Crop Cruiser G6

Operator's Manual MY19



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GA8700988 REV 3
MAY 2020
FROM SERIAL #202105

GOLDACRES

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Chapter 1

INTRODUCTION

Welcome

Congratulations on your purchase of a Goldacres sprayer. For more than a quarter of a century Goldacres has supplied Australian farmers with quality, innovative and technologically advanced spraying solutions - equipment designed in Australia for Australian conditions.

Goldacres not only produce Australia's finest range of spraying equipment - we also keenly value the unique relationship we enjoy with owners of our equipment. We are pleased to welcome 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 - RESELLER TERMS AND CONDITIONS OF SALE

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

Interpretation

1. In terms and conditions:
(1) "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;
(2) "Purchaser" means the purchaser of the Goods;
(3) "Goods" means the products and, if any, the services sold or provided by Goldacres to the Purchaser;
(4) "GST Act" and "GST" are given the meanings referred to in a New Tax System (Goods and Services Tax) Act 1999.
(5) "PPSA" means the Personal Property Securities Act 2009 (Clth) (as amended);
(6) 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

2. (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.
(2) 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

3. 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.

4. 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

5. 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

6. 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

7. 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

8. 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

9. 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

10. 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

11. (1) Goldacres liability for Goods manufactured by it is limited to:
(a) 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 (C'th") ("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
(b) 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:
(i) the defects have arisen solely from faulty materials or workmanship;
(ii) the Goods have not received maltreatment inattention or interference;
(iii) accessories of any kind used by the Purchaser are manufactured or approved by Goldacres;
(iv) where applicable, the seals on the Goods remain unbroken;
(v) there has been no improper adjustment, calibration or operation;
(vi) the use of accessories including consumables, hardware or software (not manufactured by Goldacres) has been approved in writing by Goldacres;
(vii) no contamination or leakage has been caused or induced;
(viii) any modification to the Goods have been authorised in writing by Goldacres;
(ix) there has been no inadequate or incorrect use, storage, handling or application of the Goods;
(x) there has been no use or operation of the Goods outside of the physical, electrical or environmental specifications of the Goods;
(xi) there has been no inadequate or incorrect site preparations;
(xii) there has been no inadequate or improper maintenance of the Goods;
(xiii) it has not been caused by fair wear and tear; and
(xiv) 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
(xv) 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
(xvi) 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;
(xvii) the defective Goods or any damaged part of the Goods are promptly returned free of cost to Goldacres or a representative of Goldacres;
(xviii) all warranty related repairs have been carried out with the prior authorisation of Goldacres;
(2) 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;
(3) In the case of hydraulic systems, Goldacres shall replace defective parts in accordance with clause 11(1) 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;
(4) 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;
(5) 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(1) of these conditions provided always that this clause does not seek to exclude the consumer guarantees;
(6) 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;
(7) 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;
(8) The warranties provided under these terms and conditions do not extend to second hand or used Goods that may be sold by Goldacres.

12. 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:
(1) in the case of Goods, any one or more of the following:
(a) the replacement of the Goods or the supply of equivalent Goods;
(b) the repair of the Goods;
(c) the payment of the cost of replacing the Goods or acquiring the equivalent Goods;
(d) the payment of having the Goods repaired; or
(2) in the case of services;
(a) the supplying of the services again; or
(b) the payment of the cost of having the services supplied again.

Prices

13. (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.
(2) 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

14. (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 thirteenth 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.
(2) 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

15. 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.

16. (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.
(2) 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.
(3) Until all the Debts have been paid in full:
(a) the Purchaser shall take custody of the Goods as trustee, fiduciary agent and bailee for Goldacres;
(b) the Purchaser shall keep the Goods separate from any other goods and properly marked, stored, protected and insured;
(c) the Purchaser must hold all of the money it receives ("Proceeds"):
(i) from the sale of any property into which Goods supplied have been incorporated; and
(ii) 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.
(d) The Purchaser expressly acknowledges that it is bound by the fiduciary obligation created in the preceding paragraph and acknowledges that:
(i) it must hold the Proceeds on trust for Goldacres;
(ii) it must place the whole of the Proceeds in an account separate from its own moneys (the "Proceeds Account");
(iii) it must maintain the Proceeds Account separate from its own moneys at all times.
(iv) it must maintain proper records for the Proceeds Account.
(v) 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
(vi) it must account to Goldacres on demand for all moneys standing to the credit of such account.
(e) 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.
(f) Goldacres may trace the Proceeds in equity.
(4) 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:
(a) the Debts are not paid in accordance with these terms and conditions or any other contract or arrangement between Goldacres and the Purchaser; or
(b) Goldacres receives notice of or reasonably believes that:
(i) a third person may attempt to levy execution against the Goods; or
(ii) the Purchaser is insolvent (within the meaning of the Corporations Act 2001) or bankrupt; or
(iii) 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.
(5) 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.
(6) 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.
(7) 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

17. (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.
(2) 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).
(3) 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.
(4) 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.
(5) 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.
(6) 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.
(7) 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.
(8) The Purchaser waives its rights under the following provisions of Chapter 4 of the PPSA:
(a) to receive a notice on enforcement action against liquid assets (section 121(4),
(b) to receive a notice to seize collateral (section 123);
(c) to receive a notice of disposal of Goods by Goldacres purchasing the Goods (section 129);
(d) to receive a notice to dispose of Goods (section 130);
(e) to receive a statement of account following disposal of Goods (section 132(2));
(f) to receive a statement of account if no disposal of Goods for each 6 month period (section 132(4));
(g) to receive notice of any proposal of Goldacres to retain Goods (section 135(2));
(h) to object to any proposal of Goldacres to either retain or dispose of Goods (section 137(2));
(i) to redeem the Goods (section 142);
(j) to reinstate the security agreement (section 143);
(k) to receive a notice of any verification statement (section 157(1) and section 157(3);
(9) 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.
(10) 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.

Purchasers property

18. 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

19. 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

20. 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

21. 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

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

No waiver

23. 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

24. 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

25. 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

26. 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, not 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

27. 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

28. 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.

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.

The machine is fitted with a roll-over protection structure incorporated into the frame of the cabin. To minimize the risk of injury in the event of an accident, the operator and anyone in the training seat must wear seat belts at all times.

Passengers

The machine is equipped with one training seat with a seatbelt. To minimize the risk of injury in the event of an accident, the operator and anyone in the training seat must wear seat belts at all times.

Any further passengers will not be protected by the roll-over protection system and must be kept off the machine.

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.

Continued over page

Safety Information

- 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.
- Never attempt to siphon chemicals, or substances, by sucking.
- It is imperative that the 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 equipment does not exceed the braking and carrying capacity of the vehicle as specified by the 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.
- Suitable care should be taken when driving the vehicle. Consideration should be given to both the carrying capacity of the vehicle and the gradient of the terrain when determining the speed at which the vehicle can be driven safely.
- Ensure that the maximum speed of the vehicle, when loaded, is within the vehicle manufacturer's limitations.
- Ensure equipment is securely fastened or attached to vehicle at all times.
- Never stand within the radius of the boom wings.
- Never work under any hydraulically raised boom.

Cautions

- When leaving the sprayer always isolate the batteries by turning the isolator key off and removing it.
- 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.
- Standard centrifugal spray pump: Running the pump dry will cause failure. Care should be not to operate at speeds exceeding 4200 rpm.
- Optional 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.
- NEVER start the engine when standing on the ground. Only start the engine from the operator's seat, with the transmission in neutral. Possible injury or death can occur by starting the machine through other methods.
- Never exit the cabin while the machine is in motion.
- Diesel engine exhaust fumes are harmful and can cause severe sickness or death. If it is necessary to run the engine in an enclosed area use an exhaust pipe extension. If an exhaust pipe extension is unavailable ensure that all doors are fully open and the room is well ventilated.

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.

Continued over page

Safety Information

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 engine running.

Pinch Hazard

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

Burn Hazard

- Avoid contact around the entire exhaust system of the sprayer when at operating temperature
- Avoid contact around the hydraulic tank and all hydraulic lines when at operating temperature

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 running, energy can be stored in components such as hydraulic accumulators, air tanks, tyres, A/C 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 AND RADIO ANTENNA 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.

Cooling System

- At operating temperature the fluids in the cooling system are under pressure. Only remove the radiator cap when the engine is turned off and has cooled down.
- Loosen the radiator cap slowly to relieve the pressure before removing the cap completely.
- Coolant can be added when the engine is cool and turned off.

Batteries

The machine is supplied with sealed, non-serviceable batteries. The battery electrolyte contains sulfuric acid; this is a highly dangerous liquid and should be handled with the greatest degree of care.

Continued over page

Safety Information

The acid can cause blindness, burn skin and dissolve clothing. Batteries also produce flammable hydrogen gas (especially when charging), so keep them separated from any sources of sparks and flames.

A vigilant operator can avoid these hazards by:

1. Wearing the correct personal protective equipment.
2. Avoid spilling or dripping electrolyte.
3. Place into a plastic collection tray ready for disposal if the case is found to be damaged.

EMERGENCY MEASURES

- If the electrolyte gets in your eyes, flush your eyes with clean water for at least 15 minutes, then get immediate medical assistance.
- Also thoroughly wash all other affected areas on your body with water and remove all clothing.
- If you swallow any electrolyte seek medical attention immediately.

Lifting Machine

Before raising the machine off the ground:

✓ Ensure that the boom is in its closed position.
✓ Park on a flat level, firm area and engage the park brake.
✓ 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.
- Modification of the machine to increase maximum speed is STRICTLY PROHIBITED. 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.
- 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 self-propelled sprayer may become unstable when turning at excessive speed or when operating on excessively steep terrain.
- Before leaving the sprayer the engine must be shut off, the transmission placed in neutral and the park brake engaged. NEVER ENGAGE THE PARK BRAKE WHILE THE SPRAYER IS MOVING. DAMAGE TO THE TRANSMISSION MAY RESULT.

Refuelling

- Handle fuel with extreme caution. Do not refuel the machine while smoking or near open flames or sparks.
- Always stop the engine before refueling the machine.
- To prevent fires always keep the machine clean of grease, debris and dirt.
- Do not use current emitting devices when re-fuelling.

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.

Continued over page

- The machine is fitted with a reverse warning beeper when the machine is put into reverse.
- The machine can only be driven 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 a 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.

First Aid Kit

It is recommended that a first aid kit be added to your machine.

Fire Extinguisher

A fire extinguisher is fitted under the training seat in the cabin of your machine.

It is a dry chemical ABE type fire extinguisher approved for wood, paper, flammable liquid and live electrical equipment fires.

Machine Recovery

- The mechanical drive system delivers efficient, positive power to the ground for superior traction.

  However, should your machine become bogged and the wheels subsequently locked, do not engage first gear and maximise engine revs.

  With the wheel 'locked' in a bog situation, transmitting full power WILL DAMAGE the driveline.
- Goldacres recommends that bog situations are addressed prudently by using the assistance of a tow vehicle. Doing otherwise can cause significant driveline damage and VOID WARRANTY.

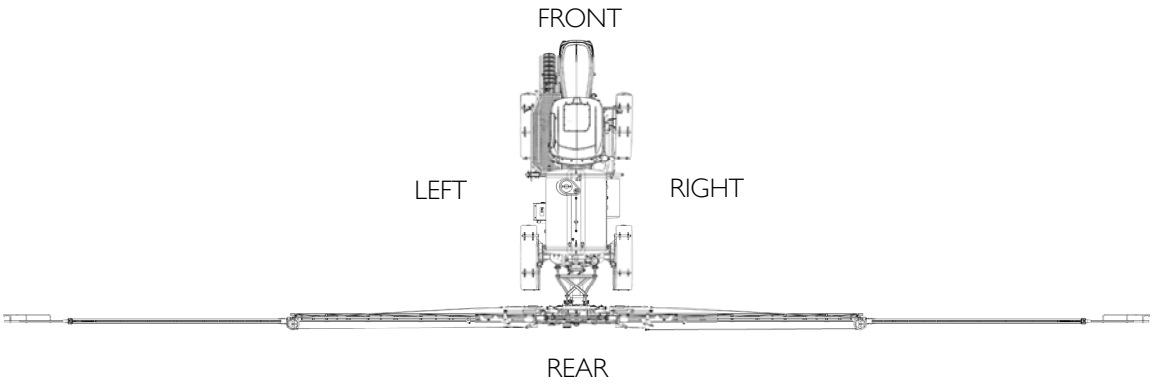
Towing & Transporting Sprayer

- A disabled sprayer is best transported on a drop deck trailer. Use chains to secure the sprayer via the tie down attachment point located under the front and rear axles.
- The machine must not be towed unless the engine is running (as the steering and brakes require engine power to operate). Before towing, the front & rear tail shaft should be disconnected due to the risk of damage to the transmission. While towing do not travel at a speed greater than 10 Km/h.
- An operator must steer and brake the sprayer under tow.
- The park brake needs to be manually released if engine is not able to run.
- Check the wheel nut tension on a regular basis. The torque and inspection frequency is outlined in the maintenance section.
- Brake performance should be checked regularly. The inspection frequency is outlined in the maintenance section.

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
Steel work: N61 Black
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.

Cabin

The cabin features panoramic views surrounding the sprayer and is customised to suit spraying applications. The rate controller and all key spraying functions are within easy reach of the operator

Further information on the cabin can be found in Chapter 4 'Cabin'.

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'.

Rate Controller

These sprayers are fitted with a Raven Rate Control Module (RCM). This is an automatic rate controller that 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.

Continued over page

General

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.

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, or in the case of the 3TS Pro, a seven 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.

The 3TS Pro option is an extension of this idea using three different nozzle sizes and gives seven effective bands of operation for even greater application control. It requires an unlock code for the Raven RCM which is provided when the feature is optioned.

The Raven RCM controls the 3TS system. For specific calibration and operating instructions, see Raven RCM operation manual supplied.

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

A centrifugal 400L/min at 8 Bar spray pump is fitted as standard. Positive displacement and oil backed diaphragm pumps capable of 260L/min can also be fitted optionally. 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.
- Standard centrifugal spray pump: Running the pump dry will cause failure. Care should be not to operate at speeds exceeding 4200 rpm.
- Optional 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
- 12 V Chemical Transfer Pumps
- Direct Chemical Injection Modules

Booms

The Crop Cruiser can be fitted with a variety of boom widths ranging from 30 to 42 metres. They feature hydraulic lift, fold and individual wing tilt controllable from the cabin. 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

Continued over page

General

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

Do not travel at excessive speeds over rough terrain. The superior ride characteristics of this machine can disguise the impact of rough terrain on the driveline and suspension system of the machine. Stop the machine and inspect for damage after impact with gutters, sinkholes, rocks etc.

Violent speed change WILL CAUSE boom damage. The high power to weight ratio and braking capacity (especially when empty) enables very high acceleration and decelerations of the machine. It is important during accelerating and braking that the effect on the spray boom in the open position is taken into account.

The mechanical drive system delivers efficient, positive power to the ground for superior traction.

However, should your machine become bogged and the wheels subsequently locked, do not engage first gear and maximise engine revs.

With the wheel 'locked' in a bog situation, transmitting full power WILL DAMAGE the driveline.

Goldacres recommends that bog situations are addressed prudently by using the assistance of a tow vehicle. Doing otherwise can cause significant driveline damage and VOID WARRANTY.

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.

Suspension

The Crop Cruiser is fitted with 5 link airbag axle suspension to provide excellent ride and comfort. Further information on the suspension can be found in Chapter 10 'Lubrication & Maintenance'.

Hydraulics

Electric over hydraulic valves are standard on these machines. The hydraulic functions are then controlled from electric switches in the cabin. The valve block is mounted on the boom centre section which is located at the rear of the sprayer.

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 Ladder is to be used to access to the platform and cabin by the operator. Always face the ladder and retain three points of contact with the ladder at all times when ascending and descending. The ladder is only lifted to the raised position when the key is turned on and the handbrake is released. The operator must take care when operating the handbrake to ensure that no person is standing on or near the ladder at the time. In an emergency, the ladder can be lowered by either applying the park brake or turning off the ignition, or removing the air supply hose from the air cylinder.

Air Conditioning

The cabin is climate controlled and a carbon filter is installed to ensure operator safety.

Further information can be found in Chapter 4 'Cabin'.

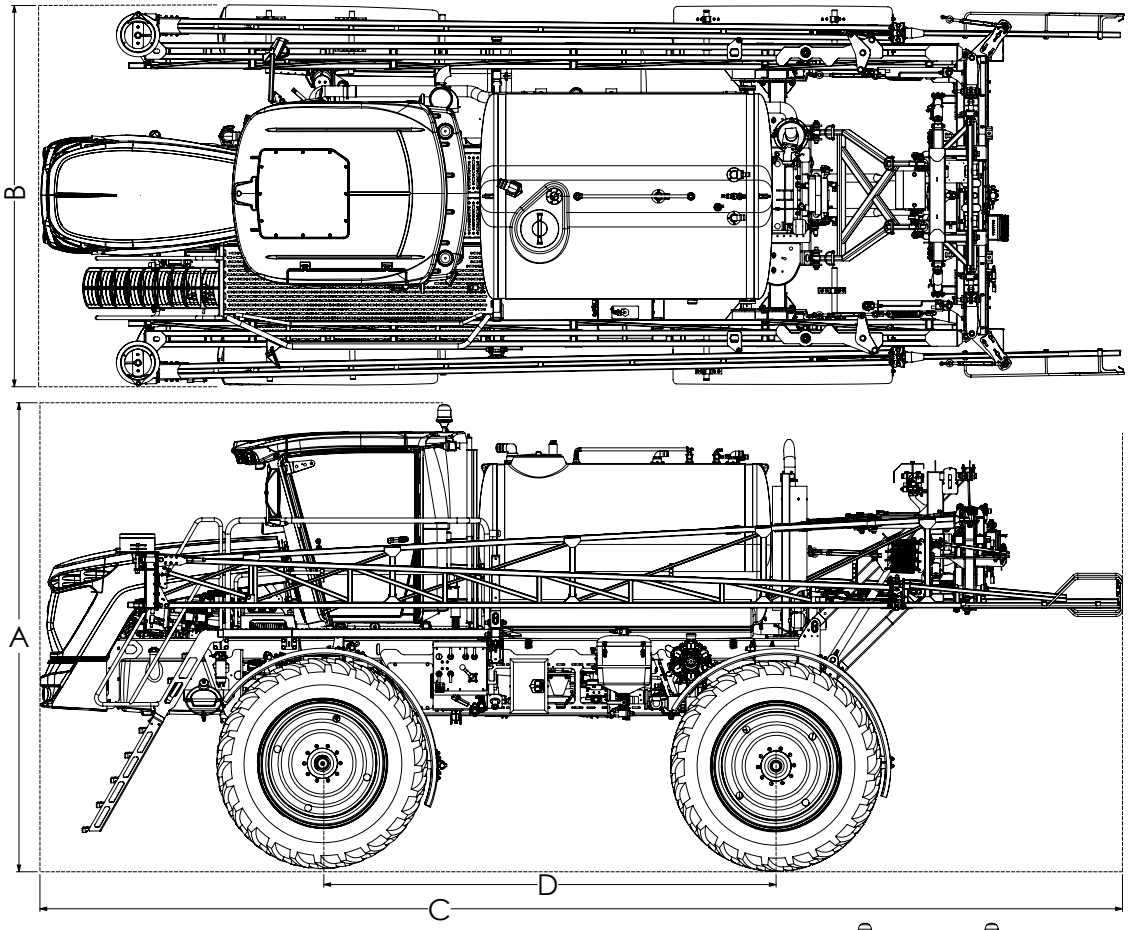
Dimensions

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.

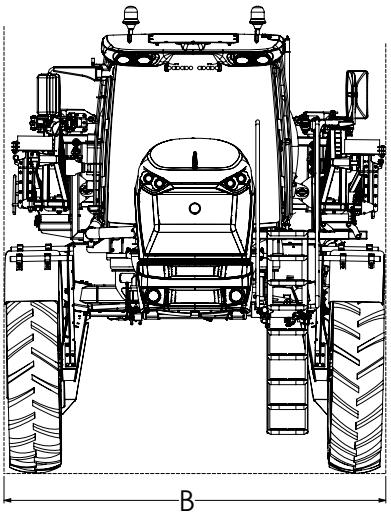
NOTE: The Crop Cruiser sprayer is approximately 4.2m in height and with aerials on the roof, can be much higher. Check the regulations in your state for maximum vehicle height restrictions. When driving on roads it may be necessary to remove aerials to meet the required height restrictions.

Aerials on the roof may also need to be removed to meet clearance requirements for over head power lines, while on the road and also in some paddocks.



BOOM SIZE	A FRONT HEIGHT	B WIDTH	C TOTAL LENGTH	D WHEEL-BASE
30 m	4.22 m	3.50 m	9.30 m	4.20 m
33 m	4.22 m	3.50 m	9.30 m	4.20 m
36 m	4.22 m	3.50 m	10.60 m	4.20 m
42 m	4.22 m	3.50 m	11.10 m	4.20 m

NOTE: Sprayer height is based on 480/80 R46 158A8 Harvest tyres fitted and with air bags deflated.



Wheels & Tyres

Tyre pressures need to be checked regularly - check every 8 to 12 hours of operation.

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.

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.

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

GA8700539 R3 applies from 2016

G6 MAX SPEED FULLY LOADED IS 25 KM/H		RECOMMENDED TYRE PRESSURE	
TYRE BRAND	TYRE SIZE	KPA	PSI
HARVEST	380/90R46 AusFlex HR45 173D	282	41
HARVEST	480/80R46 (18.4R46) HR45 166A8/159D	282	41
HARVEST	520/85R46 (20.8R46) 173A8/169D	207	30
HARVEST	620/70R42 HR45 166A8/166B	220	32

NOTE: PSI = Kpa x 0.145
EXAMPLE: 282 Kpa x 0.145 = 40.9 PSI

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 build sheet may be obtained by contacting your dealer and quoting your machine serial number as described above.

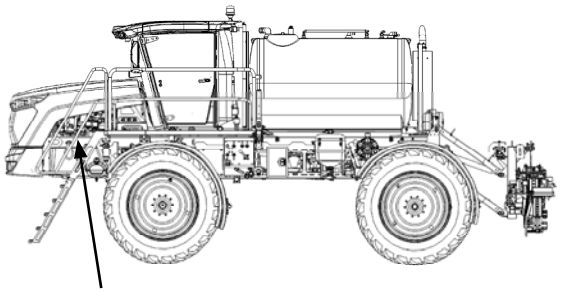
When ordering parts from your Goldacres dealer, please quote:

- 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.

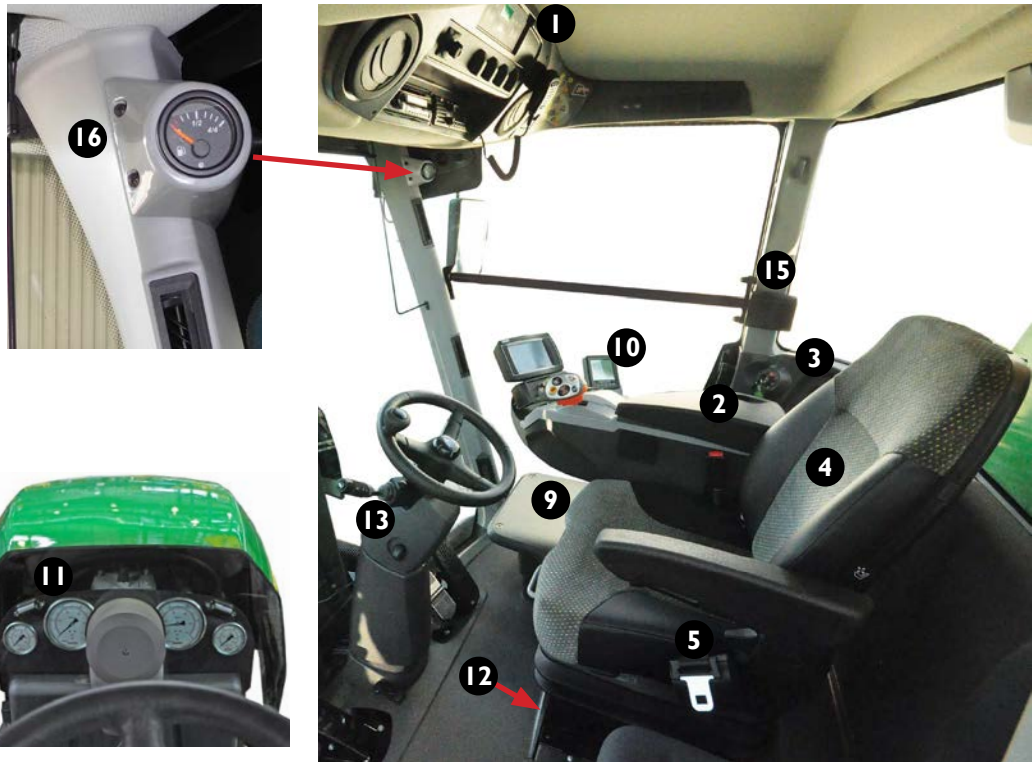


ID plate located on the left hand chassis rail near steps.

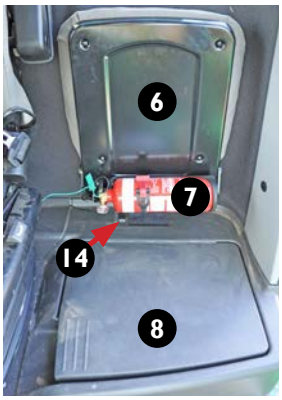
Chapter 4

CABIN

Key Features



NO.	FEATURE
1.	Over head console
2.	Side arm rest console
3.	Rear corner console
4.	Operator's seat
5.	Operator's seat belt
6.	Training seat
7.	Fire extinguisher (under training seat)
8.	Storage area/fridge - when optioned (under training seat)
9.	Power distribution box
10.	Engine monitor CAN
11.	Gauges - boom
12.	Storage area (under operator's seat)
13.	Steering wheel & controls
14.	Fridge switch (when fridge optioned)
15.	Fold out cup holder
16.	Fuel gauge



NOTE: Training seat shown folded up.

Armrest Controls



NO.	FEATURE
1.	Joystick control
2.	Raven CR7 universal terminal (Optional)
3.	Engine monitor CAN
4.	Transmission shifter
5.	Boom fold IN/OUT
6.	Boom bi-fold IN/OUT
7.	Boom rest IN/OUT
8.	Blank
9.	Cruise ON/OFF - RPM Raise ON
10.	Boom recirculation ON/OFF
11.	Spray pump ON/OFF
12.	Spray mode / Road mode
13.	Centre differential lock ON/OFF (4WD only)
14.	Rinse tank / Main tank
15.	Park brake
16.	Fence line jet indicator

Joystick Controls





NO.	FEATURE
1.	Boom lift/lower - Fenceline Nozzle LEFT/RIGHT
2.	GPS - Autosteer
3.	Boom tilt LEFT/RIGHT
4.	Cruise cancel
5.	Cruise resume/increase
6.	Cruise set/decrease
7.	Dual tilt UP/DOWN (On reverse side, not shown)
8.	Spray master

Operator's Seat



NO.	FEATURE	POSITION SETTING INSTRUCTIONS
1.	Fore / Aft Adjustment	By lifting this lever the seat can be slid backwards or forward to the desired position.
2.	Fore / Aft Locking lever	Release this lever to enable the Fore & Aft adjustment of the seat, and engage to lock the seat to the desired position.
3.	Seat Depth Adjustment	To adjust the depth of the seat cushion, pull the handle upwards. By moving the seat cushion backwards the desired seating position can be reached.
4.	Seat Pan Angle Adjustment	To adjust the angle of the seat pan, pull the handle upwards. By exerting pressure on or off the front or rear part of the seat pan it can be moved to the desired position.
5.	Height Adjustment	By lifting this lever air will be pumped in to the airbag suspension. By lowering this lever air is exhausted from the air bag.
6.	Tilt	The lever on the right hand side of the seat allows the back rest to be tilted forward or rearward. Pulling the lever forward releases the back rest so it can be repositioned.
7.	Arm Rest Adjust	By turning this knob the arm rest can be lowered or raised to suit.
8.	Lumbar	By turning this handle the lumbar in the back of the seat will increase or decrease the pressure on the operators back.
9.	Seat Belt	Operator lap seat belt must be fitted when ever the operator is seated in the cabin.

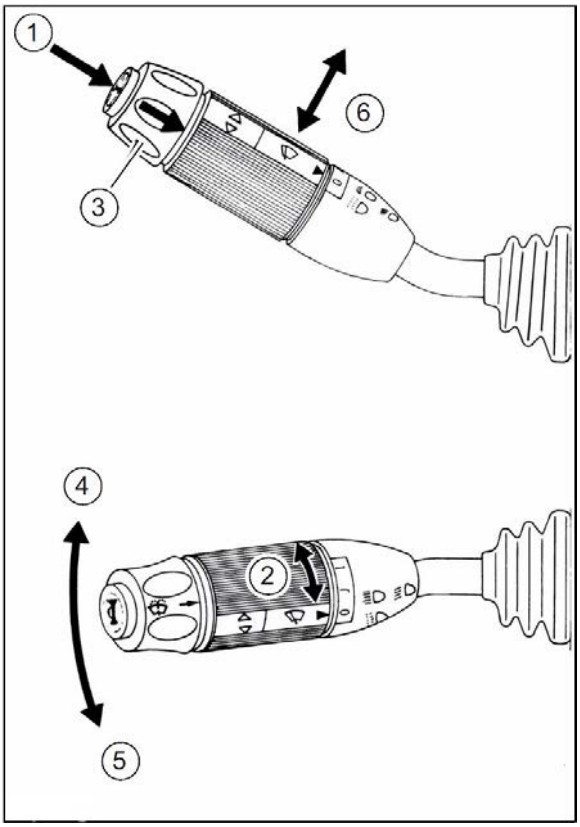
Steering Column



NO.	FEATURE	POSITION SETTING INSTRUCTIONS
1.	Steering Column Adjust	1. Hold the steering wheel with your hand. 2. Press the lever at the rear end with your foot. With the lever pressed down, set the steering column to the desired position with your hand. 3. Release lever. The desired position is now locked.
2.	Tilting the Steering Column	1. Hold the steering wheel with your hand. 2. Push lever to the top. 3. With the lever pushed up, tilt the steering column to the desired position with your hand. 4. Release lever. The desired position is now locked.
3.	Steering Wheel Height Adjust	1. Hold the steering wheel with your hand. 2. Turn centre cap a quarter of a turn anti-clockwise. 3. Set the steering wheel to the desired position by hand. 4. Turn centre cap a quarter of a turn clockwise.. The desired position is now locked.

Multifunction Switch

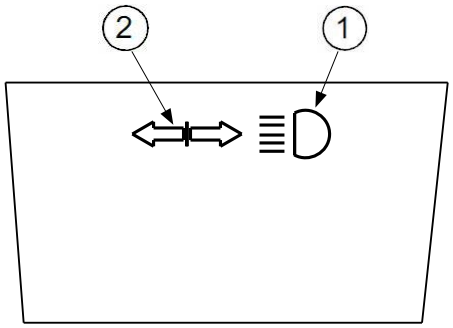
The multifunction switch is located on the left hand side of the steering column.



NO.	FEATURE
1.	Horn
2.	Windscreen wiper • 0 = Off • J = Intermittent • I = Constant
3.	Windscreen washer
4.	Right turn signal indicator
5.	Left turn signal indicator
6.	High beam/ Low beam/ Headlight flasher

Vehicle Information Unit

The vehicle information unit is located on the rear of the steering column, although other icons may be visible, only blinkers and high beam are used.



NO.	FEATURE
1.	Headlights high beam
2.	Left/right turn signal indicator

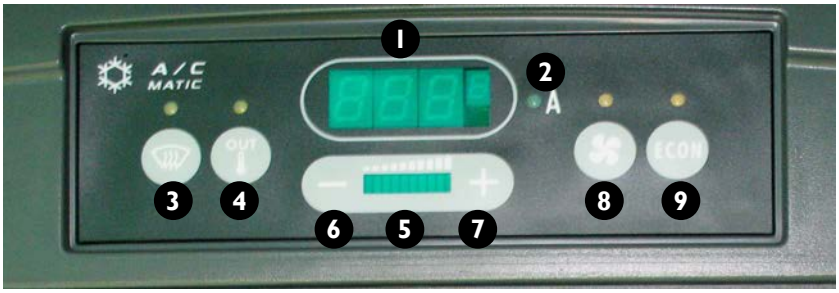
Overhead Components





NO.	FEATURE
1.	Air-conditioning
2.	Mirror Adjuster
3.	Lights
4.	AM/FM Radio/CD player
5.	UHF 2 Way Radio
6.	Hazard Lights
7.	Rotating Beacons

Air Conditioning



The automatic air conditioner regulates the temperature and humidity of the air in the cabin.

The following operating modes are available:

- Fully automatic

Ideal for high outside temperatures.

- Manual ventilation system

Automatic mode with manual fan speed setting.

- ECON

Automatic mode without cooling function.

- Drying the cab windows

Continuous compressor operation at maximum fan speed

Activating Automatic Air Conditioner

Switch the ignition on and start the engine.

After switching the ignition on, the software version appears in the display (1) for 3 seconds.

After that, the unit carries out a self-test which takes 20 seconds max. The keys are now enabled for operation.

The operating mode and the display will remember the same settings from the last time the machine was running.

In fully automatic mode the air conditioner compressor, heater and the ventilation are automatically controlled so that the pre-set cab temperature is achieved as quickly as possible and then kept constant.

This operating mode is ideal at high outside temperatures.

Activating fully automatic operation:

- Switch off cab windows drying (3), manual ventilation (8) and ECON (9) operating modes

The indicator lights (3), (8) and (9) are OFF.

Indicator light (2) lights up. Fully automatic mode is active.

At outside temperatures below 10°C, the automatic system shuts down the air conditioner compressor.

Activating Manual Fan

In manual fan operation, the heater and depending on the setting, the air conditioner compressor are automatically regulated to the pre-set set point. The fan speed can be set manually.

This offers the opportunity of setting a lower fan speed and slower temperature adaptation in case of large deviations between cab and outside temperature.

Activating the manual fan:

- Press button (8)

Indicator light (8) lights up. Manual venting is active.

Current fan speed is shown on the display (5). One bar represents a 10% speed increment between 0 and 100 %.

To reduce the fan speed:

- Press button (6) once per 10% speed decrease

To increase the fan speed:

- Press button (7) once per 10% speed increase

The changed setting is activated after 5 seconds.

Continued over page

Air Conditioning

Activating ECON Mode

In ECON mode, the air conditioner compressor is shut down. The heater and – depending on the setting – the ventilation are controlled automatically.

- Use this mode when cooling is not required

Activating the ECON mode

- Press button (9)

Indicator light (9) lights up. Indicator light (2) goes out. The ECON mode is active.

Drying Cab Windows

For drying the cab windows, the compressor is on constantly at maximum fan speed. The heater is set to the pre-set set value.

Drying the cab windows:

- Press button (3)

Indicator light (3) lights up. The drying mode is active. The fan is set to maximum speed.

To change the fan speed, see 'Activating Manual Fan'.

Setting Cab Temperature

The display (1) shows the currently set temperature. To decrease temperature:

- Press button (6)

To increase temperature:

- Press button (7)

Temperature may be adjusted in 1°C or 2°F increments depending on units selected (See 'Changing the temperature unit') per press of button.

The automatic air conditioner adjusts the cab temperature to the set value. During this process, the fan speed may rise quickly so that the cab temperature reaches the pre-set set point more quickly. Such as on a very hot day. When the cab temperature approaches the set value, the fan speed will be reduced again.

Switching Temperature Display

The temperature display can be switched between degrees Celcius and degrees Farenheit.

- Press buttons (4) and (6) simultaneously for up to 3 seconds to switch between unit modes

Repeating the above step will cycle between the two unit modes.

Displaying Outside Temperature

Press button (4). Indicator light (4) lights up. The display (1) shows the outside temperature.

Adjusting Air Conditioner Air Flow

The air flow is distributed inside the cab by fully adjustable nozzles. Each nozzle can be adjusted directionally or turned on/off to suit the individual needs of the user, e.g. to heat the leg area, close all upper vents and direct air flow from the lower vents to the floor.

Cabin Filtration System

Purpose

Cabin carbon filtration is used to remove dust, pollen, fumes and other potentially harmful pollutants from the air.

Function

The fan forced carbon filtration system in conjunction with the fully sealed cabin create a positively pressurised operator environment restricting contaminated air from entering the cabin.

The cabin carbon fan is independent of the air-conditioning blower fan. So it must be switched on individually to use.

Operation

When the sprayer is in operation the carbon filter fan must be activated via the panel mounted switch as shown below.



CAUTION: The cabin doors should be completely closed with the carbon fan system running to protect the operator from contaminated air.

Maintenance

The carbon filter will need periodic maintenance. See 'Chapter 10 - Lubrication & Maintenance' of this manual for more information.



ABOVE: The carbon filter is located on the outer right hand side of the cabin.

AM/FM Radio

The entertainment radio is fitted to the panel in front of the operator on the roof. It consists of a radio tuner as well as single CD player. A Bluetooth compatible phone system is installed in the unit.

Operational instructions can be found in the entertainment radio manual supplied with this manual.

UHF Two Way Radio

There is a UHF two way radio mounted on the roof cavity near the entertainment radio. This radio is powered up through the electrical panel and has a fused circuit.

Operational instructions can be found in the UHF Two Way Radio manual supplied with this manual.

Map Light

The map light has two separate lights that can be operated together or individually.

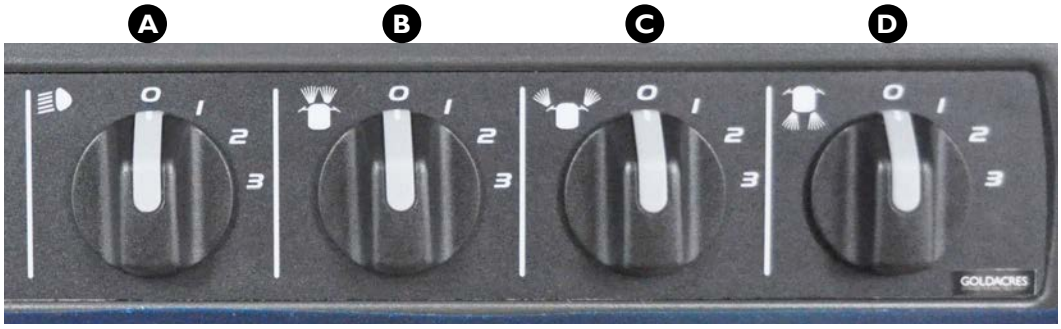
The switch on the left turns the front map light on and off. This light is fixed and cannot be aimed.

The switch on the right operates the rear map light. This light is directional and can be aimed as desired.

NOTE: The map lights only operate when the ignition key is in the 'accessories' or 'run' position.

Lighting

Controls



ITEM	FEATURE	POSITION	FUNCTION
A	Headlights	0	Off
		1	Cab interior lights, Tail Lights, Outer Boom Marker lights.
		2 & 3	Headlights + All of the above ON
B	Front Work Lights Inner	0	OFF
		1,2 & 3	Inner front work lights ON
C	Front Work Lights Outer	0	OFF
		1,2 & 3	Outer front work lights ON
D	Rear Work Lights	0	OFF
		1,2 & 3	Rear work lights & Night Pro LED boom lights ON

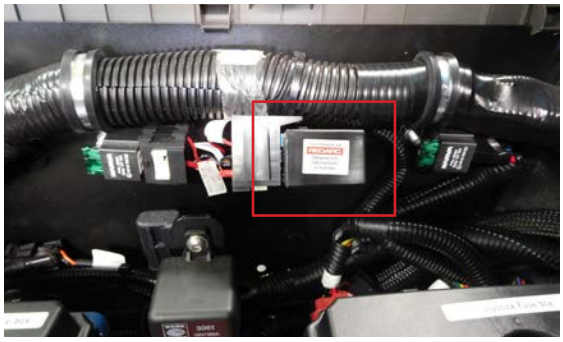
NOTE: To cycle between high and low beam the steering column multi function stick is used. The headlights must be turned on overhead first.

NOTE: Front and rear work lights will not function unless the headlight switch is in position 1, 2 or 3.

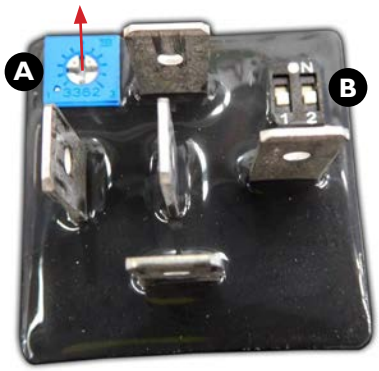
Lighting

Egress Lighting

These machines are fitted with egress lighting to assist with safely exiting the machine when parking in dark conditions. There is a timed relay that will keep the outside work lights on for 30 seconds after the machine has been shut down and the key removed. The amount of time that the relay keeps the lights on for can be adjusted. It is found inside the main cabin fuse box area.



Above: Egress lighting timer relay location in main fuse box area.



Above: Timer relay potentiometer and dip switches.

By default, the timer potentiometer is set to 30 seconds (A). It has a range between 0 and 60 seconds. Turning it clockwise increases the timer. Turning it anti-clockwise decreases the timer.

The two dimples in the white adjuster indicate the direction it is pointing in.

The two dip switches are set to the OFF position by default (B). If a lighting time longer than 60 seconds (1 minute) is required, then dip switch 2 can be set to the ON position. On this setting, each increment on the potentiometer represents 1 minute, for a maximum of range of 1 to 60 minutes.

