter Calibration Mode (CAL).

4. CAL and chosen Volume Unit (GAL or LTR) will blink together. Numeric Display will show default values as listed below.

FLASHING INDICATORS	NUMERIC DISPLAY
Calibrate Litres (LTR)	20.00
Calibrate Gallons (GAL)	5.00
Calibrate Counts (CNT)	XXXX

NOTE: XXXX represents the present COUNTS (CNT) value stored in flow meter's memory. To Calibrate using COUNTS (CNT), see next section.

NOTE: To use a calibrated container with a volume other than the default values, press INCREASE or DECREASE buttons to change value shown on Numeric Display.

5. To complete CALIBRATION for GALLONS (GAL) or LITERS (LTR), pump the exact amount shown on Numeric Display.

6. Press MODE button for 3–5 seconds to SAVE the CALIBRATION. Display will show CAL if CALIBRATION was successful.

NOTE: If MODE button is pressed for less than 3 seconds, CALIBRATION will be aborted and display will show Err (Error) to indicate the CALIBRATION was not successful. Display will return to CURRENT TOTAL (CUR) without making any changes.

TO CALIBRATE (CAL) METER USING COUNTS (CNT) VALUE:

NOTE: No pumping is required to complete CALIBRATION (CAL) for COUNTS (CNT).

1. Press MODE button to turn meter on.
2. Press and hold MODE button for 3–5 seconds to show Volume Unit Selection. Press INCREASE or DECREASE buttons to select COUNTS (CNT).
3. Press and hold MODE button again for 3–5 seconds to enter Calibration Mode (CAL).

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Chemical Transfer Flow Meter

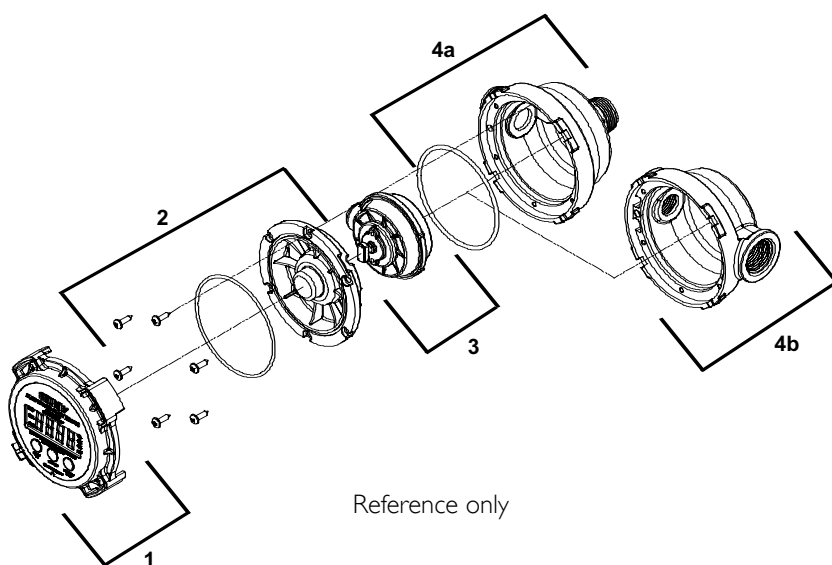
4. CALIBRATE (CAL) and COUNTS (CNT) indicators will both blink together. Numeric Display will also show a value (XXXX), which represents the present value stored in flow meter's memory.
5. Press INCREASE or DECREASE buttons to change the value shown in Numeric Display to desired value.
6. To complete CALIBRATION for COUNTS (CNT), press MODE button for 3–5 seconds. CALIBRATE (CAL) and COUNTS (CNT) indicators will turn off and display will show CAL if CALIBRATION was successful.

NOTE: If MODE button is pressed for less than 3 seconds, CALIBRATION will be aborted and display will show Err (Error) to indicate the CALIBRATION was not successful. Display will return to CURRENT TOTAL (CUR) without making any changes.

To Display Software Revision Number

1. Press MODE button to turn meter on.
2. Press MODE button again to display CUMULATIVE TOTAL (CUM).
3. While display is showing CUMULATIVE TOTAL (CUM), press and hold DECREASE button to display flow meter's software revision number (e.g. r1.00).

NOTE: CUMULATIVE TOTAL CANNOT BE RESET - EVEN BY REMOVING THE BATTERIES.



Chemical Transfer Flow Meter & Pump - Troubleshooting

PROBLEM	COMMON SOLUTIONS
Meter display will not turn on:	Check for dead battery.
	Check electronics chamber for moisture.
	Check O-ring seal for damage.
	Check to see that PCB assembly is properly seated.
	Check to see that battery is properly seated / no corrosion.
	Check for damaged magnetic switch/PCB.
Meter shows no flow: (pump runs)	Check low battery indicator.
	Check for damaged magnetic switch/PCB.
	Check magnetic wheel assembly.
	Check nutating chamber for debris.
	Check to see if outlet tube is severely restricted (kinked).
	Check for missing magnet wheel assembly.
Flow low/high/inconsistent:	Check to see if out of product.
	Check for air in system.
	Check for calibration error (Err).
	Check for particulates in fluid.
Meter leaks:	Check for damaged nutating chamber.
	Check for damaged O-ring.
	Check for loose screws.
	Check inlet/outlet fittings for proper seal.
Noisy / rough operation:	Check meter housing for cracks.
	Check nutating chamber for debris.
	Check for loose magnetic wheel assembly.