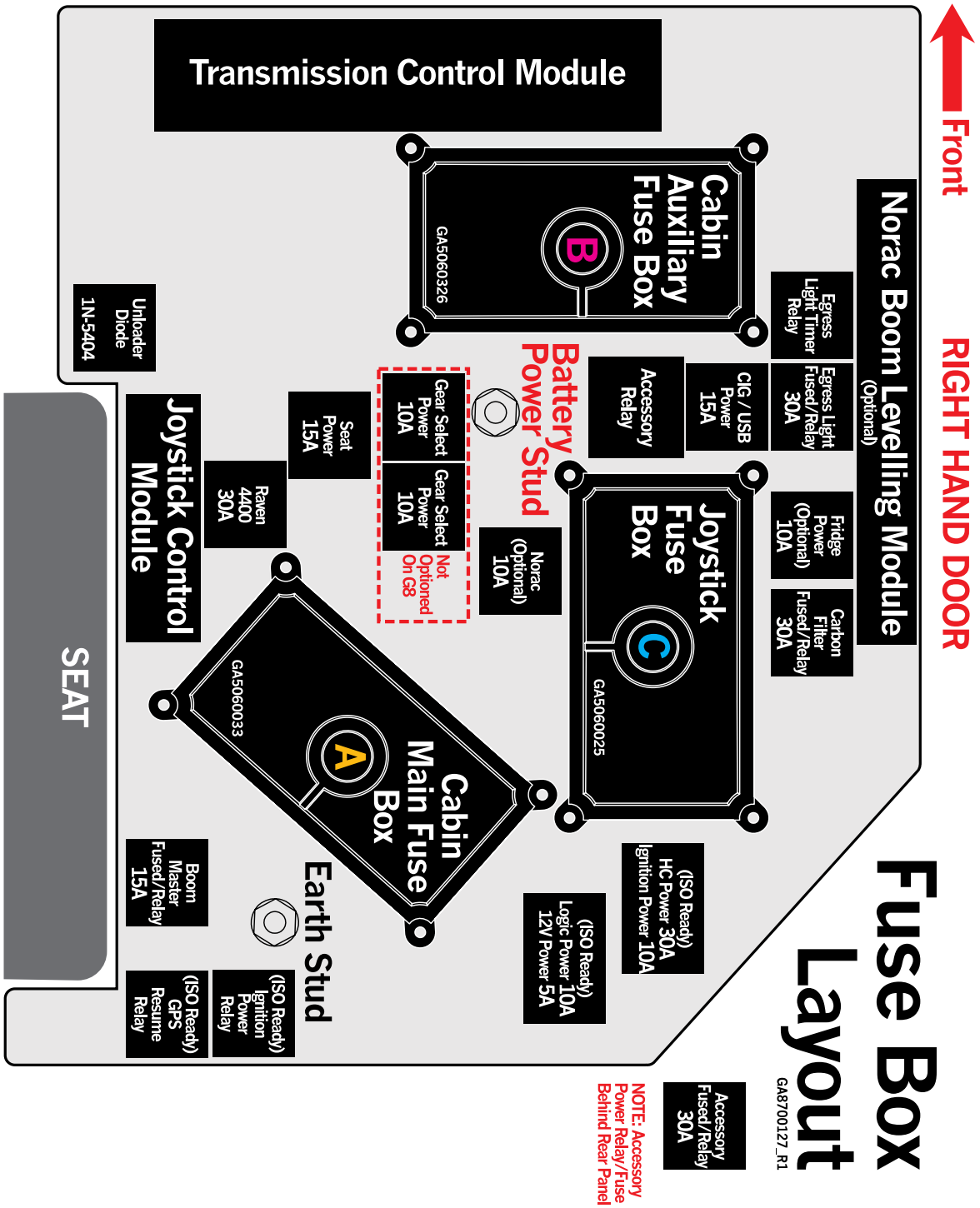
Rear Corner Console



NO.	FEATURE
1.	Ignition key
2.	Aux USB power supply
3.	Low air warning light / Hydraulic oil temperature warning light (plus audible alarm for both)
4.	Park brake warning light (plus audible alarm)
5.	Cigarette lighter
6.	Carbon filter fan switch
7.	Glass breaking hammer (Emergency use only)
8.	Engine/Transmission diagnostic connector
9.	12V Sockets

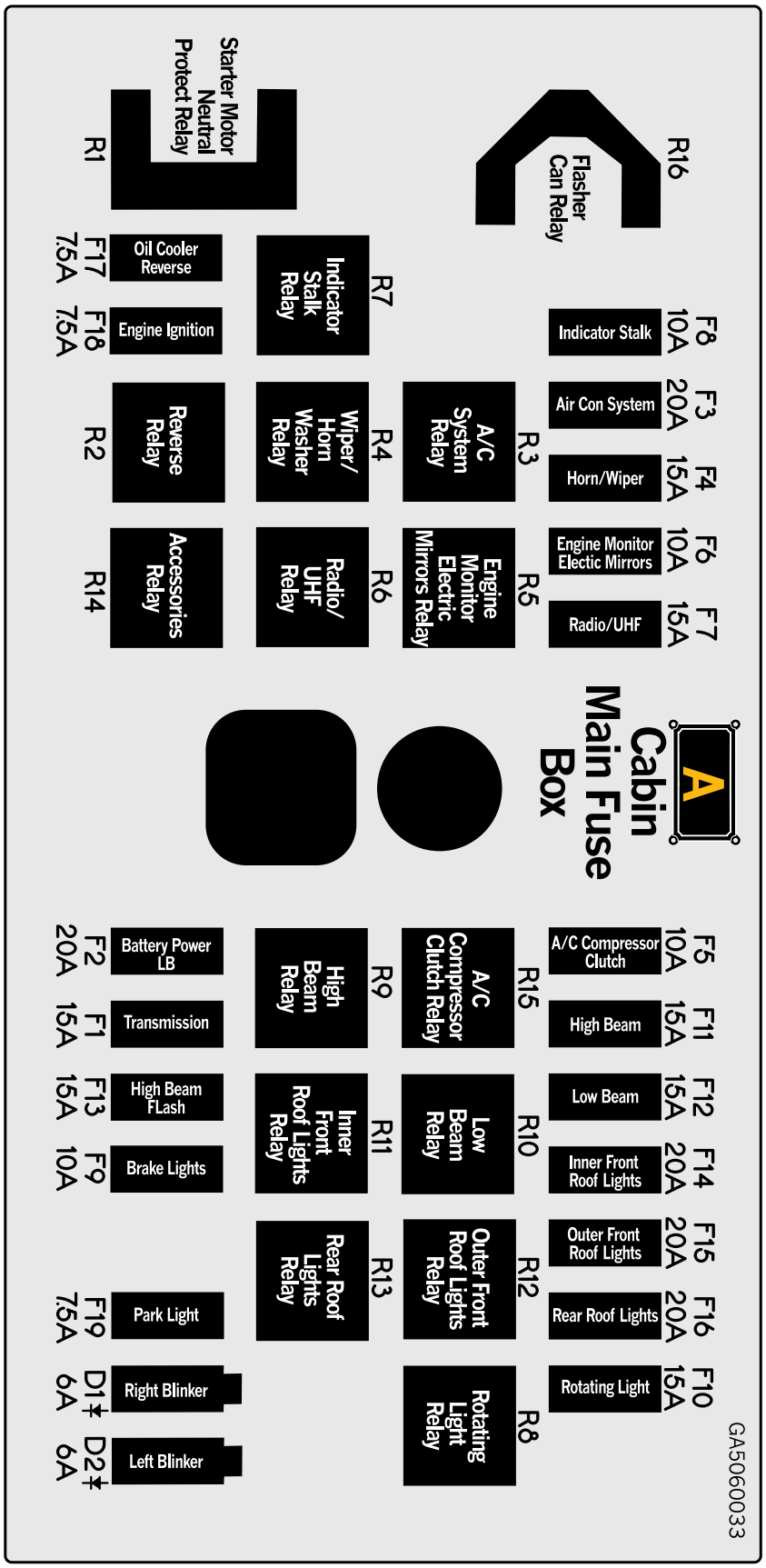
Power Distribution Box

The power distribution box is located on the floor to the right of the operators seat. The box contains fuses and relays, to gain access to these the top cover needs to be removed. To do this, turn the knobs on the top of the cover to undo the clips and then slide the cover forwards. The location of the fuses and relays are shown below.

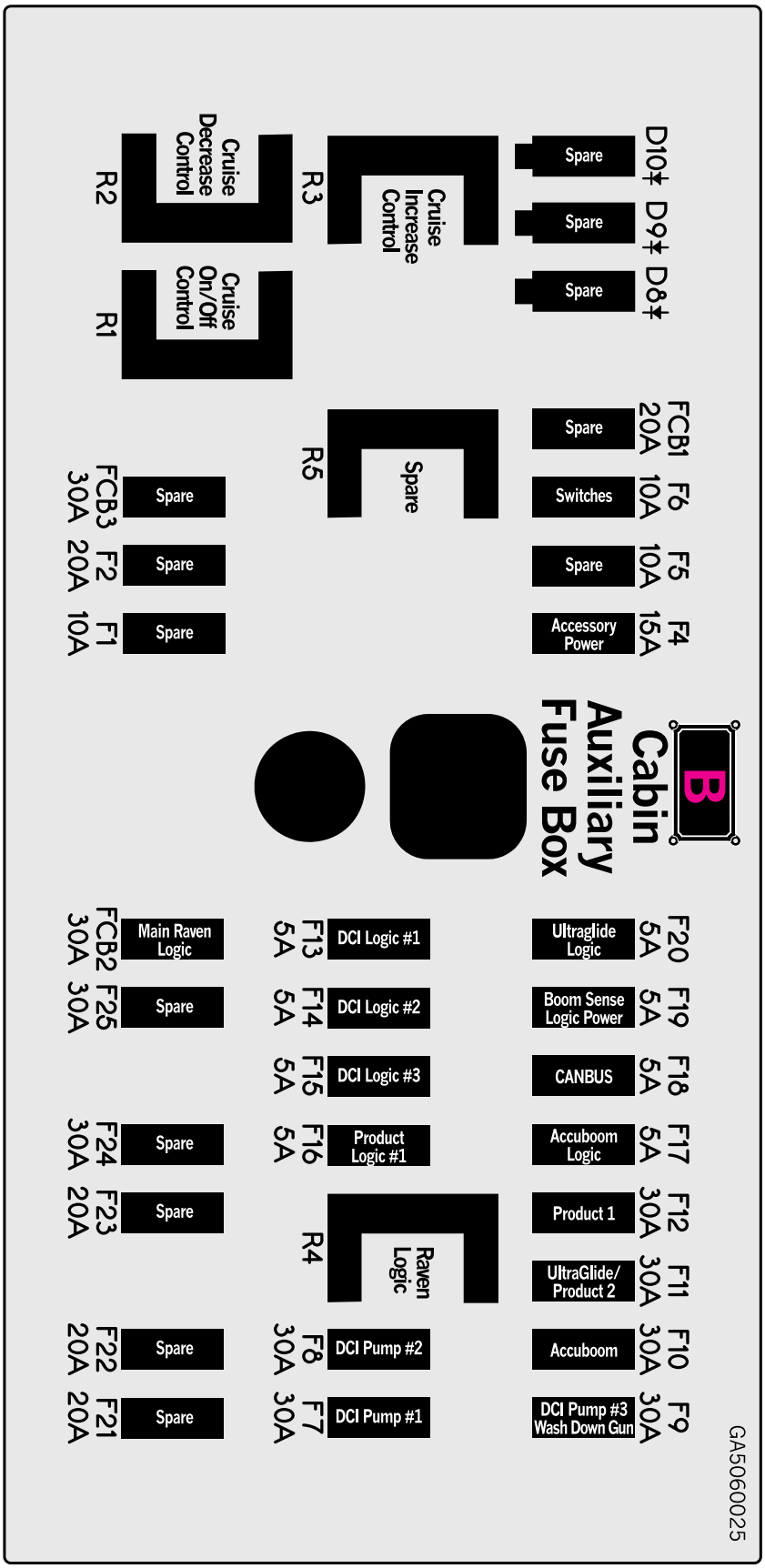


NOTE: Configuration of the main fuse box will depend on options selected.

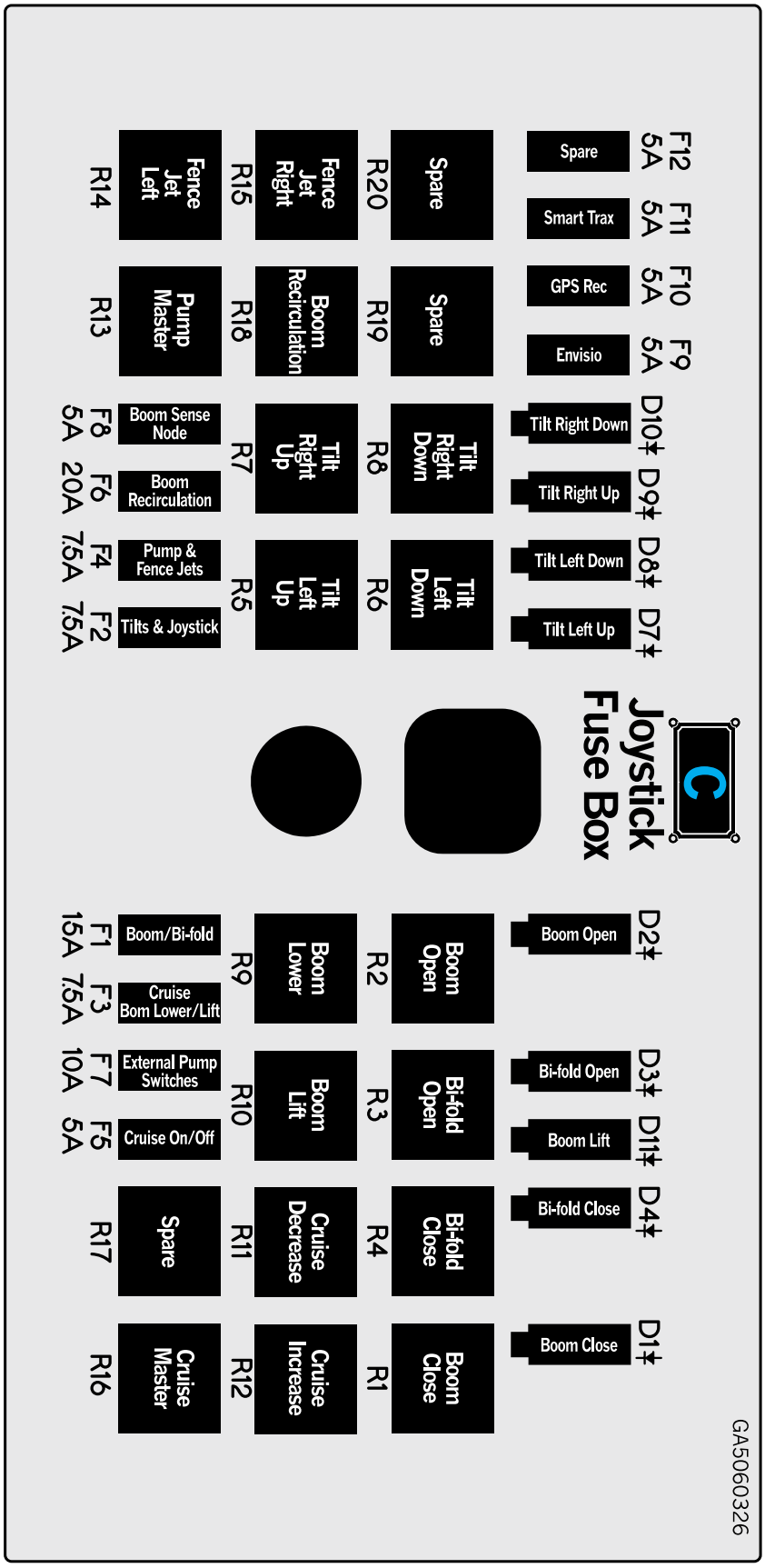
Power Distribution Box - Cabin Main



Power Distribution Box - Cabin Auxiliary



Power Distribution Box - Joystick



Autosteer System - Connectors

Inside the power distribution box are electrical connectors that have been provided for the connection of optional Autosteer equipment.

GPS REMOTE SWITCH MOMENTARY +12V

For the connection of the G-Motion GPS momentary switch from the joystick mounted on the side dash. When this single pin connector is connected to the ISOBUS based cabin harness it will be able to communicate directly with the John Deere Autosteer node. To make use of this button circuit for Trimble based Autosteer systems, it should be connected independently on the cabin harness and directly to the Trimble harness instead.

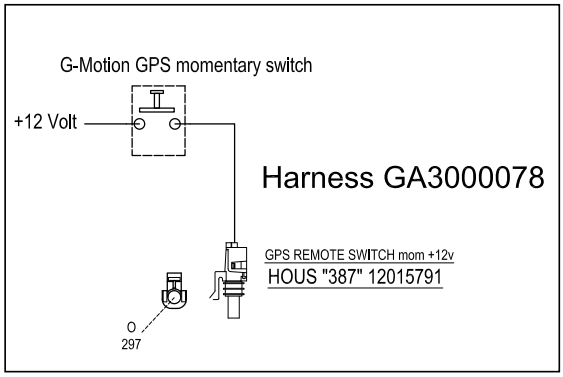
GPS REMOTE SWITCH

For the connection to an auto steer system. The cable has a 3 pin male weather pack plug for the customer to connect their Auto steer system. The switch is labelled Road mode/spray mode and is located on the side dash. When this 3 pin connector is connected to the ISOBUS based cabin harness it will be able to communicate directly with the John Deere Autosteer node. To make use of this button circuit for Trimble based Autosteer systems, it should be connected independently on the cabin harness and directly to the Trimble harness instead.

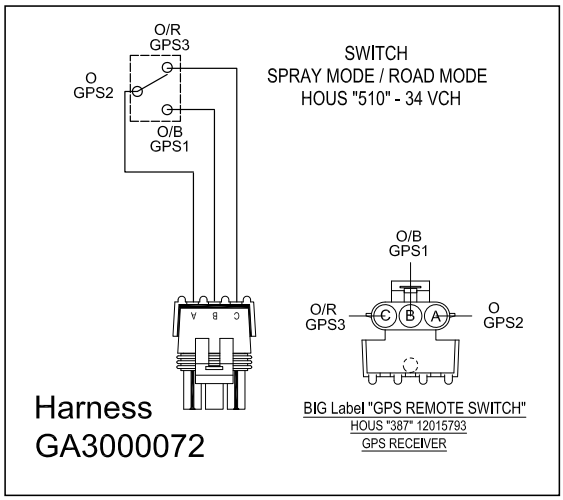
SEAT SAFETY SWITCH

The seat safety switch or operator presence switch causes the Autosteer system to turn off when the operator leaves their seat as a safety measure.

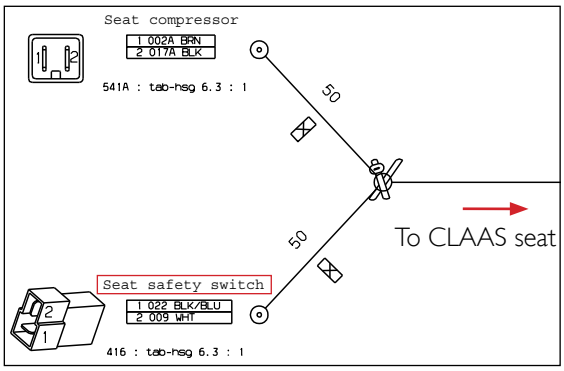
The harness part numbered GA3000147 incorporates a connector for the seat safety switch. This connector is able to communicate directly with the John Deere Autosteer node. This connector (male) on harness GA3000147 will be joined to the CLAAS cabin seat harness safety switch connector (female) when John Deere Autosteer is fitted. The seat safety switch can be optionally connected for Trimble based Autosteer systems. To do so, the seat connector should be joined direclty to the Trimble harness and independently of harness GA3000147. This way the trimble node will be able to receive the signal from the seat safety switch.



Above: GPS resume - remote switch momentary +12V circuit.



Above: GPS master - remote switch circuit.



Above: Safety switch harness from back of CLAAS seat.

Continued over page

Autosteer System - Connectors

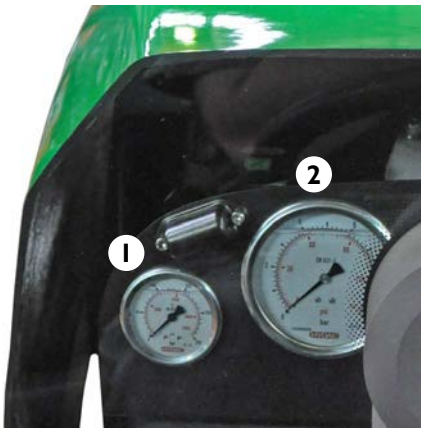
GPS RECEIVER CONNECTION POINTS

Inside the cabin roof on the left hand side, is one 12 pin connector and 2 coaxial connection points provided for roof mounted GPS recievers and antennas.



Above: GPS receiver connection points inside the cabin roof on the left hand side.

Pressure Gauges





NO.	FEATURE
1.	Bi-fold hydraulic pressure - Left Side (If optioned)
2.	Not used
3.	Standard product line pressure (Single line)
4.	Bi-fold hydraulic pressure - Right side (If optioned)

NOTE: Some gauges may not be present depending on options fitted.

CANtrak System



Understanding GEM

Generic Engine Monitor (GEM) software runs on a CANtrak display with five soft keys, providing a flexible and intuitive Human-Machine Interface (HMI). The 5 soft keys access a graphical menu structure that uses standard and easily-understood icons to indicate the key's current function. This enables the operator to select the required engine and transmission data and display it in the following formats:

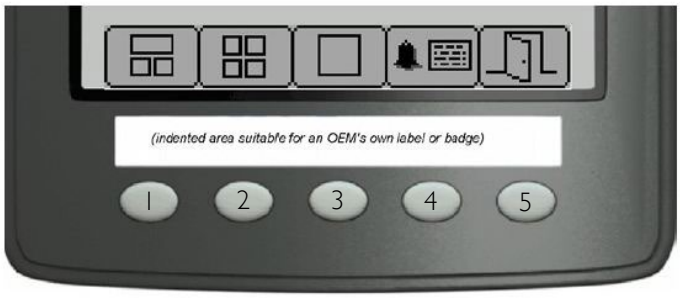
- Analogue gauges
- Digital values
- Multi-gauge/data (a combination of above)
- Historical trend graphs
- Current or stored alarm messages

Additionally, various diagnostic screens are available, allowing detailed investigation of the engine and transmission data stream. By accessing the Configuration menu, users can customise some of the displayed data to show, for example, metric or imperial units, and various parameters such as the full-scale reading of gauges.

Pressing any of the first 4 keys (GEM keys are numbered 1 to 5, from left to right) brings up the top level 'button bar' (navigation menu).

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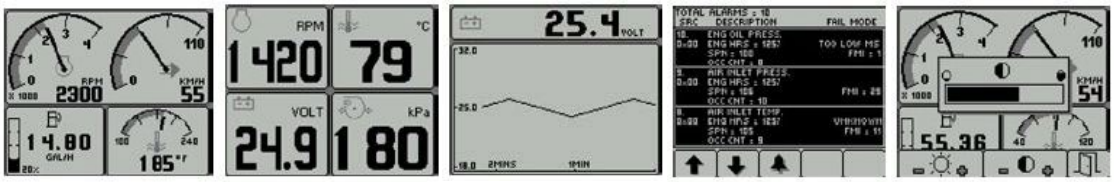
CANtrak System



GEM presents a context dependent 'button bar' above the push buttons if any key from 1 to 4 is pressed - it disappears after 5 seconds of inactivity. This 'top level' button bar shows the basic structure of GEM:

NO.	FEATURE	FUNCTION
1.	Tri Display, or Main Engine Display	Repeat presses cycle the fuel computer through various modes.
2.	Quad Display	(User configurable). Repeat presses cycle the display around 3 different quad view options..
3.	Uni Display	Showing data history (configurable). Repeat presses cycle display through available parameters.
4.	Active alarm display	Holding the button brings up stored alarms..
5.	Contrast and Lighting Adjustment	Or - if held for 3 seconds - the configuration menu..

Left to right: Key 1-5, examples of screen images after keys are pushed.



Getting Started

When power is applied to the display, a start-up screen displays for approximately 7 seconds while the unit performs a self test . If the unit makes a long 'beeping' sound, self-test has failed. Users can attempt to rectify the fault by restoring factory defaults (see Configuration section); if the fault persists, contact your supplier for guidance.

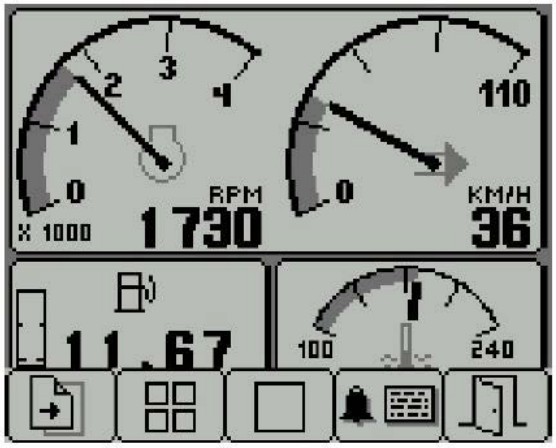
The 'Splash Screen' is displayed on boot up.

After the start up screen disappears, GEM starts displaying readings on its virtual gauges if it is connected to an active source of data. GEM displays the 'main engine display' or tri-screen on initial start up, but note that after use this changes to the screen that was last displayed (see Preferred Screen Store section for details). GEM display modes are detailed in the following sections.

GEM Soft Keys

GEM's soft keys simplify the operator interface. In use, GEM displays a 'button bar' directly above the soft keys when any of the first 4 keys (keys 1 to 4, starting from the left) are pressed - with icons representing the current function of each key. The picture at the top of the page shows the main button bar, with icons 1 to 4 representing the gauges and alarms available, and icon 5 an 'exit door'. Repeat presses of these buttons toggles around the display options available. The button bar will disappear after approximately 5 seconds if no further keys are pressed.

Continued over page



Key 1: Pages icon indicating that further presses cycle through options for the screen being viewed (in this instance fuel computer modes for the main engine display)

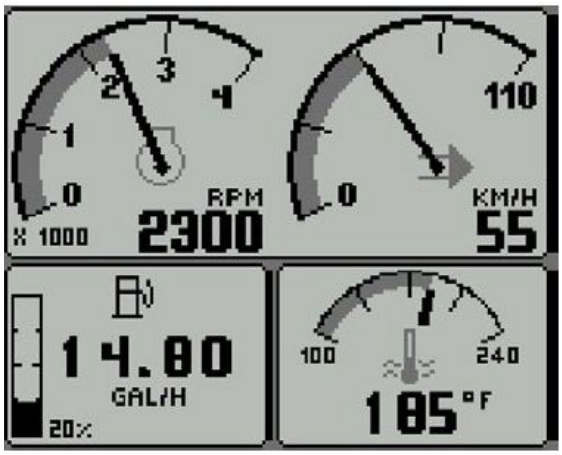
Key 2: Quad display mode

Key 3: Uni display mode

Key 4: Alarm display mode

Key 5: Exit door

The Tri Display or Main Engine Display - Key 1



Tri-display or main engine display, accessed via key 1.
NOTE: Metric units are shown by default but others may be selected via the configuration menu.

This GEM display mode provides three independent windows, and is intended to show the most frequently-accessed vehicle data (RPM, speed, temperature and fuel).

To select Tri Display, press any of the first 4 keys to show the top-level button bar, and then key 1 (the left-hand key). The parameters displayed on this page cannot be changed, apart from the fuel computer window which is explained below. However, attributes such as units and scales may be changed - see the Configuration menu section for details (note that user-defined views of vehicle data are available in the next GEM mode: Quad Display).

Tri Display - Fuel Computer Modes



Left: An example of a fuel computer mode

- Instantaneous Fuel Rate: (volume/hour)
- Average Trip Fuel Rate: If Total Fuel and Engine Hours are available it is calculated since last trip fuel/hours reset using: trip fuel/trip hours [volume/hour]
- Average Distance Per Volume: If Vehicle Speed or Vehicle Distance and the Total Fuel is available then it is calculated since last trip fuel/distance reset using: distance/volume
- Total Engine Hours: If Total Engine Hours is available
- Trip Engine Hours: Since last trip hours reset
- Trip Fuel: Since last trip fuel reset
- Total Distance: If Total Distance is available
- Trip Distance: If Total Distance is available then it is calculated since last trip distance reset. If Total Distance is not available, but Trip Distance is, then this is displayed.
- Fuel Remaining: If Tank Capacity is entered, Tank Full is reset, and Total Fuel Used is available, then Fuel Remaining is calculated using: Tank Capacity – (Total Fuel Used – Trip Fuel). Evaluation assumes Engine Fuel Used is cumulative and not zeroed on power up.

Continued over page

Distance Remaining: If the data required for Fuel Remaining and Average Distance Per Volume is available, it is calculated using: Average Distance Per Volume x Fuel Remaining

NOTE: Reset - which affects all resettable fuel computer parameters - is performed by allowing the button bar to disappear and pressing and holding key 1 for at least 3 seconds. If the button bar is visible then the display will move to the next parameter before the Reset. Setting Fuel Tank Reset and Total Fuel Tank Data is performed via the Configuration menu.

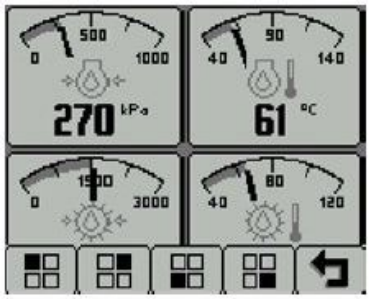
The Quad Display - Key 2

Quad display mode provides 4 gauges. To select it, press any of the keys 1 to 4 to show the top-level button bar and then key 2. Repeat presses of key 2 cycle the display around 3 separate quad screens: as a default these screens show 4 digital gauges (RPM, temperature, battery voltage, oil pressure), 4 analogue gauges (same as digital), and 4 alternative analogue gauges. All 12 gauges may be selected and configured by users, providing a simple means of creating application-specific views of engine data. Gauges are selected via quad display's 'adjust mode', by pressing key 5 (noted by an arrow icon) when GEM is running quad display and the button bar is visible. In adjust mode, corresponding key presses cycle the display through available parameters. The selected configuration is stored even when power is removed; adjust mode is exited by pressing key 5.





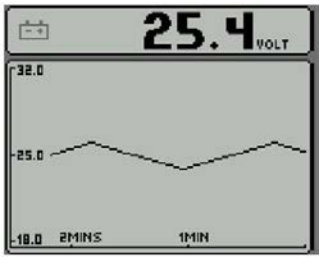
Above: Three default display setups available in quad-display mode.



Above: Adjust mode; allows users to select the individual gauge types displayed.

The Uni Display - Key 3

GEM's Uni display mode plots data history in one large window - in an X-Y graph format similar to a pen plotter. This mode is selected by pressing any of the first 4 keys to show the top-level button bar and then key 3. Data is shown in graph form, with the most recent data scrolling from right to left. The viewed time range may be adjusted in the Configuration menu from 2 minutes to 8 hours in six steps. Maximum and minimum values of the Y axis (the reading span) are adjusted automatically to give an optimum view of data. The parameter displayed is selectable by repeatedly pressing key 3 while in the graph display mode. The parameters that may be displayed are listed in the next section.



Above: Example graph display plotting battery voltage.

CANtrak System - Parameters Monitored

Engine & Transmission Parameters Monitored

This table lists the engine and transmission parameters that can be displayed by GEM and which may be shown in user-configurable Quad Display and Uni Display modes (a tick indicates the parameter may be selected). DB is an abbreviation for GEM's internal database, which stores all data transmitted from the engine/transmission. It can be accessed via the Configuration menu. (Note that this list is current at the time of going to press, new parameters are continually being added - the latest list may be found in the latest GEM data sheet available at <http://www.cantrak-int.com>).

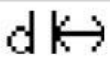
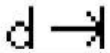
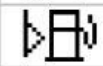
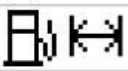
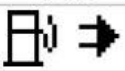
Abbreviations: The units 'MPG' and 'Gal' denote US gallons. For non-US Imperial gallons (UK, Canada, etc) units, these units are denoted as IMPG or IGal. N = nautical. KTS = Knots.

NOTE: If a parameter is not available, it will not be possible to select it. If the parameter becomes unavailable while in view, '- - -' is displayed.

Icon	Parameter	Tri	Quad	Uni	DB
	MISCELLANEOUS				
None	Torque converter lock-up				√
F N R	Current gear		√		√
F N R	Selected gear		√		√
	Accelerator position (%)		√		√
None	Transmission output shaft speed (RPM)				√
None	Transmission input shaft speed (RPM)				√
	Engine speed (RPM)	√	√	√	√
	Engine torque (%)		√		√
	Engine oil level (%)		√		√
	Coolant level (%)		√		√
	Fan speed (%)		√		√
	Vehicle speed (km/h, MPH or KTS)	√			√
	Engine hours (h)	√			√
	Trip engine hours (h)	√			√

Continued over page

CANtrak System - Parameters Monitored

Icon	Parameter	Tri	Quad	Uni	DB
	FUEL & DISTANCE				
	Trip distance (km, Miles, NMiles)	√			√
	Distance remaining (km, Miles, NMiles)	√			√
	Total distance (km, Miles, NMiles)	√			√
	Fuel rate (L/h, Gal/h or IGal/h)	√		√	√
	Average trip fuel rate (L/h, Gal/h or IGal/h)	√			√
	Fuel level (%)	√			√
	Fuel remaining (L, Gal or IGal)	√			√
	Trip fuel (L, Gal, IGal)	√			√
None	Total fuel used (L, Gal, IGal)				√
	Instantaneous fuel economy (Km/L, MPG or IMPG)	√			√
	Average fuel economy (Km/L, MPG or IMPG)	√			√

Icon	Parameter	Tri	Quad	Uni	DB
	PRESSURE (can be kPa, PSI or bar)				
	Fuel pressure		√	√	√
	Barometric pressure		√		√
	Auxiliary pressure		√		√
	Turbo pressure		√	√	√
	Air inlet pressure		√	√	√
	Air filter differential pressure		√		√
None	Injector metering rail 1 pressure				√
None	Injector metering rail 2 pressure				√
	Coolant pressure		√	√	√
	Engine oil pressure	√	√	√	√
	Transmission oil pressure		√	√	√

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CANtrak System - Parameters Monitored

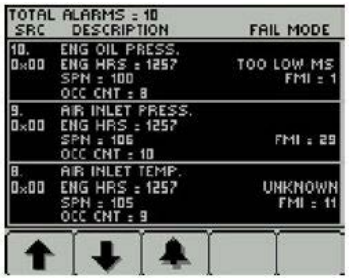
Icon	Parameter	Tri	Quad	Uni	DB
	ELECTRICAL				
	Internal voltage (V)		√	√	√
	Battery voltage (V)		√	√	√
	Battery current (A)		√		√
	Alternator current (A)		√		√
	TEMPERATURE (can be °C or °F)				
	Coolant temperature	√	√	√	√
	Engine intercooler temperature		√		√
	Engine oil temperature		√	√	√
	Transmission oil temperature		√	√	√
	Turbo oil temperature		√		√
	Fuel temperature		√		√
	Inlet manifold temperature		√	√	√
	Air inlet temperature		√		√
	Exhaust temperature		√	√	√
	Auxiliary temperature		√		√

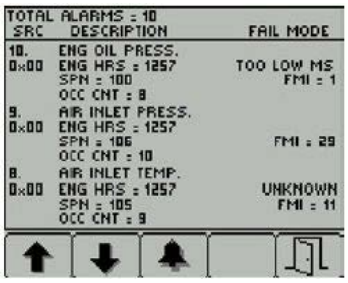
CANtrak System - Alarms

Active & Stored Alarm Lists

Active alarms. When an active/current alarm is received, a flashing pop-up window appears overlaid on the current screen in use, showing details of the current alarm. If the alarm is 'red/stop' category (this is J1939 terminology for a serious problem, e.g. low oil pressure), GEM activates its internal sounder (beeping noise), and the External Alarm Output or Pin 11 (if available on the CANtrak you have chosen).





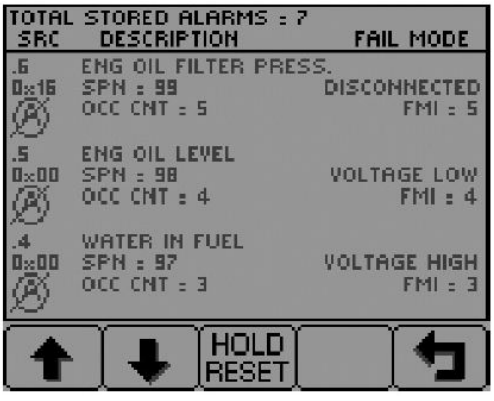


Above: Example alarm message plus alarm list screens showing unacknowledged conditions (black background) and acknowledged alarms (grey background). After acknowledgement the return key becomes active ('exit door' icon). J1939 - standard abbreviations are used wherever possible.

NOTE: 'MS' = Most Severe, "MOD"= Moderately Severe and "LS" = Least Severe.

The alarm list is accessed by pressing any key while an alarm pop-up is displayed, or by pressing any of the first 4 keys to show the button bar, and then key 4. This screen displays all current active alarms; when entered, Pin 11 External Alarm Output is deactivated (if the function is available). Alarms not yet acknowledged are shown in grey on black. Alarms already acknowledged are shown in black on grey. If engine Hours data is available, the list indicates when the alarm was initiated. When first entering the screen, the list automatically displays the most recent alarm. The list can be scrolled using keys 1 and 2. This screen cannot be exited until all alarms have been acknowledged by pressing key 3. Alarm messages are automatically cleared from the list when no longer received by GEM.

Stored alarms. Alarms stored by engine/transmission ECU's (i.e. not active or current but old/historical alarms) may be viewed by pressing and holding key 4 while the active alarm list screen is visible. On entry to this page, GEM sends a data request to the engine/transmission. The engine/transmission sends the stored alarm data to GEM, which is decoded and displayed in a similar fashion to active alarms. GEM displays an error message if there is no response from the engine/transmission. If the engine/transmission supports the erasure of stored alarms, they may now be erased by holding key 3.



Above: Example of stored alarms list.

CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
111	629	12	Red	Controller #1	Engine Control Module Critical internal failure - Bad intelligent Device or Component
115	612	2	Red	System Diagnostic Code # 2	Engine Speed/Position Sensor Circuit lost both of two signals from the magnetic pickup sensor - Data Erratic, Intermittent, or incorrect
122	102	3	Amber	Boost Pressure	Intake Manifold Pressure Sensor Circuit – Voltage Above Normal, or Shorted to High Source
123	102	4	Amber	Boost Pressure	Intake Manifold Pressure Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
124	102	16	Amber	Boost Pressure	Intake Manifold 1 Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level
131	91	3	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source
132	91	4	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
133	974	3	Red	Remote Accelerator	Remote Accelerator Pedal or Lever Position Sensor Circuit – Voltage Above Normal, or Shorted to High Source
134	974	4	Red	Remote Accelerator	Remote Accelerator Pedal or Lever Position Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
135	100	3	Amber	Engine Oil Pressure	Oil Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
141	100	4	Amber	Engine Oil Pressure	Oil Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
143	100	18	Amber	Engine Oil Pressure	Oil Pressure Low – Data Valid but Below Normal Operational Range - Moderately Severe Level
144	110	3	Amber	Engine Coolant Temperature	Coolant Temperature Sensor Circuit – Voltage Above Normal, or Shorted to High Source
145	110	4	Amber	Engine Coolant Temperature	Coolant Temperature Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
146	110	16	Amber	Engine Coolant Temperature	Coolant Temperature High - Data Valid but Above Normal Operational Range - Moderately Severe Level
147	91	1	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit – Abnormal Frequency, Pulse Width, or Period
148	91	0	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor Circuit – Abnormal Frequency, Pulse Width, or Period
151	110	0	Red	Engine Coolant Temperature	Coolant Temperature Low - Data Valid but Above Normal Operational Range - Most Severe Level
153	105	3	Amber	Intake Manifold #1 Temp	Intake Manifold Air Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
154	105	4	Amber	Intake Manifold #1 Temp	Intake Manifold Air Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
155	105	0	Red	Intake Manifold #1 Temp	Intake Manifold Air Temperature High – Data Valid but Above Normal Operational Range - Most Severe Level
187	3510	4	Amber	5 Volts DC Supply	Sensor Supply Voltage #2 Circuit – Voltage Below Normal, or Shorted to Low Source

Continued over page

CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
193	520199	3	Amber	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage Above Normal, or Shorted to High Source
194	520199	4	Amber	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage Below Normal, or Shorted to Low Source
195	111	3	Amber	Coolant Level	Coolant Level Sensor Circuit - Voltage Above Normal, or Shorted to High Source
196	111	4	Amber	Coolant Level	Coolant Level Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
197	111	18	Amber	Coolant Level	Coolant Level - Data Valid but Below Normal Operational Range - Moderately Severe Level
199	1661	4	Amber	Engine Automatic Start Lamp	Engine Automatic Start Lamp Driver Circuit - Voltage Above Normal, or Shorted to High Source
211	1484	31	None	J1939 Error	Additional Auxiliary Diagnostic Codes logged - Condition Exists
212	175	3	Amber	Oil Temperature	Engine Oil Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source
213	175	4	Amber	Oil Temperature	Engine Oil Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source
214	175	0	Red	Oil Temperature	Engine Oil Temperature - Data Valid but Above Normal Operational Range - Most Severe Level
221	108	3	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit – Voltage Above Normal, or Shorted to High Source
222	108	4	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
227	3510	3	Amber	5 Volts DC Supply	Sensor Supply Voltage #2 Circuit – Voltage Above Normal, or Shorted to High Source
231	109	3	Amber	Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
232	109	4	Amber	Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
233	109	18	Amber	Coolant Pressure	Coolant Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level
234	190	0	Red	Engine Speed	Engine Speed High - Data Valid but Above Normal Operational Range - Most Severe Level
235	111	1	Red	Coolant Level	Coolant Level Low - Data Valid but Below Normal Operational Range - Most Severe Level
237	644	2	Amber	External Speed Input	External Speed Input (Multiple Unit Synchronization) - Data Erratic, Intermittent, or Incorrect
238	3511	4	Amber	System Diagnostic code # 1	Sensor Supply Voltage #3 Circuit – Voltage Below Normal, or Shorted to Low Source
239	3511	3	Amber	System Diagnostic code #2	Sensor Supply Voltage #3 Circuit - Voltage Above Normal, or Shorted to High Source
241	84	2	Amber	Wheel-based Vehicle Speed	Vehicle Speed Sensor Circuit - Data Erratic, Intermittent, or Incorrect
242	84	10	Amber	Wheel-based Vehicle Speed	Vehicle Speed Sensor Circuit tampering has been detected – Abnormal Rate of Change
244	623	4	Amber	Red Stop Lamp	Red Stop Lamp Driver Circuit - Voltage Below Normal, or Shorted to Low Source
245	647	4	Amber	Fan Clutch Output Device Driver	Fan Control Circuit - Voltage Below Normal, or Shorted to Low Source
249	171	3	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
256	171	4	Amber	Ambient Air Temperature	Ambient Air Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
261	174	16	Amber	Fuel Temperature	Engine Fuel Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level

Continued over page

CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
263	174	3	Amber	Fuel Temperature	Engine Fuel Temperature Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source
265	174	4	Amber	Fuel Temperature	Engine Fuel Temperature Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source
268	94	2	Amber	Fuel Delivery Pressure	Fuel Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
271	1347	4	Amber	Fuel Pump Pressurizing Assembly #1	High Fuel Pressure Solenoid Valve Circuit – Voltage Below Normal, or Shorted to Low Source
272	1347	3	Amber	Fuel Pump Pressurizing Assembly #1	High Fuel Pressure Solenoid Valve Circuit – Voltage Above Normal, or Shorted to High Source
281	1347	7	Amber	Fuel Pump Pressurizing Assembly #1	High Fuel Pressure Solenoid Valve #1 – Mechanical System Not Responding Properly or Out of Adjustment
284	1043	4	Amber	Internal Sensor Voltage Supply	Engine Speed/Position Sensor (Crankshaft) Supply Voltage Circuit - Voltage Below Normal, or Shorted to Low Source
285	639	9	Amber	SAE J1939 Datalink	SAE J1939 Multiplexing PGN Timeout Error - Abnormal Update Rate
286	639	13	Amber	SAE J1939 Datalink	SAE J1939 Multiplexing Configuration Error – Out of Calibration
287	91	19	Red	Accelerator Pedal Position	SAE J1939 Multiplexing Accelerator Pedal or Lever Sensor System Error - Received Network Data In Error
288	974	19	Red	Remote Accelerator	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Data Error - Received Network Data In Error
292	441	14	Red	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 - Special Instructions
293	441	3	Amber	OEM Temperature	Auxiliary Temperature Sensor Input # 1 Circuit - Voltage Above Normal, or Shorted to High Source
294	441	4	Amber	OEM Temperature	Auxiliary Temperature Sensor Input # 1 Circuit - Voltage Below Normal, or Shorted to Low Source
295	108	2	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
296	1388	14	Red	Auxiliary Pressure	Auxiliary Pressure Sensor Input 1 - Special Instructions
297	1388	3	Amber	Auxiliary Pressure	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Above Normal, or Shorted to High Source
298	1388	4	Amber	Auxiliary Pressure	Auxiliary Pressure Sensor Input # 2 Circuit - Voltage Below Normal, or Shorted to Low Source
319	251	2	Maint	Real Time Clock Power	Real Time Clock Power Interrupt - Data Erratic, Intermittent, or Incorrect
322	651	5	Amber	Injector Cylinder #01	Injector Solenoid Cylinder #1 Circuit – Current Below Normal, or Open Circuit
323	655	5	Amber	Injector Cylinder #05	Injector Solenoid Cylinder #5 Circuit – Current Below Normal, or Open Circuit
324	653	5	Amber	Injector Cylinder #03	Injector Solenoid Cylinder #3 Circuit – Current Below Normal, or Open Circuit
325	656	5	Amber	Injector Cylinder #06	Injector Solenoid Cylinder #6 Circuit – Current Below Normal, or Open Circuit
331	652	5	Amber	Injector Cylinder #02	Injector Solenoid Cylinder #2 Circuit – Current Below Normal, or Open Circuit
332	654	5	Amber	Injector Cylinder #04	Injector Solenoid Cylinder #4 Circuit – Current Below Normal, or Open Circuit
334	110	2	Amber	Engine Coolant Temperature	Coolant Temperature Sensor Circuit – Data Erratic, Intermittent, or Incorrect

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CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
338	1267	3	Amber	Vehicle Accessories Relay Driver	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Above Normal, or Shorted to High Source
339	1267	4	Amber	Vehicle Accessories Relay Driver	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage Below Normal, or Shorted to Low Source
341	630	2	Amber	Calibration Memory	Engine Control Module data lost - Data Erratic, Intermittent, or Incorrect
342	630	13	Red	Calibration Memory	Electronic Calibration Code Incompatibility - Out of Calibration
343	629	12	Amber	Controller #1	Engine Control Module Warning internal hardware failure - Bad Intelligent Device or Component
349	191	16	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid but Above Normal Operational Range - Moderately Severe Level
351	627	12	Amber	Controller #1	Injector Power Supply - Bad Intelligent Device or Component
352	3509	4	Amber	5 Volts DC Supply	Sensor Supply Voltage #1 Circuit – Voltage Below Normal, or Shorted to Low Source
386	3509	3	Amber	5 Volts DC Supply	Sensor Supply Voltage #1 Circuit – Voltage Above Normal, or Shorted to High Source
415	100	1	Red	Engine Oil Pressure	Oil Pressure Low – Data Valid but Below Normal Operational Range - Most Severe Level
418	97	15	Maint.	Water in Fuel Indicator	Water in Fuel Indicator High - Data Valid but Above Normal Operational Range – Least Severe Level
422	111	2	Amber	Coolant Level	Coolant Level - Data Erratic, Intermittent, or Incorrect
425	175	2	Amber	Oil Temperature	Engine Oil Temperature - Data Erratic, Intermittent, or Incorrect
428	97	3	Amber	Water in Fuel Indicator	Water in Fuel Sensor Circuit - Voltage Above Normal, or Shorted to High Source
429	97	4	Amber	Water in Fuel Indicator	Water in Fuel Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
431	558	2	Amber	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Circuit - Data Erratic, Intermittent, or Incorrect
432	558	13	Red	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Circuit - Out of Calibration
435	100	2	Amber	Engine Oil Pressure	Oil Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect
441	168	18	Amber	Electrical Potential (Voltage)	Battery #1 Voltage Low - Data Valid but Below Normal Operational Range – Moderately Severe Level
442	168	16	Amber	Electrical Potential (Voltage)	Battery #1 Voltage High - Data Valid but Above Normal Operational Range – Moderately Severe Level
449	157	0	Red	Injector Metering Rail 1 Pressure	Fuel Pressure High - Data Valid but Above Normal Operational Range – Moderately Severe Level
451	157	3	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
452	157	4	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
488	105	16	Amber	Intake Manifold	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
489	191	18	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid but Below Normal Operational Range - Moderately Severe Level

Continued over page

CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
497	1377	2	Amber	Switch Circuit	Multiple Unit Synchronization Switch Circuit - Data Erratic, Intermittent, or Incorrect
523	611	2	Amber	System Diagnostic code # 1	OEM Intermediate (PTO) Speed switch Validation - Data Erratic, Intermittent, or Incorrect
527	702	3	Amber	Circuit - Voltage	Auxiliary Input/Output 2 Circuit - Voltage Above Normal, or Shorted to High Source
528	93	2	Amber	Switch - Data	Auxiliary Alternate Torque Validation Switch - Data Erratic, Intermittent, or Incorrect
529	703	3	Amber	Circuit - Voltage	Auxiliary Input/Output 3 Circuit - Voltage Above Normal, or Shorted to High Source
546	94	3	Amber	Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
547	94	4	Amber	Fuel Delivery Pressure	Fuel Delivery Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
551	558	4	Amber	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Circuit - Voltage Below Normal, or Shorted to Low Source
553	157	16	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure High – Data Valid but Above Normal Operational Range - Moderately Severe Level
554	157	2	Amber	Injector Metering Rail 1 Pressure	Fuel Pressure Sensor Error - Data Erratic, Intermittent, or Incorrect
559	157	18	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail #1 Pressure Low – Data Valid but Below Normal Operational Range - Moderately Severe Level
584	677	3	Amber	Starter Solenoid Lockout Relay Driver Circuit	Starter Relay Circuit - Voltage Above Normal, or Shorted to High Source
585	677	4	Amber	Starter Solenoid Lockout Relay Driver Circuit	Starter Relay Circuit - Voltage Below Normal, or Shorted to Low Source
595	103	16	Amber	Turbocharger 1 Speed	Turbocharger #1 Speed High - Data Valid but Above Normal Operational Range – Moderately Severe Level
596	167	16	Amber	Alternate Potential (voltage)	Electrical Charging System Voltage High – Data Valid but Above Normal Operational Range - Moderately Severe Level
597	167	18	Amber	Alternate Potential (voltage)	Electrical Charging System Voltage Low – Data Valid but Below Normal Operational Range - Moderately Severe Level
598	167	1	Red	Alternate Potential (voltage)	Electrical Charging System Voltage Low – Data Valid but Below Normal Operational Range - Most Severe Level
599	640	14	Red	Engine External Protection Input	Auxiliary Commanded Dual Output Shutdown - Special Instructions
649	1378	31	Maint	Engine Oil Change Interval	Change Lubricating Oil and Filter – Condition Exists
687	103	18	Amber	Turbocharger 1 Speed	Turbocharger #1 Speed Low - Data Valid but Below Normal Operational Range – Moderately Severe Level
689	190	2	Amber	Engine Speed	Primary Engine Speed Sensor Error – Data Erratic, Intermittent, or Incorrect
691	1172	3	Amber	Turbocharger #1Compressor Inlet Temperature	Turbocharger #1 Compressor Inlet Temperature Sensor Circuit – Voltage Above Normal, or Shorted to High Source
692	1172	4	Amber	Turbocharger #1Compressor Inlet Temperature	Turbocharger #1 Compressor Inlet Temperature Sensor Circuit – Voltage Below Normal, or Shorted to Low Source
697	1136	3	Amber	Sensor Circuit - Voltage	ECM Internal Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
698	1136	4	Amber	Sensor Circuit - Voltage	ECM Internal Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source

Continued over page

CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
719	22	3	Amber	Crankcase Pressure	Extended Crankcase Blow-by Pressure Circuit - Voltage Above Normal, or Shorted to High Source
729	22	4	Amber	Crankcase Pressure	Extended Crankcase Blow-by Pressure Circuit - Voltage Below Normal, or Shorted to Low Source
731	723	7	Amber	Engine Speed Sensor #2	Engine Speed/Position #2 mechanical misalignment between camshaft and crankshaft sensors - Mechanical System Not Responding Properly or Out of Adjustment
~~753~~	~~723~~	~~2~~	~~Amber~~	~~Engine Speed Sensor #2~~	~~Engine Speed/Position #2 Camshaft sync error - Data Erratic, Intermittent, or Incorrect~~
757	2802	31	Amber	Electronic Control Module	Electronic Control Module data lost - Condition Exists
778	723	2	Amber	Engine Speed Sensor #2	Engine Speed Sensor (Camshaft) Error – Data Erratic, Intermittent, or Incorrect
779	703	11	Amber	Auxiliary Equipment Sensor Input	Warning Auxiliary Equipment Sensor Input # 3 (OEM Switch) - Root Cause Not Known
951	166	2	None	Cylinder Power	Cylinder Power Imbalance Between Cylinders - Data Erratic, Intermittent, or Incorrect
1117	627	2	None	Power Supply	Power Lost With Ignition On - Data Erratic, Intermittent, or Incorrect
1139	651	7	Amber	Injector Cylinder # 01	Injector Cylinder #1 - Mechanical System Not Responding Properly or Out of Adjustment
1141	652	7	Amber	Injector Cylinder # 02	Injector Cylinder #2 - Mechanical System Not Responding Properly or Out of Adjustment
1142	653	7	Amber	Injector Cylinder # 03	Injector Cylinder #3 - Mechanical System Not Responding Properly or Out of Adjustment
1143	654	7	Amber	Injector Cylinder # 04	Injector Cylinder #4 - Mechanical System Not Responding Properly or Out of Adjustment
1144	655	7	Amber	Injector Cylinder # 05	Injector Cylinder #5 - Mechanical System Not Responding Properly or Out of Adjustment
1145	656	7	Amber	Injector Cylinder # 06	Injector Cylinder #6 - Mechanical System Not Responding Properly or Out of Adjustment
1239	2623	3	Amber	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Above Normal, or Shorted to High Source
1241	2623	4	Amber	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage Below Normal, or Shorted to Low Source
1242	91	2	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 1 and 2 - Data Erratic, Intermittent, or Incorrect
1256	1563	2	Amber	Control Module Identification Input State	Control Module Identification Input State Error - Data Erratic, Intermittent, or Incorrect
1257	1563	2	Red	Control Module Identification Input State	Control Module Identification Input State Error - Data Erratic, Intermittent, or Incorrect
1852	97	16	Amber	Water in Fuel Indicator	Water in Fuel Indicator - Data Valid but Above Normal Operational Range - Moderately Severe Level
1911	157	0	Amber	Injector Metering Rail	Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Most Severe Level
2111	52	3	Amber	Coolant Temperature	Coolant Temperature 2 Sensor Circuit - Voltage Above Normal, or Shorted to High Source
2112	52	4	Amber	Coolant Temperature	Coolant Temperature 2 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
2113	52	16	Amber	Coolant Temperature	Coolant Temperature 2 - Data Valid but Above Normal Operational Range - Moderately Severe Level
2114	52	0	Red	Coolant Temperature	Coolant Temperature 2 - Data Valid but Above Normal Operational Range - Most Severe Level

Continued over page

CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
2115	2981	3	Amber	Coolant Pressure	Coolant Pressure 2 Circuit - Voltage Above Normal, or Shorted to High Source
2116	2981	4	Amber	Coolant Pressure	Coolant Pressure 2 Circuit - Voltage Below Normal, or Shorted to Low Source
2117	2981	18	Amber	Coolant Pressure	Coolant Pressure 2 - Data Valid but Below Normal Operational Range - Moderately Severe Level
2182	1072	3	Amber	Engine Brake Output # 1	Engine Brake Actuator Driver 1 Circuit - Voltage Above Normal, or Shorted to High Source
2183	1072	4	Amber	Engine Brake Output # 1	Engine Brake Actuator Driver 1 Circuit - Voltage Below Normal, or Shorted to Low Source
2185	3512	3	Amber	System Diagnostic code # 1	Sensor Supply Voltage #4 Circuit – Voltage Above Normal, or Shorted to High Source
2186	3512	4	Amber	System Diagnostic code # 1	Sensor Supply Voltage #4 Circuit – Voltage Below Normal, or Shorted to Low Source
2195	703	14	Red	Auxiliary Equipment Sensor	Auxiliary Equipment Sensor Input 3 Engine Protection Critical - Special Instructions
2215	94	18	Amber	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level
2216	94	1	Amber	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Above Normal Operational Range – Moderately Severe Level
2217	630	31	Amber	Calibration Memory	ECM Program Memory (RAM) Corruption - Condition Exists
2249	157	1	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Most Severe Level
2261	94	15	Maint	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Above Normal Operational Range - Least Severe Level
2262	94	17	Maint	Fuel Delivery Pressure	Fuel Pump Delivery Pressure - Data Valid but Below Normal Operational Range - Least Severe Level
2263	1800	16	Amber	Battery Temperature	Battery Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level
2264	1800	18	Amber	Battery Temperature	Battery Temperature - Data Valid but Below Normal Operational Range - Moderately Severe Level
2265	1075	3	Amber	Electric Lift Pump for Engine Fuel	Fuel Priming Pump Control Signal Circuit – Voltage Above Normal, or Shorted to High Source
2266	1075	4	Amber	Electric Lift Pump for Engine Fuel	Fuel Priming Pump Control Signal Circuit – Voltage Below Normal, or Shorted to Low Source
2292	611	16	Amber	Fuel Inlet Meter Device	Fuel Inlet Meter Device - Data Valid but Above Normal Operational Range - Moderately Severe Level
2293	611	18	Amber	Fuel Inlet Meter Device	Fuel Inlet Meter Device flow demand lower than expected - Data Valid but Below Normal Operational Range - Moderately Severe Level
2311	633	31	Amber	Fuel Control Valve #1	Fueling Actuator #1 Circuit Error – Condition Exists
2321	190	2	None	Engine Speed	Engine Speed / Position Sensor #1 - Data Erratic, Intermittent, or Incorrect
2322	723	2	None	Engine Speed Sensor #2	Engine Speed / Position Sensor #2 - Data Erratic, Intermittent, or Incorrect
2345	103	10	Amber	Turbocharger 1 Speed	Turbocharger speed invalid rate of change detected - Abnormal Rate of Change
2346	2789	15	None	System Diagnostic Code #1	Turbocharger Turbine Inlet Temperature (Calculated) - Data Valid but Above Normal Operational Range – Least Severe Level

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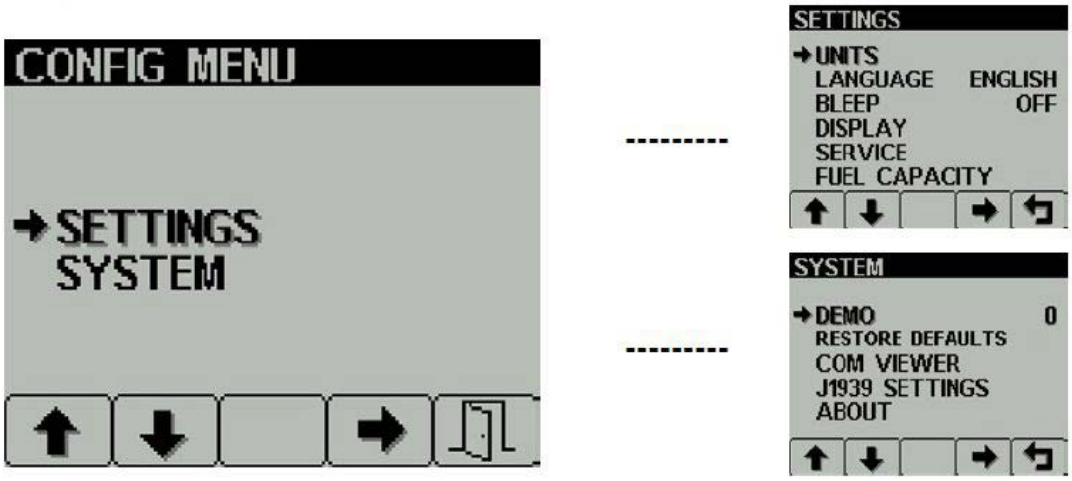
CANtrak System - Engine Fault Codes

Fault Code	J1939 SPN	J1939 FMI	Lamp Colour	J1939 SPN Description	Cummins Description
2347	2790	15	None	System Diagnostic Code #1	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid but Above Normal Operational Range – Least Severe Level
2363	1073	4	Amber	Engine Compression Brake Output # 2	Engine Brake Actuator Circuit #2 – Voltage Below Normal, or Shorted to Low Source
2365	1112	4	Amber	Engine Brake Output # 3	Engine Brake Actuator Driver Output 3 Circuit - Voltage Below Normal, or Shorted to Low Source
2367	1073	3	Amber	Engine Compression Brake Output # 2	Engine Brake Actuator Circuit #2 – Voltage Above Normal, or Shorted to High Source
2368	1112	3	Amber	Engine Brake Output # 3	Engine Brake Actuator Driver 3 Circuit - Voltage Above Normal, or Shorted to High Source
2372	95	16	Amber	Engine Fuel Filter Differential Pressure	Fuel Filter Differential Pressure - Data Valid but Above Normal Operational Range - Moderately Severe Level
2373	1209	3	Amber	Exhaust Gas Pressure	Exhaust Gas Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source
2374	1209	4	Amber	Exhaust Gas Pressure	Exhaust Gas Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
2375	412	3	Amber	Exhaust Gas Recirculation Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source
2376	412	4	Amber	Exhaust Gas Recirculation Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
2377	647	3	Amber	Fan Clutch Output Device Driver	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source
2425	730	4		Intake Air Heater # 2	Intake Air Heater 2 Circuit - Voltage Below Normal, or Shorted to Low Source
2426	730	3		Intake Air Heater # 2	Intake Air Heater 2 Circuit - Voltage Above Normal, or Shorted to High Source
2555	729	3	Amber	Inlet Air Heater Driver #1	Intake Air Heater #1 Circuit - Voltage Above Normal, or Shorted to High Source
2556	729	4	Amber	Inlet Air Heater Driver #1	Intake Air Heater #1 Circuit - Voltage Below Normal, or Shorted to Low Source
2557	697	3	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver #1 - Voltage Above Normal, or Shorted to High Source
2558	697	4	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver #1 - Voltage Below Normal, or Shorted to Low Source
2963	110	15	None	Engine Coolant Temperature	Engine Coolant Temperature High - Data Valid but Above Normal Operational Range - Least Severe Level
2973	102	2	Amber	Boost Pressure	Intake Manifold Pressure Sensor Circuit - Data Erratic, Intermittent, or Incorrect

CANtrak System - Configuration

Configuration Menu

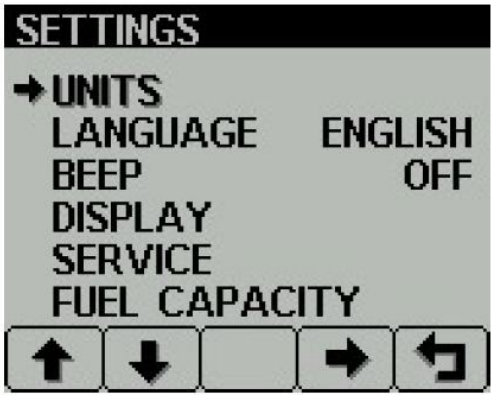
This mode allows users to set various GEM operating parameters such as imperial or metric units, scale limits for the speedometer, engine service interval, etc. The configuration menu is entered by pressing and holding key 5 ('Exit door' icon) for at least 3 seconds while GEM is in normal operating mode. The top-level configuration menu will be displayed as shown below. Use Keys 1 and 2 (up and down arrows) to point to either SETTINGS or SYSTEM sub-menus. Press key 4 to enter the selected sub-menu. User preferences are set in SETTINGS sub-menu. SYSTEM sub-menu accesses maintenance and low-level system configuration settings. These sub-menus are detailed below. Key 5 ('Exit door' icon) exits the current menu/sub menu. Settings are automatically stored on exit.



Above: The top-level Configuration menu showing two choices of SETTINGS and SYSTEM sub-menus. Pressing Key 4 enters the menu highlighted. Key 5 showing the 'exit door' icon returns you to the previous menu.

Settings Sub-Menu

The settings sub-menu allows the user to configure or view the following items:



UNITS: Speed, distance, pressure, volume, etc.

LANGUAGE: Choose from various language options

BEEP: Keys "beep" when pressed (toggles on or off); note that an audible beep still sounds if an alarm occurs

DISPLAY: Select ranges for max. RPM, max. speed, and graph X axis

SERVICE: Set service interval in hours, and reset interval counter

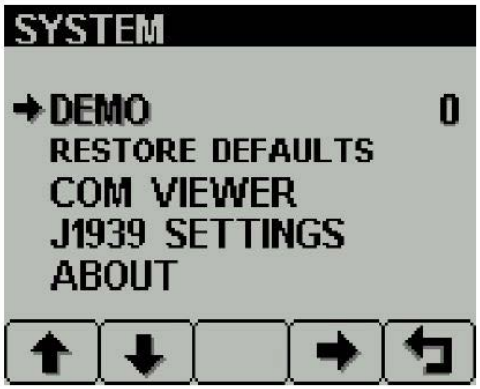
FUEL CAPACITY: Adjust tank capacity and reset tank level to full

Continued over page

CANtrak System - Configuration

System Sub-Menu

The system sub-menu allows the user to configure or view the following items:



DEMO: Switches between GEM's demonstration mode and the normal mode of displaying live engine/ transmission data. Demo allows GEM to operate without live data and provides 3 levels of simulated data: 1 = Speed On; 2 = Speed Off; 3 = Alarms On. Demo is automatically set to OFF if live data is received. DEMO mode can be selected, allowing you to evaluate GEM without connecting an engine/ transmission (it is accessed via the Configuration menu described above). If the unit is in DEMO mode and live data from the engine/ transmission becomes active, DEMO mode will automatically be switched off.

RESTORE DEFAULTS: Allows you to reset all configuration information to default metric or imperial values. The default settings are:

Setting	Metric	Imperial
Language	ENGLISH	
Max. RPM	4000	
Max. speed	110 KM/H	70 MPH
Graph range	2 minutes	
Speed	KM/H	MPH
Distance	KM	MILES
Pressure	kPa	PSI
Volume	L	Gallon (US)
Temperature	ºC	ºF

COM VIEWER: Displays last messages received on J1939 (CAN) and NMEA 0183 (GPS - derived speed over ground data) ports. You can also view GEM's database (DB) which stores all data transmitted from the engine/transmission.

NOTE: this is a diagnostic feature that may be helpful for OEMs/users diagnosing faults.

J1939 SETTINGS: J1939 configuration screen for engine and transmission source: 1 = engine 1 (port), 2 = engine 2 (Starboard); alarm filter (GLB (Global) = all alarm sources, SRC = selected engine/ transmission only); SPN version (4 is default but older engines will need to be set to 1, 2 or 3 as appropriate). Note. Consult your engine or vehicle supplier to establish which SPN version is appropriate if you have problems reading alarm data.

ABOUT: Displays the following product information:

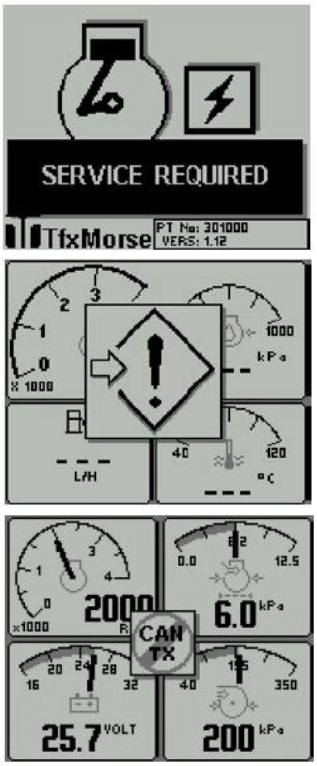
- ID NO: Unique number of the display
- EEPROM: Number of write cycles
- PART No: Software part number
- VERS: Software version number
- CHK: Flash memory checksum
- SOURCE: The source of received data
- LIB1: Low level system library version
- LIB2: Low-level graphical display interface library version (if used).

Continued over page

CANtrak System - Configuration

Pop Up Messages & Warnings

- Engine service warning. In the Configuration menu, users can set the engine service interval in hours. When GEM determines an engine service is due, it displays SERVICE REQUIRED on the splash screen that appears at power-up.
- Data communications failure. If GEM cannot detect engine/ transmission data broadcasts , a pop-up window with a data communications failure warning icon will appear and flash. Once engine/transmission data is detected the warning disappears and normal data display resumes.
- CAN TX disable. If CAN TX (transmission) is disabled, then the status will be displayed, with a pop-up window flashing with a period of approximately 1 second on, 10 seconds off. Note that this function is a requirement of the J1939 specification and is not normally of importance for GEM applications.
- Data not supported. If the required data parameter is not available, the gauge will display " - - - " near the units and parameter icon (see centre picture for example)



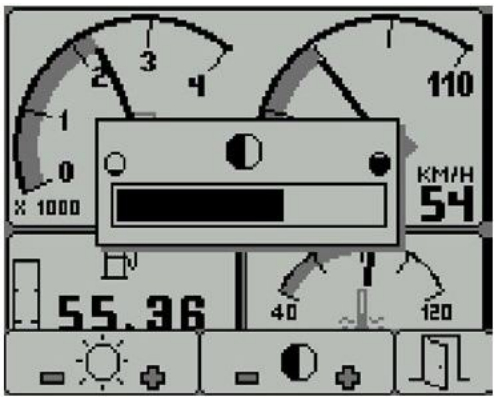
Above, top to bottom: Pop up warnings - Engine service required, a data communications failure and CANTX is disabled.

Setting LCD Lighting & Contrast

Pressing key 5 (the right-hand key) when the menu icons are not being displayed brings up the lighting and contrast menu. The LCD has a number of back-lighting levels that allow the display to be read in the dark. The appropriate level is selected by pressing keys 1 or 2 to decrease or increase illumination. Contrast is adjusted in the same manner, using keys 3 and 4 (Figure 12.1). Note that GEM monitors the temperature of the LCD and automatically adjusts display contrast as required, therefore it is not likely that a user will need to make a manual contrast adjustment unless extreme climate changes occur. The menu is exited by pressing key 5. The lighting and contrast settings are retained after the unit is switched off.

NOTE: resetting contrast. If the contrast has been adjusted poorly, you may restore the factory setting (a central value) by pressing keys 1 to 4 simultaneously. This action does not change other user-configured settings.

NOTE: The backlight can be set to Auto or ON.



Above: Contrast level adjustment on the lighting and adjust screen.

Continued over page

CANtrak System - Configuration

Preferred Screen Storage

GEM automatically stores the current screen as a user's preferred page, after a delay of approximately 15 seconds (if no buttons are pushed). On next power-up the display will start with the splash screen, and then go to the last stored screen.

NOTE: selecting Restore Defaults on the Systems sub-menu of Configuration will set the main engine screen as the default display.

Key Pad Lock

GEM's five keys can be locked, such that an operator cannot change any settings or access any other display mode - in a similar manner to the key lock functions on a mobile phone. This is achieved by pressing and holding keys 1 and 5 simultaneously for four seconds. Repeating this operation resets GEM/ CANtrak back to normal operation.

Maintenance & Troubleshooting

No regular maintenance is required, except for cleaning the GEM lens as required using a soft, damp cloth. Do not use abrasive materials or solvents. Should any further attention be necessary, please contact your supplier.

GEM Diagnostics

Problem	Possible solution
Unit does not power up	Ensure connections to unit are correct. Ensure power source is present.
Display is blank or black	Adjust/ reset lighting and contrast settings. Ensure temperature is within operating range of the unit.
Unit fails self-test	Perform Restore Factory Defaults procedure.
Unit fails to display any data	Ensure connections to unit are correct. Ensure data source supports J1939 message protocol.
Unit fails to display certain parameter(s)/unable to select certain parameter(s)	Ensure GEM supports required parameter(s). Ensure data source provides required parameter(s).
Active alarm messages are not displayed	Ensure data source provides alarm message data in the following format: J1939 Active Diagnostic Trouble Codes- Diagnostic Message 1 (DM1).
Stored alarm messages are not displayed	Ensure data source provides alarm message data in the following format: J1939 Active Diagnostic Trouble Codes- Diagnostic Message 2 (DM2).

Glossary

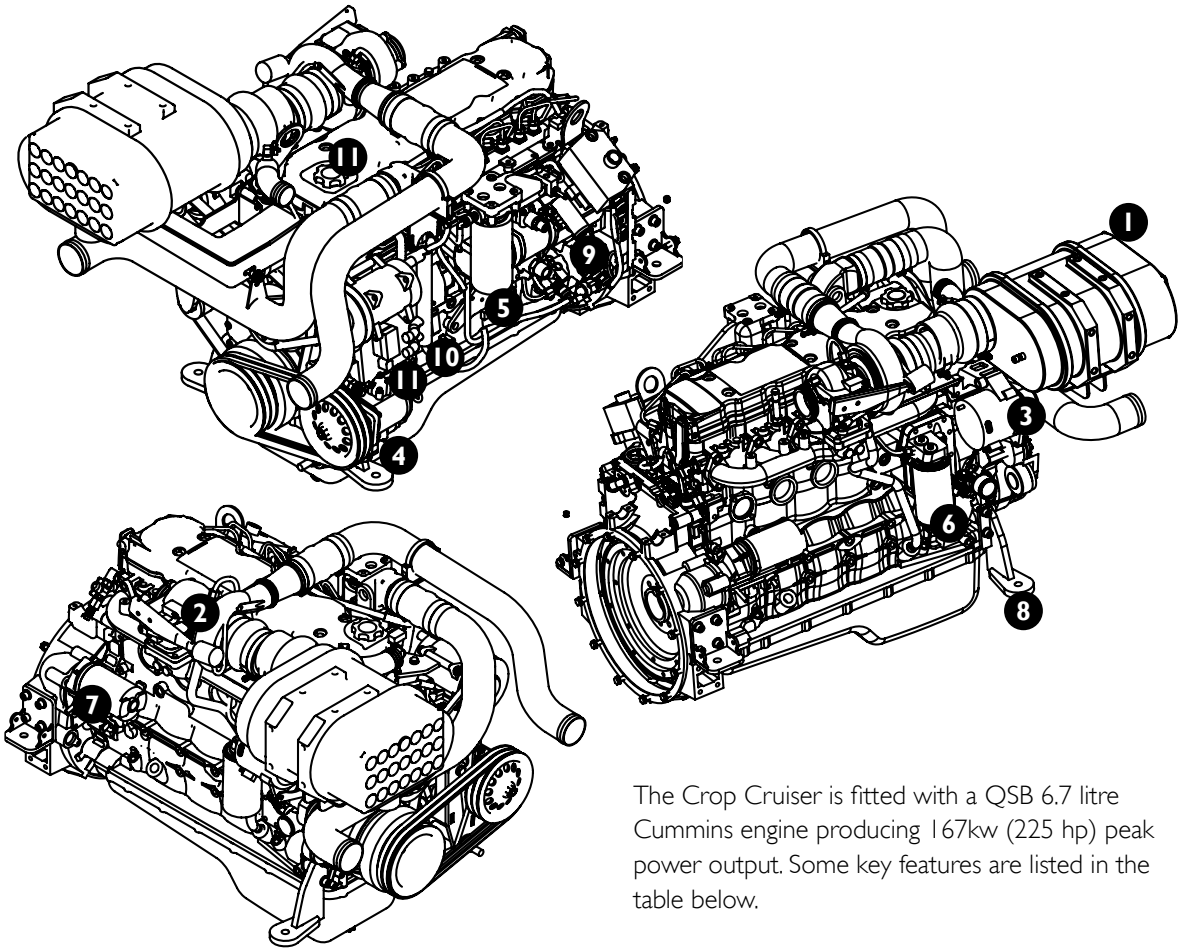
- CAN: Controller Area Network (also referred to as CANbus); serial communications protocol for automotive use
- CANtrak: Intelligent CAN-compatible LCD display module
- GEM: Generic Engine Monitor
- GPS: Global Positioning System
- HMI: Human-Machine Interface
- ISO: International Standard Organisation
- J1939: SAE engine data protocol using CAN 2.0B
- LCD: Liquid Crystal Display
- NMEA: National Marine Electronics Association; serial communications protocol for marine use
- PID: Parameter Identifier
- RS-232: Standard electrical interface for serial communications
- RS-485: Standard differential electrical interface for serial communications
- SAE: Society of Automotive Engineers Inc.
- SID: Subsystem Identifier
- Soft keys: Push-button keys whose function changes according to use
- SPN: Suspect Parameter Number: J1939-specific fault code ID number

NOTE: The messages, icons, error codes etc displayed by GEM conform to J1939 standards wherever possible.

Chapter 5

DRIVETRAIN

Engine



The Crop Cruiser is fitted with a QSB 6.7 litre Cummins engine producing 167kw (225 hp) peak power output. Some key features are listed in the table below.

NO.	FEATURE
1.	Air cleaner
2.	Turbo
3.	Alternator
4.	Hydraulic pump - Engine fan drive
5.	Fuel Filter (Secondary)
6.	Oil Filter
7.	Starter motor
8.	Engine mounts
9.	Hydraulic pump - Machine hydraulics
10.	Dipstick
11.	Oil Filler (A second fill point is located near the dipstick - No. 10.)

Transmission

The Crop Cruiser uses an Allison 2500-series transmission. Refer to the Allison Transmission operation and codes manual (supplied) for any information on operation or trouble shooting the Allison transmission.

See also Chapter 8 'Operation' for information on using the Allison transmission.

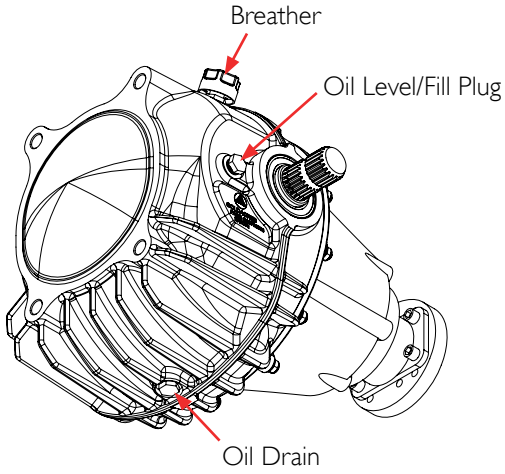
Differential

The differential runs in an oil bath sump. The oil level can be checked by removing the level plug on the side of the differential housing. The oil should be replaced as per the service intervals specified in Chapter 10 'Lubrication & Maintenance'.

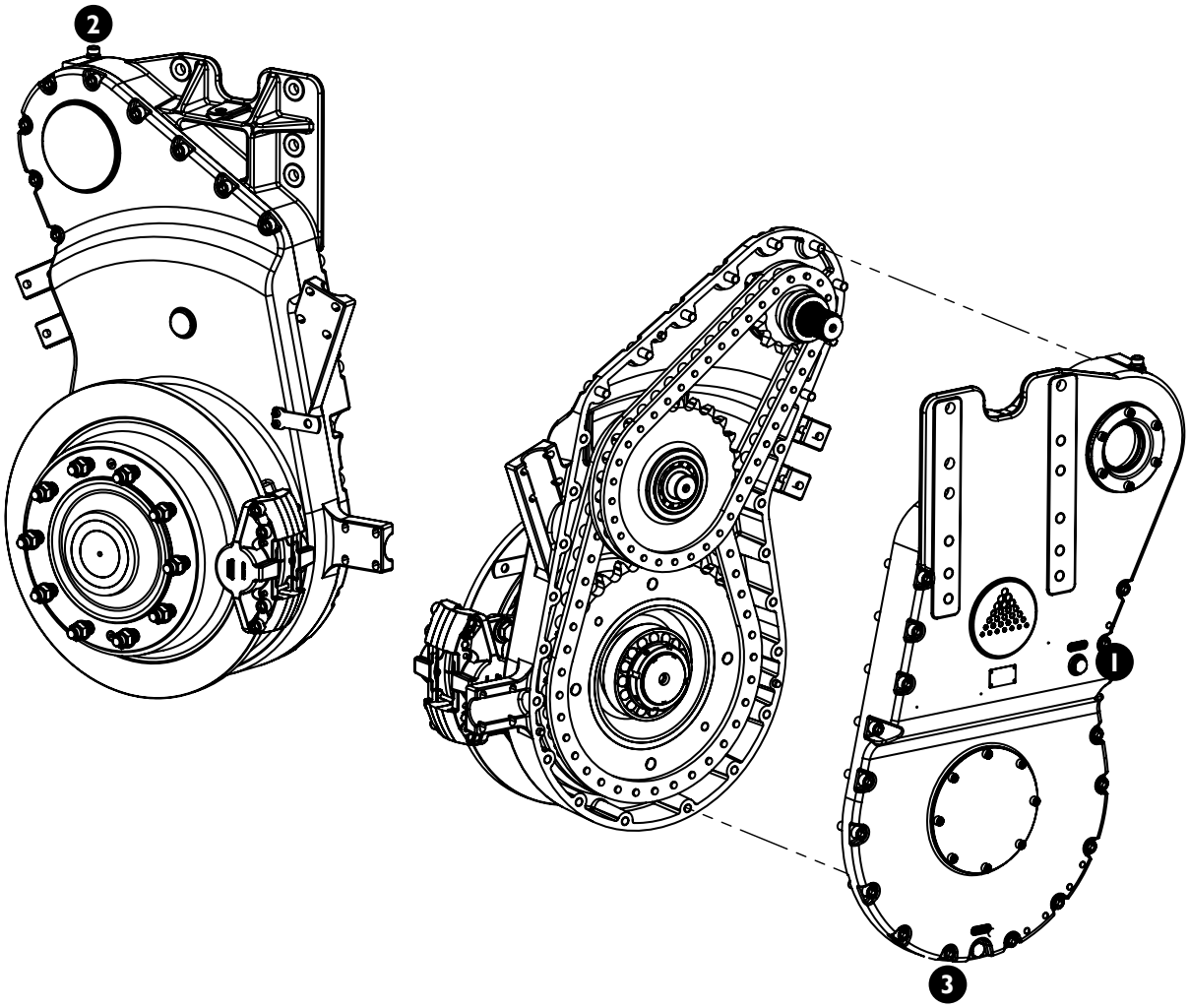
NOTE: The rear differentials are fitted with an LSD. Some chattering noise may be present during first use, but will subside over time. This is normal.

NOTE: The lubricant specification can be found in Chapter 10 'Lubrication & Maintenance' section of this manual.

There is a breather located on the top of the differential. This allows the oil to expand and contract without creating a vacuum or pressurising the differential housing. This breather must be cleaned regularly.



Chain Drive & Drop Legs



NO.	FEATURE
1.	Oil Level Plug
2.	Breather port
3.	Oil Drain

Crop Cruisers run dual reduction chain driven drop legs. Drive is transferred from the differential through drive shafts to the input shaft of the drop leg. A Super 120 HT drive chain is between the input shaft and the middle idler shaft. The bottom chain is a Super 140 HT and joins the idler shaft to the output axle shaft.

The drop legs have an oil bath sump which the chains run through to carry the oil to the bearings. The idler shaft bearing housings have sumps so that the bearings always have oil lubrication.

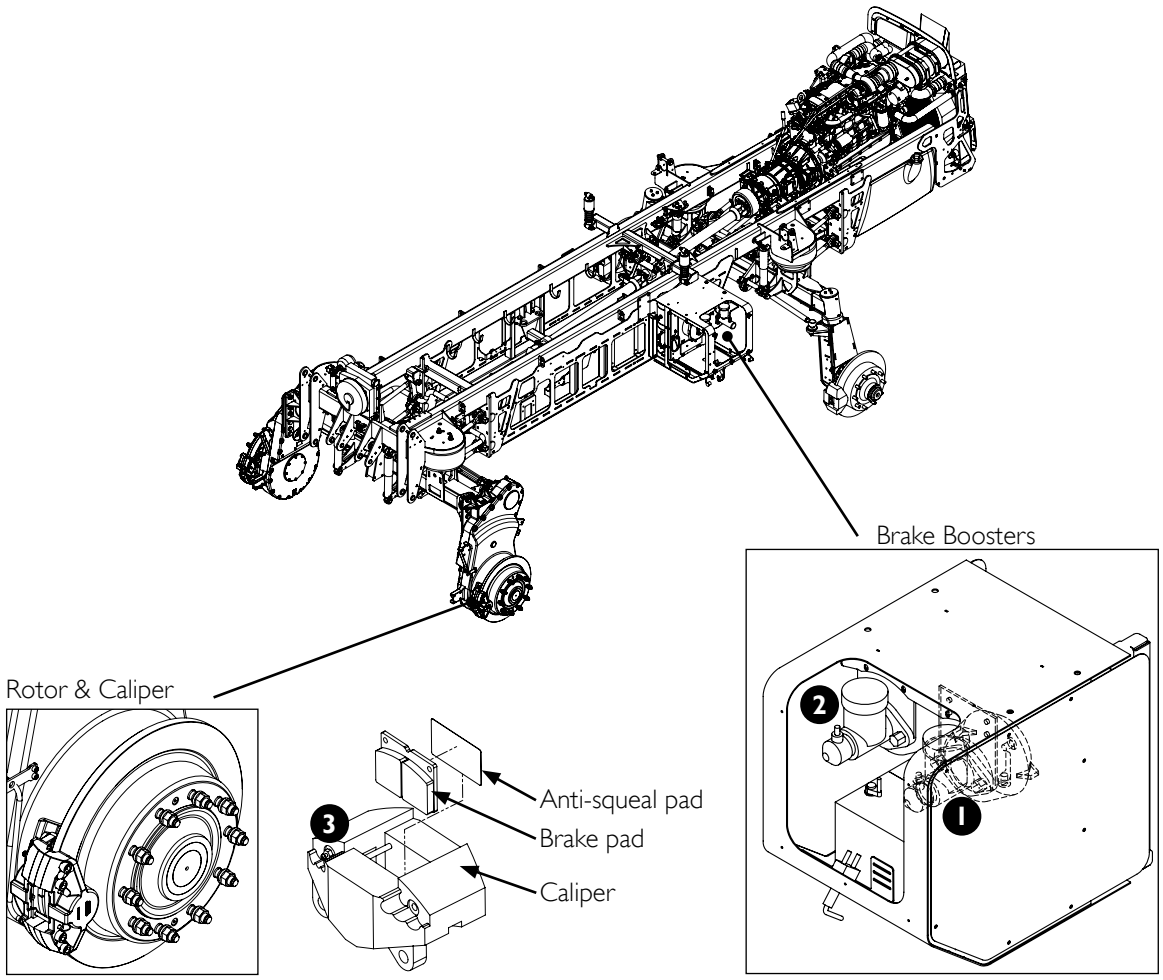
The oil level can be checked by removing the level plug (No. 1).

There is a breather port located on the top of the drop legs. This allows the oil to expand and contract without creating a vacuum or pressurising the drop leg housing. This breather must be cleaned regularly.

The chain will stretch over time and become loose. When this occurs the chains must be replaced. There is no tensioning mechanism for the drive chains as stretched chains will damage the drive sprockets and therefore must be replaced.

For all service intervals and maintenance requirements for the Drop Leg, refer to Chapter 10 'Lubrication & Maintenance'.

Braking System



NO.	FEATURE
1.	Master cylinder (Front brakes)
2.	Master cylinder (Rear brakes)
3.	Bleed nipple (One located on each caliper)

The braking system used on this machine is a split system consisting of four rotors with one calliper per rotor. These callipers are powered by an air over hydraulic system. The front two callipers are powered off of one master cylinder and the rear callipers are powered off the second master cylinder.

Rotors

The rotor used on the Crop Cruiser sprayers are a customized construction and must be purchased from your local Goldacres dealer. They are a 600 mm diameter rotor that is fitted over the hub.

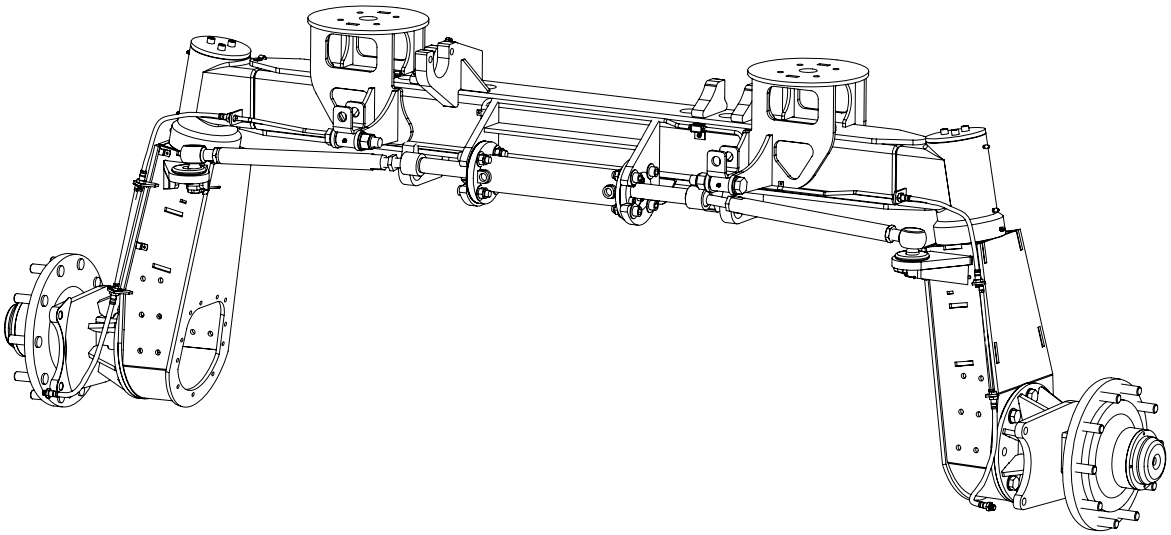
Calipers & Pads

The callipers used on the Crop Cruiser sprayers have two brake pads, with Kevlar anti-squeal liners, which clamp on to the rotor when the brakes are applied. These pads must be inspected regularly for wear. When the pads wear down to the indicator groove they must be replaced. Build up of mud and debris will cause the brake pads to wear prematurely. For this reason the brake callipers must be kept clean at all times.

Brake Boosters

Both brake boosters are located in the pod on the right hand side of the sprayer. The booster closest to the front is used to power the front brakes and the one closest to the rear powers the rear brakes. To ensure sufficient brake fluid in the system, check each brake booster reservoir regularly.

Steering System



Camber

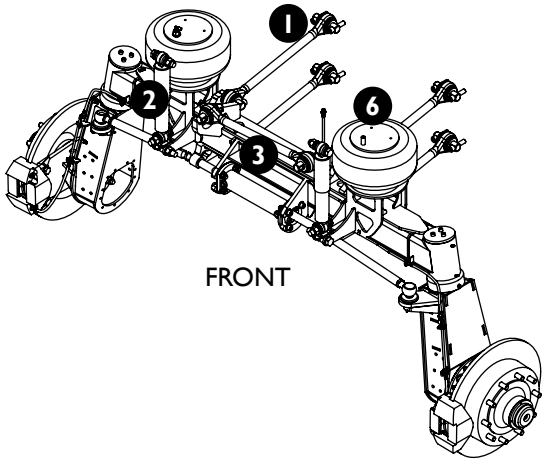
The wheel camber is set to +1° at the time of manufacturing but it can be adjusted by adding shims between the hub and the drop axle if required.