Hydraulic Fill Pump



Suction & Delivery Lines

- Use good quality suction hose and fittings that will not collapse or leak air under suction.
- If pumping water from structures other than a storage tanks, we recommend the use of an appropriate sized floating filter equipped with a check valve.
- It is essential the suction line to the pump is the same size as the suction port (3")

A smaller size delivery line can be used but will reduce pump output.

Setting Pump RPM

WARNING: Do not run the pump with the water delivery line closed (deadheaded) for prolonged periods, as pump overheating and seal damage will result. Pump should never be run empty. Always turn the delivery ball valve off slowly as pump damage can occur if it is turned off too quickly.

The hydraulic fill pump requires approximately 40 litre per minute of oil @ 2000 psi.

TRACTOR HYDRAULICS - OPEN CENTRE

- Before starting the tractor open the oil bypass adjustment screw (as circled in picture above)
- Start the tractor and engage the pump.
- Turn the adjustment screw in to increase the pump RPM'S until it is running just fast enough to prime.

- When properly primed close the water delivery line to dead head the pump Continue adjusting the bypass screw until the water pressure reaches a maximum 3.4 bar.
- Once this is achieved, lock down the bypass screw and reopen the pump water delivery line.

TRACTOR HYDRAULICS - CLOSED CENTRE

- The oil bypass adjustment screw should be screwed all the way in and locked down (Oil bypass screw circled above).
- The flow control valve on the tractor (hare and tortoise) used to set the hydraulic oil flow.
- Before starting the pump on a closed centre hydraulic system, ensure this screw is fully closed and locked down.
- Set the flow control valve on the tractor to its lowest setting (tortoise).
- Start the tractor and engage the pump.
- Adjust the flow control valve on the tractor until the pump is running just fast enough to prime.
- When properly primed, close the water delivery line to deadhead the pump, Continue to adjust the oil flow until the water pressure reaches a maximum 3.4 bar.
- Once this is achieved re-open the pump water delivery line.

WARNING: If the pump bypass screw is not closed when operated on a closed centre hydraulic system the tractor will pump excessive volumes of oil to compensate. This will cause the hydraulic oil to overheat, which may result in damage to the pump and tractor transmission.



Hydraulic Fill Pump

Operation

WARNING: Do not pump flammable or hazardous liquids with hydraulic fill pumps.

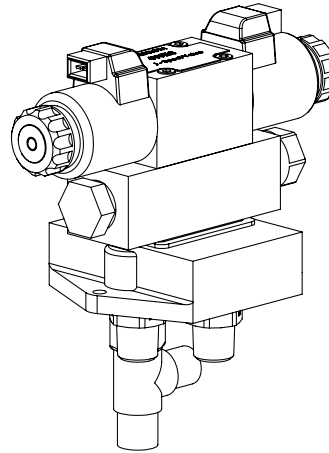
IMPORTANT: Before starting the pump for the first time, fill the pump chamber and suction hose with water and ensure the delivery line is open. This will aid in initial pump priming and reduce the likelihood of seal damage. The pump chamber can be filled through either the 1/2" or delivery port on the top of the pump.

NOTES:

- Do not run the pump dry or un-primed for extended periods, otherwise seal damage will result.
- The amount of oil fed to a hydraulic centrifugal pump directly determines its RPM and thus the liquid pressure at which the pump operates.
- Excessive oil flow will cause the hydraulic motor to over-rev, resulting in damage to the pump and hydraulic motor. It is imperative to set the correct oil flow to the hydraulic motor every time the pump is connected to the tractor.

FILL PROCEDURE

1. Connect the 3" fill hose (not supplied) to quick fill cam lock coupling.
2. Ensure that the fill pump bypass ball valve is in the OFF position.
3. Ensure that pump is primed prior to starting.
4. Activate fill pump with toggle switch located on the EZ control panel.
5. Slowly turn fill pump bypass ball valve to the ON position. This valve allows you to regulate the rate of fill with more or less hydraulic flow as required.
6. Once the required amount of water has been transferred, rotate the ball valve to OFF position and then switch off the fill pump toggle switch.



Above: Fill pump electric over hydraulic control block.

Direct Chemical Injection

Filling Chemical Tank(s)

The chemical tanks are filled in one of two ways depending DCI options fitted. For the bulk 600 L DCI option, a chemical transfer pump is used. For the dual 165 L DCI tank option, a venturi based chemical probe transfer system is used. By utilising the main spray pump to create water pressure in a venturi, vacuum is applied to the chemical tank. This vacuum in turn draws the chemical out of an enviro drum or container and into the chemical tank on the injection module.

DUAL 165 L DCI TANK OPTION FILL PROCEDURE

CAUTION: If the chemical injection tank is overfilled, chemical will be drawn into the main tank.

Please ensure that when the chemical injection tank is almost full that the suction is turned off.