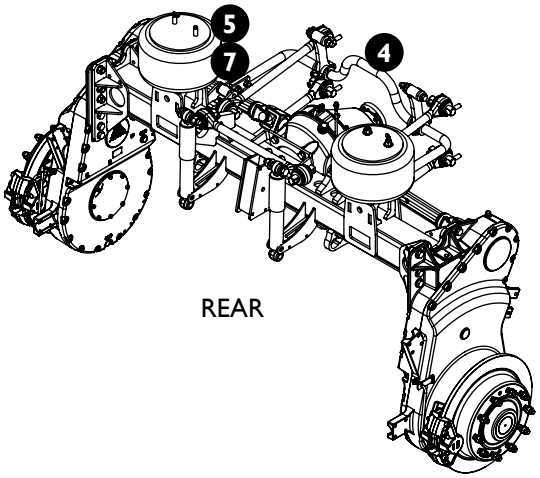
Steering Toe-in

The wheels of the sprayer should toe in 0-5mm.

NOTE: information on checking Camber and Toe can be found in Chapter 10 'Lubrication & Maintenance'.

Suspension System





NO.	FEATURE
1.	Parallel link
2.	Shock absorber
3.	Panhard rod
4.	Sway bar (Rear only)
5.	Air bag - Large rear
6.	Air bag - Small front
7.	Ride height valve

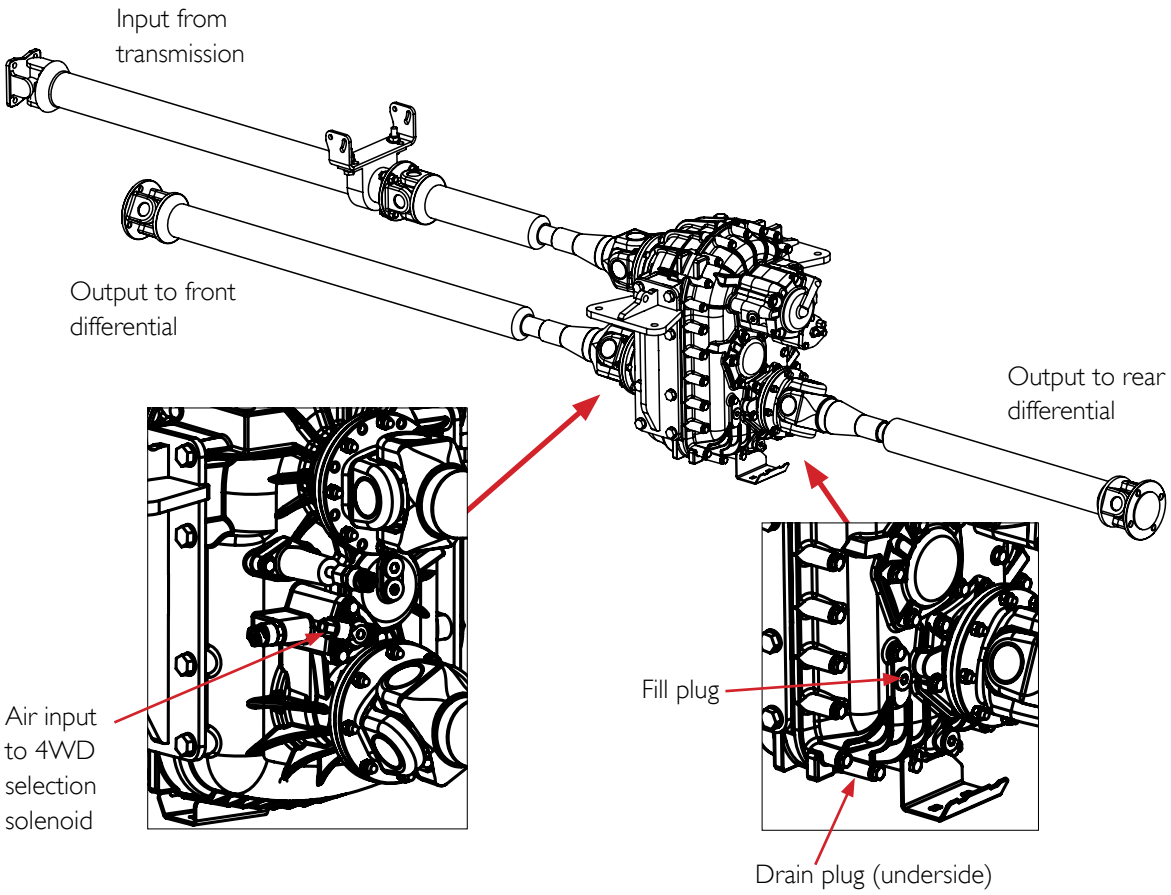
The five point suspension system used on the Crop Cruiser sprayer consists of four parallel links, one Panhard rod, and 2 air bags on each axle. The rear axle of the machine is also fitted with an anti-roll sway bar.

Parallelogram links hold the axle in place under the chassis. Panhard rods hold the axle centred in the chassis. The parallelogram arms allow the drop legs to distort or twist forward and backwards when the wheels come in contact with an obstruction such as a pot hole, log or embankment. This oscillation is absorbed by polyurethane bushes on each end of the links. The life time of these bushes is subject to the conditions the sprayer operates in and the style of operation that it receives.

The polyurethane bushes should be checked at regular service intervals as advised in Chapter 10 'Lubrication & Maintenance'.

Air bags mounted on each side of the axle allow the axle to oscillate and dampen the ride.

Transfer Case



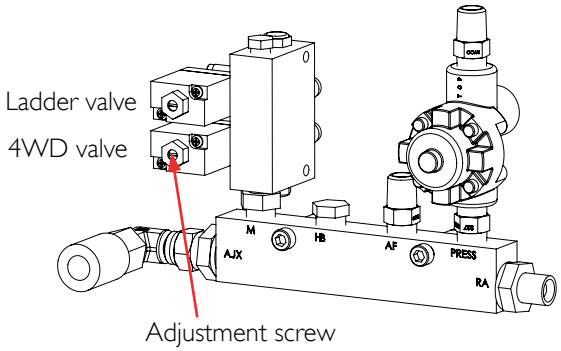
The transfer case is fitted to 4WD machines only and operates as full time 4WD.

It is a single speed transfer case that directs drive from the transmission to the wheels in the ratio of 33% to the front and 66% to rear. A centre differential lock is fitted which when activated, will direct 50% of power to the front wheels and 50% to the rear wheels.

The centre differential lock is engaged from a switch located in the arm rest console in the cab. The switch activates a solenoid which sends air through a 1/4" line to the transfer case shift cylinder.

The shift cylinder is pushed in by the air and the differential lock is engaged. When the lock is turned off, air is released from the 1/4" line and a spring pushes the shift cylinder on the transfer case back out.

For more information on the transfer case and solenoid, see Chapter 10 'Lubrication & Maintenance'.



Above: Pneumatic manifold located behind the right hand side Pod. The 4WD solenoid has an override screw in the bottom that can be overridden with a flat head screwdriver.

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

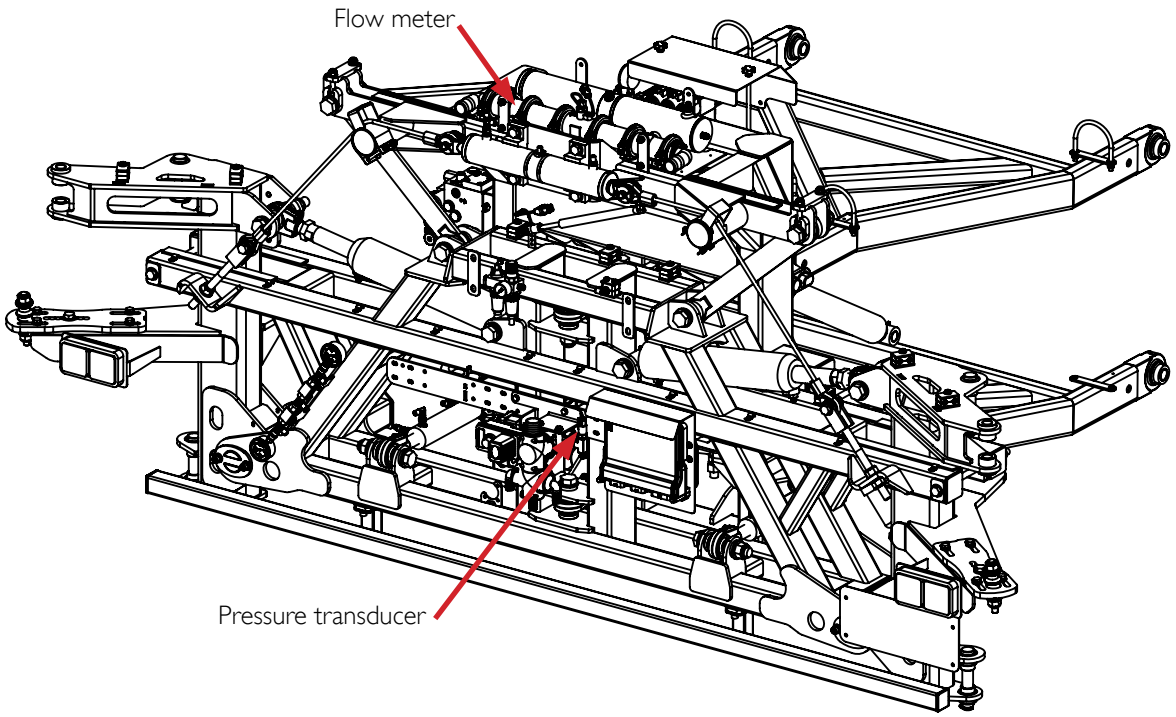
PARAMETER	VALUE	UNIT
Speed Cal		-
Meter Cal		-
Valve Cal		-
Rate 1		L/Ha
Rate 2		L/Ha
Tier 1		L/min
Tier 2		L/min
Tier 3		L/min
Pump Cal		RPM

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

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

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

Flow Meter & Pressure Transducer 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)

Consult your Raven RCM operation manual supplied for detailed setup and calibration information.

Flow Meter

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'.

Continued over page

Flow Meter

- 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 100 litres out of a 6000 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 6100 litres instead of 6000 litres and the original Meter Cal value is 185, then:

New 'Meter Cal' value = (185 x 6100) / 6000 = 188

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.

Nozzles

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 %.

Continued over page

Nozzles

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

3 Tier System (3TS)

The Raven RCM controls the 3TS system. For specific calibration and operating instructions, see Raven RCM operation manual supplied.

Speed Sensors

Raven automatic rate controllers can utilise a speed reading from the:

- Transmission Output
- GPS receiver

Transmission Output

When the transmission output is used for speed the system must be set as if it were reading a radar sensor (SP2).

GPS receiver

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

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.

Chapter 7

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 4200 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.

Sprayer in Transit

The machine is approximately 4.2 m in height and with aerials on the roof, can be much higher. Check the regulations in your state for maximum vehicle height restrictions. When driving the Super Cruiser on roads it may be necessary to remove aerials to meet the required height restrictions.

Aerials on the roof may also need to be removed to meet clearance requirements for over head power lines, while on the road and also in some paddocks.

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 Goldacres Super Cruiser Sprayer will ensure the efficient safe operation of the sprayer. 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 350 ft/lb is maintained.

Engine

- If the engine has been running, take extra care around hot engine parts such as the exhaust.
- Check the engine oil level frequently. Due to the "bedding in" of the engine components and additional friction between connecting parts, expect the oil usage to be higher than normal.
- Avoid excess engine idling.
- Inspect the air intake system and check for leaks.

Lubrication & Hydraulic Fluids

- Maintain correct hydraulic oil levels and monitor the oil temperature on a regular basis.
- Check the transmission oil level and ensure that grease points are lubricated effectively. Crush Hazard Warning (refer to Chapter 2 'Safety').
- Inspect for leaks in the hydraulic system

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.

Suspension Bolts

- There are numerous suspension bolts located at each end of the parallel links and at each end of the pan hard rods and sway bars. These bolts should be checked to ensure that they have not become loose.

Lights

- Check each light around the vehicle for correct operation.

Starting

Before operating the machine all fluid levels must be checked in accordance with this manual.

The battery isolator switch must be engaged to provide power to the machine systems.

To start the engine, the transmission must be in neutral.

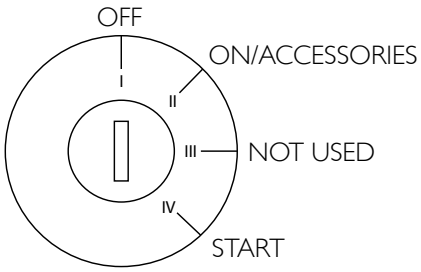
Insert the ignition key and turn clockwise. The ignition key is located on the rear right console.

Key Positions

The key has 4 positions, however only the first 3 are used on this machine.

1. Off, vertical position.
2. On/accessories, in this position all cabin components will be energised.
3. Not Used.
4. Start, this is a momentary position which can only be achieved by holding the key hard in this position, the engine will be cranking if the transmission is in neutral. Once released the key will return to the On/accessories position.

To shut down the engine rotate the ignition key counter clockwise until in the vertical 'Off' position.



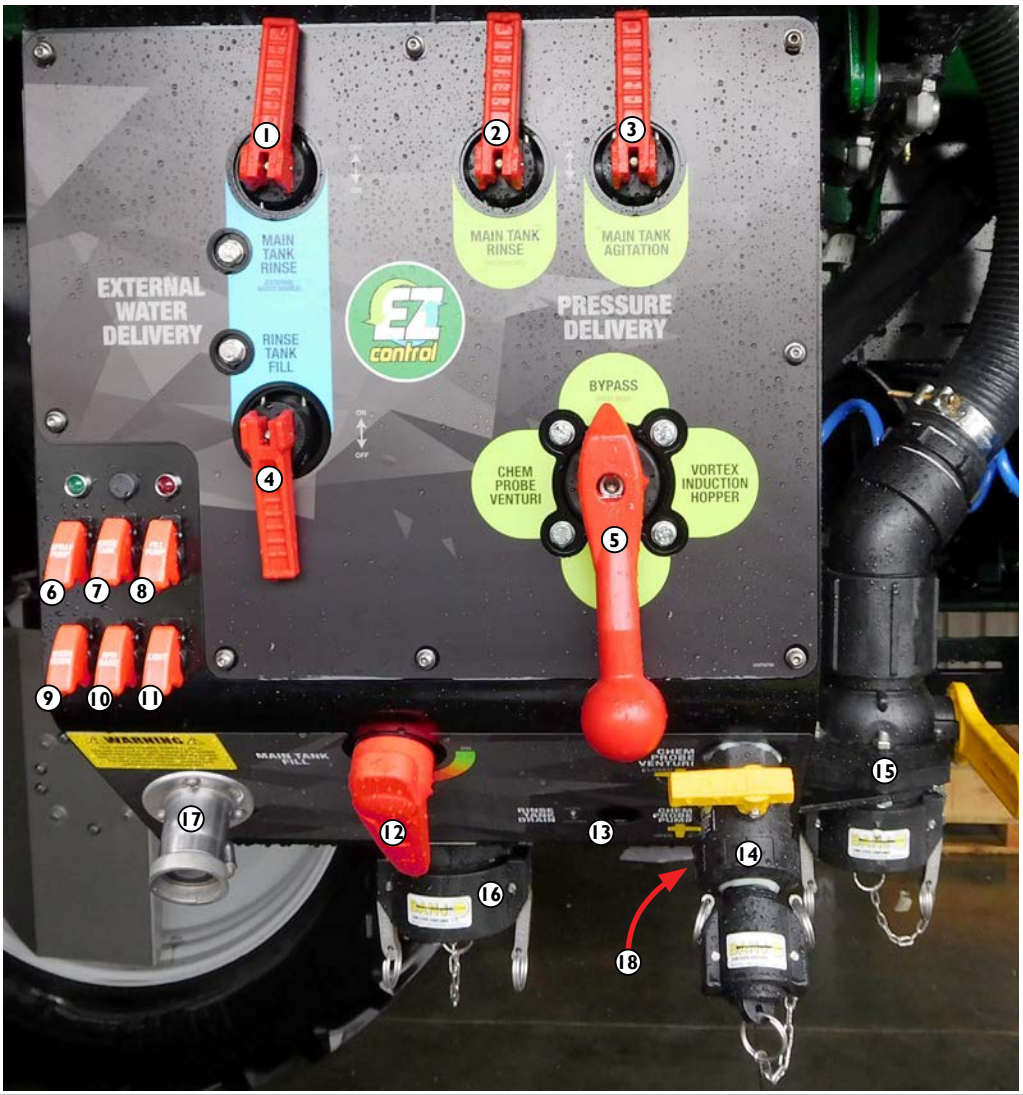
Shut Down

1. Bring the machine to a complete stop.
2. Place the gear selector in NEUTRAL.
3. Activate the park brake switch. The ladder will go down.
4. Turn the key to the OFF position.
5. Wait for a minimum of 30 seconds before turning the isolator switch to OFF. This allows time for the engine data to be saved back to the ECM.

Chapter 8

OPERATION

EZ Control Station



NO.	FEATURE	NO.	FEATURE
1.	Main tank rinse (external water)	10.	RPM raise switch
2.	Main tank rinse (recirculate)	11.	Pod light switch
3.	Main tank agitation	12.	Main tank fill ball valve
4.	Rinse tank fill (external water)	13.	Rinse tank drain (G5 only)
5.	Three way ball valve handle	14.	Chemical probe venturi
6.	Spray pump switch	15.	Main tank 3" fill point (direct to tank)
7.	Rinse tank switch	16.	Main tank 3" fill point (hydraulic pump)
8.	Hydraulic fill pump switch (optional)	17.	Micromatic rinse socket (optional)
9.	Wash down gun switch	18.	Chemical probe pump

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.

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

PRESSURE DELIVERY	USE
Vortex induction hopper	Turn ON to use vortex induction hopper
Chemical Probe Venturi	Turn ON to use chemical probe
Main tank agitator	Turn ON to activate agitator
Bypass	Turn ON bypass when in spray mode
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.

Suction Filter

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. Fluid supply to the suction filter is controlled by an electronically operated valve. The valve can be activated either from inside the cabin or a switch on the right hand side Pod (EZ control station).

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

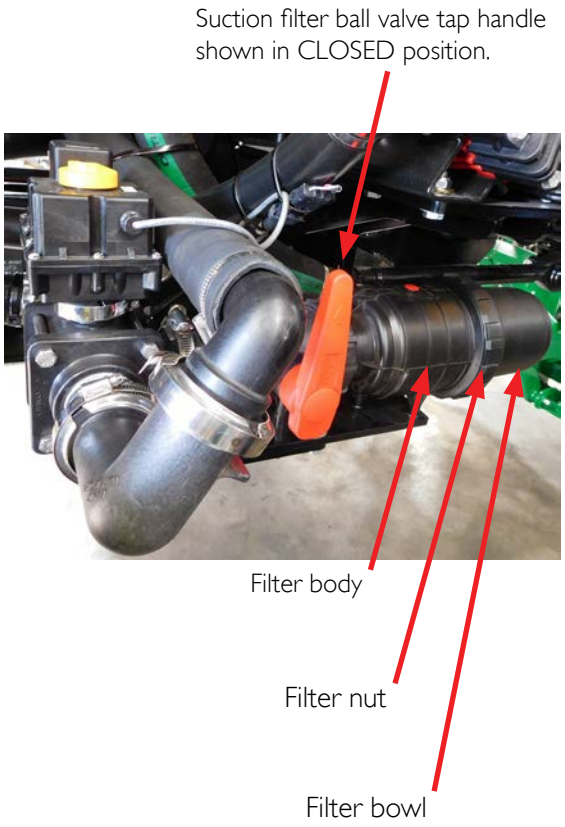
For information specific to your circumstances, the spraying equipment being used and the chemicals being applied, consult your agronomist or chemical supplier.

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 CLOSED 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.



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. Turn ON the 'Spray Pump' switch and then the 'RPM Raise' switch. 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 4000-4200 rpm on standard fitment centrifugal pump or 400-540 rpm on optional fitment diaphragm pump.

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 up. 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.

Continued over page

Chemical Induction Hopper

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.

- 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.

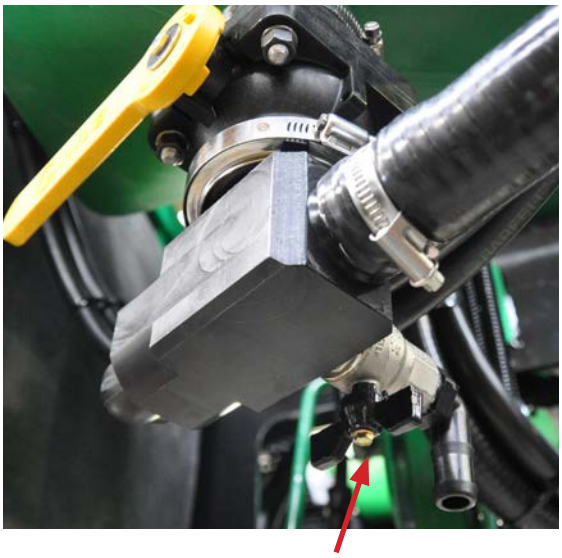
To do this:

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 (viewed from below)

Joystick Control





Boom Controls

BOOM LIFT

Press the black oval button upward the boom raise circuit is activated. Releasing the button will return the switch to the neutral, centre position.

BOOM LOWER

Press down on the black oval button, the boom lower function is activated. The boom will lower until the boom lower height switch, which is mounted on the parallelogram, is tripped. When the switch is released it returns to neutral, centre position.

TILT RIGHT UP

Press the black circular button up and to the right the boom tilt right up circuit is energised. This lifts the right hand side boom only, when the tilt function is fitted to the sprayer. When the switch is released it returns to neutral centre. When ultra glide is connected to the sprayer the right side will be disabled from automatic mode if this switch is activated in this direction.

TILT RIGHT DOWN

Press the black circular button back and to the right the boom tilt right down circuit is energised. This lowers the right hand side boom only, when the tilt function is fitted to the sprayer. When the switch is released it returns to neutral centre. When ultra glide is connected to the sprayer the right side will enabled automatic mode when this switch is activated in this direction.

TILT LEFT UP

Press the black circular button forward the boom tilt left up circuit is energised. This lifts the left hand side boom only, when the tilt function is fitted to the sprayer. When the switch is released it returns to neutral centre. When ultra glide is connected to the sprayer the left side will be disabled from automatic mode when this switch is activated in this direction.

TILT LEFT DOWN

Press the black circular button down the boom tilt left down circuit is energised. This lowers the left hand side boom only, when the tilt function is fitted to the sprayer. When the switch is released it returns to neutral centre. When ultra glide is connected to the sprayer the left side will be enabled into automatic mode when this switch is activated in this direction.

DUAL TILT UP/DOWN

This raises and lowers both of the boom wings, when the tilt function is fitted to the sprayer. When the switch is released it returns to neutral centre. If the switch is pushed forward and held, both left and right wings will tilt UP to the maximum. When the switch is pulled back and held, both the left and right wings will tilt DOWN to a level horizontal setting. Small movements of the switch will bring the tilts up or down in smaller increments.

BOOM MASTER ON/OFF

The large yellow button cycles the Boom Master ON/OFF. This button eliminates the need for the ISOBUS foot pedal.

Continued over page

Joystick Control

Plumbing Controls

LEFT FENCE LINE JETS

Press the black oval button forward once and the left fence line nozzle on the left hand end of the boom is activated. When activated, a red LED on the console and red LED on the boom tip will be illuminated. To switch off the fence line nozzle, press the button once more.

RIGHT FENCE LINE JETS

Press the black oval button forward once, the right fence line nozzle on the right hand end of the boom are activated. When activated, a red LED on the console and red LED on the boom tip will be illuminated. To switch off the fence line nozzle, press the button once more.

Auto Steer & Cruise Control

AUTO STEER ON/OFF

Press to cycle customer fitted auto steer ON/OFF.

CRUISE SET/DECREASE

When the top black rocker button is depressed the current ground speed will be set as the cruise control speed. The cruise switch on the console must be in the ON position for this to engage and the foot brake must be released. Once cruise control is engaged, depressing the top rocker button down will decrease ground speed. To disable cruise control the Cruise OFF switch can be cycled to the off position or the foot brake can be engaged.

CRUISE RESUME/INCREASE

When the bottom black rocker button is depressed, the cruise control will resume the ground speed that was previously set before the system was disabled by the foot brake or the cruise off switch. The cruise switch on the console must be in the ON position for this to engage and the foot brake must be released. Once cruise control is engaged, depressing the bottom rocker button down will increase ground speed. If the engine ignition has been cycled a new cruise speed will have to be set. To disable cruise control the Cruise OFF switch can be cycled to the off position or the foot brake can be engaged.

CRUISE CANCEL

Pressing the yellow button will cancel the currently active cruise control. Simulates pressing the brake pedal.

NOTE: Cruise control should not be engaged when RPM Raise is switched on.

Arm Rest Controls



BOOM FOLD IN

By pressing the switch forward, the boom close function is activated. This folds both the left and right booms in at the same time. The switch must be held until the booms contact the boom rest uppers. Stopping while the booms are folding will stress the booms. If bi-fold is fitted the boom outers must first be folded.

BOOM FOLD OUT

By pressing the bottom of the switch, the boom open function is activated. This folds the boom out in to the working position. The switch must be depressed until the booms fold all the way out and come to a stop, If bi-fold is fitted the booms must first be folded out before bi-folding the outers.

BI-FOLD OPEN

By pressing the bottom of the switch, the bi-fold open function is activated. This command will fold the boom outers out in to the working position. The switch must not be released until the booms are all the way out or boom stress can occur. When the booms are all the way out hold the button depressed until the bi-fold pressure gauges read 1700-1900 psi. This pressure maintains boom alignment while moving. This function must only be activated once the inner booms have been unfolded.

BI-FOLD CLOSE

By pressing the switch forward, the bi-fold close function is activated. This command will fold the boom outers in and saddle them onto the inner booms. The switch must not be released until the booms are folded all the way in or boom stress can occur. This function must be activated before the inner booms are folded.

BOOM REST IN/OUT

To move the boom rest out, press and hold the bottom of the momentary switch down until the rests are fully out and stop moving.

Note: This function only effects the left hand side boom rest. The right hand side boom rest is fixed.

To move the boom rests in, simply press the switch forward and hold, until the rests stop moving.

NOTE: Operation sequence and full instructions on boom folding can be found in the Boom chapter under Boom Folding section.

CRUISE CONTROL / RPM RAISE

Press switch forward to turn ON Cruise Control function. Press this switch forward again will turn the function OFF.

Press the bottom of this switch will turn ON the RPM Raise, which will increase the engine RPM to 1500 RPM. Press the bottom of the switch again will turn this function OFF.

Continued over page

Arm Rest Controls

BOOM RECIRC

By pressing this switch forward, will turn ON the recirculation function. The spray pump must be on and the suction from tank open. Pressing the bottom of the switch will this function OFF.

SPRAY PUMP ON/OFF

Press switch forward to activate the spray pump. When the pump is on the light on the arm rest will be illuminated. The pump will remain operating until the switch is returned to the SPRAY PUMP OFF location. If dual product pumps are installed this switch must be first turned on to activate the pump circuit required.

SPRAY MODE / ROAD MODE

With this switch in SPRAY MODE, the transmission will only go to 4th gear for spraying speed. Press the bottom of the switch to go into ROAD MODE, 5th & 6th gear are selectable for speeds up to 50 Km/h.

4WD ON/OFF

This switch will toggles the transfer case into 4WD mode. The machine is normally rear wheel driven. This switch and feature will only be present on 4WD optioned machines.

PARK BRAKE ON/OFF

This switch must be in the ON (forward) position before starting the engine. If not, pull the orange slide lock and then press forward to turn the function 'ON'. Once the engine has started and the foot service brake has been applied, pull the orange slide lock back and press the bottom of the switch to disengage the park brake. A drive gear can now be selected. When stopping the machine, the foot service brake needs to be applied to bring the machine to a complete stop, and then the transmission needs to be placed in 'N' before the park brake switch can be put in the 'ON' position.

DUAL PRODUCT ON/OFF

This switches the second spray line over to an additional line, usually for Weedseeker operation.

NOTE: When dual product is fitted the Pump switch on the joystick will act as a pump master switch.

PUMP 1 ON/OFF

This switch will only be fitted if dual product is optioned. Press the switch to turn product one pump on or off as required.

PUMP 2 ON/OFF

This switch will only be fitted if dual product is optioned. Press the switch to turn product two pump on or off as required.

This switch will only activate the product pump and does not control the boom lines.

NOTE: For product 1 and 2 pumps to turn on, the pump switch on the joystick must also be turned on.

RINSE TANK/MAIN TANK

This switch alternates between sucking fluid from either the rinse tank or the main tank through the suction filter. This function can also be controlled via a switch on the right hand side pod (EZ control station). A buzzer will sound in the cabin and at the EZ control station when in rinse tank mode to help avoid accidental spraying from rinse tank rather than main tank.

NOTE: The spray pump must be off when switching this function to avoid damaging it.

Controller - Raven Rate Control Module



Raven Rate Control Module (RCM)

The RCM is fitted as standard 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.

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

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.



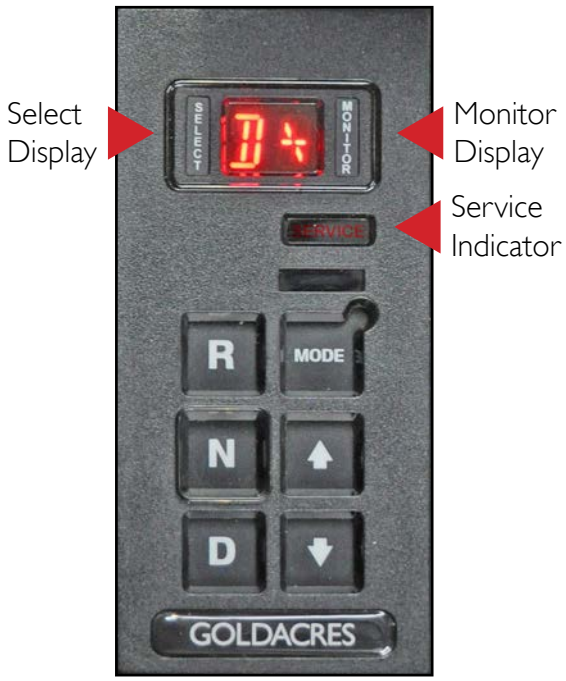
Above: An optional Raven CR7 universal terminal (UT) can be fitted to interface with the RCM over the ISOBUS system fitted as standard to these machines. Many other UTs by other manufacturers are also compatible to be used.



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

Transmission

The operator must wear the operator safety belt at all times when seated in the cabin or when the machine is in motion. To engage a gear from neutral, first apply the foot service brake located to the right of the steering column, then release the park brake and press the 'D' button on the gear selector to drive forward or 'R' to reverse.



SELECT DISPLAY

This LED Character shows which gear has been selected by the operator. It will display D, R, or N or a number reflecting the specific gear. P is typically not displayed for Park – the P only appears on the MONITOR DISPLAY side.

MONITOR DISPLAY

This LED character shows which transmission gear is currently engaged. This includes P, R, N, and numerical values for forward gears. This side typically does not display D for Drive – it allows the operator to glance down and see the specific gear they are currently using.

TRANSMISSION FAULT WARNING

If the SERVICE indicator is illuminated then there is a fault in the shift by wire system. A qualified technician should inspect the system as soon as possible.

WARNING: Operating the machine with the wrench icon flashing is not recommended. It may indicate a loss of safety back up systems, and the operator should use extra caution when shifting to ensure that the transmission is performing properly.



Reverse gear.



Neutral; the gear selector must be in this position for starting.



Drive, in this position 1st - 6th gears are available and will be selected by the ECM when required. Overdrive gears 5th & 6th will only be engaged when in ROAD MODE.



Gear UP. Press to manually upshift one gear at a time until top gear is selected when the transmission is in Drive. The SELECT display will show which gear range has been selected, and the MONITOR display will show which transmission gear is currently engaged.

NOTE: The transmission will not shift above the gear range selected. When Drive (D) is selected the full range automatic shifting is restored.



Gear DOWN. Press to manually downshift the transmission one gear at a time until 1st gear is selected.

The SELECT display will show which gear range has been selected and the MONITOR display will show which transmission gear is currently engaged.

NOTE: The transmission will not shift above the gear range selected. When Drive (D) is selected the full range automatic shifting is restored.



This button is NOT FUNCTIONAL. A light in the top right corner will cycle ON/OFF when pressed, but is not connected to any function on the machine.



SPRAY MODE / ROAD MODE

Rock the switch forward to engage SPRAY MODE. The transmission will only go to 4th gear for spraying speed. Rock the switch back to engage ROAD MODE. Transmission will shift through full range including 5th & 6th gear for speeds up to 50Km/h.

Transmission

PULLING AWAY

The transmission needs to be in NEUTRAL (N) and the operator should have their right foot on the service brake before releasing the park brake.

If DRIVE (D) or REVERSE (R) are pressed while the park brake is still on, no gear will be engaged by the transmission - an audible alarm will sound. Once the desired gear is selected release the foot service brake to start moving.

When in 1st gear, reduced torque is applied until 11 Km/h is reached and then all the engine torque is applied.

NOTE: The transmission must be in neutral before pressing RPM raise and Cruise Control must be off.

Troubleshooting

Loss of J1939

Loss of the J1939 to or from the shifter will result in an error indicated on the display as '**D-\-'**. The SELECT display works as normal except that in drive, only the error '**D-\-'** is displayed. Up shift and down shift commands are sent on the J1939 link and can not function in this mode. The vehicle transmission will not be able to hold any of the forward gears unless the loss of J1939 occurred while a lower range was currently selected – in this case the selected range will be the max range. Press D during this condition to enable shifting to all 6 gears, and consult a qualified technician.



RANGE INHIBIT INDICATOR

Certain conditions may cause the Allison transmission control module (TCM) to restrict shifting. The range inhibit indicator alerts the operator that such a condition exists when the SELECT display (the left digit) begins flashing, and the MONITOR Display (the right digit) remains constant. Please consult a qualified technician in this case.

Towing & Transporting Sprayer

- A disabled sprayer is best transported on a drop deck trailer. Use chains to secure the sprayer via the tie down attachment point located under the front and rear axles.
- The machine must not be towed unless the engine is running (as the steering and brakes require engine power to operate). Before towing, the front tail shaft should be disconnected, due to the risk of damage to the transmission. While towing do not travel at a speed greater than 10 Km/h.
- An operator must steer and brake the sprayer under tow.

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 8000 L.

8000 L / 1.28 kg = 6250 L

This means that the total volume of liquid Nitrogen allowed in a 8000 L tank is 6250 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.

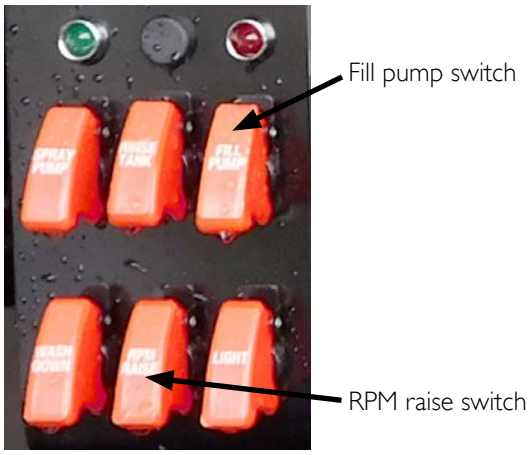
PUMPING WITH OPTIONAL HYDRAULIC FILL PUMP

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

   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.
   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.

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 500 L. 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.

Remote Fill Points - 3"

There are two options for the 3" remote fill points. One is located on the front right hand side of the chassis just in front of the front axle. The other is located on the left hand side of the chassis and is mounted to the side of the Pod.

These fill points go straight into the main tank, bypassing the control Pod, in doing so, the tank rinse and or rinse tank filling can not be operated when filling from these points.

The fill times are faster using these points and they give the option to remote fill from a Goldacres BatchMate unit with pre-mixed chemical straight into the main tank.

Right: Remote fill 3" inlet mounted to right hand side Pod.





Left: Remote fill 3" inlet mounted to chassis on left hand side before front axle.

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 3 way ball valve to Bypass, and ensure suction handle is on 'Suction Main Tank'.
5. Turn the agitator on.
6. Turn the spray pump on. Check to ensure that the Supermix agitator is working. There should be a visible circulation of water near the back of the tank near the agitator.
7. 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 6000 litres in the tank with a 400 L/min pump agitate for 6000/400 = 15 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.

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 4000-4200 rpm on standard fitment centrifugal pump or 400-540 rpm on optional fitment diaphragm pump 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 main pressure station ball valve must be in the bypass (spray mode) position.

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 spray controller operators manual supplied.
3. Turn on all boom sections
4. Purge all boom lines with product from the main tank. (If RapidFlow is fitted, then switch on for approx 2 minutes)
5. Switch off all boom sections.
6. Commence travel on primary swathe 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.

RapidFire

Overview

The RapidFire system provides instantaneous, individual nozzle shut off that is controlled by air operated solenoids at each nozzle. This provides greater flexibility in changing boom section widths and faster shut off at the nozzle. The machine is plumbed in 16 sections as standard.

The RapidFire system reduces the amount of plumbing on the sprayer and allows for the fitting of a boom recirculation system.





Air check nozzle bodies arranged along centre section and booms



Air dryer/oiler



Raven Rate Control Module (RCM)

Continued over page

RapidFire

Air Solenoid Nozzles

The machine is fitted with 16 section nozzle control as standard. The nozzle system consists of a master and slave arrangement for each section. One master air solenoid per section is electrically operated, which then sends air to activate a number of slave cylinders that are pneumatic only.

Master cylinders have dual or single nozzle bodies, depending on the spacing optioned at time of purchase, but they operate in the same way.

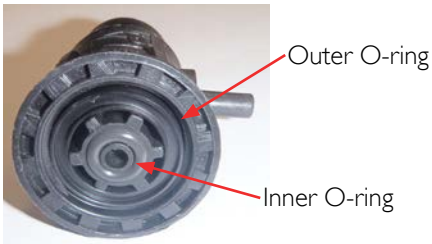
In the event that nozzles do not operate as expected there are some checks that can help diagnose and solve the problem. First check the electrical connections to the master air solenoids. There should be power at the connector when the nozzles are activated from the cabin and the connectors should be securely plugged in to the nozzle. The air lines should also be checked for secure fitment and presence of air pressure in the 6 mm supply lines to the masters when the machine is running.

Nozzle & Air Check

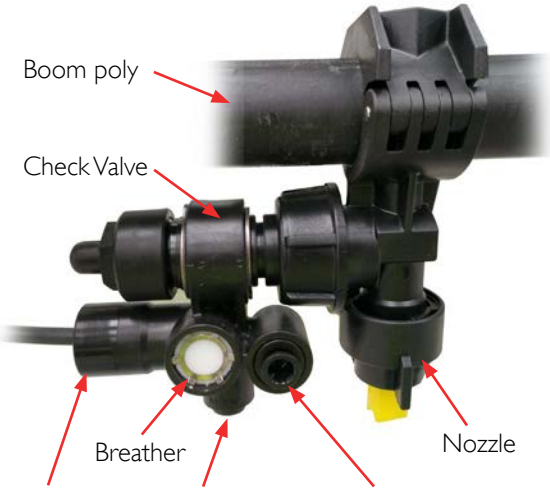
The air check nozzles allow for instantaneous response at the nozzle tip. The lines can be at spraying pressure and when switched on or off, the nozzle responds quickly with no dribbling, as pressure builds up or subsides.

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 rated pressure and droplet size with 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.



Master air solenoid valve



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.

Continued over page

RapidFire

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 1000 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.

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.

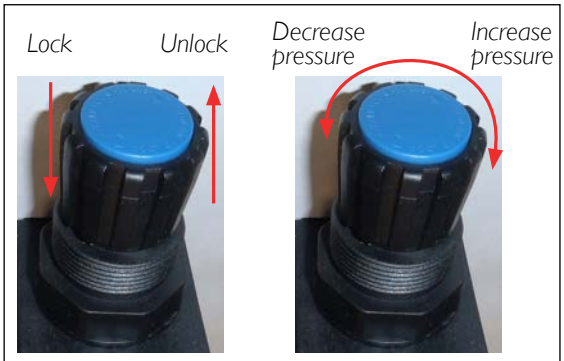
To drain the trap, turn the black knob at the bottom of the clear bowl and push it up. Air and moisture will be expelled from the bowl. Keep the knob pressed up until all the moisture has been released. Once finished, release the knob and turn it back until it stops. Ensure correct safety equipment is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

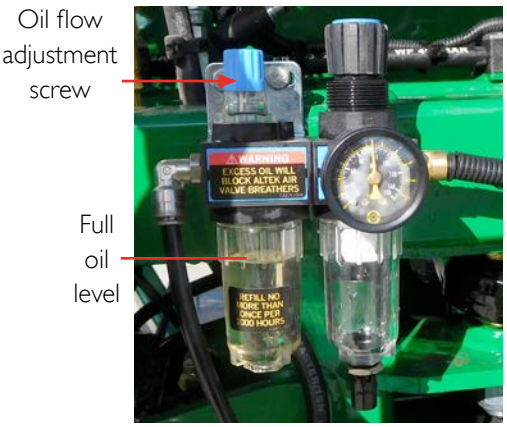
To ensure the correct flow of oil into the air, the oil flow adjustment screw may need to be adjusted to suit the conditions.

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 1000 hours or when required.



Air pressure regulator adjustment





RapidFlow

Overview

RapidFlow is a boom recirculation system. 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.

Operation

NOTE: It is important that boom recirculation is turned off before spraying. If it is left on while spraying, the flow meter will read incorrectly leading to the wrong amount of chemical being applied.

BEFORE SPRAYING (CHARGING THE LINES)

1. Turn off all boom sections on the console.
2. Have the pump running agitating the tank mix.
3. Turn on boom recirculation switch.

NOTE: The lines will require at least 80L of fluid to fill them.

4. When ready to spray turn off boom recirculation and turn on the required boom sections.

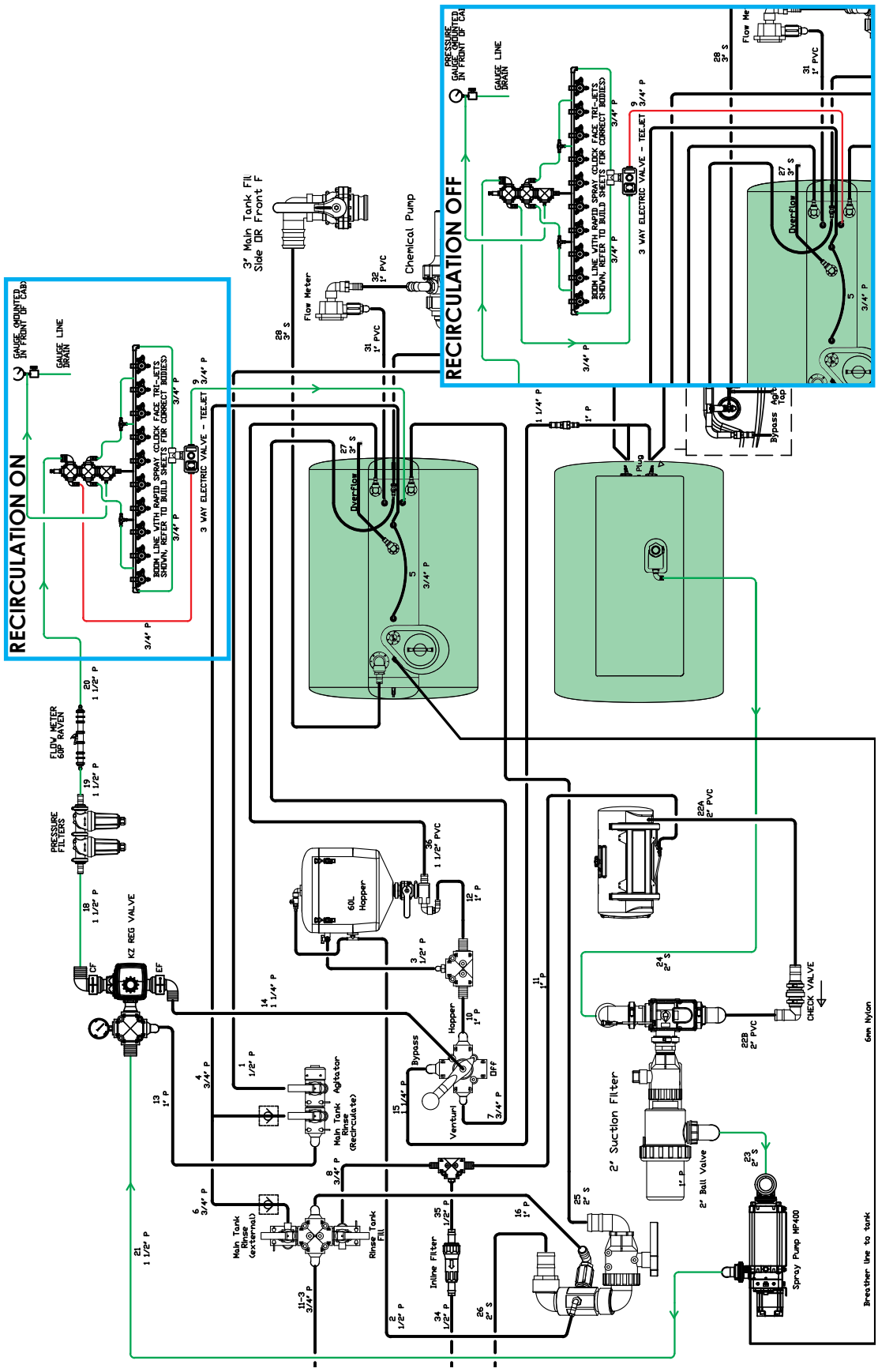
AFTER SPRAYING (RINSING)

1. Turn off all boom sections on the console.
2. Set spray pump suction mode to rinse tank.
3. Turn pump on.
4. Turn on boom recirculation switch.

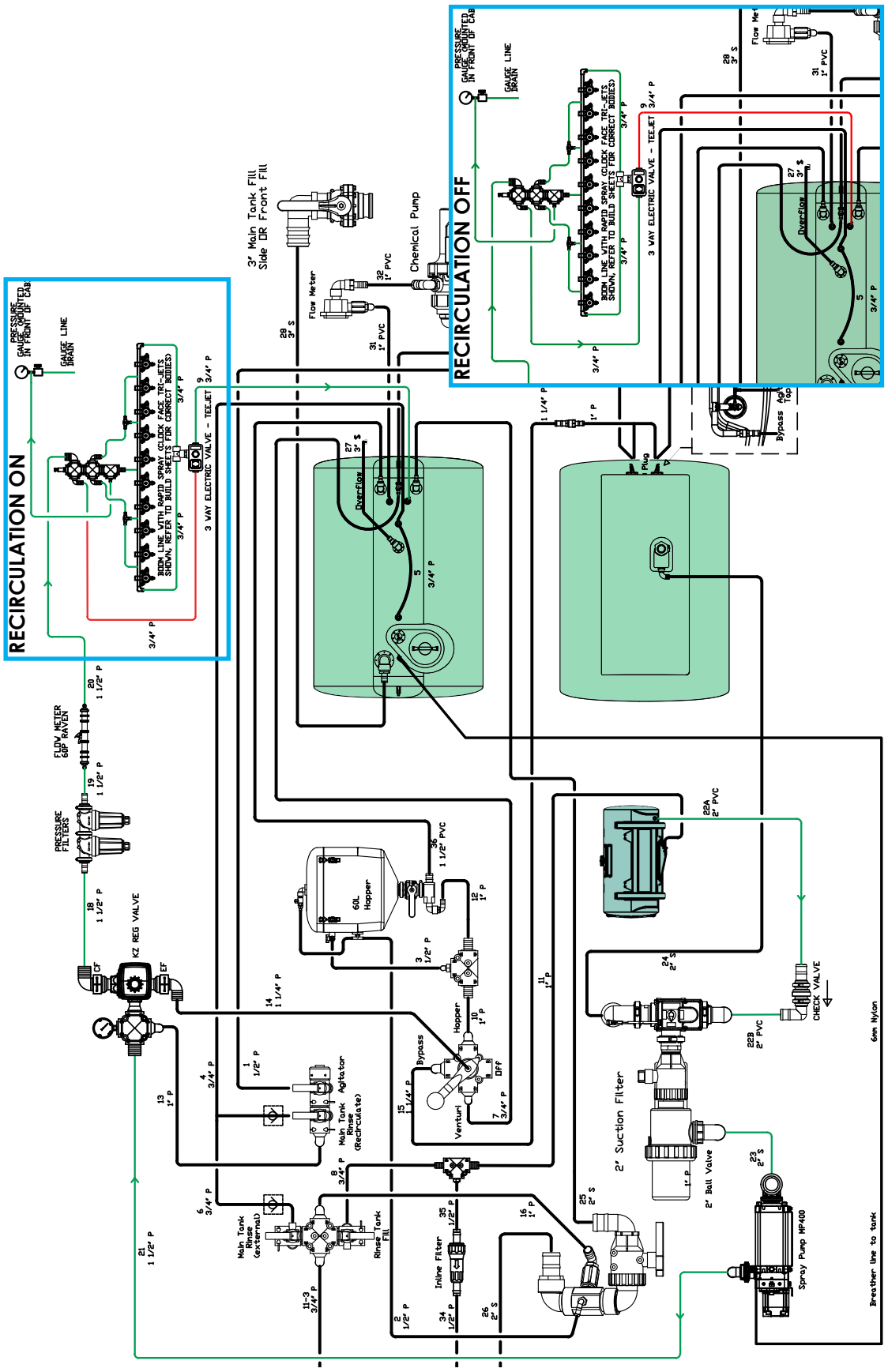
NOTE: The boom sections can be pulsed on/off to flush/rinse the tips and nozzle bodies.

5. Turn off boom recirculation switch.
6. Turn spray pump off.
7. Reset spray pump suction mode back to main tank.

RapidFlow - Pressure Delivery Schematic



RapidFlow - Rinsing Schematic



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 NOZZLES ONLY

This procedure will allow rinse water back into the main spray tank and through the boom recirculation system.

1. Turn spray pump off.
2. Set spray pump suction mode to rinse tank rather than main tank. A buzzer will sound in the cabin and at the EZ Control station,until it is switched back to main tank.
3. Set Raven console into manual mode. Ensure that Boom Recirculation is turned 'OFF'.
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 spray 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, hold decrease to reduce.

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 ball valve on EZ control and allow rinsate to drain out through the main tank drain.
5. Add a quantity of fresh water (a minimum of approximately twice the pumps capacity) to the rinse water tank as per filling instructions.
6. Turn on pump with agitator and bypass open to allow fresh water to circulate.
7. Turn off all taps to allow the pressure relief valve to blow off and purge the 'relief to tank' line.
8. Operate induction equipment (if fitted), with a quantity of fresh water in order to flush venturi system. Lower the induction hopper and open drain valve while the agitation jet is running.
9. Now follow the instructions for boom flushing - keep ball valve drawing from rinse water tank.
10. Turn on boom recirculation switch.

NOTE: The boom sections can be pulsed ON/OFF to flush/rinse the tips and nozzle bodies.

11. Turn off boom recirculation switch.
12. Stop spray pump and close all valves.
13. Return pump suction to 'Suction Main Tank'.

Pressure Filter Cleaning

There are 2 in-line pressure filters in the spray pressure line that traps the minute particles that are not collected by the main suction filters.

To drain these filters, open the ball valve located at the bottom of the filter body and let drain. Always remember to stand aside as they may contain some chemical residue.

Allow the chemical in the filter to dribble out into a suitable container to avoid environmental contamination.



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 filter bowl. As per filter removal instructions.
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.

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.

6. Drain the pressure filters.

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.
- 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.

If necessary, remove consoles from cabin and store in a safe and secure location. 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.

Make sure any ice has thawed before using sprayer.

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/hr.

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" 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.

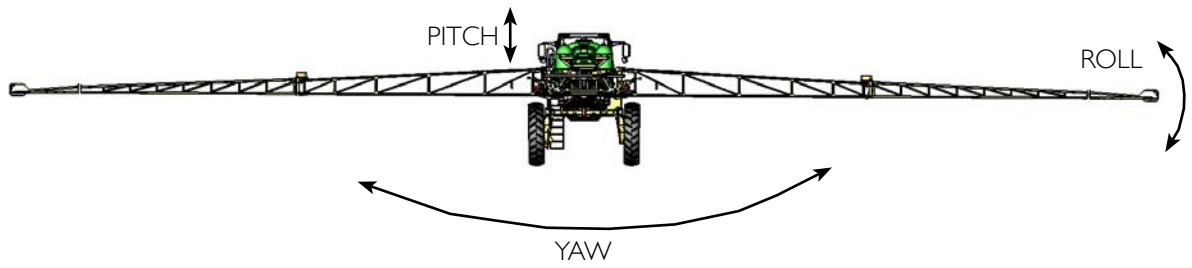
TriTech booms feature a unique (patented) boom suspension system.

This system provides suspension in three directions:

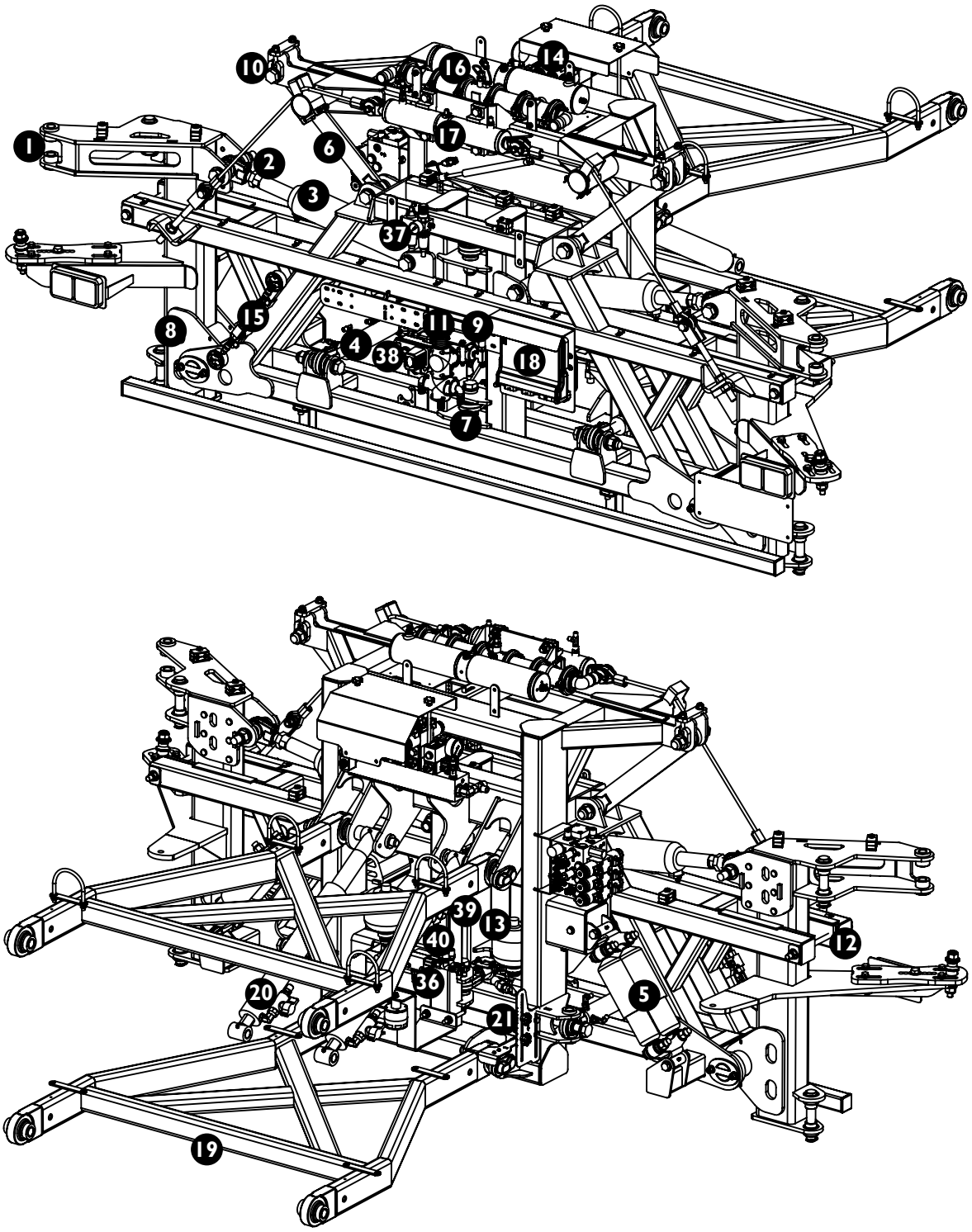
PITCH Hydraulic cylinders connected to nitrogen filled accumulators dampen the vertical boom movement encountered over rough ground conditions.

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.



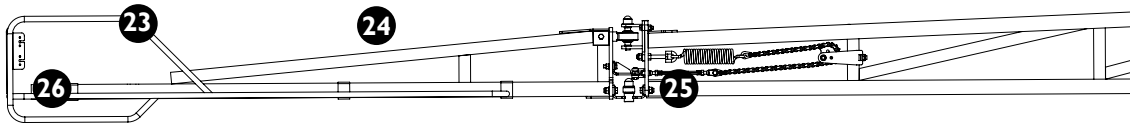
Boom Overview



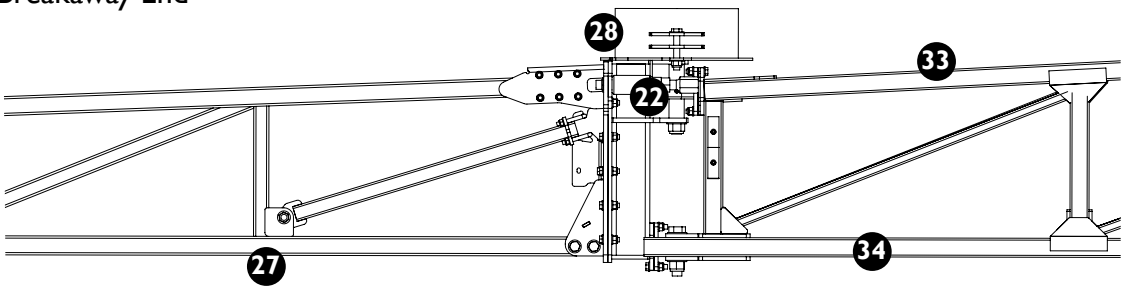
TriTech Centre Section & Paralift

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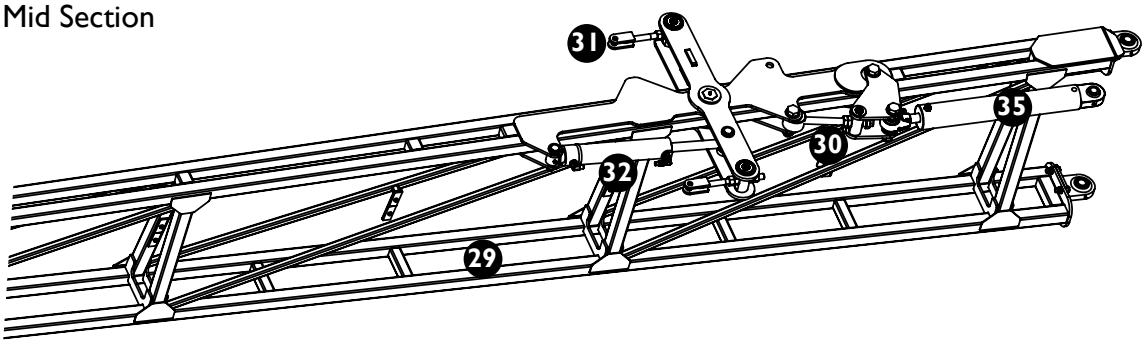
Boom Overview



Breakaway End



Mid Section



Inner Boom Wing End

NO.	FEATURE
1.	Boom rose end
2.	Tilt arm adjuster
3.	Tilt cylinder
4.	Yaw cylinder
5.	Roll shocker
6.	Diagonal delta links
7.	Lineal delta links
8.	Tilt pin (60 mm)
9.	Pressure transducer
10.	Boom alignment adjuster
11.	Rapidfire flow distributor
12.	Tilt arm wear strips
13.	Hydraulic yaw accumulators
14.	Electric Over Hydraulic valves
15.	Hydraulic yaw controls
16.	Flow meter
17.	Centre leveling cylinder
18.	Raven RCM
19.	Paralift arms
20.	Lift cylinders

NO.	FEATURE
21.	Boom lower limit switch
22.	Boom stopper bolt
23.	Boom end protector
24.	Boom breakaway tip
25.	3D breakaway mechanism
26.	Fence line jet
27.	Boom outer wing (Aluminium)
28.	Boom cable drum
29.	Boom inner wing (Steel)
30.	Adjuster for fold cylinder
31.	Bi-fold cable adjuster
32.	Bi-fold - Hydraulic cylinder
33.	Boom top chord (Inner wing)
34.	Boom bottom chord (Inner wing)
35.	Boom fold cylinder (36 m configuration)
36.	Bi-fold - Double pilot operated check valves
37.	Rapidfire oiler & dryer
38.	Rapidflow valve
39.	Hydraulic yaw - Pressure reducing valve
40.	Flow dividers

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. 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 Raise & Lower

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

Crop Cruiser feature a Paralift rear which uses two hydraulic cylinders to perform the lift, while also acting as a component providing the vertical suspension. 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 Crop Cruiser booms have a hydraulic fold feature, allows the boom to 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.

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.

Boom Cables

Boom cables are a critical part of the Crop Cruiser 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 hang out of alignment or 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

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

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.

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 boom is relatively new and 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 in the cabin).

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.

Hydraulic Boom Wing Tilts

TriTech booms can incorporate a hydraulic tilt option, which 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.

Boom Options

Bi-fold

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 Tri Tech 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 as standard on machines with Bi-fold. 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.

Norac Boom Levelling

The Norac ultrasonic boom height levelling system allows you to spray more precisely by automatically adjusting the height of your boom as you travel across the paddock. The operator sets a desired height above the target.

This means that you spend less time watching your booms and trying to prevent them from hitting the ground or crop. The Norac system detects changes in target height and adjusts your boom accordingly.

The ultrasonic sensor detects the height of the target and adjusts the boom height with the hydraulic tilt cylinders to suit the preset height.

Further information on ultrasonic boom height levelling can be found in the Norac section in Chapter 12 'Optional Accessories'.

Boom Operation

Folding Operation

FOLDING PROCEDURE:

1. Starting with the boom in the working (unfolded) position, use the switch to tilt the wings down.
2. Use the 'Boom' UP switch in cabin to raise the boom fully.
3. Use the 'Boom Fold' IN switch to fold the boom completely in.
4. Use the 'Boom' DOWN switch in cabin to lower the boom until the boom just touches the rests.
5. Then continue to lower the boom a further 100 mm so as to put sufficient weight onto the rests.
6. Use the 'Boom Rest' IN switch to fold boom rests in.
7. Finally, press the boom fold switch momentarily to fold the booms tight on the rest.

UNFOLDING PROCEDURE:

1. Use the 'Boom Rest' OUT switch to fold boom rests completely out.
2. Use the 'Boom' UP switch in cabin to raise the boom fully to clear the boom rests.
3. Use the 'Boom Fold' OUT switch to fold the boom completely out so that the boom is aligned with the centre section.
4. Use the 'Boom' DOWN switch in the cabin to 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.

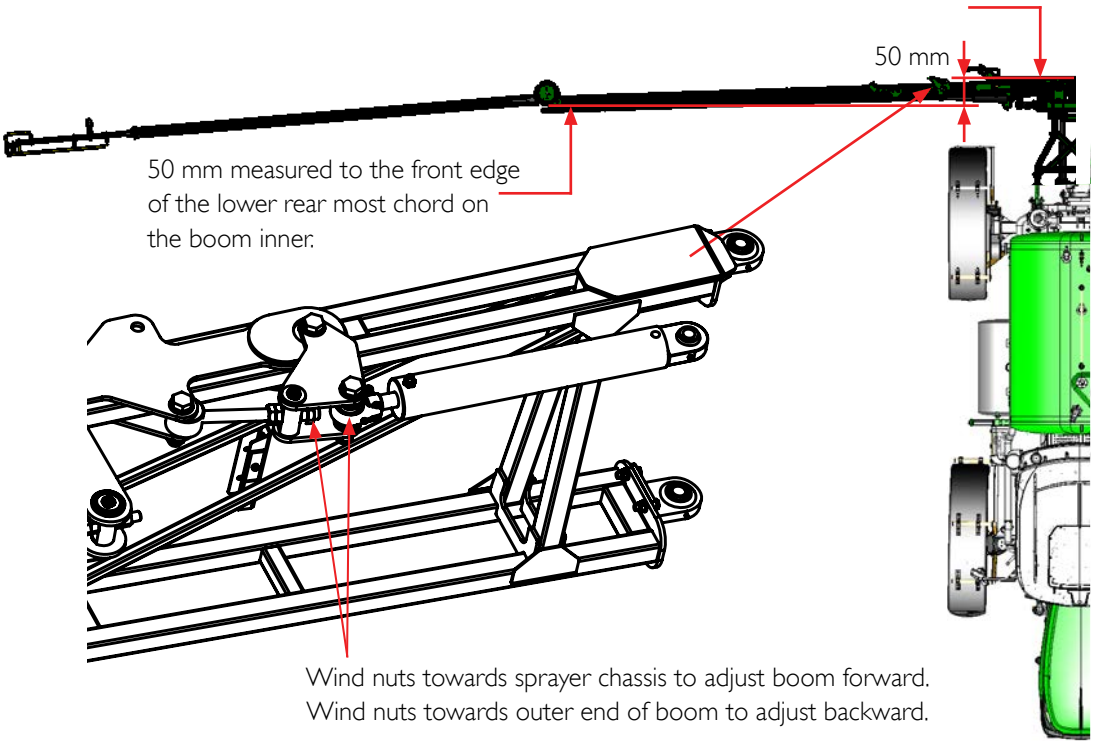
NOTE: To make the boom fold cylinders extend or compress equally on both sides, continue holding the 'Boom Fold' OUT button once the boom has fully unfolded or hold 'Boom Fold' IN once the boom has fully folded for a few extra seconds.

Boom Adjustment

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 at their full extents.
3. Look along the inner booms between the cable drums to assess the alignment.
4. 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).
5. If adjustment is required, loosen the two lock-nuts on the boom fold adjuster bolt at the rear of the boom.
6. To adjust the boom forward, tighten the outer adjuster nut. To adjust the boom rearward, tighten the inner adjuster nut
7. When the boom is in the required position tighten both locknuts to hold in place.
8. 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

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.

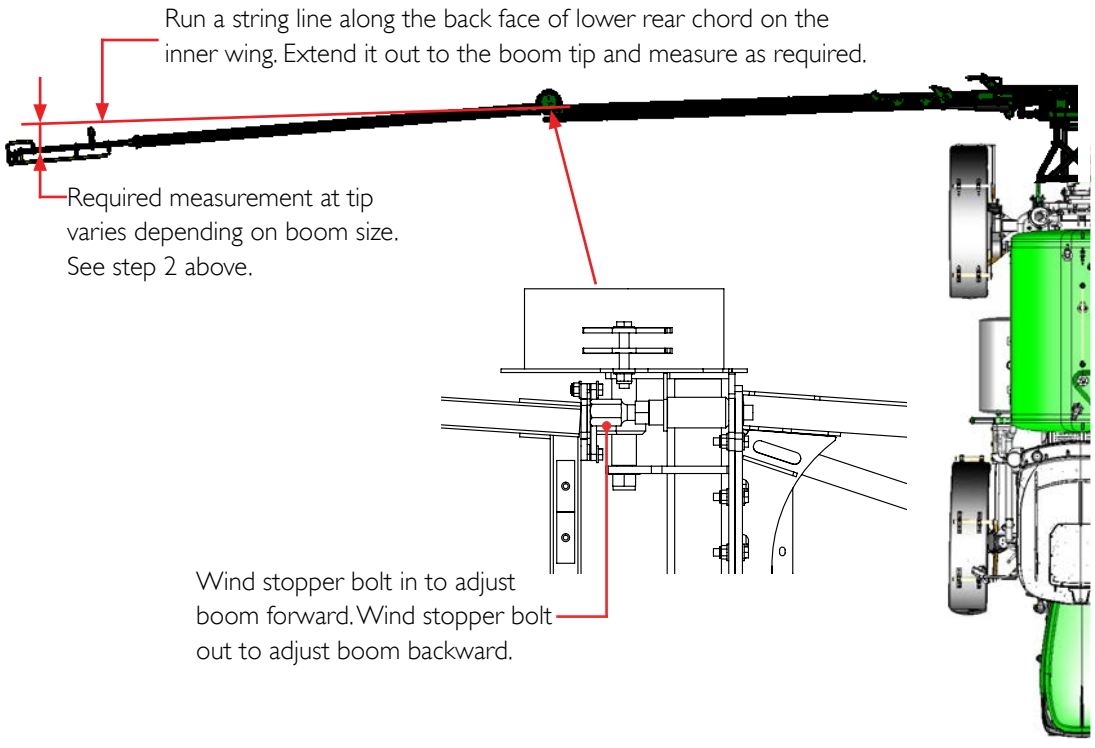
5. Once correct alignment has been achieved the cable spring tension must be set so there is a 3 mm gap between the coils.

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.

NOTE: The rear cable is used for folding only, and must not be tight when the boom is unfolded.

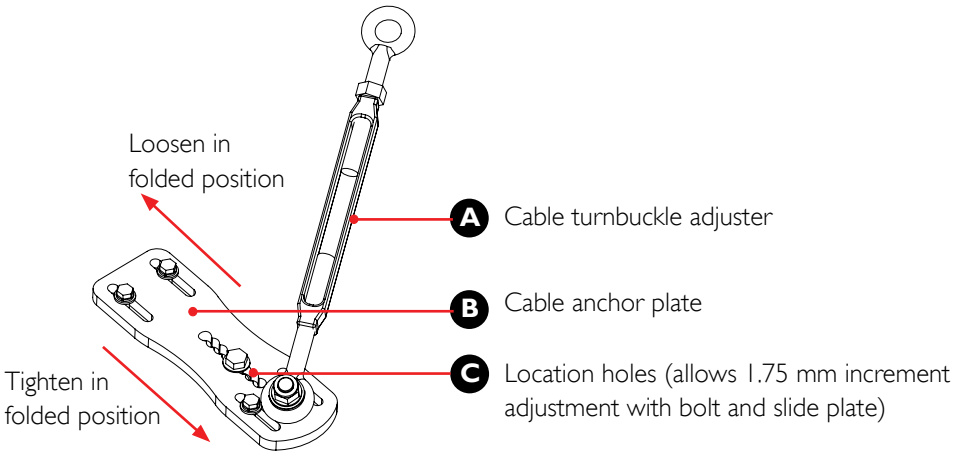


Boom Adjustment

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.



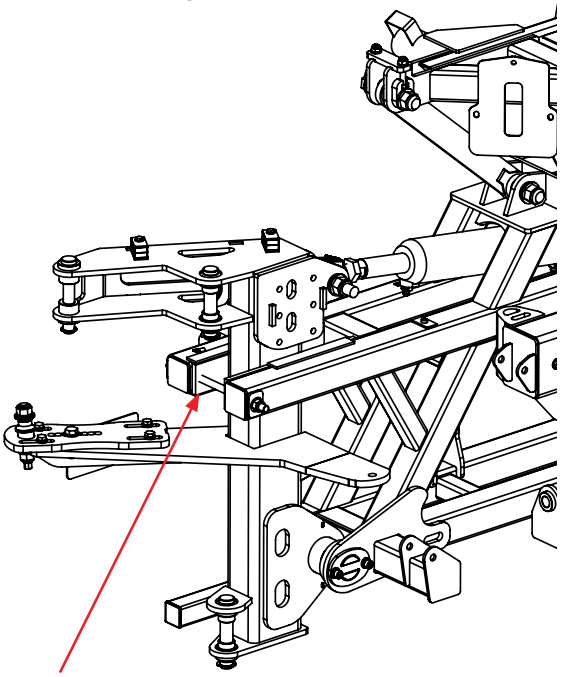
Boom Adjustment

Vertical Boom Alignment - Unfolded Position

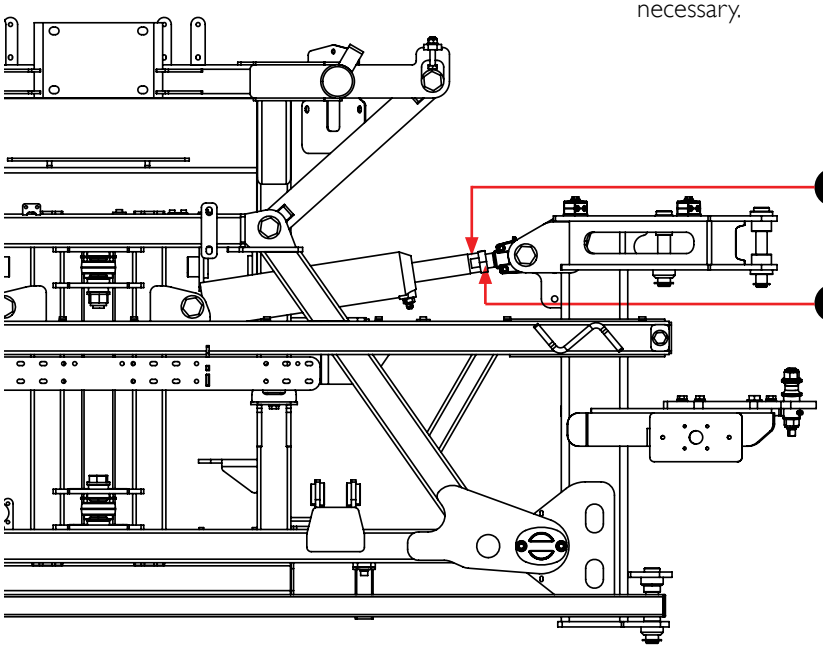
When the boom is in the working position, the inner and outer boom should be level or slightly increasing in height from the centre section to give a consistent and even spray application height. A new boom may be susceptible to stretching or sagging as the components are worn in. Several adjustment 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 cable drums.
- 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.



NOTE: Keep distance between wear pad and tilt arm at 0-0.5 mm to prevent tilt arm twisting for prolonged product life. Replace wear strips when necessary.



Hydraulic Tilt Adjustment

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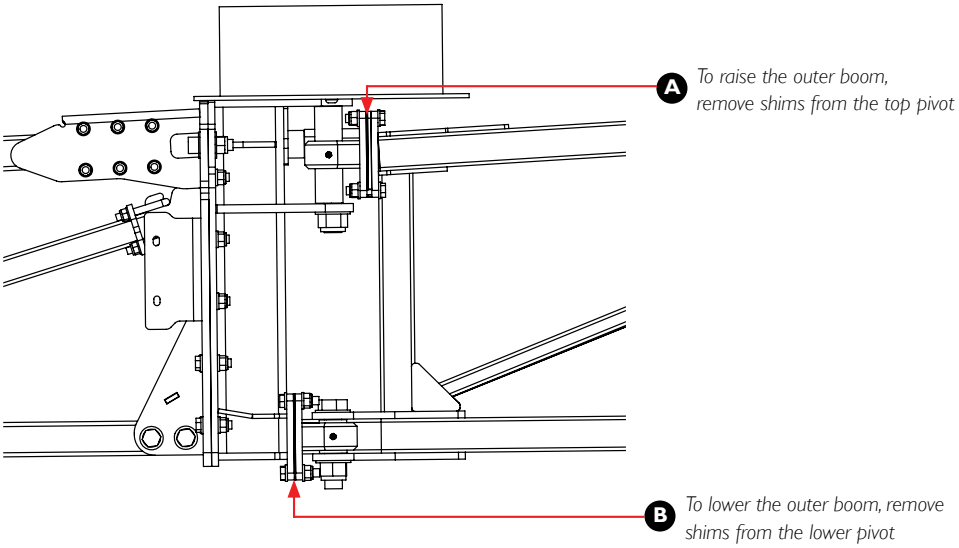
Boom Adjustment

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. Retension 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.

For 24-30 m booms:
1 shim added = 10-20 mm change at boom end

For 33-36 m booms:
1 shim added = 20-30 mm change at boom end



Boom Adjustment

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 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.

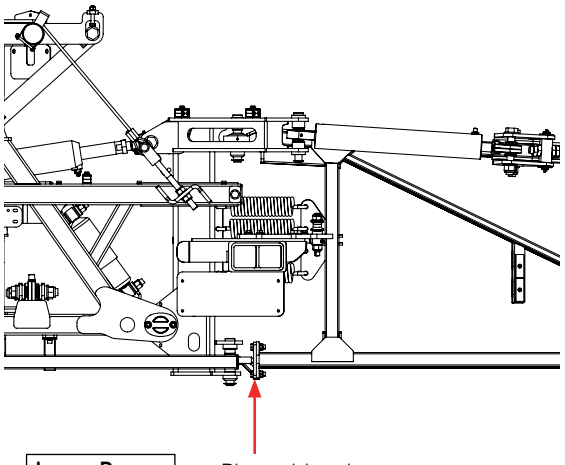
When the booms are folded up in the transport position, the outer boom must saddle onto the inner boom. If this alignment of out the outer boom will not saddle correctly and will not be supported in transport.

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 require in the first 6 months of operation as the booms stretch an ware in.

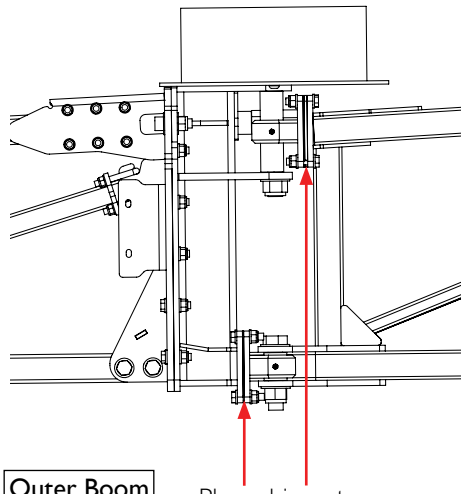
OUTER BOOMS

- 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/or lower pivots equals approximately 15 mm change in height.



Inner Boom Adjustment

Place shims here



Outer Boom Adjustment

Place shims at both pivots

Boom Adjustment

Aluminium Outer Wing

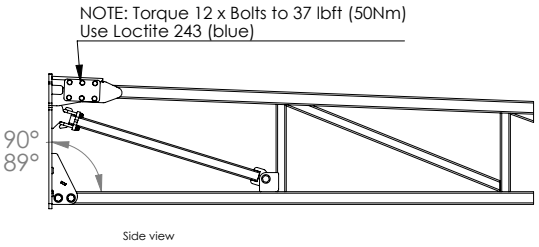
When the booms are fitted at the factory, they are made level or slightly increasing in height from the centre section. Under working conditions the aluminium outer booms will need to be checked at every 50 hour intervals as per the Maintenance Schedule.

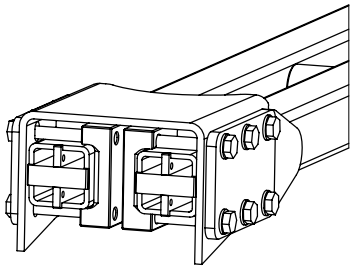
If the aluminium outer boom is not level in the working position, then a likely cause of this may be sagging or stretching.

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.

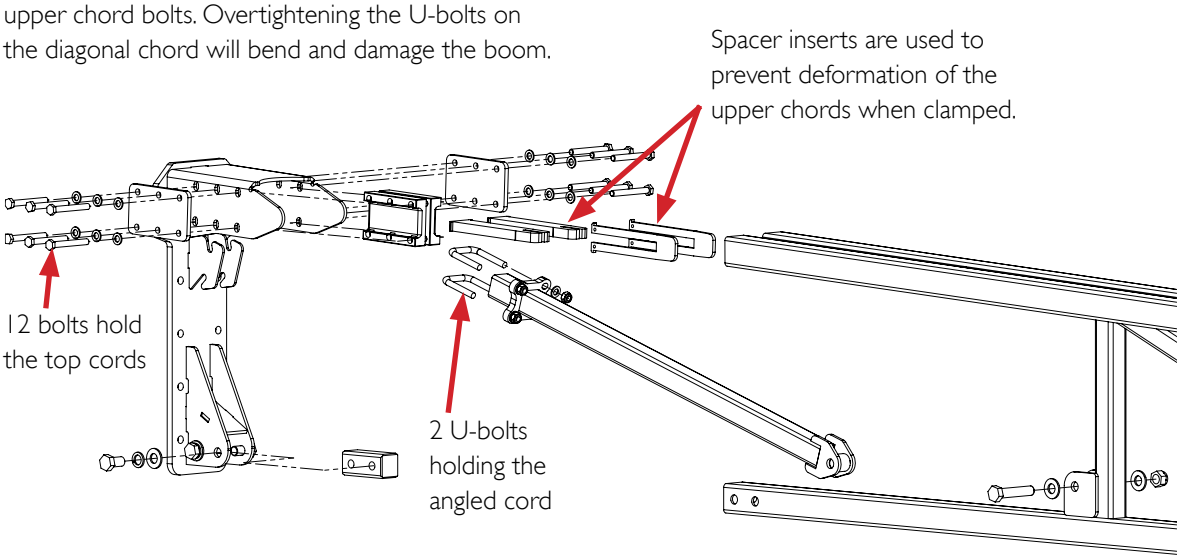
If the aluminium top cords around the bolts show any signs of movement, then the bolts will need to be tightened.

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.



Three Dimensional Breakaway

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.

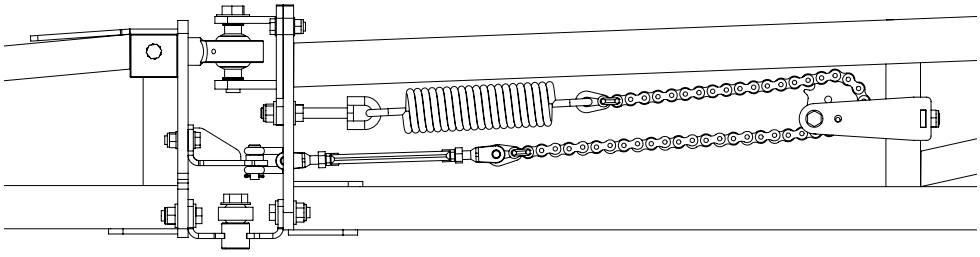


Figure A

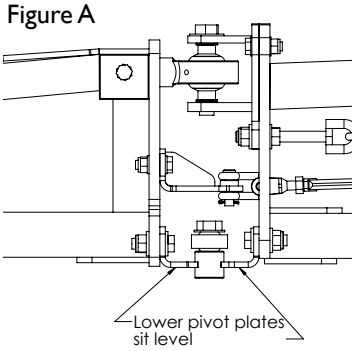


Figure B

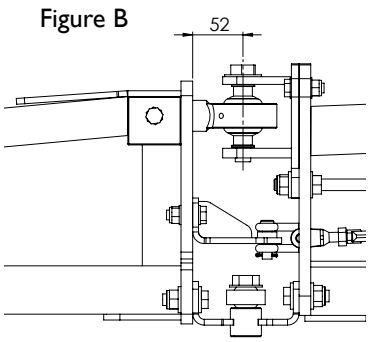
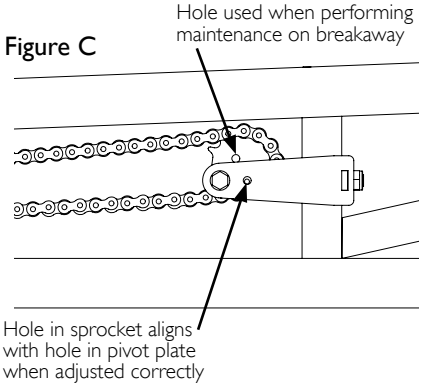


Figure C



Hydraulic Yaw Suspension

Overview

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

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 with a nitrogen charged (70 bar) accumulator which 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 with a nitrogen charged (70 bar) accumulator which is connected via a t-piece into the 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 70 bar precharge pressure. 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 restricts the boom yaw movement trying to hold the boom centralised. 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.

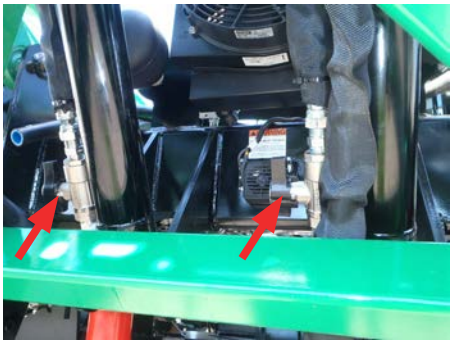
NOTE: When the hydraulic yaw system is installed or any components are replaced, the closed loop hydraulic circuit needs to be bled of any air. The maximum pressure needs to be set, the system charged and the booms aligned.

Circuit Bleeding

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 pressure gauges from the quick connect port on the accumulators.
5. Connect the bleed hose (supplied in the sprayer kit) to quick connect ports on the accumulators.
6. Couple the pioneer connectors 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. 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.
8. When oscillations are complete move the boom into a perfect centred position. Remove bleed hoses.

Setting Pressure Reducing Valve

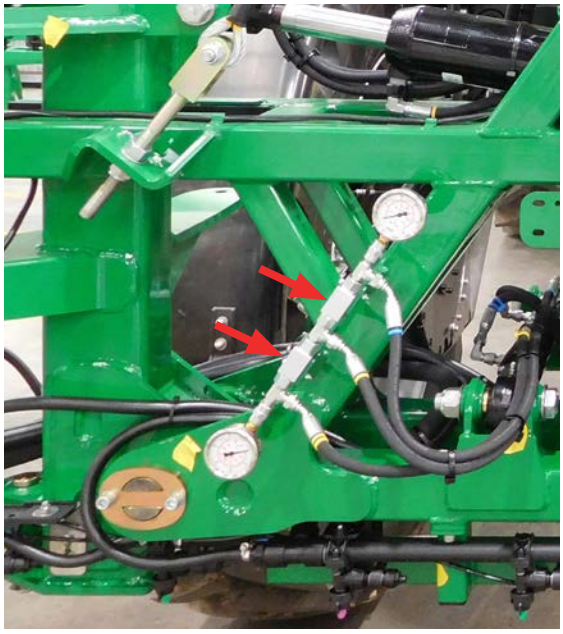
1. Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
2. Open the boom into the working position and lower to the minimum working height.
3. Isolate the boom lift cylinders by rotating the Paralift cylinder valves to the off position.



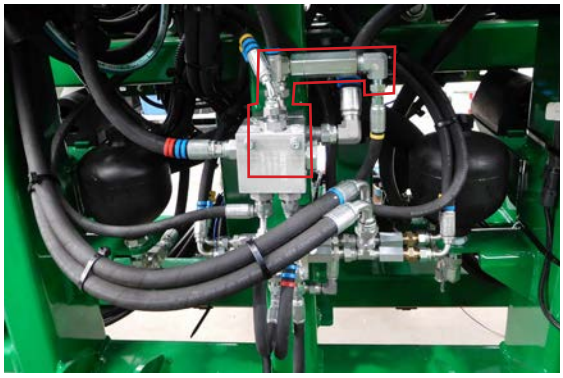
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Hydraulic Yaw Suspension

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'.

System Charging

1. Park the machine on a flat level surface, engage the park 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. 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 (1500 PSI) entering the hydraulic circuit.

6. After 30-60 seconds release the lift circuit and isolate the hydraulic yaw charge ball valves by rotating them to OFF position. The pressure gauges in the hydraulic yaw circuit should be reading 100 bar (1500 PSI).

7. Ensure that the boom is sitting level or aligned correctly. If one side of the yaw is sitting forward of the other OPEN the charge ball valve and push the boom around to align it and even the cylinders out, once aligned CLOSE the charge ball valves. Check the pressure gauges are still at 100 bar (1500 PSI).

Bi-fold

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 earlier for a regular boom.

Alignment - Outer Aluminium Boom - Working Position

1. When adjustment of the inner booms is complete the outer booms can now be aligned.
2. The 24-30 m TriTech booms must be 30-50 mm forward of the inner booms. The 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 adjuster bolt lengthened.
5. If the 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 weight of 15 kg is applied to it.