NOTE: Chemical to be inducted into the injection module(s) is carried out on the right hand side of the sprayer. However, before this can be done some set up work is required on the left hand side. All steps shown below refer to tank number 1 - Repeat these steps for tank number 2.

Step 1. The main spray tank must contain a minimum of 500 L of water. This will ensure that the spray pump has sufficient water to operate the venturi.

Step 2. Set the spray pump running between 400 & 500 rpm. On the left hand side of the sprayer turn the 'Chem probe' valve ON. This will start the venturi in the top of the tank.

Step 3. Back on the right hand side of the sprayer. Ensure that the chemical tank vent valve is OFF. Now set the three way ball valve to "Vacuum to tank 1".

Step 4. Connect the probe / enviro drum coupling hose to the 1" cam lock fitting as shown in the DCI Quickstart guide. Connect to the container with the chemical to be transferred.

Step 5. OPEN the chemical tank vent valve. This must be done to allow the injection pump to draw fluid. OPEN the ball valve and the chemical should now be drawn into the tank on the sprayer. Once the desired level has been reached turn the ball valve OFF.

Step 6. Turn chemical probe tap OFF (on LHS) and switch spray pump OFF.

BULK 600 L DCI TANK OPTION FILL PROCEDURE

Step 1. Connect the chemical probe/enviro drum coupling hose to the 1" cam lock fitting on the pod. Connect the other end to the chemical container to be transferred from.

Step 2. Turn on the chemical transfer pump and transfer the desired amount of chemical.

Priming Pump

Before spraying commences it is important to prime the pump. This will eliminate any air in the system. It can also aid with agitation, however the pump is designed for very low volumes and is not designed as an agitation pump.

Step 1. Set the 4 way rotary valve to 'Recirculate'.

Step 2. Set the pump suction to 'Suction from chemical tank'.

Step 3. Refer to the console programming section relating to self testing. Run the pump for several minutes to remove any air from the lines. The system should now be ready to use.

Spraying

Now that the chemical tank is full and the pump is primed the sprayer is now ready to use.

Step 1. Turn the 4 way rotary valve to 'Boom'.

Step 2. Open the 'Chemical tank vent' valve.

Step 3. Set the application rate as per the programming section.

You now have confidence that the DCI system will be delivering precise amounts of chemical to the boom.

Rinsing DCI System After Use

It is very important that the system is rinsed out correctly after use. Failure to do so may result in damage to the direct chemical injection pump or chemical residue being left in the tank or hoses. There are two methods of rinsing. 1 – Pumping circuit rinse. This would be done if the same chemical is to be used the next day for example. 2 – Complete system rinse. This would be done if the sprayer is not going to be used for a long period or if a chemical change was going to be made.

Continued over page

Direct Chemical Injection

Pumping Circuit Rinse

Step 1. Ensure the 4 way rotary valve is set to 'To boom'.

Step 2. Set the pump suction to 'Pump suction from rinse tank'.

NOTE: Ensure there is a sufficient amount of water in the main sprayer rinse water tank.

Step 3. Set the sprayer up as though you were doing a normal boom line rinse. Activate the DCI module and turn on the boom valves. Rinse water will now be pumped through the DCI pump and out to the boom. This should be done for at least 10 minutes.

Complete System Rinse

Step 1. If there is any chemical left in the chemical tank this can be either drained out using the drain tap, or pumped out by setting the 4 way rotary valve to 'Calibrate' and ensuring the 'Pump suction from chemical tank' is on. Connect a hose using the calibrate cam lock to the external drum. Set the monitor so the pump is running.

Step 2. Now that the DCI tank is empty the tank can be flushed out. Connect to an external water source on the main spray pod. Now turn on the 'Chemical tank rinse' on the DCI pod. This will force rinse water into the top of the DCI tank through the rinsing nozzle. Once the tank is $\frac{3}{4}$ full turn the tap off.

Step 3. The pump suction valve should be set to 'Pump suction from chemical tank', set the 4 way rotary valve to 'recirculate' and set the DCI pump running. Let the pump recirculate for several minutes.

Step 4. The rinsate from the DCI tank can now be either drained out or using the controller, pumped out through the boom.

Step 5. Repeat steps 2 to 4 until you are satisfied that the system is decontaminated.

Direct Chemical Injection - SCS4400 Programming

If the console detects the presence of a chemical injection pump during initial console programming it will automatically interrupt the programming procedure after the [RATE CAL] value has been entered for the initial product. At this point it will then request values be entered for the injection module: Product type, valve type, meter cal, value cal, rate cal, before reverting back to [SPEED SENSOR TYPE] in the initial console programming.

If the console senses it is connected to two injection pumps it will subsequently request the information for the second unit be entered before reverting back to the initial console programming.

If a chemical injection module is connected to the console it will automatically highlight product 2 and display a prompt for 'PRODUCT TYPE' to be selected after the [RATE CAL] value has been entered for the initial product (Product 1)

CHEMICAL INJECTION PRODUCT TYPE

Momentarily depressing the [CE] key repeatedly at this stage toggles the console between 'LIQUID and 'GRANULAR' control selections:

- Chemical injection pumps require selection of 'LIQUID CONTROL' to function correctly
- Ensure 'LIQUID CONTROL' is displayed then depress the [ENTER] key to lock it in.
- The console will now prompt for a 'VALVE TYPE' value to be selected

CHEMICAL INJECTION VALVE TYPE

Momentarily depressing the [CE] key repeatedly at this stage toggles the console through the various valve types:

- Injection pumps require selection of 'STANDARD VALVE' to function correctly.
- Ensure 'STANDARD VALUE' is displayed then depress the [ENTER] key to lock it in
- The console will now prompt for a 'METER CAL' value to be entered

CHEMICAL INJECTION METER CAL

Raven chemical injection pumps are pre-calibrated. The pump may have a calibration tag attached quoting a value of 110.

This is an imperial calibration value and must be ignored. The correct metric value is [372].

To enter this meter calibration figure:

- Depress the [ENTER] key to display the 'E' enter symbol.
- Key in the correct calibration figure [372]
- Depress the [ENTER] key again to lock it in.
- The console will now prompt for a 'VALVE CAL' value to be entered.

NOTE: Once initial console programming is completed it is recommended that this value be checked using the following procedure.

NOTE: 10 decilitres = 1 litre.

- Fill the injection tank with water
- Place the 4-way tap on the outlet side of the pump to recirculate.
- Turn the console [POWER] switch 'on'
- Momentarily depress the [PRODUCT SELECT] key repeatedly until the product corresponding to the relevant injection pump unit is highlighted
- Momentarily depress the [PRODUCT ON/OFF] key repeatedly to turn the product on
- Momentarily depress the [AUTO/MANUAL] key repeatedly until AUTO/NOBM is displayed
- Enter a [SELF TEST] value equivalent to the normal operating speed i.e. 16 kph (see 'Self-Test' section in SCS 4400 programming and operation section for further details)
- Depress the [RATE CAL] key to display the 'E' enter symbol
- Key in a value of 10 decilitres (1 L)
- Depress [ENTER] again to lock it in
- Disconnect the recirculating hose at the top of the injection tank
- Turn the boom master and all the boom section switches 'on'

Continued over page

Direct Chemical Injection - SCS4400 Programming

NOTE: Main sprayer pump does not need to be engaged to perform this test function but all boom sectional switches need to be on to simulate the total width of the boom. With the main pump disengaged and the injection pump on bypass no liquid should exit the nozzles even though the boom valves are on.

- Ensure liquid is flowing from the re-circulation hose to indicate the pump is primed
- Turn off the boom master switch
- Depress the [TOTAL VOLUME] key
- Depress the [ENTER] key to display the 'E' enter symbol
- Key in a value of [0] to reset this function
- Depress the [ENTER] key to lock it in
- Place a measuring flask under the end of the re-circulation hose
- Return the boom master switch 'on' position
- Run the injection pump until 10 decilitres (1 L) [TOTAL VOLUME] is displayed then turn the master switch 'off'
- Inspect the measuring flask and note the volume of water collected
- If the [METER CAL] value is correct a litre of water should be collected in the measuring flask
- If not use the formula below to correct the [METER CAL] value

NEW [METER CAL] VALUE = OLD [METER CAL] VALUE X 10 VOLUME MEASURED IN FLASK

Repeat the above test procedure to confirm the new [METER CAL]

CHEMICAL INJECTION VALVE CAL

Chemical injection pumps use a standard valve cal of [123]

To enter the value calibration figure:

- Depress the [ENTER] key to display the 'E' enter symbol

- Key in the appropriate [VALVE CAL] calibration number [123]
- After keying in the appropriate valve calibration figure depress [ENTER] again to lock it in.
- The console will now prompt for a [RATE CAL] value to be entered.

CHEMICAL INJECTION APPLICATION RATE

Raven Chemical Injection Modules operate in decilitres/hectare. 1 decilitre = 100 millilitres thus there are 10 decilitres to a litre

[RATE CAL] is the rate (decilitres/hectare) desired for the particular chemical application

To enter a [RATE CAL]

- Depress the [ENTER] key to display the 'E' enter symbol
- Key in the desired application rate (i.e. 10 decilitres/ha)
- Depress [ENTER] again to lock it in

NOTE: At this point if the console detects a second injection pump it will revert back to [PRODUCT TYPE] for the second unit so begin the DCI programming procedure again.

If a second injection pump is not detected the console will revert back to the initial programming phase and prompt for a 'SPEED SENSOR TYPE' to be entered. If this is the case revert back to step 8 in the initial console programming instructions

LOW FLOW LIMIT

A Low Flow Limit can be entered for the chemical injection pump independent of the main product (see initial console programming section for details).

To enter a Low Flow Limit value for the chemical injection pump:

- Ensure the correct product is highlighted on the screen. If not depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word 'SERIAL' will be highlighted.

Continued over page

Direct Chemical Injection - SCS4400 Programming

- Depress the [DATA MENU] key again to highlight 'PRODUCT'
- Depress the [DOWN] key repeatedly to move the cursor adjacent to 'LOW LIMIT'
- Depress [ENTER] key to display the 'E' (enter symbol)
- Enter the 'LOW FLOW LIMIT' value calculated. Remember this figure needs to be entered in decilitres
- Depress the [ENTER] key again to lock it in
- Depress a volume or area key to exit the data sub menu and return to the operational screen.