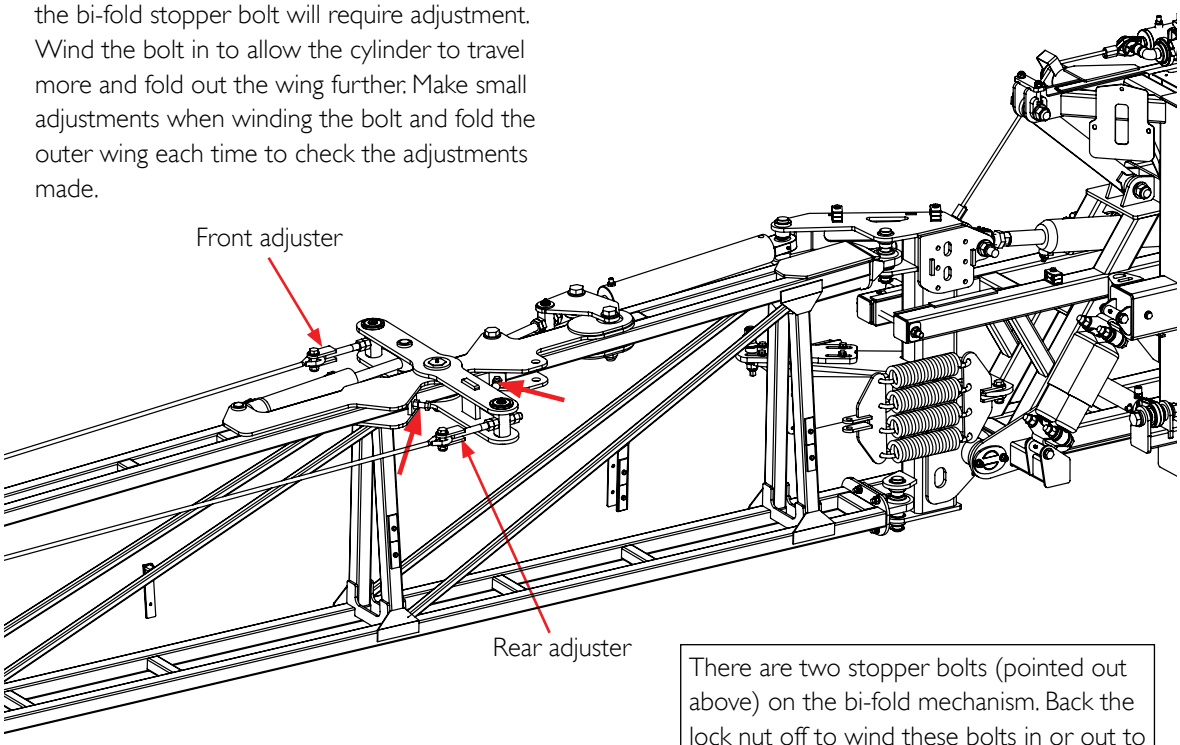
Alignment - Outer Aluminium Boom - Folded Position

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 during transport.

2. To increase to 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 be boom.

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



There are two stopper bolts (pointed out above) on the bi-fold mechanism. Back the lock nut off to wind these bolts in or out to allow the bi-fold cylinder to travel a further or shorter distance. Once desired travel is set, re-tighten the lock nut.

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.

Continued over page

Bi-fold

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
42 m	1700 PSI

The bi-fold pressure is shown on the gauges located on the dash panel in front of the cabin.

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

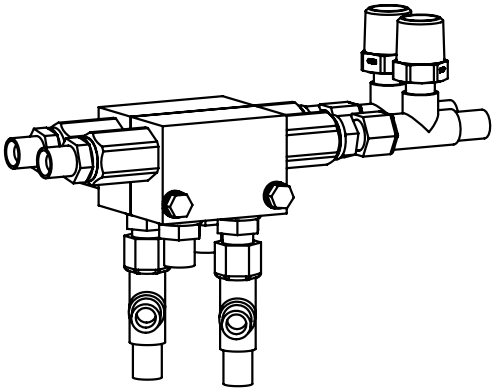


Bi-fold pressure reducing valve

With the boom fully folded out, check the bi-fold pressure on the gauges on the dash panel. 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.

To adjust, the bi-fold pressure reducing valve located on the spool block should be wound in or out. Winding the knob in will increase the pressure, winding it out will decrease pressure. When adjusting the pressure, make only 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.



Above: Bi-fold double pilot operated check valves.

The bi-fold double pilot operated check valves are mounted to the middle rear of the boom centre section.

The check valve for the right hand side is located closest to the Paralift, with the left side check valve on top of it.

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

If the centre and the booms tilt excessively when folding, the centre level cables may need to be adjusted.

To check if the boom are tilting when folding, have somebody stand behind the sprayer out of the boom reach, and watch to see which way the booms tilt 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.

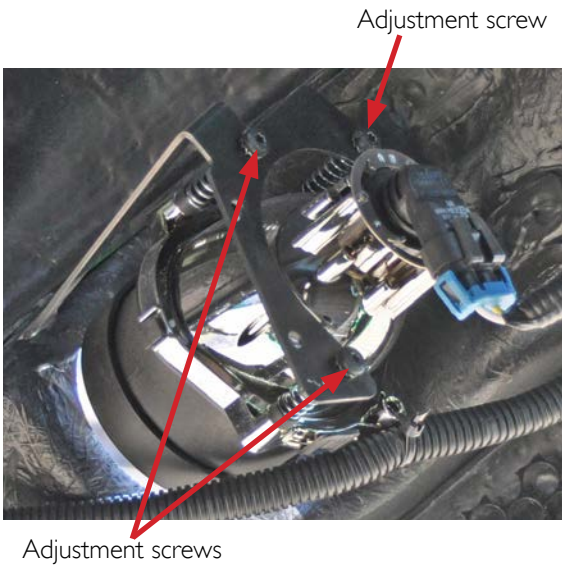
Chapter 10

LUBRICATION & MAINTENANCE

Headlights

The headlights use an HB3 globe type globe. To replace the globe, the bonnet will need to be unclipped on both sides and rolled forward. Do not let the bonnet roll forward under it's own weight. Lean over the cold engine and unclip the loom from the globe and then unclip the globe from the headlight housing and remove. Replace with new globe and follow the instruction in reverse. Ensure bonnet has been re-clipped before driving.

Headlight alignment can be made by adjusting the three screws located around the headlight body. Make a change and then check to see the movement was in the correct direction.



SERVICE ITEM	PART NO. - GOLDACRES	PART NO. - GENERIC
Headlight globe - Low beam	GA3000082	HB3 12V 60w
Headlight globe - High beam	GA3000082	HB3 12V 60w

Engine

Opening Bonnet

The bonnet is fastened down by two latches on either side. Once open, the bonnet is supported by over centre weight.

CAUTION: If the engine has been running, take extra care around hot engine parts such as the exhaust.

CAUTION: When the bonnet is closed, ensure that the latches are tight before driving machine.

Fuel Filters

There are three fuel filters mounted on the left hand side of the engine.

The first filter is an in-line filter that is located behind the fuel tank near the parallel link arms on the left hand side.

The water separator or primary filter is mounted on the front of the left hand chassis rail. This filter is the second point from the fuel tank, it separates any water from the fuel and also filters contaminants.

This filter has a sensor in the base of it which will alarm when excessive amounts of water is detected in the fuel.

This filter should be replaced with in the first 50 hours of use and then every 250 hours of engine operation.

The water trap at the base of the cylinder should be drained daily.

The Secondary filter is mounted on the left hand side of the engine. This filter is finer than the primary filter.

NOTE: Filter specifications can be found in Chapter 10 'Lubrication & Maintenance'.

Engine Oil & Filter

Check the engine oil level daily. The engine oil must be checked with the engine stopped. The engine oil dipstick must be removed from the engine tube, cleaned and then re-dipped to verify the correct engine oil level. The oil level must be between the 'ADD' and 'FULL' marks on the dipstick. If the oil level is below the 'ADD' mark top up the engine with the appropriate fluid. The lubricant specification can be found in the 'Recommended Lubricants' section of this chapter.

The engine oil must be drained within the first 50 hours of engine use and then as per the maintenance schedule after that. To drain the engine oil place a container, at least 30 litre capacity, under the remote drain plug, located on the left hand side on the front cross rail in front off the fuel tank, and then remove the plug. The engine oil filler cap can be loosened to allow the oil to drain easier.

Once drained refit the oil drain plug and fill though the rocker cover on the top of the engine or the filler located near the dipstick. The oil can be checked via the dipstick on the left of the engine.

When the engine oil is changed the engine oil filter must be replaced. The engine oil filter is located on the right side of the engine. The filter is a spin on element.

NOTE: Filter specifications can be found in Chapter 10 'Lubrication & Maintenance'.

Coolant

Crop Cruiser radiators are fitted with a header tank. This allows for expansion of the coolant when the engine warms up. The radiator cap allows excess fluid to drain out of the over flow if the coolant expands too much. The coolant level must be visible from the lid of the header tank. The level will be 50 mm below the lid when the engine is cool.

Coolant level must be checked DAILY.

CAUTION: Never remove the radiator cap when the engine is hot.

The header tank is fitted with a level sensor. If the coolant drops below this sensor the engine controller will send an alarm through to the CanTrak console and shut the engine down.

Coolant must be checked at regular service intervals. Refer to maintenance schedule. Test kits are available from Cummins to check this.

The coolant must be replaced every 2000 hours. Quantity and type can be found in 'Recommended Lubricants' section at the beginning of this chapter.

There are ball valves located on the heater hoses at the rear of the engine and also at the header tank. These ball valves can be isolated during hotter periods to allow the air conditioning system to operate more efficiently. When replacing the entire coolant system these ball valves must be opened so that all the air is bled from the coolant lines.

Engine

Engine Drive Belt

The engine drive belt is a serpentine belt that has a self tensioner on it. The belt requires inspection at regular service intervals. If the belt begins to slip the belt may require replacement as it can become laminated or slippery. If the tensioner loses its tension it can also cause the belt to slip and must be replaced. The belt should be replaced every 1000 hours.

To replace the engine drive belt insert a ½" drive into the tensioner arm and pull upwards.

Pull the belt off the pulleys and off the fan.

Fit the new belt in reverse, ensure all pulleys are aligned correctly with the belt before releasing the tensioner.

Engine Fan Hydraulic Pump Belt

The engine fan hydraulic pump belt have a manual adjuster. To tension the belt, the pump mounting bolt and tensioner must to be loosened. Use the lock nuts located on the tensioner to pivot the pump and tension the belt. When the belt is tensioned correctly tensioned to approximately 19 mm deflection, tighten the lock nuts on the tensioner and the pump mounting bolt.

If the belt is over tight, damage may be done to the pump shaft and pulleys.

Air Conditioner Belt

The air conditioner compressor belt has a manual adjuster. To tension the belt the compressor mounting bolt and adjuster bolt must be loosened. To tighten the belt, use the lock nuts on the adjuster to pivot the compressor and pull the belt tight. When the belt is correctly tensioned tighten the retaining hardware.

There should be no more than 12 mm deflection in the belt when it is tensioned correctly. The compressor belt should be replaced every 1000 hours.

Engine Air Cleaner

The air cleaner is mounted to the top of the engine on the front right hand side. Mounted on the right hand side of the hydraulic oil tank frame is a vacuum gauge (this can be seen from the cabin). This is used to detect a blocked air filter. The gauge will operate in the middle range when in normal working conditions, and in the 'RED' zone when blocked. This indicates it is time to remove the primary filter and replace it.

It is recommended to inspect the filters when the machine is new. Inspection of the primary filter should be carried out at service intervals or when the vacuum gauge indicates. NEVER clean the secondary filter, this filter should be replaced if it is contaminated or damaged.

Cabin Air Cleaner

A carbon air cleaner is fitted to the right hand side of the cabin. This filter cleans the impurities from the air being drawn into the cabin. The air is drawn in through the carbon filter by a fan and pressurises the cabin to prevent impure air entering the cab from any holes or seal leaks. The filter elements have a foam pre-cleaner covering them, this foam element can be removed and washed in water. The element must be totally dried before refitting. Carbon balls inside the filter capture any impurities in the air that are drawn through it. A colour indicator on the end of the filter identifies when the carbon balls need to be recharged to maintain filtering effectiveness. By removing the element from the housing and inspecting the colour of the carbon balls the service life can be witnessed. When the indicator shows the filter needs to be recharged it must be replaced with a new carbon filter or recharged by a certified agent.

COLOUR GUIDE:
Purple - Active
Brownish Orange- Active
Brownish Red - Requires recharging or replacing

NOTE: See 'Service Parts - Filters' section of this chapter for filter specifications and part numbers.

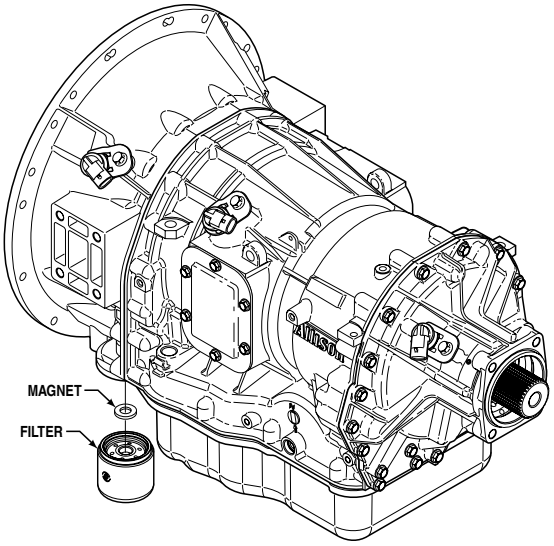


Transmission

The Allison 6 speed automatic transmission oil level can be checked by using the dipstick located in front of the cabin on the left hand side.

The oil level must be checked with the engine running. If the oil is cold (less than 70 degrees Celsius) the oil level must be in the lower range.

If the oil temperature is warm (above 70 degrees Celsius) the oil level must be in the upper range.



External Filter Replacement

1. Remove the spin-on external filter by rotating it in the counter-clockwise direction. A standard strap-type wrench may be used.
2. Remove the magnet from the filter attachment tube or the top of the filter element.
3. Clean any metal debris from the magnet. Any metal pieces found larger than dust needs to be further investigated.
4. Reinstall the magnet onto the filter attachment tube.
5. Lubricate the gasket on the filter with a thin film of transmission fluid.
6. Install, by hand, the filter until the gasket touches the converter housing or cooler manifold.

IMPORTANT: Turning the filter more than one full turn after gasket contact will damage it.

7. Turn the filter ONE FULL TURN ONLY after gasket contact.
8. Reinstall the drain plug and sealing washer. Tighten the drain plug to 30-40 Nm (22-30 lb ft).
9. Refill transmission. Refer to end of chapter for fill quantity and fluid specifications.

Transmission Oil Cooler

The transmission oil cooler is integrated into the radiator.

NOTE: Refer to the maintenance schedules and the Lubricants and Filters tables at the end of this chapter for servicing details.

NOTE: Refer to the Allison Transmission operation and codes manual (supplied) for any information on operation or troubleshooting the Allison transmission.

Transfer Case - 4WD

The transfer case directs drive from the transmission to the front and rear axles on machines fitted with four wheel drive.

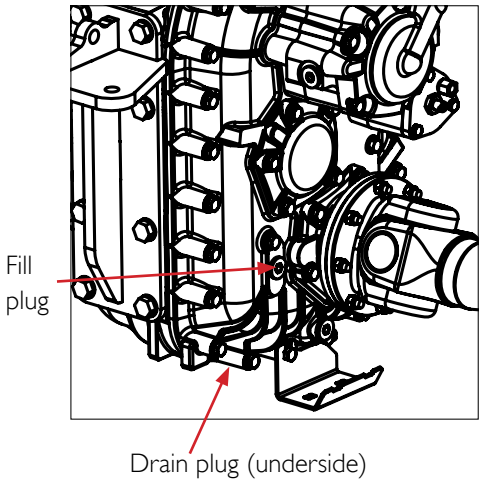
The transfer case runs an oil bath sump. The oil level can be checked by removing the oil level plug located on the side of the transfer case.

The oil should be replaced at the first service to remove any manufacturing contamination.

When draining the oil, the machine should be driven for a short time before hand to warm up the oil. This allows it to drain easier. Remove both the drain and fill plugs when draining the oil.

When filling the transfer case, the machine should be parked on level ground. Fill up to the oil level plug. Clean the oil level plug before refitting.

NOTE: See 'Recommended Lubricants' section at end of this chapter for lubricant specifications.

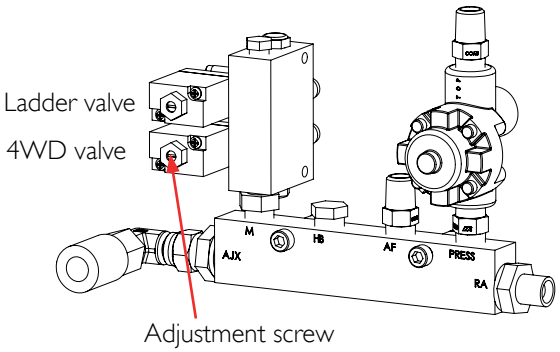


An air solenoid is located behind the right hand side Pod. When the centre differential lock is switched on in the cab, the solenoid is activated. This then sends air from the solenoid, down to the shift cylinder on the transfer case. The cylinder is pushed in by the air and the lock is engaged.

This solenoid can be manually overridden if required. Locate the solenoid under the chassis as shown. The override screw is on the bottom. Using a flat head screw driver, push up into the screw and turn a 1/4 turn in either direction.

Air should now be flowing through the solenoid and the differential lock should be engaged.

To disengage, turn the screw a 1/4 turn in the opposite direction to when it was overridden.



Above: Pneumatic manifold located behind the right hand side Pod. The 4WD solenoid has an override screw in the bottom that can be overridden with a flat head screwdriver.

Driveline

Fixed drivelines are used to transmit drive between the transmission and the differential. These drivelines have greasable universal joints at each end, and centre bearings on the shafts. The rear shaft has a telescopic spline which also requires greasing. These drivelines should be inspected for wear and greased at regular service intervals.

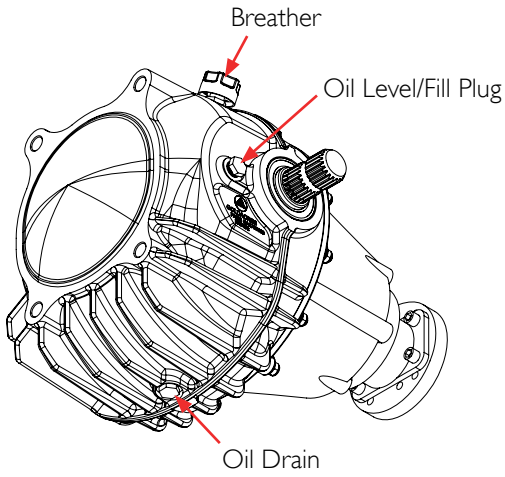
Differential

The differential runs in an oil bath sump. The oil level can be checked by removing the level plug on the side of the differential housing. The oil should be replaced at the first service to remove manufacturing contamination. The oil must be replaced every 500 hours.

NOTE: The rear differentials are fitted with an LSD. Some chattering noise may be present during first use, but will subside over time. This is normal.

NOTE: See 'Recommended Lubricants' section at end of this chapter for lubricant specifications.

There is a breather located on the top of the differential. This allows the oil to expand and contract without creating a vacuum or pressurising the differential housing. This breather must be cleaned at regular service intervals.



Drop Legs

Crop Cruisers run dual reduction chain driven drop legs. Drive is transferred from the differential through drive shafts to the input shaft of the drop leg. A Super 120 HT drive chain is between the input shaft and the middle idler shaft. The bottom chain is a Super 140 HT and joins the idler shaft to the output axle shaft.

The drop legs have an oil bath sump which the chains run in and carry the oil to the bearings. The idler shaft bearing housings have sumps so that the bearings always have oil lubrication.

The oil level can be checked by removing the level plug. There are breathers on top of the drop legs. This allows the oil inside to expand and contract without pressurising or creating a vacuum in the drop leg housing. This breather must be cleaned at regular service intervals.



Above: Drop leg breather.

Drive Chain Maintenance

Crop Cruisers are fitted with two size quality Tsubaki drive chains to transmit power to the wheels. These chains are of the highest quality and are designed for a long trouble free life, however, proper care and maintenance of the drive system must be adhered to for maximum chain and sprocket life. The top chain is 120 Super HT chain while the bottom drive chain is 140 Super HT.

Even the best chains eventually stretch over time and become loose however. The maximum allowable chain stretch is 1.5%. When this occurs the chains must be replaced. The chains' service life is gauged by total stretch. There is no tensioning mechanism because when a chain stretches it no longer aligns correctly with the drive cogs and therefore should be replaced to prevent excessive wear on the teeth of the drive sprockets.

Suspension

The five point suspension system used on the machine consists of four parallel links, one Panhard rod and two air bags on each axle. The rear axle of the machine is also fitted with an anti roll sway bar.

Parallelogram links hold the axle in place on the chassis. Panhard rods hold the axle centred in the chassis. The parallelogram arms allow the axle to distort or twist forward and backwards when the wheels come in contact with an obstruction such as a pot hole, log or embankment. This oscillation is absorbed by polyurethane bushes in each end of the links. The life time of these bushes is subject to the conditions the machine operates in and the style of operation that it receives. The polyurethane bushes should be checked at regular service intervals as stated in this manual. Air bags mounted on to each side of the axle allow the axle to oscillate.

Polyurethane Bushes

There are two sized polyurethane bushes used in the suspension system on this machine. The first bushes are located in the Para Link and Panhard rods. There are 20 of these bushes used in the machine and they can be purchased from your Goldacres dealer.

The second bushes are located on the sway bar.

Polyurethane bushes wear gradually over time and should be checked for movement during servicing. If there is any play in these bushes they should be replaced.

Parallel Link

Each end of the parallel link is attached to the chassis and differential with polyurethane bushes and 3/4" high tensile bolts. These links hold the axle in place while the bushes allow deflection when the wheels come in contact with an impact such as wash out or embankment. The bolts and bushes should be checked each time that the vehicle is serviced. If the axle is tending to twist or rock the bushes must be replaced.

Shock Absorbers

There are four shock absorbers fitted to the machine, one fitted to each side of the front and rear axle. The shockers dampen the movement of the air bags to prevent recoil. These should be check for damaged rubbers or oil leaks.

Panhard Rods

The Panhard rods fitted to the machine are designed to prevent any sideways movement of the axles and to hold the axles central to the chassis. These rods are attached to the top of the axle and bottom of the chassis with two polyurethane bushes and 3/4" high tensile bolts. These bolts and bushes should be checked each time that the vehicle is serviced. If the axle is tending to twist or rock the bushes must be replaced.

Sway Bar

The sway bar is attached to the chassis and top of the rear axle with polyurethane bushes. This bar is designed to prevent excessive roll in the vehicle. The bushes should be checked each time that the vehicle is serviced.

Air Bags

The four air bags use compressed air to inflate them. They have ride height valves attached to the chassis and axle. As a load is exerted on the chassis the air bags will compress lowering the ride height valve arm. The ride height valve will then let air into the air bag causing it to inflate. As load is lessened on the axle the air bags will expand raising the arm of the ride height valve. The ride height valve will exhaust letting air flow out of the air bag causing it to deflate until the ride height arm becomes level again.

The air bags have internal rubber bumps that prevent the air bag bottoming out and jarring when the axle contacts large obstacles.

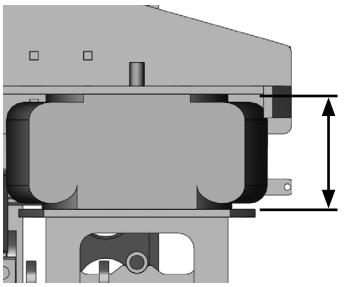
The rear axle has two ride height valves which level the sprayer, the front axle has one ride height valve in the middle of the axle which maintains the required height and allows it to pivot freely.

Airbag Height settings

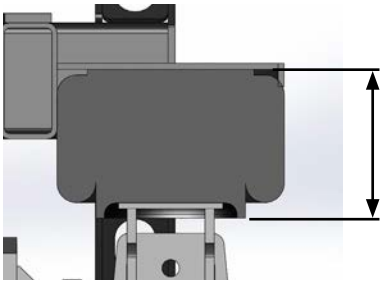
The front air bag height should be set at 250 (+-5) mm. The rear air bag height should be set at 283 (+-5) mm. If this distance is not maintained the angle of the drive shaft changes causing a vibration and possible damage to the drive train.

Continued over page

Suspension



The front air bag is measured from the inside of the top mount to the top of the bottom mount.



The rear air bag is measured from the inside of the top mount to the bottom of the plastic skirt of the air bag.

PROCEDURE TO EVACUATE AIR BAGS FOR TRAILER TRANSPORT

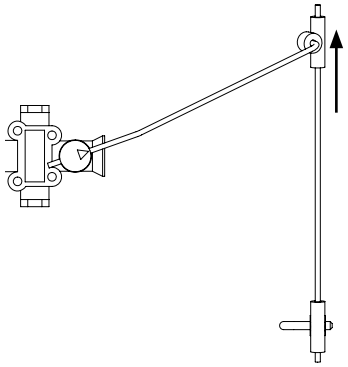
Loosen the drain tap on the air tank and drain the air. Loosen the fitting on the top of the air bag mount and release the air in the air bags. The air bags will lower on to the bump stops. Once the machine is on the bump stops tighten up the air tank valves and the fittings to the air bags. Don't alter or change the height control valve linkages to release the air.

Ride Height Valve Adjustment

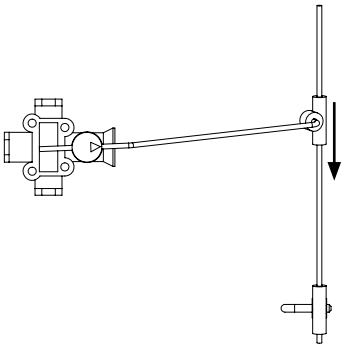
The ride height valves are used to adjust the air pressure within the air bags to maintain the correct ride height. There are two ride height valves located on each side of the rear axle and one located in the centre of the front axle.

The ride height can be adjusted by loosening the hose clamp attached to the vertical rod on the end of the ride height valve and then moving the valve arm in the required direction.

When the sprayer has been unused for a period of time, the air bags may deflate, this is normal. They will refill when the machine is started.



Above: To raise the machine, move the arm up the vertical rod.



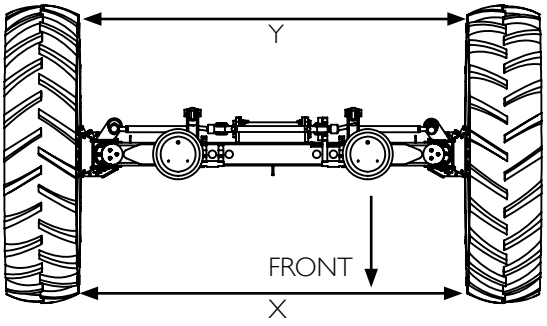
Above: To lower the machine, move the arm down the vertical rod.

Steering

Steering Toe In

Steering toe-in should be set to 0-5 mm. To check this measurement follow these steps:

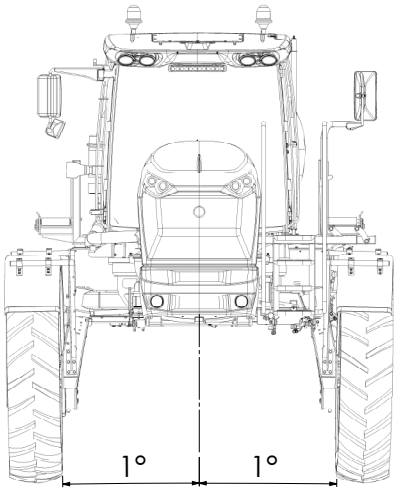
1. Stop the machine on a flat level surface, apply the parking brake and remove the keys from the ignition.
2. Measure up from the ground 900 mm on the front of the steer tyre and mark.
3. Repeat for the rear of the steer tyre.
4. Measure between the front of the left and right steer tyres at the mark previously made and record.
5. Measure between the rear of the left and right steer tyres at the mark and record.
6. The front measurement must be 0-5 mm less than the rear measurement.
7. To make an adjustment, loosen the tie rod lock nuts and then loosen or tighten until the toe-in measurement is correct. Re-tighten the lock nuts.



Above: Measurement X should be 0-5 mm less than measurement Y.

Camber

The wheel camber is a factory set parameter and cannot be adjusted. At the time of manufacture the wheel camber is set to +1.0°.



Braking System

The braking system used on this machine is a split system consisting of four rotors with one caliper per rotor. These calipers are powered by an air over hydraulic system. The front two calipers are powered off one master cylinder and the rear calipers are powered off a second master cylinder.

Rotors

The rotor used on the crop cruiser sprayers are a customized construction and must be purchased from your local Goldacres dealer. They are a 600 mm diameter rotor that is fitted to the hub on the inside of the wheel. Rotor thickness when new is 22 mm and the minimum thickness before necessary replacement is 20 mm.

Calipers & Pads

The calipers used on the Crop Cruiser sprayers have two brake pads which clamp on to the rotor when the brakes are applied. These pads must be inspected regularly for wear. When the pads wear down to the indicator grove they must be replaced. Build up of mud and debris will cause the brake pads to wear prematurely for this reason the brake calipers must be kept clean at all times.

Brake Boosters

Both brake boosters are located in the pod on the right hand side of the sprayer. The booster closest to the front is used to power the front brakes and the rearward booster powers the rear brakes. To maintain sufficient brake fluid in the system, each brake booster reservoir must be checked regularly.

Brake Bleeding

The braking system is an air over hydraulic configuration. The front and rear brakes are operated from two separate brake boosters and reservoirs. The boosters are located in the module on the chassis on the drivers side.

To bleed the brakes, there must be sufficient air pressure. Each brake caliper must then be bled separately.

MANUAL BLEEDING METHOD

1. Connect a clear plastic tube to the bleed screw and place the opposite end of the tube into a container

NOTE:

- Fill the container with approximately 30 mm of brake fluid and then submerge the end of the plastic tube in the fluid. This is important to stop air being drawn back through the system.
- The system should be bled until no more air bubbles appear in the container.
- It is recommended that during this process the person bleeding the brakes wear suitable eye protection.

2. With an assistant, loosen the bleed screw and then slowly depress the brake pedal. When the brake pedal reaches its full travel re-tighten the bleed screw before allowing the pedal to return to its released position. Continue this process until the air in the system stops bubbling up in the container and a continuous stream of fluid can be seen leaving the bleed screw.
3. Repeat this procedure for each of the other brake assemblies.

NOTE: Ensure that at all times the fluid level in the reservoirs remain above the minimum mark.

If the desired result is not achieved after completing this process then the brake system must be pressure bled.



Braking System

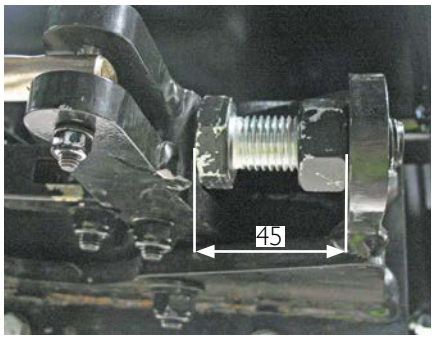
Park Brake

The park brake is mounted at the rear of the transmission. It is a drum brake that is applied using a cable and booster which is activated by a switch in the corner console.

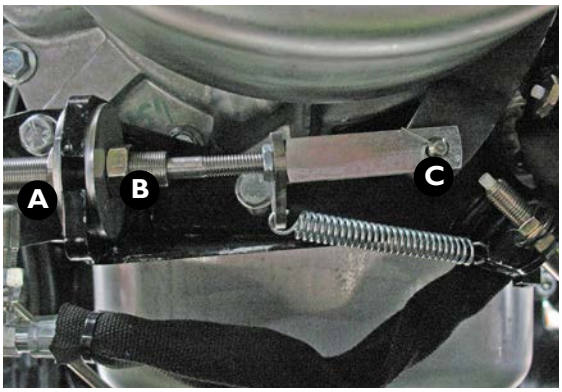
The park brake has an electric switch mounted on it that is closed when the park brake is engaged. This will sound an alarm and illuminate the warning lamp on the front console if the transmission is moved into a gear other than neutral when the park brake is engaged.

PARK BRAKE ADJUSTMENT

1. Park the sprayer on even level ground. Leave the park brake on so the cabin access ladder remains down.
2. Chock all wheels of the sprayer, ensuring it cannot roll while it is being worked on.
3. Wind out the override bolt until it contacts the clevis arm. Then continue winding for another 5 mm. In the wound out position, the bolt should measure approximately 45 mm from the top of the bolt head, to the closest face of the adjuster bolt mounting plate as shown below.



4. Once the hand brake has been overridden, the condition of the park brake pads must be inspected before adjustment of the cable at the transmission.
5. Use locking nuts (A & B) to adjust the cable tension at the rear of the transmission. The cable should be tensioned just enough so the clevis pin (C) can't be spun by hand.
6. Once adjustments have been made, tighten lock nuts A & B.



7. Fully wind in the override bolt.

WARNING: DO NOT disassemble the hand brake booster. It contains a high tension spring under compression which has the potential to cause serious injury or death.

Wheels

Tyre Changing

- Only an experienced person working with the correct equipment should change the wheels.
- When changing a wheel, ensure that the sprayer is on hard, level ground and the wheels at the opposite end of lifting are chocked.
- Remove the isolator and the key from the ignition.
- Before raising the machine off the ground ensure that the boom is at its fully closed position.
- Where possible empty the spray tank before lifting the machine.
- Place the jack securely under the jacking point and gently raise the machine until the weight has been removed from the wheel.
- Do not support the sprayer using materials that may crumble.
- Do not work under the machine when supported solely by a jack.

NOTE: When the tank is fully loaded each wheel supports a weight up to approximately 4 tonnes. Always ensure that the jack is designed to operate under this pressure.

Tyre Maintenance

- Maintain the correct tyre pressure at all times. Inflation above the recommended pressures may cause damage to the tyres.
- Extreme caution is required during the inflation of tyres. If tyres are inflated at a rapid rate then the tyre rim combination may explode. This can result in serious or fatal injuries.
- When inflating a tyre regularly check the tyre pressure with an inflation gauge.
- Do not weld, heat or modify the rim, as this is likely to weaken the rim.

Be proactive and regularly check the condition of your tyres.

Tyre Pressures

The tyres on the Crop Cruiser operate under harsh conditions. High road speeds and high loads can cause tyres to wear prematurely. It is very important that tyres are maintained and operated correctly. Tyre pressures are the most important factor in maintaining the correct load rating of the tyre.

It is advisable to protect the tyres as much as possible to reduce deterioration.

Chemical sprays and insecticides are harmful to the rubber in the tyres and should be washed off after use.

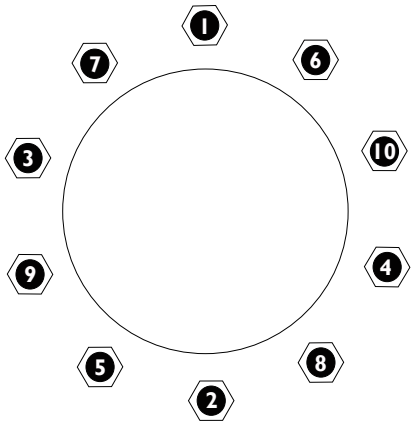
Tyre Pressures must be checked daily to maintain a satisfactory working life.

Also see chart in Chapter 3 'General Information & Specs'.

Wheel Nut Tension

Wheel nuts must be tensioned daily when the machine is new or when the wheel nuts have been removed and refitted.

Once the wheel nuts hold their tension inspection can be lengthened to approximately 50 hours. Wheel nut tension specification on the Super Cruiser front and rear wheels is 350 ft/lb.



Above: Follow this tightening sequence to ensure even wheel nut torque distribution (350 ft/lb).

Hydraulics

Crop Cruiser sprayers are fitted with three hydraulic systems:

- The first is used to operate the steering and boom cylinders.
- The second system is used to operate the spray pump.
- The third powers the engine cooling fan.

These systems operate from a common hydraulic reservoir. The reservoir has a sight tube mounted on the side. The oil level must always be visible in top third of the tube. The oil temperature will reach at 60-80 degrees Celsius in typical operation.

NOTE: See 'Recommended Lubricants' section at beginning of this chapter for lubricant specifications.

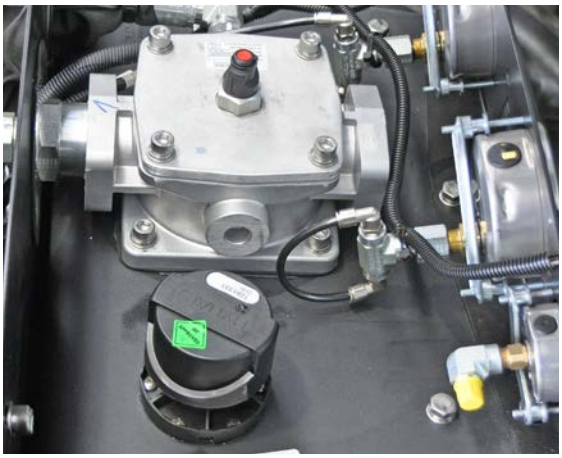


Main Hydraulic Systems

The two hydraulic systems are used to provide liquid for the steering, hydraulic cylinders and liquid pump. The first hydraulic system is a priority system, driven by a hydraulic pump attached directly to the engine. This system has two priority levels. The highest priority components on the system are the steering. The second priority components are the boom hydraulics as well as the fill pump. The second system drives and maintains the spray pump speed.

Return Filter

The hydraulic filter is located in the tank in front of the cabin. This filter should be replaced after the first 50 hours of use and then every 500 hours after that. The return filter filters all of the return oil to the reservoir. There is a red indicator located on the top of the filter. If the indicator pops out then the filter must be replaced because it is blocked and causing back pressure through the system. This filter should be checked once the oil has reached operating temperature as cold oil can cause a false reading on the indicator.



Hydraulic Oil Cooler

The oil cooler is located on the rear of the chassis above the rear differential. This cooler uses an electric fan and a thermostatic switch to keep the oil at the optimum temperature. The cooler will switch on when the oil flowing through reaches 55°C. Ensure that the fins on the cooler are kept clear of debris.



A warning system has been fitted to alert the operator when the hydraulic oil may be overheating. When the temperature reaches 95°C, the low air light will come on and the buzzer will sound. This warning is shared with the low air warning circuit. It is important to assess whether there is a problem with low air or the hydraulic oil is overheating.

IMPORTANT: Do not use this machine in ambient temperatures exceeding 40°C. Significant damage may occur where machine is operated continuously in very hot conditions.

Continued over page

Hydraulics

Cease operating the machine and check the temperature gauge mounted on the side of the oil tank. If it is high, but the oil cooler is clear of debris and the electric fan is operating as normal, then likely the ambient temperature is too high and the machine should not be operated. Very dusty environments are more likely to clog the fins of the oil cooler and should be checked more regularly under those conditions.

Hydraulic Pumps

The double hydraulic pump is attached directly to the engine air compressor. These pumps are positive displacement type pumps and are powered off the engine timing gears.

- The first pump is used to supply fluid for the steering and boom cylinders.
- The second pump is used to supply fluid for the spray pump.

After fluid leaves the front hydraulic pump it travels through a priority valve. This valve gives priority to the steering system to ensure that the steering orbital (attached at the CF connection) always receives sufficient oil flow. When the steering system has received sufficient flow, the priority valve begins to enable fluid to travel to the rear hydraulic circuit that control boom functions. This flow is determined by the load sense line from the steering orbital.

PORT	DESCRIPTION
P	Pressure supply
CF	Supply to steering orbital
EF	Supply to solenoid bank
LS	Feedback from steering orbital



Above: Hydraulic pumps on left hand side of engine.

Steering Orbital

The steering orbital is located under the front of the cabin. This supplies oil flow to the steering cylinder when directed by the steering wheel.

PORT	DESCRIPTION
P	Pressure supply
R & L	Supply and return to steering cylinders
LS	Load sense to priority valve
T	Return to reservoir

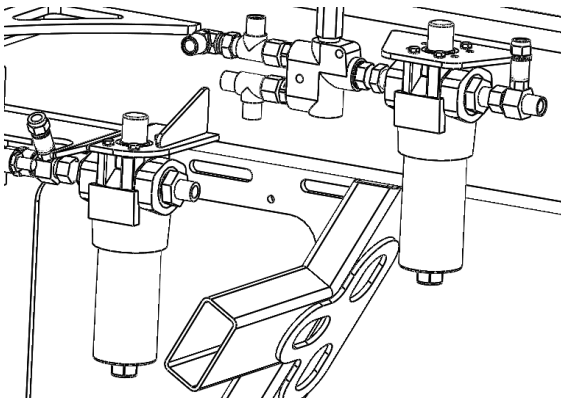


Above: Steering orbital mounted under cabin.

Pressure Filters

After fluid leaves the hydraulic pumps, it travels through to the pressure filters. The pressure filters are used to filter the oil before it is pumped through the system. When a filter becomes blocked, the indicator on the top of the filter will change from green to red. When this occurs, the filter should be replaced immediately. The pressure filters should be replaced every 500 hours.

NOTE: See 'Recommended Lubricants' section at beginning of this chapter for lubricant specifications.



Above: The pressure filters are located under the cab in the left hand chassis rail.

Continued over page

Hydraulics

Electric Over Hydraulic Controls

The boom and fill pump functions are controlled by electric over hydraulics solenoids. These solenoids are energised by functions on the joystick/console in the cabin and switches on the EZ control station.

The boom functions are controlled by the solenoid block mounted at the top of the boom centre section. This hydraulic block is plumbed as an open centre circuit. The oil from the priority valve flows through the block continuously. When a hydraulic function is activated the unloader solenoid closes providing flow and pressure to the function on demand. There is a gauge mounted at the left end of the block for diagnosis.

PORT	DESCRIPTION
P	Pressure supply
T	Return to reservoir
A & B	Bi-fold and tilt cylinder connections
L1 & L2	Lift cylinders & yaw charge circuit

Continued over page

Hydraulics

Hydraulic Spool Block

Boom rest and fill pump are controlled by the valve block mounted on the cross member of the chassis under the cabin.

The solenoid valve blocks have various functions.

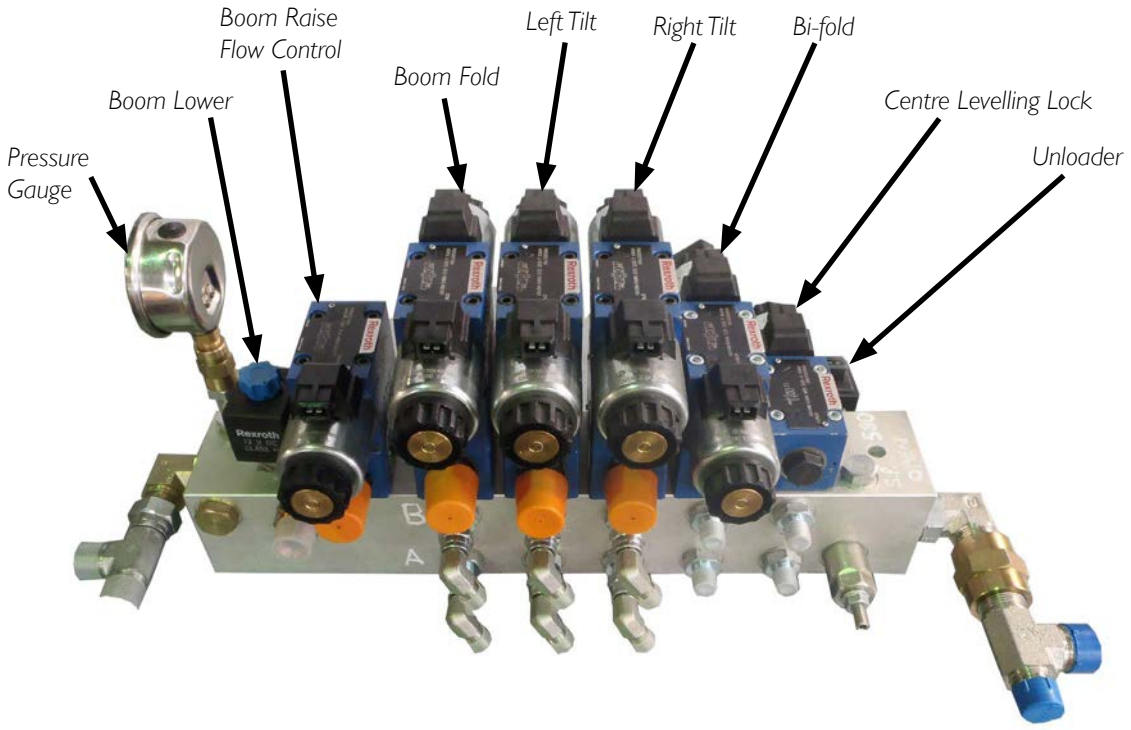
The directional valve controls oil flow to the desired circuit. Each particular circuit can be identified by the tag on the wires attached to the solenoids.