When a low limit value is entered it is important that the zero speed shut off setting is turned off. The zero speed shut off setting will turn the regulating valve off when low or no speed is registered. With this setting turned on it is not possible to spray from a stationary position. To set the zero speed shut off to 'OFF' the following steps must be followed.

TO SET 'ZERO SPEED SHUT-OFF' TO OFF.

- Ensure the correct product is highlighted on the screen. If not depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word 'SERIAL' will be highlighted.
- Depress the [DATA MENU] key until 'CONSOLE' is highlighted.
- Depress the [DOWN] key repeatedly to move the cursor adjacent to 'ZERO SPEED'
- Depress [CE] key to change the display from 'ON' to 'OFF'.

Depress a volume or area key to exit the data sub menu and return to the operational screen

RESETTING AREA AND VOLUME INFORMATION FOR CHEMICAL INJECTION UNITS WHEN STARTING A NEW APPLICATION

The SCS 4400 has the ability to simultaneously store Area and Volume data for a chemical injection unit

independently to that being recorded for the main tank

NOTE: Before resetting the Area and Volume functions for a chemical injection unit record any previous data in the console that maybe applicable for future use.

The Area and Volume functions for the chemical injection units can be reset using the following procedure;

'TANK VOLUME' gives the operator a reference as to the number of decilitres left in the tank as the injected chemical is applied to the field. For this feature to function correctly the estimated volume in the chemical tank must be entered before application period is commenced.

TO RESET CHEMICAL INJECTION PUMP TANK VOLUME

- Ensure the correct product is highlighted on the screen. If not momentarily depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Depress the [VOLUME TANK] key
- Depress the [ENTER] key to display the 'E' enter symbol
- Enter the volume of chemical actually in the tank at the start of the application period. Remember this needs to be entered in decilitres
- Depress [ENTER] again to lock it in

NOTE: The console will subtract the decilitres used (count down) from this value as the load is applied to the field giving the operator a reference as to the number of decilitres left in the tank

TO ZERO OUT DATA IN AREA AND VOLUME

- Ensure the correct product is highlighted on the screen. If not momentarily depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Depress the relevant key relating to the value to be reset. For example [TOTAL AREA], [TOTAL VOLUME], [FIELD AREA] or [FIELD VOLUME]

Continued over page

Direct Chemical Injection - SCS4400 Programming

- Depress the [ENTER] key to display the 'E' enter symbol
- Enter a value of '0' to reset the particular function
- Depress [ENTER] key to lock it in

The Area and Volume will now count up from zero as the application is commenced.

[FIELD AREA] and [FIELD VOLUME] are generally use as sub-totals for [TOTAL AREA] and [TOTAL VOLUME].

For example: if applying several tank loads to the one area [FIELD AREA] and [FIELD VOLUME] can be use to record data for the current tank load while the [TOTAL AREA] and [TOTAL VOLUME] can be used to record accumulative data for the whole area. If [TOTAL AREA] and [TOTAL VOLUME] are used to accumulate data do not reset them until starting a new area.

SELF-TEST SIMULATION

The [SELF TEST] feature provides speed simulation for testing an injection unit in the 'AUTO' mode whilst stationary.

CAUTION: The boom valves must be open when the injection pumps are switched on otherwise a deadhead situation will occur which may result in a burst delivery line.

Before using the [SELF TEST] feature ensure the individual products are in the 'AUTO' mode.

The console automatically defaults all products to the 'OFF' mode when the console power switch is turned 'on'

To change a product to the 'AUTO' mode;

- Ensure the correct product is highlighted on the screen. If not momentarily depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Momentarily depress the [PRODUCT ON/OFF] key to turn the product 'on'. At this point the console should read 'AUTO NOBM' (auto no boom).
- If it reads 'MAN NOBM' (manual no boom) momentarily depress the [AUTO/MANUAL] key

to switch to the product to the auto mode.

The 'NOBM' (no boom) component automatically disappears when the console senses the switching 'on' of a boom section

The [SELF TEST] function should be used

- To help familiarize the operator with the Raven chemical injection system before spraying in the field is commenced.
- To test the sprayer after a period of non-use to ensure the system is operating correctly before filling the tanks with chemical
- To help familiarize any new operators with the Raven chemical injection system

THE [SELF TEST] FEATURE SHOULD NEVER BE USED WITH CHEMICAL IN THE TANK

DO NOT USE THIS FEATURE WITH THE BOOMS IN THE TRANSPORT POSITION

To simulate a speed

- Depress the [SELF TEST] key momentarily
- Depress [ENTER] key to display the 'E' enter symbol
- Key in a desired test speed. Note this feature has a decimal point so a '0' needs to be added when entering a whole figure. For example 1, 6 and 0 for 16 Kph.
- Depress the [ENTER] key again to lock it in.

A desired test speed should now be displayed in the speed window at the lower left corner of the display, spraying can now be simulated by simply turning on the boom switches

The [SELF TEST] feature will automatically clear itself when motion is detected from the speed sensor

NOTE: Some radar and GPS units may sense motion when the sprayer is stationary thus continually clear this function. To counteract this simply unplug the speed sensor at the back of the console whilst using this function.

Continued over page

Direct Chemical Injection - SCS4400 Programming

CHANGING THE ORDER IN WHICH ADDITIONAL PRODUCTS APPEAR ON THE CONSOLE SCREEN

If more than one injection unit is connected to the console the order in which they appear as the 2nd and 3rd product on the console screen can be change to suit the operator using the following procedure;

NOTE: The console will automatically allocate the carrier product to the 1st position on the screen

- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word 'SERIAL' will be highlighted.
- Momentarily depress the [DATA MENU] key repeatedly until 'CAN' is highlighted
- Momentarily depress the key repeatedly to move the cursor adjacent to the line 'PRESS ENTER TO READDRESS PROD NODES'
- Depress the [ENTER] key to begin the reboot process
- The console will now display 'REBOOT NODES IN SEQNC, PRESS ENTER WHEN DONE'
- Disconnect the logic power to both injection pumps (the logic power is the smaller of the two sets of red and white wires leading to each pump. Disconnect by either uncoupling the plug or pulling out the 5 amp fuse)
- Wait a few seconds then reconnect the injection units in the order you wish them to assume the 2nd and 3rd position on the screen (note: position 1 will always be taken up by the carrier product)
- Depress the [ENTER] key again to resume normal operation

NOTE: If the console displays 'check control node 2 or 3' when reconnecting an injection module at any stage;

- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word 'SERIAL' will be highlighted.
- Momentarily depress the [DATA MENU] key

repeatedly until 'CAN' is highlighted.

- Momentarily depress the key repeatedly to move the cursor adjacent to the particular product be it either 2 or 3.
- If the communication link is turned 'off' the console will display 'PROD CONTROL NODE 2 OR 3 NOT INSTALLED'.
- At this point momentarily depressing the [CE] key will turn the communication link between the console and the injection pump unit either 'on'.
- If properly connected and turned 'on' a PGM and VER number should be displayed.
- Depress and volume or area key to resume normal operation.

Fill

-
- 1**
- Calibrate
- Off
- To Boom
- 2**
- Off
- Turn to Position
- CAUTION**
- Do not use this system to inject chemicals into a tank or vessel. This system is designed for use in a tank or vessel only.
- 3**
- Direct Chemical Injection*
- Pump Section from Chemical Tank
- Pump Section from Rinse Tank
- CAUTION**
- Do not use this system to inject chemicals into a tank or vessel. This system is designed for use in a tank or vessel only.
- 4**
- Chemical Tank Rinse
- 5**
- Tank Vent
- 6**
- Drain
- Probe
- Calibrate

Empty

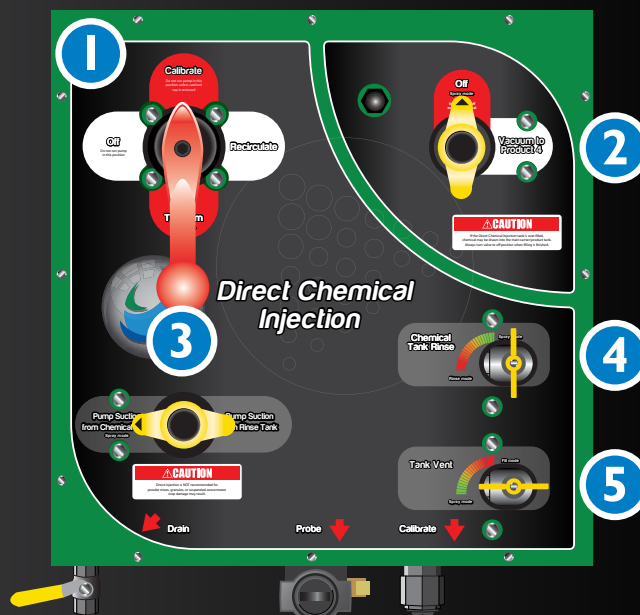
-
- 1** Calibrate
- 2** Vacuum to Produce Seal
- 3** Pump Section from Chemical Tank
- 4** Chemical Tank Rinse
- 5** Tank Vent
- 6** Drain
- Direct Chemical Injection**
- CAUTION**
- DANGER**

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Direct Chemical Injection - Quick Start Guide