The double operated check valve blocks oil flow through the solenoid when the solenoid is not energised. This prevents that function leaking down, for example if the right hand side of the boom was tilted up the double operated check valve will stop oil leaking through when the solenoid is de-energised and lower the boom, preventing it moving when the operator is not directing it.

The flow control allows the amount of oil flow to the hydraulic circuit to be varied thus adjusting the speed of that circuit. By turning the flow control adjustment in, clockwise, the flow is reduced thus reducing the speed at which that hydraulic function will operate. By turning the flow control out, counter clockwise, the flow is increased thus increasing the speed of that hydraulic function.



The pressure reducing valve is used to control the maximum pressure in the Bi-fold circuit. The pressure in the boom bi-fold cylinders determines the suspension of the outer boom. If the pressure is too high the boom rides too rigid and will not have break out. If the pressure is too low the boom will have low break out and tend to wave around. The pressure in the bi-fold circuit should be between 1500 and 1700 PSI when the boom is in the folded out, working, position.

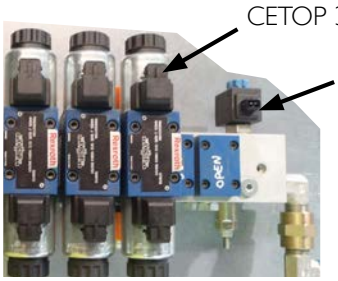


Hydraulics

Unloader Solenoid

The unloader solenoid is located at the rear of the sprayer on a hydraulic bank that contains CETOP 3 solenoids. The unloader solenoid can be identified as the cartridge solenoid on the front face of the manifold. It sits in a lower plane than the CETOP 3 solenoids.

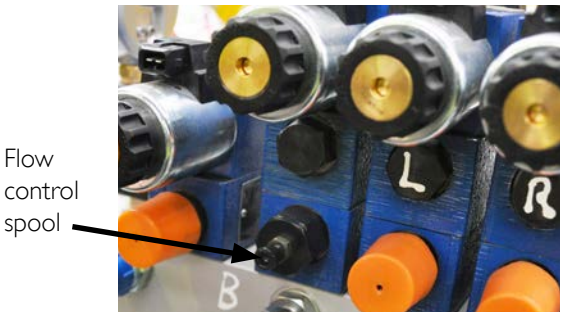
When the boom hydraulics are de-energised this solenoid allows fluid to return back to the hydraulic tank. As soon as one of the hydraulic circuit solenoids is activated the unloader solenoid will also activate and prevent the fluid returning directly back to the tank, therefore increasing the pressure in the system to main relief pressure and allow the hydraulic function to be performed. When the system performs a function, the gauge on the left hand end of the block should read 2500 PSI. If the reading is lower, contact your local Goldacres dealer for support.



Boom Raise & Lower Solenoids & Cylinders

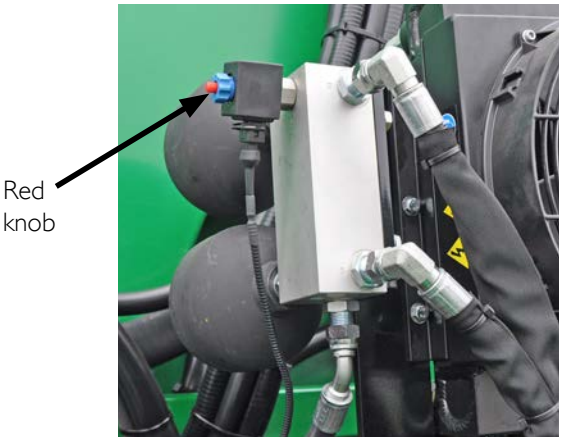
The raise and lower boom solenoids are separate solenoids. The raise solenoid is a single acting CETOP 3 solenoid. The lower solenoid is a cartridge solenoid that has a one way check in its spool.

When the lift solenoid is energised oil flows from the pressure port in the CETOP 3 manifold through the lower solenoids one way check out to the lift cylinders. The oil flow can be controlled by the flow control spool under the lift CETOP 3 solenoid.



There is also a lift lockout solenoid in the circuit, located on the accumulator manifold, at the rear of the machine. This feature is used to eliminate boom bounce when the wings are folded and boom rests are in during transport.

This solenoid can be overridden in the event that they become non operational. To do this, locate the solenoid, there is a red knob on top of it. Wind the knob all the way in. This will allow the flow of hydraulic oil to the lift cylinders.



This is a temporary solution to allow the boom to move up and down. It is recommended to troubleshoot the system to find the fault. If the problem cant be diagnosed, contact your dealer.

NOTE: When lowering the boom the unloader solenoid will not be activated.

Boom Open/Close Solenoid & Cylinders

The boom open/close solenoid is located in the bank of solenoids at the rear of the sprayer. This solenoid is a double acting solenoid.

To open and close the boom, two hydraulic phasing cylinders are used.

Tilt Left/Right Solenoid

The tilt left and tilt right solenoid is located in the bank of solenoids at the rear of the sprayer. This solenoid is a double acting solenoid.

Hydraulics

Centre Levelling System

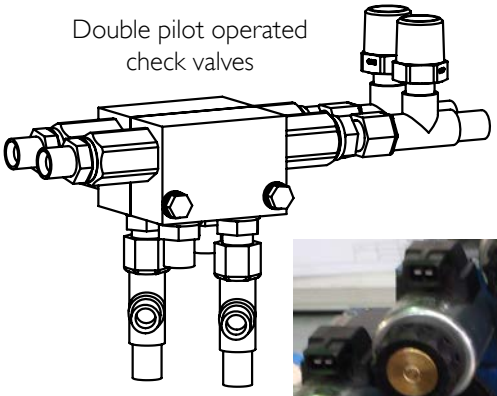
Fitted to the centre section of the boom is a centre levelling system. The central cylinder pulls the cables tight and holds the centre section level in relation to the Paralift. This way there can be no uneven pivoting or tilting of the booms during all folding operations.

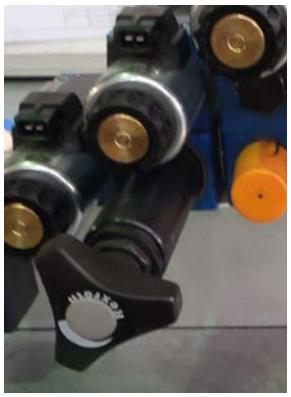


Above: Centre levelling system - holds booms level when folding.

Bi-fold Circuit

The Bi-fold solenoid is located in the bank of solenoids at the rear of the sprayer. This solenoid is a double acting solenoid.





Pressure reducing valve

There is a pressure reducing valve mounted under the solenoid. This prevents the circuit being over pressurised so that the outer booms retain suspension. This pressure can be monitored on the pressure gauges at the front of the cabin. The Bi-fold circuit has two double operated check valves in the system to maintain the pressure in the boom lines when it is folded out in the working position.

Hydraulic Yaw

Hydraulic yaw cylinders that are fitted to the centre section get there oil supply from the pressure circuit. When charging the yaw system the yaw ball valves are opened and the lift circuit is dead headed. Oil flows through the yaw pressure reducing valve, which limits the maximum pressure to 1500 PSI, charges the yaw cylinders and accumulators. The yaw ball valves must then be isolated as the hydraulic yaw circuit is closed loop. The pressure gauges on the hydraulic yaw accumulators must be inspected to maintain the correct operating pressure.



Hydraulic System Liquid Spray Pump Control Manifold

The liquid spray pump control manifold is located on the inside of the chassis, on the left-hand side of the sprayer. It is a pressure flow compensated valve. This means that the oil flow to the product pump can be maintained even if the pressure of the oil is increased or decreased. This allows the product spray pump RPM to remain constant even if engine RPM changes.

The valve has a built in pressure relief valve. This valve prevents excessive pressures within the hydraulic system. It operates when a pressure of 2250 PSI is reached. During normal operation this will prevent any fluid bypassing the system. If a fault develops in the system, this valve will enable fluid to return to the tank, without causing damage to the system.

Hydraulics

Spray Pump Solenoid

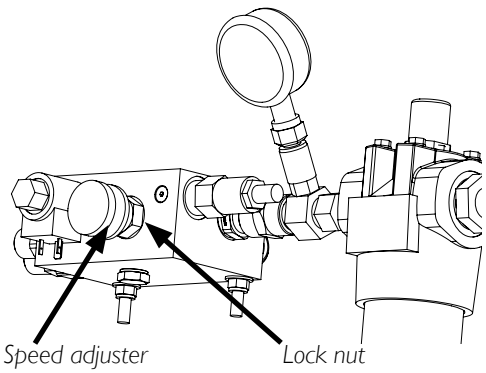
The liquid spray pump solenoid is a single acting spring return solenoid and is built into the liquid pump control manifold. When this solenoid is activated, fluid is forced to travel to the needle valve before travelling to the hydraulic drive for the liquid spray pump.

Spray Pump Needle Valve

The liquid spray pump needle valve is built into the liquid spray pump control manifold. This valve enables the speed of the pump drive to be adjusted. Do not run it faster than 4000-4200 rpm on standard fitment centrifugal pump or 400-540 rpm on optional fitment diaphragm pump.

Setting Spray Pump RPM

1. Park the sprayer on even level ground. Leave the park brake on so the cabin access ladder remains down.
2. Chock all wheels of the sprayer, ensuring it cannot roll while it is being worked on.
3. Allow the hydraulic oil to reach operating temperature.
4. Set engine to around 2000 rpm.
5. Switch spray pump on.
6. Hold the outer adjuster and loosen the locknut behind it.
7. Set the spray pump speed to 4000-4200 rpm on standard fitment centrifugal pump or 400-540 rpm on optional fitment diaphragm pump. Rotate clockwise (wind in) to decrease the speed, rotate anti-clockwise (wind out) to increase the spray pump speed.
8. Hold adjuster and tighten the lock nut.



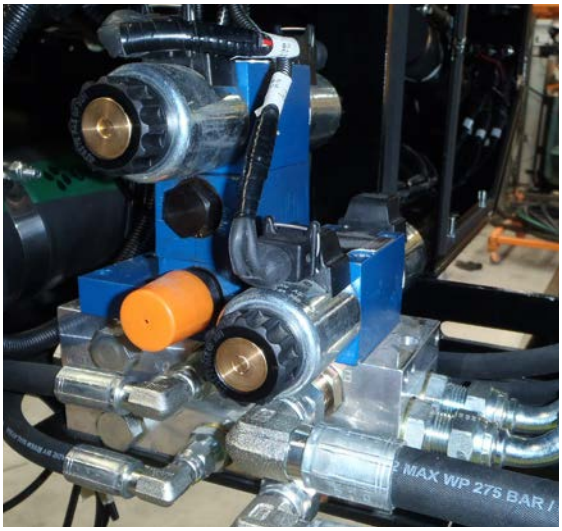
Suction & Delivery Lines

- 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.

Hydraulic Fill Pump (Optional)

The fill pump is controlled by the valve block mounted on the left hand side chassis rail under the cabin area.



Pneumatic System

The pneumatic system on this machine is used to actuate the brakes, operate the air bags, control the cabin access ladder, activate the operator's seat and on 4WD models, engage and disengage the centre differential lock and operate the RapidFire system.

Air Tanks

The air system fitted to this machine incorporates three air tanks all located on the left hand chassis rail under the cabin. The first tank is known as the wet tank and collects the air from the compressor and feeds air to the second two tanks. The second two tanks are used as reservoirs for the brakes and supply air for the air bags.

Due to condensation in the tanks, they must be drained daily. Tank 1 is the first tank in the system after the compressor and receives the majority of the fluid entering the system. To drain fluid from this tank, a drain tap has been placed into the bottom of this tank. The second two tanks also have drain taps fitted and must be drained on a 10 hour or daily basis.

To drain the air, loosen the manual drain tap on each tank and allow the condensation and air to escape from the tank.

CAUTION: Beware of high-speed particles leaving the tank. Also be aware that due to the expansion of the air the valve may become very cold.

After flowing into tank 1, the air is supplied to tank 2 and tank 3, through two one way valves. These valves are designed to prevent de-pressurisation of tanks 2 and 3 if a fault develops above these points in the system.

Tank two is used to supply the rear brake booster and supply air for the front and rear air bags.

Tank three is used to supply the front brake booster and has a drain in the bottom.

Compressor

The compressor used on this system is attached to the timing gear case on the rear of the engine. The output of the compressor is connected to the input into tank number 1. To regulate the amount of air being generated by the compressor a governor is attached to the side of the compressor. This governor is connected with a sense line back to tank. The governor enables the compressor to continue pumping until the required tank pressure is achieved. Once this pressure is reached the governor stops the compressor pumping air. The governor is set to stop the compressor when a pressure of 120 PSI is reached.

Pressure Relief Valve

To prevent the pressure within the air system exceeding acceptable limits, tank 1 has a pressure relief valve built onto the top of the tank. This valve is set to operate when a pressure of 150 PSI is reached and vents the air to atmosphere.

Pressure Protection Valve

The pressure protection valve is attached to the outlet of tank 2, before the air is supplied to the air bags and valves. This valve supplies air to the air bags and valves only if the pressure within tank 2 is at least 75 PSI. If an air bag blows then this valve will only supply air to the bags until the pressure within the tank drops below 75 PSI. This valve is used to ensure that there is always sufficient air pressure in the tanks to supply the brake boosters.

Pneumatic Cylinders

There is a pneumatic cylinder used on the cabin access ladder. This cylinder gets air flow from the park brake booster line. There is a flow control needle valve, on the inlet of the cylinder, to control the speed of the ladder when raising and falling. To increase or decrease the speed of the ladder going down, the needle valve on the flow control can be screwed in to decrease the speed and screwed out to increase the speed.

NOTE: The speed of the ladder is set at the factory and if adjustments need to be made, ensure that the safety precautions are followed.

Quick Release Air Coupling

Air supply is available out of the air tanks for miscellaneous use such as to blow out filters and nozzles etc. A Ryco 290 series, super high-flow airline coupling has been placed in the system. This coupling is located in the third air tank under the machine on the left hand side.

Electrical System

Batteries

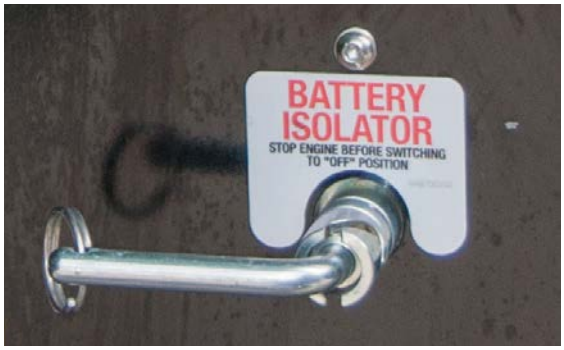
The electrical system operates on 12 volts. To provide a 12 volt supply with sufficient current, two 12 volt batteries have been used in parallel. This means that like polarity terminals have been joined.

- Before carrying out any repairs to the electrical system turn the battery isolator switch to the 'off' position. The battery isolator is located on the bottom of the brake pod which is located on the right hand chassis rail.
- When welding connect the ground terminal directly to the part being welded and ensure that the batteries are disconnected. Disconnect any electronic controls such as the engine controller, transmission controller and the spray controller.
- When welding on the sprayer ensure, If fitted, that all weed seeker controllers are totally removed from the sprayer.

Battery Isolator

The battery isolator switches power flow from the batteries to the sprayer. The switch is a 250 Amp unit. The isolator switch cuts all power to the sprayer except for the radio back up power. The isolator switch must be isolated when the sprayer is not in use to prevent battery leakage or power faults. The isolator switch is situated on the bottom of the brake pod which is located on the right hand chassis rail.

NOTE: The battery isolator is not an Emergency stop. The isolator key should only be removed after more than 30 seconds from stopping the engine, so data can be written and saved to the ECU.



Battery Jumper

The battery jumper points are located on the brake pod. These points are connected to the terminals on the battery. When charging the batteries or jump starting another vehicle:

- Switch the engine off.
- Switch off the battery isolator switch.
- Connect the positive jumper lead to the positive battery jumper point.
- Connect the negative jumper lead to the negative battery jumper point.

Electrical Components

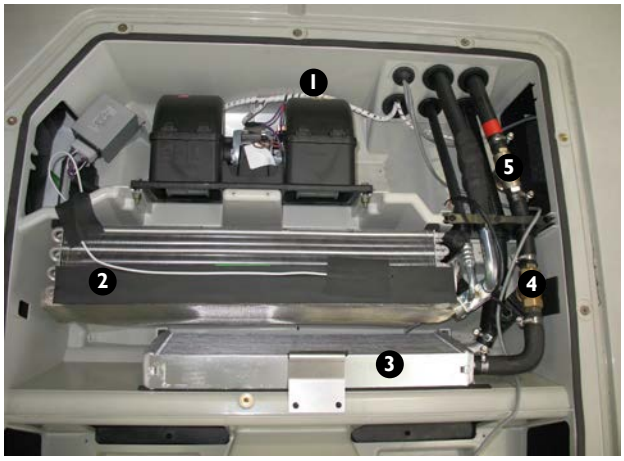
The Electrical control panel is located in the side console on the right of the operator's seat. These panels contain fuses and relays to activate the sprayer circuitry. To gain access to the panels the console lining must be removed by releasing the latches on top of the cover and pulling it forwards.

These boxes control various relays, diodes and fuses to operate a number of electrical circuits through out the sprayer. The layout of the fuse boxes can be seen in the Chapter 4 'Cabin'.

When a fault occurs, the fuses will blow and disconnect the circuit. If a fuse has been blown identify the corresponding device and investigate the cause before reconnecting the new fuse.

The fuses have been placed in the system to protect the system against electrical faults. When a fuse is replaced it is important that the fuse is replaced with another fuse of the same rating.

Air Conditioning System



NO.	COMPONENT
1.	Fan
2.	AC Evaporator
3.	Heater Core
4.	Heater Control Valve
5.	Heater Water Filter

Heating, Ventilation & Air Conditioning Operation

The air conditioning circuit operates by the pressuriser fan drawing clean air into the cabin through the carbon filter. This fan pressurises the cabin with clean air and forces air out any holes or leaking seals in the cabin ensuring no impurities can be drawn into the operator's clean environment.

The blower fan then pulls air through the air conditioning evaporator and heating evaporator and pushes it to the demist and roof vents. If the air conditioning compressor is engaged the air conditioner evaporator will cool the air as it is drawn though it. If the heater thermostat is turned to heat, the air will warm again as it passes through. If the heater is off, the cool air passes through to the vents.

Compressor

The air conditioning compressor is located on the front side of the engine. This compressor is connected to the engine by a v-belt. The compressor is engaged when ever the cabin blower fan switch is energised. The thermostat will cycle the air compressor if the evaporator gets to cold.

Condensor

The air conditioning system condenser is located in front of the engine radiator. The condenser is cooled by air being drawn through from the engine fan. The condenser requires regular cleaning of dust and any debris.

NOTE: Take care not to damage the condenser coils or fins when cleaning the condenser.

Receiver Dryer

The air conditioning receiver dryer is fitted to the right hand chassis rail under the cabin. This component captures any moisture that is circulating in the air condition system. Moisture in the air conditioning system freezes and causes blockages. The component must be replaced any time the air conditioning system is opened or serviced.

Heating System

Coolant from the engine flows through the heater core causing it to radiate heat into the cabin when the engine is up to temperature. The volume of the water travelling through the system, and therefore the amount of heat transferred, may be adjusted by setting the temperature on the A/C head unit.

To enable the heating core to be isolated from the engine two taps have been installed. The first tap is located on the right hand side of the engine behind the radiator. The second tap is located at the header tank.

NOTE: If the heating is not working when the engine is warm, ensure that the isolating taps are allowing coolant to flow through to the heater core.

First Service - 50 Hours

ENGINE

SERVICE ITEM	TYPE OF SERVICE	PART NO. - GOLDACRES	PART NO. - GENERIC
Engine oil	Drain & Replace	GA5012457 (20L) GA5017913 (200L)	-
Engine oil filter	Replace	GA5051755	LF3970
Fuel filter - Engine	Replace	GA5051765	FF5612, FF5421
Fuel filter - Primary	Replace	GA5051760	FS1242
Fuel filter - In-line	Replace	GA5069895	WZ153 (3/8" tails)

TRANSMISSION & TRANSFER CASE

SERVICE ITEM	TYPE OF SERVICE	PART NO. - GOLDACRES	PART NO. - GENERIC
Transmission oil	Inspect	GA5006959 (20L)	-
		GA5006960 (208L)	-
Transmission external spin-on filter	Inspect	GA5048281	29539579 or HF35296
Transfer case oil	Drain & Replace	GA5072325 (20L)	-
Parking brake cables	Inspect & adjust	-	-

FRONT AXLE

SERVICE ITEM	TYPE OF SERVICE	PART NO. - GOLDACRES	PART NO. - GENERIC
Differential oil - Non-LSD	Drain & Replace	GA5047310 (200L)	-
Front wheel bearings	Check Pre-load & inspect	See Parts Manual	-
Toe in (1-5 mm)	Measure	-	-

REAR AXLE

SERVICE ITEM	TYPE OF SERVICE	PART NO. - GOLDACRES	PART NO. - GENERIC
Differential oil - LSD	Drain & Replace	GA5009421 (20L) GA5009422 (200L)	-
Drop leg oil	Drain & Replace	GA5047310 (200L)	-
Drive chains	Inspect & measure	See Parts Manual	-

HYDRAULIC OIL TANK

SERVICE ITEM	TYPE OF SERVICE	PART NO. - GOLDACRES	PART NO. - GENERIC
Hydraulic oil return filter	Replace	GA5069056	-
Hydraulic pressure filters	Replace	GA5008721 x 2	-

AIR-CONDITIONING

SERVICE ITEM	TYPE OF SERVICE	PART NO. - GOLDACRES	PART NO. - GENERIC
Compressor drive belt	Check & re-tension	GA5071435	13A1080

Service Parts - Lubricants

SERVICE ITEM	SERVICE SPECIFICATION	CAPACITY (L)	PART NO.
Engine	SAE 15W-40 heavy duty engine oil that meets Cummins standard CES20078 API1 & CI-4	15L	GA5012457 (20L) GA5017913 (200L)
Hydraulic oil	46W Dedicated hydraulic oil eg: Valvoline Ultramax HVI 46	90L	GA5017199 (200L)
Transmission	Castrol Allison Transynd - TES295	20L approx. (dry)	GA5006959 (20L) GA5006960 (208L)
Transfer gearbox	SYN FE 75W-90	6.6L	GA5072325 (20L)
Differentials	80W90 EP Gear Oil - Non LSD	14L (welded diff casing)	GA5047310 (200L)
	Titan Supergear LS 85W140 High Performance Fuchs - LSD	14L (welded diff casing)	GA5009421 (20L) GA5009422 (200L)
	80W90 EP Gear Oil - Non LSD	9.5L (cast diff casing)	GA5047310 (200L)
	Titan Supergear LS 85W140 High Performance Fuchs - LSD	9.5L (cast diff casing)	GA5009421 (20L) GA5009422 (200L)
Driven drop legs	80W90 EP Gear Oil	36L (fill to level hole)	GA5047310 (200L)
General grease points	Multi-Purpose Grease	-	-
Steering pivot points	Molybdenum Based Grease	-	-
Coolant	TEC PG XL Cummins	39L approx.	GA5008311 (205L)
Brake fluid	DOT 4 Synthetic	0.5L per booster approx.	GA5016739 (5L)
Spray pump	SAE 15W40	2.79L for Zeta 300	GA5012457 (20L)
		2.68L for Zeta 260	GA5012457 (20L)
		1.28L for Zeta 170	GA5012457 (20L)
Air-conditioning unit	Oil, Sanden SP20	571ml dry	-
	Gas R134a	2kg	-
Auto greaser	EP0	4L	-
Rapidfire oiler	Air Tool Oil	50ml	GA5053550 (1L) GA5054345 (5L)

- For differing weather conditions consult your Cummins operator's manual to choose the suitable oil grade.
- 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, G15 anti-corrosion spray is applied to all fasteners (bolts, washers and nuts) and zinc plated components.
- G15 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.

Service Parts - Filters

SERVICE ITEM	PART NO. - GOLDACRES	PART NO. - GENERIC
Hydraulic Pressure Filters	GA5008721 x 2	Extended bowl filter – 0110-D-010-BH3HC
Hydraulic Return Filter	GA5069056	-
A/C Carbon Filter	GA5066740	P277
Air Cleaner Primary Element	GA5069031	P608666
Air Cleaner Safety Element	GA5069032	P601560
Engine Oil Filters	GA5051755	LF3970
Transmission Oil Filters	GA5048281 (spin on)	Series 2000 = 29539579 or HF35296
	GA5048285 (internal)	Series 2000 = 29537966 internal kit
Fuel filter (primary)	GA5051760	FS1242
Fuel filter (engine)	GA5051765	FF5612 , FF5421
Fuel filter in-line	GA5069895	WZ153 (3/8" tails)

Service Parts - Headlights

SERVICE ITEM	PART NO. - GOLDACRES	PART NO. - GENERIC
Headlight globe - Low beam	GA3000082	HB3 12V 60w
Headlight globe - High beam	GA3000082	HB3 12V 60w

Service Parts - Belts

SERVICE ITEM	PART NO. - GOLDACRES	PART NO. - GENERIC
V Belt, Air Conditioner Compressor	GA5071435	13A1080
Belt, Serpentine, Water Pump Alternator	GA5075275	-

Tyre Pressures

GA8700539 R3 applies from 2016

G6 MAX SPEED FULLY LOADED IS 25 KM/H		RECOMMENDED TYRE PRESSURE	
TYRE BRAND	TYRE SIZE	KPA	PSI
HARVEST	380/90R46 AusFlex HR45 173D	282	41
HARVEST	480/80R46 (18.4R46) HR45 166A8/159D	282	41
HARVEST	520/85R46 (20.8R46) 173A8/169D	207	30
HARVEST	620/70R42 HR45 166A8/166B	220	32

NOTE: PSI = Kpa x 0.145
EXAMPLE: 282 Kpa x 0.145 = 40.9 PSI

Maintenance Schedules

See end of this chapter for a list of items that need to be replaced for the first service.

After the first service, replace or inspect the items at the intervals indicated.

Engine

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Engine oil level	Inspect	Inspect	Replace	Replace	Replace	Replace
Engine oil filter	Inspect	Inspect	Replace	Replace	Replace	Replace
Fuel filter - engine	Inspect	Inspect	Replace	Replace	Replace	Replace
Fuel filter - (separator filter)	Drain	Drain	Replace	Replace	Replace	Replace
Fuel Filter - (in-line)	Inspect	Inspect	Replace	Replace	Replace	Replace
Fuel level	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Antifreeze/Coolant	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Fan	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Drive belts	Inspect	Inspect	Inspect	Inspect	Inspect	Replace
Cooling system	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Mounting bolts and vibromounts	-	Inspect	Inspect	Inspect	Inspect	Inspect
Hoses, lines and clamps	-	Inspect	Inspect	Inspect	Inspect	Inspect
Exhaust system	-	Inspect	Inspect	Inspect	Inspect	Inspect
Air cleaner (Primary filter)	-	Inspect	Inspect	Inspect	Inspect	Replace
Air cleaner (Safety filter)	-	Inspect	-	Inspect	Inspect	Replace
Air intake piping	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Crankcase breather tube	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Belt tensioner bearing	-	Inspect	Inspect	Inspect	Inspect	Inspect
Belt tension - (450 Nm)	-	Inspect	Inspect	Inspect	Inspect	Inspect
Turbocharger	-	Inspect	Inspect	Inspect	Inspect	Inspect
Air compressor	-	Inspect	Inspect	Inspect	Inspect	Inspect
Harmonic balancer	-	Inspect	Inspect	Inspect	Inspect	Inspect

NOTE: Engine coolant to be replaced at 2000 hours.

NOTE: For more detailed engine maintenance information refer to 'Cummins Operation and Maintenance Manual QSB4.5 and QSB6.7 Engine' supplied with your machine.

Continued over page

Maintenance Schedules

Transmission

FILTER CHANGE INTERVALS			
100 % Concentration Allison Approved TES 295 Fluid*		Allison Approved Non-TES 295 Fluids*	
Main Filter (Spin-on)	Internal Filter	Main Filter (Spin-on)	Internal Filter
2000 Hours 24 Months	Replace on rebuild	500 Hours 6 Months	Replace on rebuild
FLUID CHANGE INTERVALS			
100 % Concentration Allison Approved TES 295 Fluid*		Allison Approved Non-TES 295 Fluids*	
3000 Hours 36 Months		500 Hours 6 Months	

* Less than 100% concentration Allison approved TES 295 fluid is considered a mixture and should utilise Allison approved non-TES295 fluid change intervals.

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Selector Linkage	-	Inspect	Inspect	Inspect	Inspect	Inspect
Bolts	-	Inspect	Inspect Tension	Inspect Tension	Inspect Tension	Inspect Tension
Oil Lines	-	Inspect	Inspect	Inspect	Inspect	Inspect
Electrical Harnesses	-	Inspect	Inspect	Inspect	Inspect	Inspect
Cooling System	-	Inspect	Inspect	Inspect	Inspect	Inspect

Transfer Gearbox

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Oil level	Inspect	Inspect	Inspect	Replace	Inspect	Replace
Input output seals	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Breather	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect

Drive Shafts

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Transmission and at Axle Input, Centre Bearing	-	Inspect	Inspect	Inspect	Inspect	Inspect
Universal Joints	-	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect
Slip Splines	-	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect
Centre Bearing	-	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect

Continued over page

Maintenance Schedules

Axles & Drop Leg

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Differential Oil	-	Inspect	Inspect	Replace	Inspect	Replace
Drop leg Oil	-	Inspect	Inspect	Replace	Inspect	Replace
Drive Chains	-	-	Inspect Measure	Inspect Measure	Inspect Measure	Inspect Measure
Steering Pins/Bearing	-	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Inspect Replace
Tie Rod Ends and Ball Joints*	-	Lubricate Inspect	Tension Lubricate Inspect	Lubricate Inspect	Tension Lubricate Inspect	Lubricate Inspect
Universal Joints	-	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect	Lubricate Inspect
Bearings	-	Inspect	Inspect	Inspect	Inspect	Inspect
Axles	-	Inspect	Inspect	Inspect	Inspect	Inspect
Toe In (1-5mm)	-	-	Measure	Measure	Measure	Measure

NOTE: Bearings in drop legs need to be replaced at 3000 hours.

* **NOTE:** Machines fitted with John Deere Autosteer systems need the tie rod ends checked and re-tensioned every 20 hours to prevent excessive toe angle change over time.

Wheels & Tyres

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Rims	-	-	Inspect	Inspect	Inspect	Inspect
Wheel nuts - 350 ft/lb	Tension	Tension	Tension	Tension	Tension	Tension
Tyre pressure	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Tyres	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect

Suspension System

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Polyurethane bushes	-	Inspect	Inspect	Inspect	Inspect	Inspect
Bolts and nuts *	-	Inspect	Tension	Tension	Tension	Tension
Shock absorbers	-	Inspect	Inspect	Inspect	Inspect	Inspect
Ride height valve	-	Inspect	Inspect	Inspect	Inspect	Inspect
Sway Bar Bushes	-	Inspect	Inspect	Inspect	Inspect	Inspect
Torque Rod - Welds	-	Inspect	Inspect	Inspect	Inspect	Inspect

NOTE: Polyurethane bushes, Shock absorbers, Sway bar bushes need to be replaced at 2000 hours.

***NOTE:** Parallel link bolts are to be torqued to 350 ft/lb.

Maintenance Schedules

Braking System

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Brake fluid	-	Inspect	Inspect	Inspect	Inspect	Replace
Brake pads	-	Inspect	Inspect	Inspect	Inspect	Replace
Hydraulic brake lines/hoses	-	Inspect	Inspect	Inspect	Inspect	Inspect
Brake discs	-	Inspect	Inspect	Inspect	Inspect	Inspect
Seals	-	Inspect	Inspect	Inspect	Inspect	Inspect
Brake operation	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Parking brake cables	-	Adjust	Adjust	Adjust	Adjust	Adjust
Parking brake drum	-	Inspect	Inspect	Inspect	Inspect	Inspect
Parking brake pads	-	Inspect	Inspect	Inspect	Inspect	Inspect
Parking brake operation	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Parking brake switch	-	Inspect	Inspect	Inspect	Inspect	Inspect
Caliper mountings	-	Inspect	Inspect	Inspect	Inspect	Inspect
Caliper and Rotor	Inspect	Clean	Clean	Clean	Clean	Clean

NOTE: Brake rotor minimum thickness is 20 mm.

Hydraulic System

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Hydraulic oil	-	Inspect	Sample	Sample	Sample	Replace
Hydraulic oil return filter	-	Inspect	Inspect	Replace	Inspect	Replace
Hydraulic pressure filters	-	Inspect	Inspect	Replace	Inspect	Replace
Hydraulic lines and hoses	-	Inspect	Inspect	Inspect	Inspect	Inspect
Hydraulic cylinders	-	Inspect	Inspect	Inspect	Inspect	Inspect
Hydraulic pumps	-	Inspect	Inspect	Inspect	Inspect	Inspect
Hydraulic pump mountings	-	Inspect	Inspect	Inspect	Inspect	Inspect
Hydraulic valves	-	Inspect	Inspect	Inspect	Inspect	Inspect
Hydraulic relief pressures	-	Inspect	Adjust	Adjust	Adjust	Adjust

Pneumatic System

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Air tanks	Drain	Drain	Drain	Drain	Drain	Drain
Air lines and fittings	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect

Continued over page

Maintenance Schedules

Electrical System

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Battery electrolyte level	-	Inspect	Inspect	Inspect	Inspect	Inspect
Lights	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Leads and wires	-	-	Inspect	Inspect	Inspect	Inspect
Earth leads	-	-	Inspect	Inspect	Inspect	Inspect
Wires near moving parts	-	-	Inspect	Inspect	Inspect	Inspect
Boom limit switch	Inspect Adjust	Inspect Adjust	Inspect Adjust	Inspect Adjust	Inspect Adjust	Inspect Adjust
Neutral start switch	-	-	Inspect	Inspect	Inspect	Inspect
Battery terminal	-	-	Clean & Protect	Clean & Protect	Clean & Protect	Clean & Protect

Chassis

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Ladder switch	-	-	Inspect	Inspect	Inspect	Inspect
Ladder folding mechanism	-	Lubricate	Lubricate	Lubricate	Lubricate	Lubricate
Ladder mounting bolts	-	Tighten	Tighten	Tighten	Tighten	Tighten
Pump mounting bolts	Tighten	Tighten	Tighten	Tighten	Tighten	Tighten
Cab mount bolts and bushes	Tighten	Tighten Inspect	Tighten Inspect	Tighten Inspect	Tighten Inspect	Tighten Inspect
Cabin seals	-	-	Inspect	Inspect	Inspect	Inspect
Cabin interior	Clean	Clean	Clean	Clean	Clean	Clean
Tank retaining strap bolts	Tighten	Tighten	Tighten	Tighten	Tighten	Tighten
Para lift link bushes	Lubricate	Lubricate	Lubricate	Lubricate	Lubricate	Replace
Tank frame mount bolts	-	Tighten	Tighten	Tighten	Tighten	Tighten
Chassis frame	-	-	Inspect	Inspect	Inspect	Inspect
Induction hopper mounting	-	Lubricate	Lubricate	Lubricate	Lubricate	Lubricate
Boom support mounting bolts	-	Tighten	Tighten	Tighten	Tighten	Tighten
Machine exterior	-	Clean	Clean	Clean	Clean	Clean
Windscreen wiper fluid	-	Inspect	Inspect	Inspect	Inspect	Inspect

Continued over page

Maintenance Schedules

Air-conditioning System

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Condensor	Clean	Inspect	Inspect	Inspect	Inspect	Inspect
Air conditioner lines	-	-	Inspect	Inspect	Inspect	Inspect
Refrigerant and dryer	-	-	Inspect	Inspect	Inspect	Replace
HVAC box	-	-	Inspect	Inspect	Inspect	Inspect
Carbon filter	-	Inspect	Inspect	Replace	Inspect	Replace
Carbon filter inlet	-	Inspect	Inspect	Inspect	Inspect	Inspect
Compressor drive belt	-	Inspect	Inspect	Adjust	Adjust	Adjust

Spraying Equipment

SERVICE ITEM	DAILY (10Hrs)	WEEKLY (50Hrs)	250hrs/ 3 months	500hrs/ 6 months	750hrs/ 9 months	1000hrs/ 1 year
Sprayer boom	Inspect	Adjust Inspect	Adjust Inspect	Adjust Inspect	Adjust Inspect	Adjust Inspect
Nuts and bolts	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Hinge bushes	Lubricate	Lubricate	Lubricate	Lubricate	Lubricate	Lubricate
Tilt bushes	Lubricate	Lubricate	Lubricate	Lubricate	Lubricate	Lubricate
Sprayer calibration	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Filters (suction filter, pressure filter, flush filter, compressor air filter)	Inspect	Inspect	Inspect or replace	Inspect or replace	Inspect or replace	Inspect or replace
Nozzles	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Pump (pre-spray test)	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Pump oil condition and level	Inspect	Inspect	Replace	Replace	Replace	Replace
Pump diaphragms	-	-	-	Replace	-	Replace
Pump seals	-	-	-	Replace	-	Replace
Pump valve O-rings	-	-	-	Replace	-	Replace
Pump valve springs and cages	-	-	-	Replace	-	Replace
Hoses and fittings	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Boom secure in boom rests	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Sprayer pump and lines	Flush	Flush	Flush	Flush	Flush	Flush
Spray tanks empty	Inspect	Inspect	Inspect	Inspect	Inspect	Inspect
Flow meter	Inspect Drain	Inspect Drain	Inspect Drain	Inspect Drain	Inspect Drain	Inspect Drain
Ball valves	Open & inspect	Open & inspect	Open & inspect	Open & inspect	Open & inspect	Open & inspect

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Chapter 11

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

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. 4000 - 4200 RPM - Standard centrifugal pump only. 400 - 540 RPM - Optional diaphragm pump only.
		Check oil for colour change. If the oil appears milky, a diaphragm will be damaged and needs to be replaced.
		Check valves in pump - Optional diaphragm pump only.
		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.
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

Continued over page

Spray Pump

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
Pressure fluctuation	Air leak on suction side of pump	Check suction pump for air leaks.
	Incorrect pump speed	Adjust pump speed: 4000 - 4200 RPM - Standard centrifugal pump only. 400 - 540 RPM - Optional diaphragm pump only.
	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 pump speed: 4000 - 4200 RPM - Standard centrifugal pump only. 400 - 540 RPM - Optional diaphragm pump only.
	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

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.

Flow Meter & Controller

Use the following procedures to the 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.

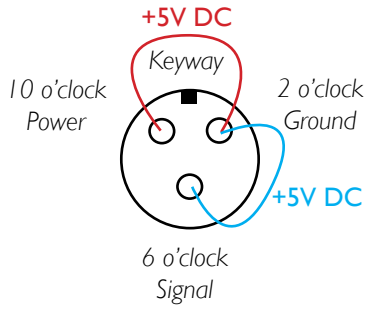
CONTROL VALVE OVERRIDE

- 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 shows the position of the boom and the adjustment necessary to get them level.

OUTER WING POSITION (OUT)	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

Plumbing

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

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

Brakes

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Brakes are spongy	Air in brake lines	Bleed brakes as outlined in maintenance chapter
Sprayer is stopping inconsistently	Grease or oil on the brake discs	Clean the discs with a clean cloth and methylated spirits.
	Warped brake discs	Inspect the discs to ensure they are straight. If warped, they must be replaced.
The brakes are screeching or squealing.	Insufficient friction material on brake pads and/or rotors worn.	Inspect brake pads and rotors. Replace immediately if worn beyond wear indicators. Rotor min. thickness 20 mm.
	Brake pad rubbing on piston	Fit Anti-squeal liners on pads

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
Vehicle sits unevenly	Incorrectly adjusted ride height valves.	Adjust the ride height valves as per the instructions in the Lubrication and Maintenance chapter.

Air Conditioning

PROBLEM	COMMON CAUSES	COMMON SOLUTION
Air conditioning not cooling effectively.	Condenser Blocked	Check the condenser for a build up of dirt and plant matter, clean if required.
	Compressor belt loose.	Inspect the belt to see if it is tensioned correctly. If belt is showing signs of wear, replace.
	A/C system needs re-gassing	If this is the case, only allow a qualified air conditioning technician to work on the system. R134a refrigerant must not be allowed to escape to the atmosphere.
	Evaporator blocked	Build up of dirt and plant matter, clean if required. Be careful not to damage any of the components.

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 equipment unless ordered.

Chemical Induction Probe

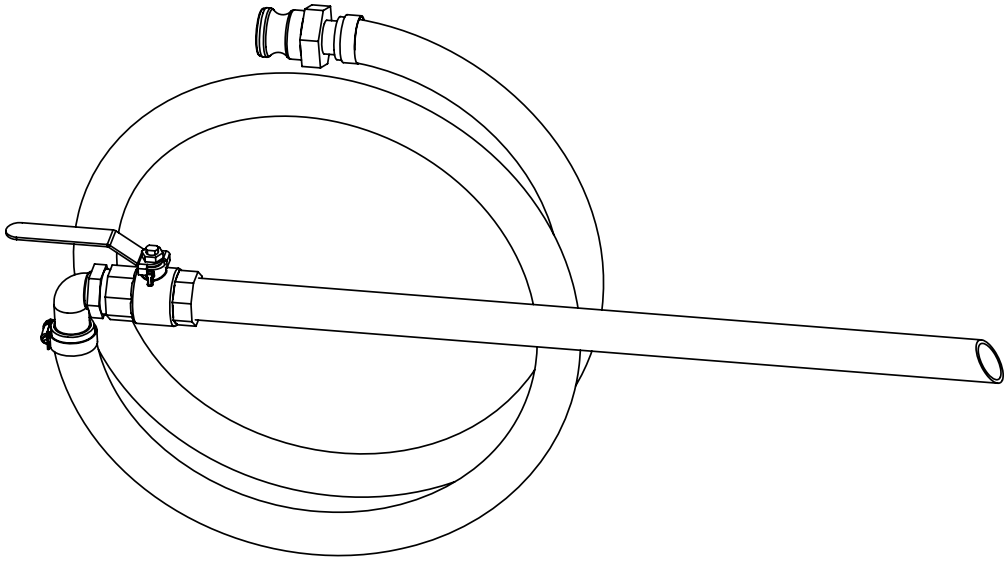
Overview

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.

TO OPERATE THE CHEMICAL PROBE:

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. Rotate the valve handle to venturi probe.
6. Operate the pump at the speed necessary to generate at least 100 PSI delivery pressure. Do not run the pump 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 120 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, rotate the valve to Bypass/ Spray mode, keep the agitator valve 'OPEN' and disconnect the probe. Once chemical has been transferred into the main spray tank the sprayer should always be agitating until spraying begins.

Chemical Transfer Pump

Overview

The Transfer Pump is used to transfer chemical to the main tank, in place of the venturi chemical probe. Combined with an FM-1100 flow meter, its an accurate way of measuring chemical being transferred into the main tank.

Pump Specifications:

- Flow rate - Up to 45 L/min
- Head - To 3.0 m
- Pressure - To 1.0 bar

NOTE: Sotera stainless steel rotary vane pumps are designed for maximum practical corrosion protection with a wide range of thin liquids. . However, ensure chemical compatibility between liquids pumped and the pumps wetted parts before using.