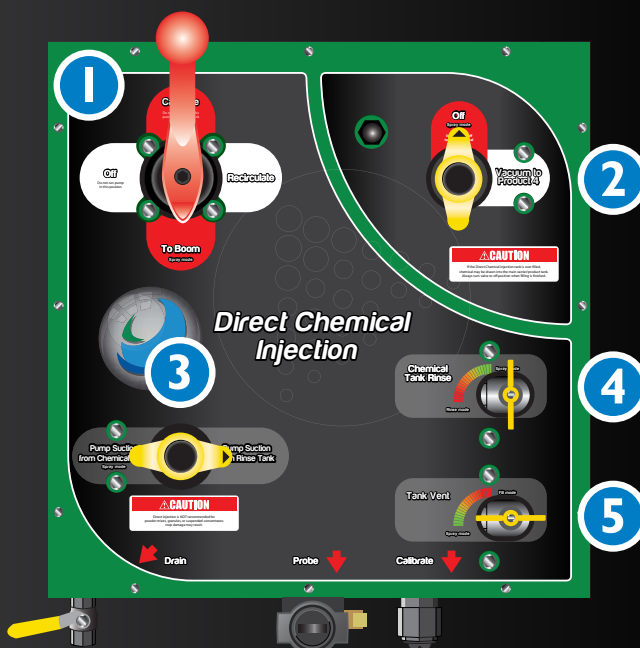
Calibrate

1. Move handle to To Calibrate
2. Move handle to Off (SPRAY MODE)
3. Move handle to Pump Suction from Rinse Tank (SPRAY MODE)
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (SPRAY MODE)



Flush

1. Move handle to To Boom (SPRAY MODE)
2. Move handle to Off (SPRAY MODE)
3. Move handle to Pump Suction from Rinse Tank
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (SPRAY MODE)

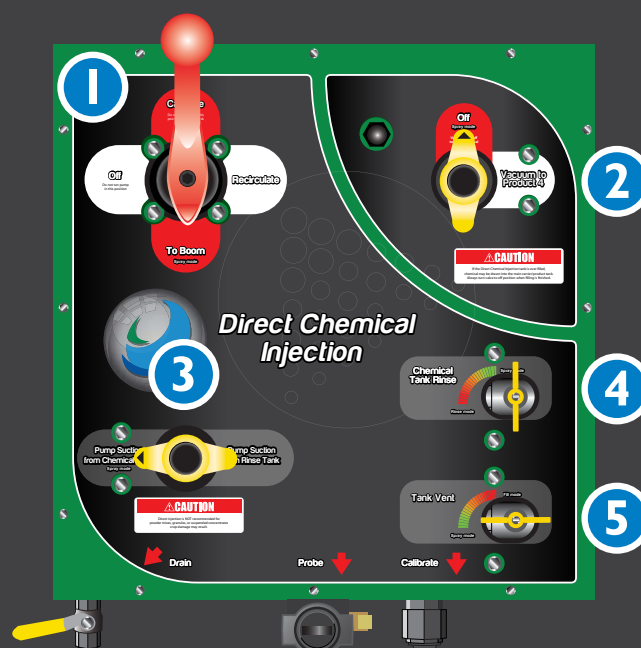


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Direct Chemical Injection - Quick Start Guide

Spray

1. Move handle to To Boom (SPRAY MODE)
2. Move handle to Off (SPRAY MODE)
3. Move handle to Pump Suction from Rinse Tank (SPRAY MODE)
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (SPRAY MODE)



Boom Height Control - Norac

Overview

Boom Height Control systems maintain the boom at a preset height by monitoring field contours and making responsive boom adjustments. Using data from either 3 or 5 ultrasonic sensors, the Boom Height Control systems makes responsive height adjustments allowing booms to automatically follow the contours of the land. Maintaining spray nozzles at the recommended spray tip height allows chemical to be applied using an optimum spray pattern providing even application and reducing drift. Boom Height Control reduces the need for the operator to move their head back and forth to monitor changes in field terrain, thereby reducing stress and fatigue. This allows the operator to focus on machine operation and safety. Manual operation of a sprayer in uneven field terrain may require reduced operating speeds for continual boom adjustments.

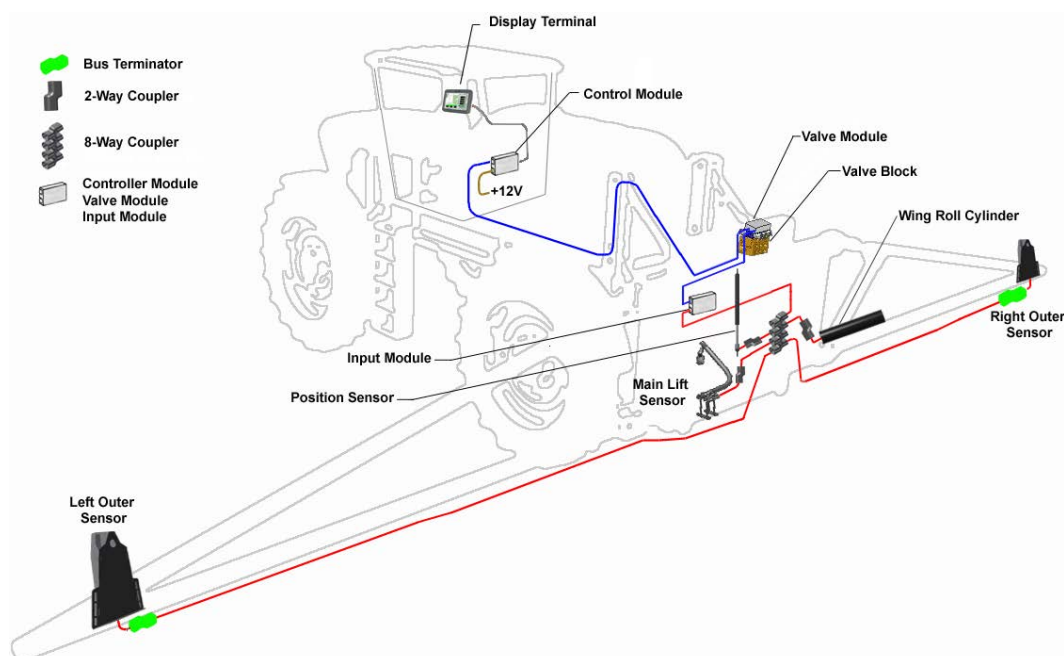
Ultrasonic sensor hardware and software is designed specifically for height control applications. The ultrasonic signals can distinguish the difference between the ground and standing crop or field residue. Boom height is controlled by choosing Soil Mode (senses the soil surface), Crop Mode (senses the top of the crop), or Hybrid Mode (technology that calculates a virtual top of the crop for more accurate control).

Refer to manufacturer's manual(s) for detailed information about this system.

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PRECISION DEFINED

Goldacres UC5 Active Wing Roll



Fill Flow Meter - 70 Series

Key Features

The Tee Jet monitor and flow meter system can be set up to measure the amount of flow entering the main spray system or it can be set up with a supplementary electronic ball valve that will shut off when a pre determined volume is reached preventing over filling of the sprayer.

When the flow meter system is connected without the ball valve the flow meter is not required to be turned on to fill the tank. However when the electronic ball valve is part of the system the console must be powered on and the target volume must be set to open the ball valve and allow liquid to flow through and fill the tank. If this is not done the ball valve will remain closed, blocking flow to the main tank and dead heading the fill pump.

The console can be programmed to reset to the maximum tank volume every time the filling process is activated. If a lesser amount is required then the maximum volume can be reduced to the required amount. When this amount is reached an alarm will sound. If the system has a ball valve, the valve will shut off stopping flow to the main tank. If the valve is not fitted the [CLR] button can be pressed to silence the alarm.

Operation

Button Functions



Start Up Screen



Continued over page

Fill Flow Meter - 70 Series

Operating Screen

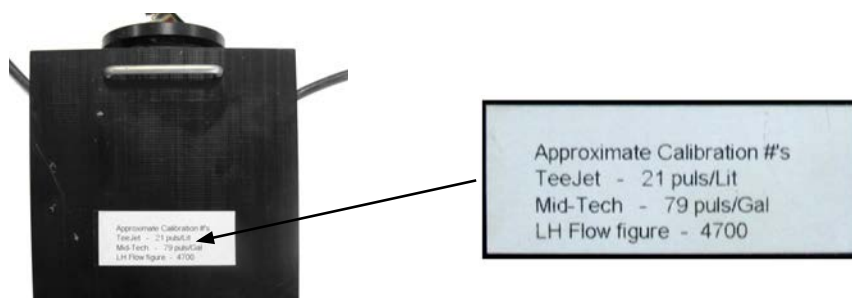


Console Programming

1. Press 'PRO' to turn display screen on. (once turned on, numbers shown on screen may vary to those shown below)



2. The flow meter calibration number must be entered. This number is located on the flow meter ID label.



Continued over page

Fill Flow Meter - 70 Series

3. To do this, press 'PRO' and hold down for 3 seconds. Using the up and down arrows adjust the number so that it matches the flow meter calibration figure (pulses/liter).



4. Press the 'PRO' button once the correct calibration number has been entered. This will take you to the next screen but will also set the calibration figure that was just entered. (To save the flow meter cal figure, the 'Pro' button must be pressed once. Don't press and hold the 'PRO' button to exit from this screen or changes won't be saved. See step 6 for exiting calibration.)
5. When in this screen, the maximum target volume is set. This is used as a quick reset to the tank's maximum volume. Use the up and down arrows to set the required maximum tank volume.



6. Once all calibrations have been entered, press and hold 'PRO' for 3 seconds to go back to the fill screen. (shown below, numbers shown here may vary to what is displayed on your screen)
7. To set the target volume, press 'PRO' once so the target value flashes. Use the arrows to adjust the value. Press 'PRO' when value is reached.



8. Press up and down arrows simultaneously to turn off.

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Fill Flow Meter - 70 Series

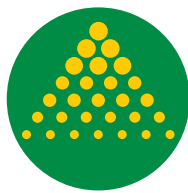
Flow Meter Operation

1. Press 'PRO' to switch display screen on
2. To begin measuring flow into the sprayer tank, ensure '>L' next to the target volume is flashing. You can now apply flow through the fill system. The actual volume on the bottom line should begin increasing.



Note: If '>L' is not flashing when the TeeJet electric ball valve is fitted, the 'Actual' volume will not count

3. Once the target volume has been reached, an alarm will activate. Stop water flow and press 'CLR' to silence the alarm.
4. To reset the actual volume, press and hold 'CLR'
5. If at any stage the target volume becomes incorrect, press 'CLR' once. This will reset the target volume to the maximum value you programmed in when setting up the console.
6. When the operation is complete, press the up and down arrows simultaneously to turn the console off.



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