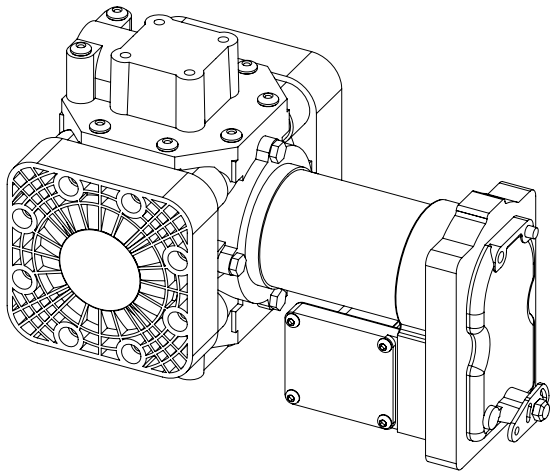
NOTE: Do not use the pump to transfer flammable petroleum products.

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 on pump and open valve on chemical probe and valve 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, 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: Sotera chemical transfer pump (GA5072100).

Chemical Transfer Flow Meter



The FM-1100 Flow Meter is a positive displacement fluid metering unit.

- 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)



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



MODE/ ON | **INCREASE** | **DECREASE/ ZERO**

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).

Continued over page

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.

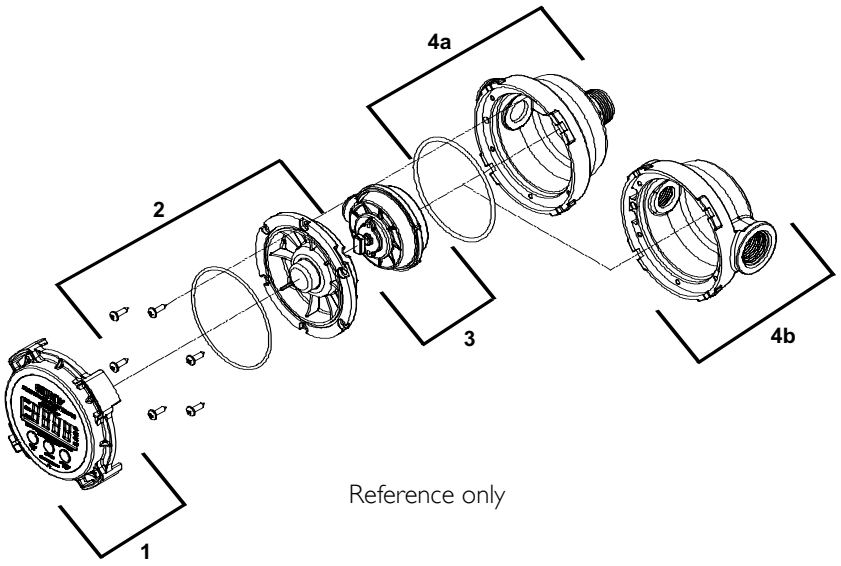
To Display Software Revision Number

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.



Reference only

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.
	Check to see if out of product.
Flow low/high/inconsistent:	Check for air in system.
	Check for calibration error (Err).
	Check for particulates in fluid.
	Check for damaged nutating chamber.
Meter leaks:	Check for damaged O-ring.
	Check for loose screws.
	Check inlet/outlet fittings for proper seal.
	Check meter housing for cracks.
Noisy / rough operation:	Check nutating chamber for debris.
	Check for loose magnetic wheel assembly.

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.

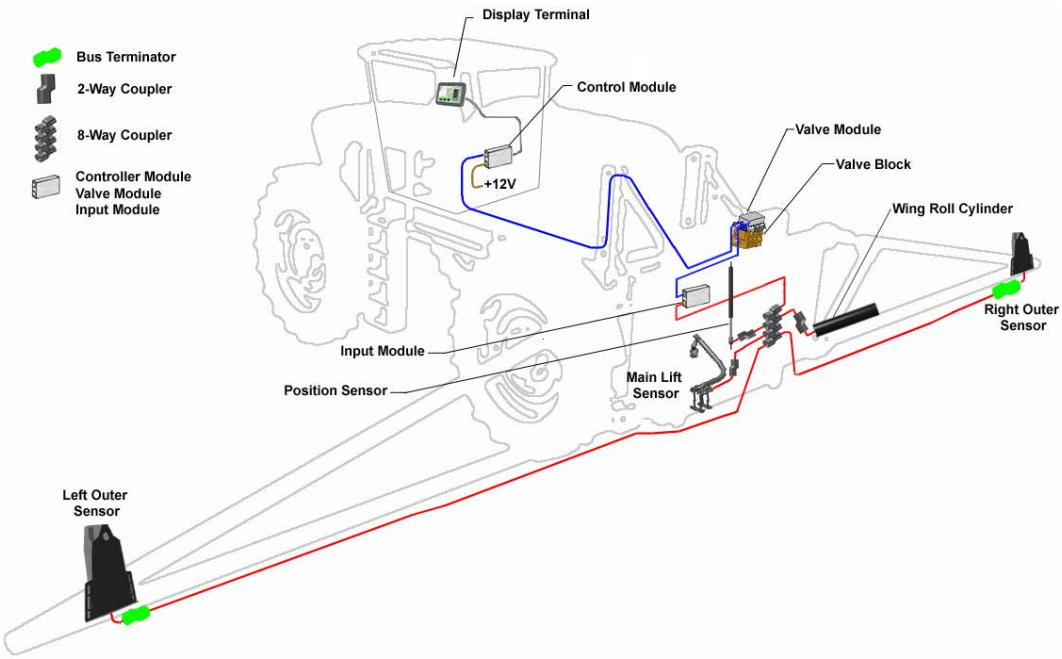
Ultrasonic sensor hardware and software is designed specifically for height control applications. The ultrasonic signals can distinguish the difference between the ground and standing crop or field residue. Boom height is controlled by choosing Soil Mode (senses the soil surface), Crop Mode (senses the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

WWW.NORAC.CA

PRECISION DEFINED

Goldacres UC5 Active Wing Roll



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 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") to achieve maximum pump output

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

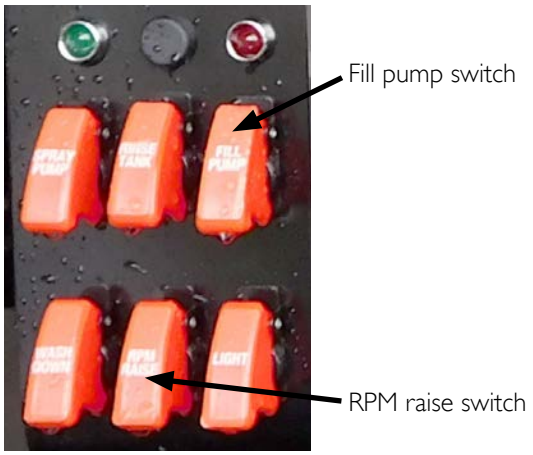
3" Fill Pump - Operation

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

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



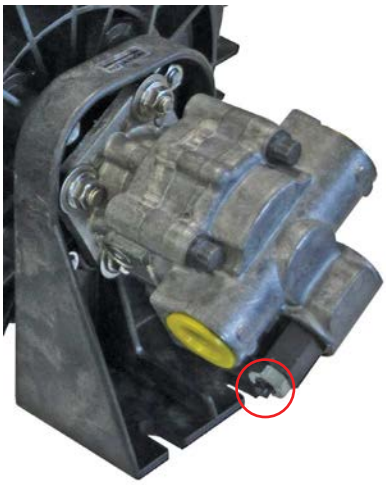
3. With the engine running at low idle, turn the 'Fill Pump' switch ON.
   NOTE: Do not turn the fill pump switch ON or OFF with the engine above low idle.



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.

Setting Hydraulic Fill Pump RPM

The 3" fill pump speed can be altered by adjusting the screw and lock on the rear of the hydraulic motor. The hydraulic system has been sized so that the fill pump can not be over revved, so the speed control should be wound all the way out.



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

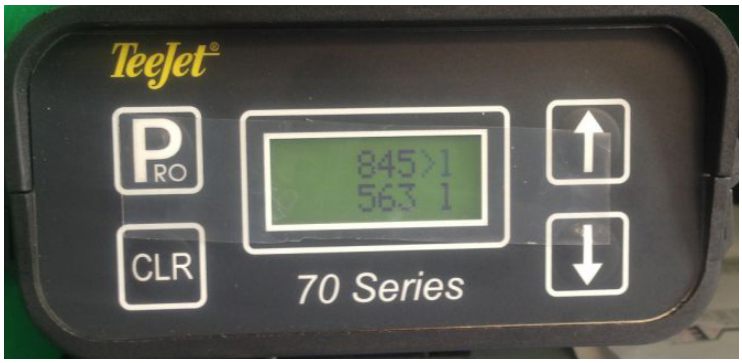
Fill Flow Meter - 70 Series

Operating Screen

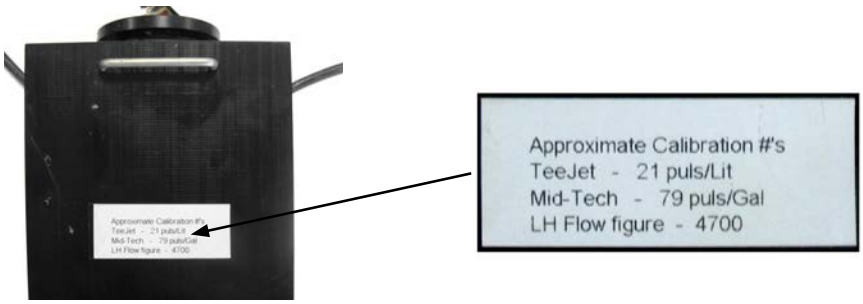


Console Programming

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. Dont press and hold the 'PRO' button to exit from this screen or changes wont 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 tanks 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.

Continued over page

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.

Groeneveld Auto Greaser

Preface

The Groeneveld Automatic Greasing System is cutting edge design encompassing robust components and precision engineering to bring the owner operator not only ease in operation and maintenance but also peace of mind that all moving systems are able to work at their peak.

To this end, Goldacres acknowledges that while we hold a high degree of knowledge in their product, we would always recommend that owners and dealers contact their local Groeneveld dealer for technical advice and assistance. We also advise that you use only genuine Groeneveld parts and lubricants. After all, this system is your investment in your machines serviceability and longevity!

The information following, has been produced by using excerpts from the Groeneveld EG0101 Zero General Manual. Utilising text, tables and diagrams as well as text and photographs supplied by Goldacres.

The following information about the auto greaser system has been approved by Groeneveld.

Introduction

Groeneveld Automatic Greasing Systems ensure the daily maintenance of the moving parts attached to the system. They avoid unnecessary machinery wear and down-time and thus save cost and prevent exasperation.

Groeneveld greasing systems are used by production companies, machinery used in service industries, agriculture, shipping, the offshore industry and the transport industry.

In the following list are the most important advantages:

- Increase of the service intervals, thus less unnecessary down-time;
- Less wear of the lubricated parts because of accurate and constant lubricating;
- Reduced repair and replacement costs;
- Reduced unexpected down-time;
- Fewer production losses.

With a Single line Automatic Greasing System, all attached lubrication points of a vehicle or machine are automatically lubricated at the correct time with the correct dose.

Moreover, optimum grease or lube-oil distribution over the whole lubricating surface is achieved, because the lubrication takes place while the machinery or vehicle is in operation. Every action is automatically carried out by the system. The user needs only to refill the reservoir periodically.

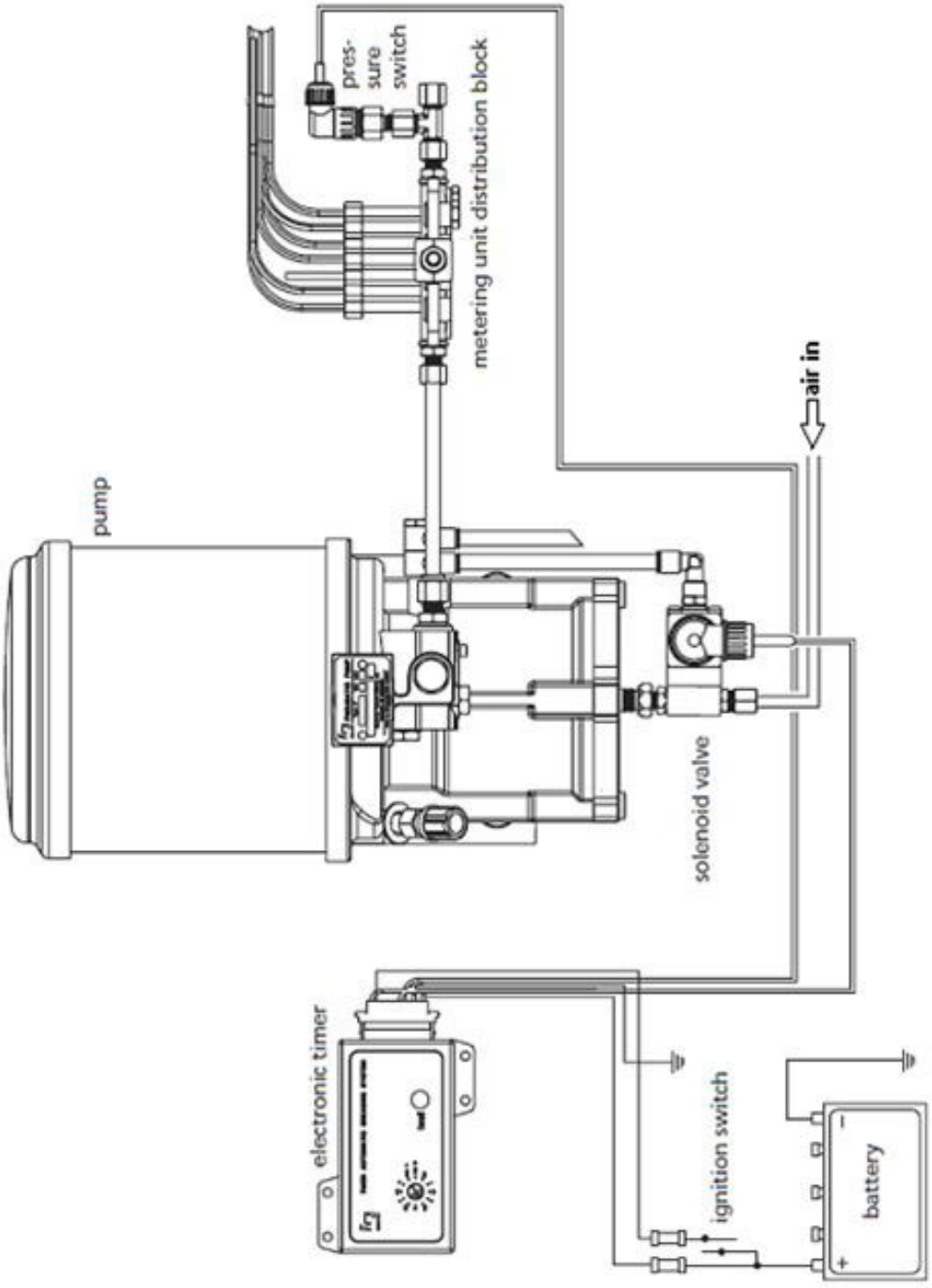
Definitions

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

IMPORTANT: Instructions that if ignored will cause damage to the system or machine.

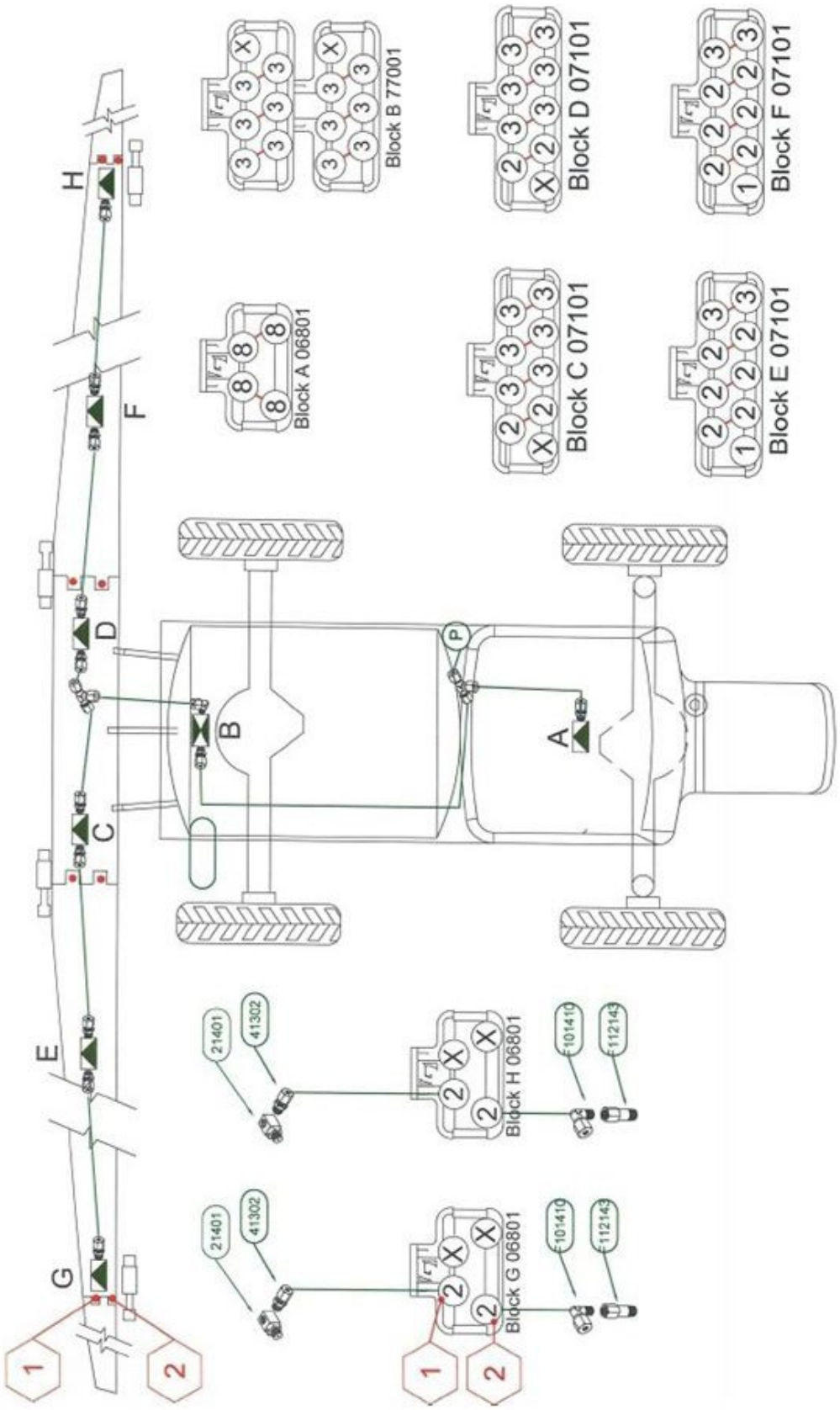
WARNING: Instructions that if ignored will cause personal injury or death to the operator or bystanders.

Groeneveld Auto Greaser - Overview I



Above: System Overview

Groeneveld Auto Greaser - Overview II



Above: System layout for crop cruiser

Groeneveld Auto Greaser - Components

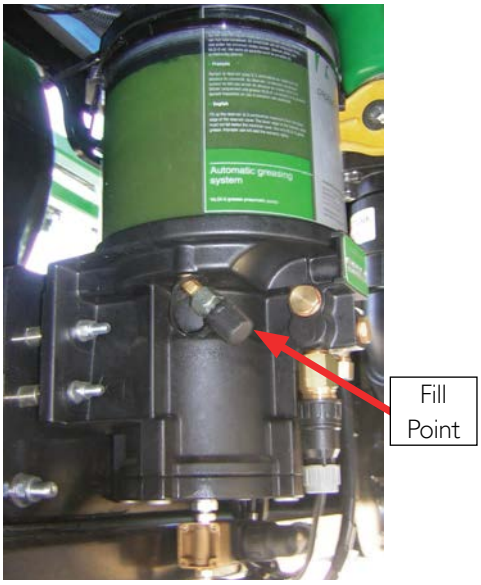
The COMPONENTS section will give you a basic run down of the components, their location and their purpose. A full operational description of the system is in the OPERATION section. Some settings, tips and words of advice and caution are also listed where applicable at each component's section. Please familiarise yourself with this area thoroughly.

Pump Unit

The Pump Unit is made up of the following parts – the main storage area, the metered reservoir where the next grease dose is held, main piston, follower plate, compressed air inlet, fill point and return / non return valves. The purpose and operation of these will be explained in the manual.
The filling point is on the left side of the pump unit and should be covered with a protective cap.

Before filling, ensure you read and understand the following note and cautions:

IMPORTANT: When you take delivery of your sprayer, ensure you check the right hand side of the pump unit and look for a red tag or an over flow hole. If the red tag is still fitted, REMOVE IT now. If it is left in place, the reservoir may fail on refilling due to pressure build up.



Pump Unit



Red tag bung must be removed



Unplugged overflow hole

Continued over page

Groeneveld Auto Greaser - Components

NOTE: The fill point requires a Groeneveld female fill pump adaptor. You can purchase these via your local Groeneveld dealer or contact your Goldacres dealer to order.

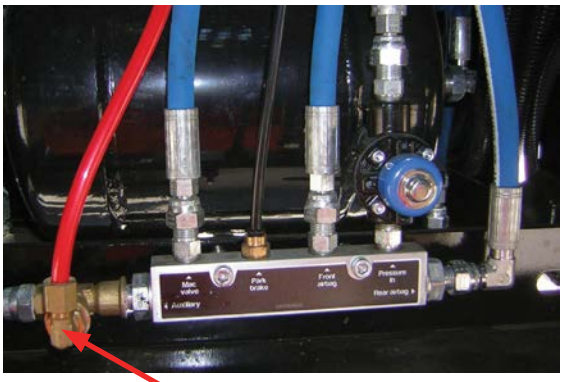
IMPORTANT: Do not overfill the main reservoir. Fill to about 2 cm from the top only. This instruction is also on the reservoir tank. Over filling will cause the reservoir to fracture.

IMPORTANT: Use ONLY HP0 or NLGI0 rated grease. It needs to be Lithium based and contain NO Teflon or Graphite as they stick to the meters and eventually jam them. The grease must NOT contain Aluminium or Copper compounds as they are abrasive to the seals and lines.

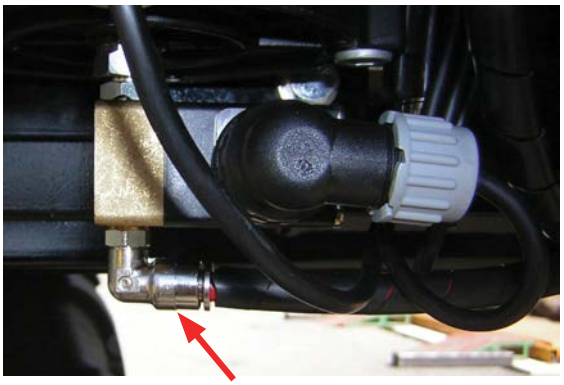
If you should happen to slightly overfill the reservoir, grease will overflow from the hole on the right of the pump unit. This will continue for about 3 days until the overflow channel is clear.

Main Air Supply

The air supply that operates the auto greasing system is the red air line running from the pneumatic manifold behind the right hand pod, to the bottom of the pump unit.



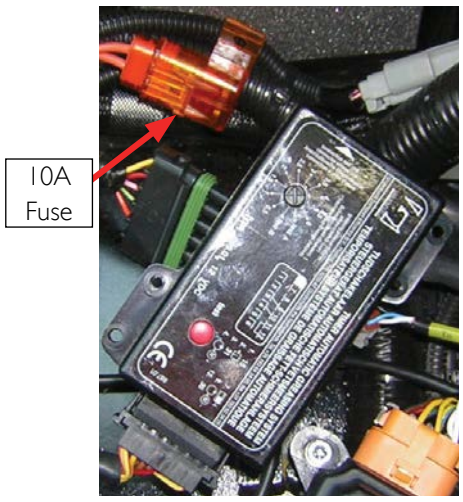
Main air supply from manifold



Main air supply input to pump unit solenoid

Electronic Timer

The electronic timer sets the intervals for operation of the greasing system. The auto greaser applies only small, metered amounts of grease at a time. This can be set at 30 minute intervals. The timer is located in the main cabin in the main fuse compartment to the right of the operators' seat. The timer is wired into the red covered ignition bus or via the 180A Relay. Power is applied when the ignition key is turned on.



Above: Electronic timer in main fuse compartment

The timer is protected by a 10A fuse in the clear orange cover.

IMPORTANT: The timer should initially be preset to 90 minutes intervals as this has been found to be the optimal grease delivery interval for most applications. However, certain operating conditions will require more or less than this amount.

It is the responsibility of the operator to ensure that the machine parts are receiving sufficient lubrication.

Hotter operating conditions cause the grease to become thinner and may therefore require more frequent interval settings.

Over lubrication, as well as under lubrication, can lead to premature failure of machine components and should be avoided.

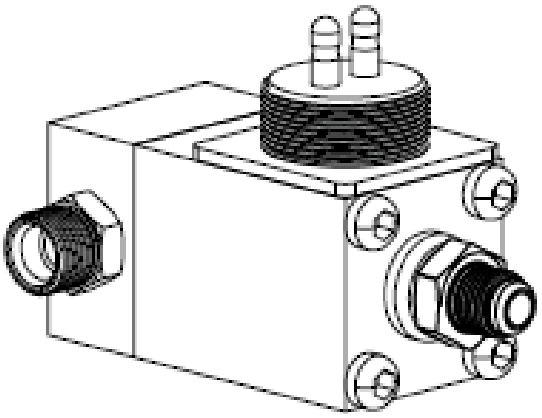
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Groeneveld Auto Greaser - Components

Solenoid

The solenoid at the bottom of the grease dispenser opens the valve, allowing air pressure to enter through the compressed air connection and push against the main piston.

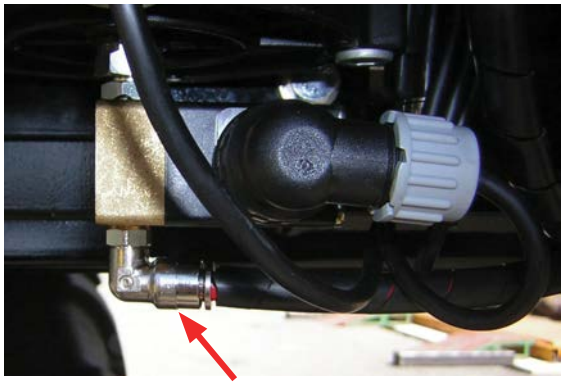
The solenoid valve between the air tank and the pneumatically operated pump (usually fitted to the pump) is a normally closed, free venting type. The valve is connected electrically by an M24 screw connector.



Above: Solenoid unit - Normally closed.



Solenoid located at bottom of pump unit



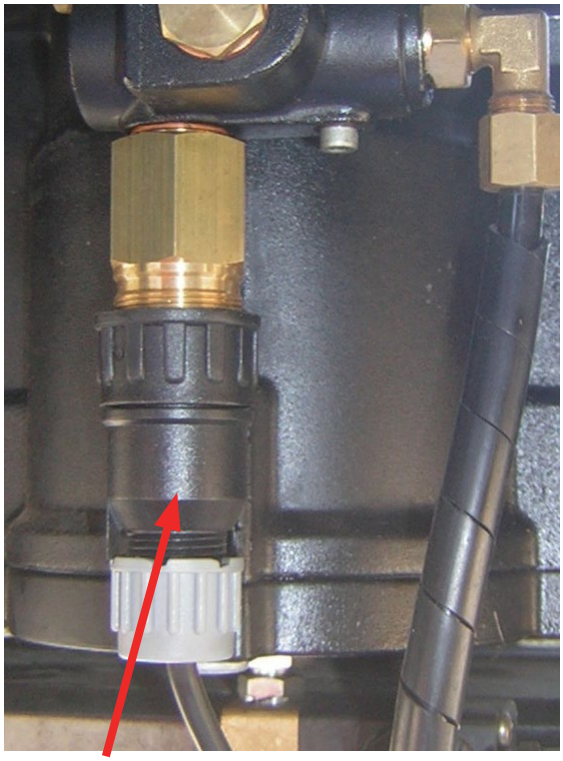
Main air supply input to pump unit solenoid

Continued over page

Groeneveld Auto Greaser - Components

Pressure Switch

The pressure switch is easily seen at the front of the unit. This monitors the system pressure during operation. Should pressure drop below a set point (due to brake in a main grease line), the switch will close and sound a low pressure alarm in the cabin.



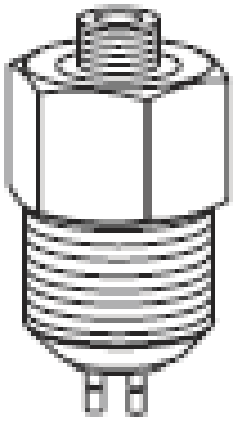
Pressure switch location

The air pressure supplied to the auto greaser is 110 – 120 PSI (7.6 Bar). The minimum required for effective operation of the auto greaser is 90 PSI (6.1 Bar). Below this, grease pressure will likely be inadequate to effectively protect the components.

The pressure switch operates at 40 PSI (2.7 Bar) grease pressure. Should a main grease line become broken (see next heading on this page), the pressure will drop below 40 PSI and the alarm in the cabin will sound.

A pressure switch is included in the lubrication system (in the main pipe) to provide an alarm for too low a pressure in the system during the lubrication cycle.

This switch closes at a pressure of 40 bar, making a connection to earth. If this does not happen during the lubrication cycle, because insufficient or no grease pressure is generated, an alarm will be given. During the remaining cycle time there will be an intermittent alarm signal. This alarm will be repeated after a preset time if the problem is not corrected.



Above: Pressure switch

An M24 screw connector connects the switch electrically.

For a system with a pneumatically operated pump the pressure switch is fitted to a distribution block. The electrically operated pump is provided with a built-in pressure switch.

Continued over page

Groeneveld Auto Greaser - Components

Return Valve

The return valve indicated in the photograph below allows grease to return to the reservoir from the grease line when pressure is released at the end of the lubrication cycle.



Above: Return valve

NOTE: Removing this blank is not advised. There is a check ball held in under spring tension that will come out at some speed. If this is lost, the return valve and non return valve will not work and the system will pump the grease back to the reservoir. If you believe there is a problem with this part of the system, contact your Groeneveld dealer direct.

WARNING: Removing this blank is not advised. There is a check ball held in under spring tension that will come out at some speed. Eye injury may result from the ball bearing if the blank is removed. If you believe there is a problem with this part of the system, contact your Groeneveld dealer direct.

Second Grease Outlet

A second grease outlet is on the pump unit and shown in the photograph below, in this case it is covered by the brass blank indicated. The main grease line is indicated by the arrow to the right of the blank.

NOTE: If you decide you want to run a second grease outlet line, please contact your Groeneveld dealer directly for technical advice.



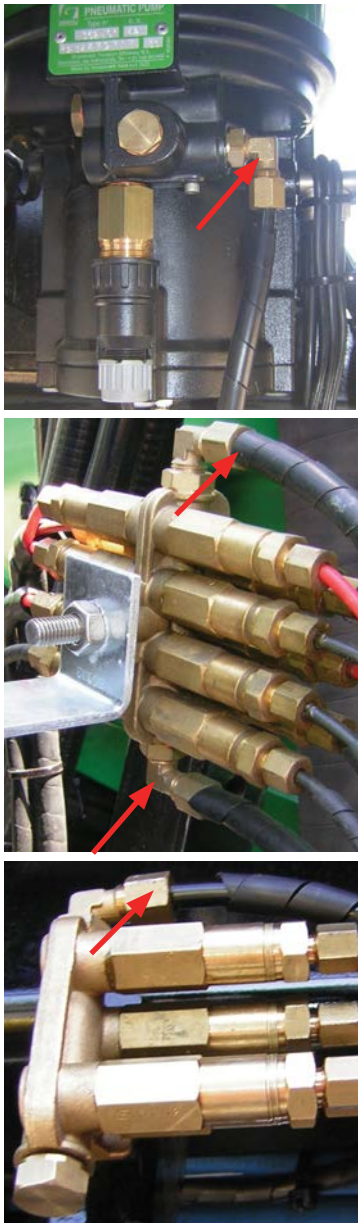
Above: Second grease outlet

Continued over page

Groeneveld Auto Greaser - Components

Main Grease Lines

The main grease lines leave the pump unit and terminate at either a bank of metering units or a single metering unit. On your system, a single line leaves the pump unit and to a 'T' joint which branches off to the front and rear of the machine.



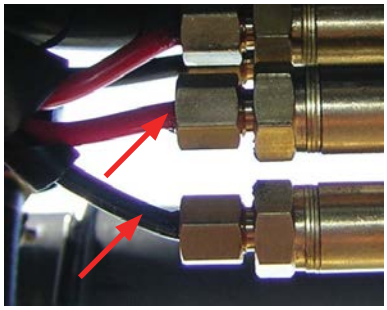
Above: Main Grease Lines

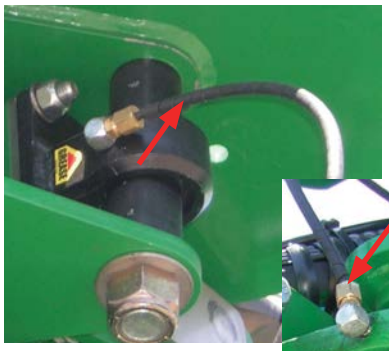
IMPORTANT: The main lines from the pump unit to the single or banks of metering units are monitored for pressure. Should one of these lines brake or leak, there will be a notable pressure drop in the system and a buzzer will sound in the cabin to alert you. The system will no longer be operating effectively and some or all areas may not be lubricated.

Grease Nipple Lines

The grease nipple lines are the smaller lines that run from the meter units and deliver the metered dose of grease to the grease nipple. These are Black, Red or Blue.

The 3 hose colours can be used if there are 3 different sized metering units in a bank. These make it easier to trace the lines to their terminating points.







Above: Grease Nipple Lines

Black is used to denote the lines out of the largest meter unit/s (based on the shims or spacers).
Red is used to denote the lines out of the smallest meter unit/s (based on the shims or spacers).
Blue is used to denote the lines out of the intermediate meter unit/s (based on the shims or spacers).

IMPORTANT: These lines do not have their pressure monitored. Should a line after its meter unit be broken, the system will not sound the alarm buzzer. The grease will flow out of the point of least resistance, which is the hole or brake in the hose. It is important to make regular inspections of these lines to ensure they are not damaged. Also inspect the grease point for evidence of lubrication.

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Groeneveld Auto Greaser - Components

Meter Distribution Block

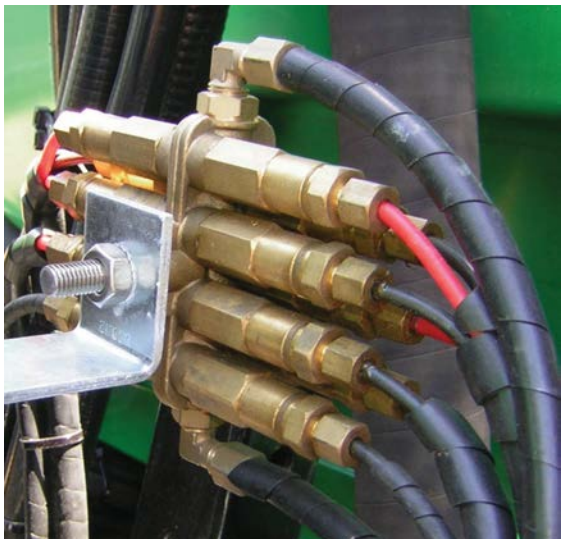
The meter unit distribution block is a brass fitting that holds multiple meter units. It has a port to attach the main grease line in and a main grease line out if there are further banks to feed off that line. If there are no further banks, one of the 2 main grease line ports can be closed with a screw in blank. Any unused meter points will be terminated with a blanking plug.

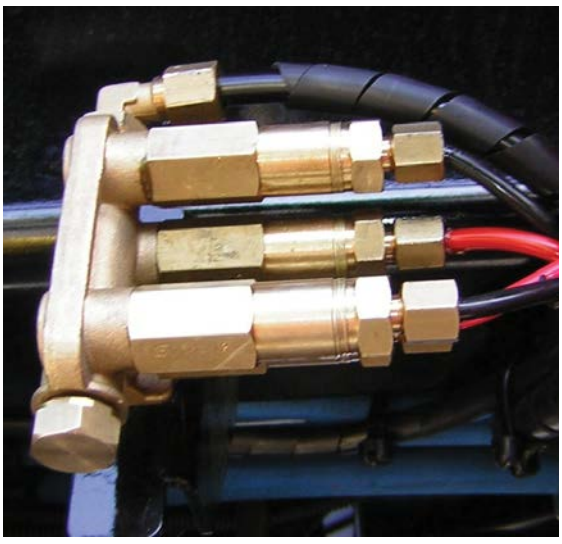
IMPORTANT: Do not open any of the blanked ports or meter units. This can allow contaminants into the lines and thus be a potential cause of faults or failures.





Above & Right: Bare meter distribution block

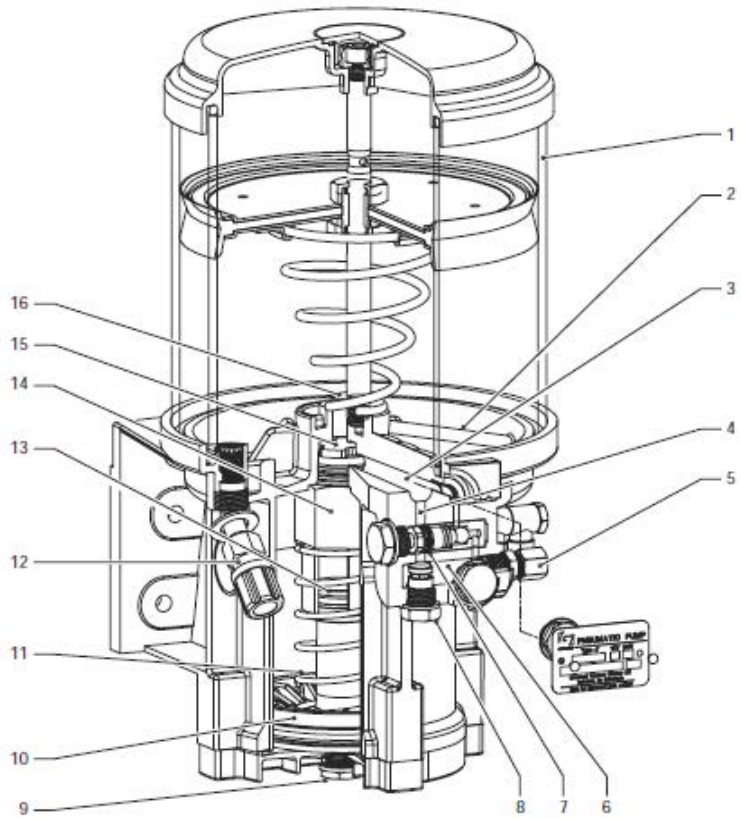




Above & Right: Fully fitted meter distribution block

Groeneveld Auto Greaser - Pump Unit

1. Reservoir with follower plate
2. Air venting channel
3. Grease channel
4. Return channel to reservoir
5. Main line connection
6. Pressure channel
7. Return valve
8. Non-return valve
9. Compressed air connection
10. Main air piston
11. Spring
12. Filler connector
13. Small grease piston
14. Grease chamber
15. Flapper valve
16. Connection to reservoir



Above: Pump unit exploded view

Pump Unit Operation

The timer counts down the preset interval and then closes the circuit applying power to the solenoid, opening it and allowing air pressure to enter through the bottom of the pump unit.

The air pressure is applied via the compressed air connection (9) the main piston (10) will be forced upwards applying pressure to the lubricant in chamber (14).

The pressure in chamber (14) forces valve (15) against the seat. The connection (16) to the reservoir (1) is closed so the grease does not pump straight back into the reservoir.

The lubricant leaves the chamber (14) via a channel (3) through the non-return valve (8) into the main or primary line. It moves along the main lines under pressure and acts on the plungers in the metering units.

The metering units are brought under full pump pressure passing their metered quantities of lubricant into the lubrication points. As a result of the pressure differential at the return valve (7) the return channel (4) remains closed.

At the end of the complete 3 minute lubrication cycle, the air pressure under the main piston (10) falls, allowing the piston to be pushed downward by the spring (11). At the same time flapper valve (15) is released and, because of the reduced pressure in the chamber (14), lubricant is drawn from the reservoir. This primes the system for the next cycle.

The non-return valve (8) prevents grease from the system piping and metering units from flowing back into the chamber (14).

The pressure in the main pipe opens the return valve (7) via the channel (6). This allows the pressure of the lubricant to flow via the channel (4) to the reservoir.

The metering units, with this pressure drop can now automatically refill themselves. The springs inside the meter units push the plunger back and the reservoir in front of the plunger fills, priming it for the next cycle.

There is NO pressure relief valve for the grease. Once the system has expended all the grease in the meter units, the system hydraulically locks until the end of the cycle time.

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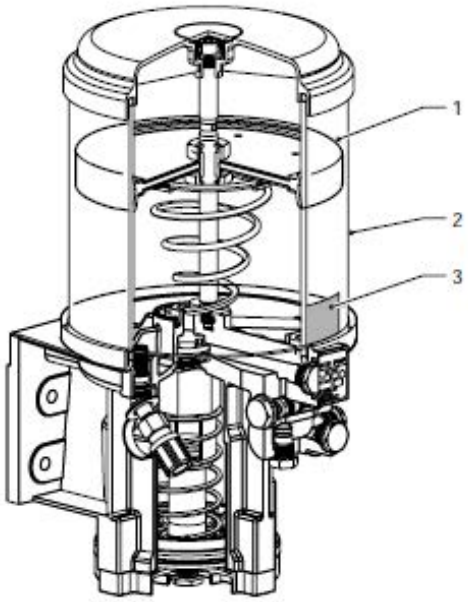
Groeneveld Auto Greaser - Pump Unit

Pump Unit Reservoir

The reservoir (2) is made from impact-resistant plastic that can withstand the influences of fluctuating temperatures. The reservoir can hold a quantity of lubricant that in most cases is sufficient for about 4 months, depending on the number of grease points.

The minimum level (5 cm) is marked by a label (3) on the reservoir.

NOTE: There is NO maximum level mark.



Above: Reservoir

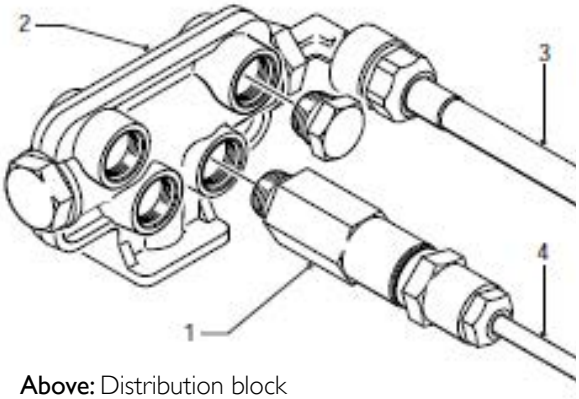
In the standard reservoir a follower plate is placed above the level of the lubricant. This plate follows the level of the lubricant; as the level falls the follower plate falls with it under the action of a tension spring. The follower plate prevents the increase of air into the lubricant and any consequent soaping of the lubricant. Funneling of grease as the level falls is also prevented. The follower plate also wipes the reservoir wall clean. This allows the level of the lubricant to be checked easily at a glance.

Groeneveld Auto Greaser - Meter Units

Meter Units

There are 11 metering unit types (1) available for the Single line system, each with a differing metered lubricant quantity. By careful selection of the type of metering unit each lubrication point can be provided with the right quantity of lubricant.

The metering units are fitted in groups on distribution blocks (2); this is a cast brass distribution block to which the primary (main) line (3) is connected. The blocks are available with several ports or outlets to which metering units can be connected. The unused outlets should be blanked-off. The metering units are also made of brass and are, because of their enclosed design, exceptionally suitable for use in dirty and dusty conditions.



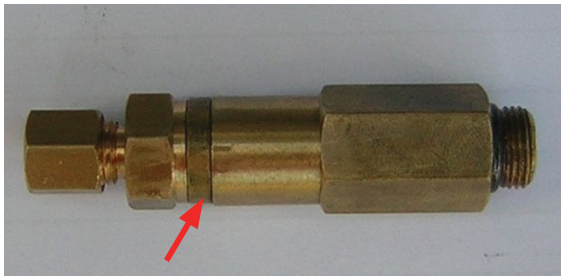
Above: Distribution block

IMPORTANT: Do not open any of the blanked ports or meter units. This can allow contaminants into the lines and thus be a potential cause of faults or failures.

The metering units that are used in your greasing system may differ externally, or even internally, from the one illustrated here. However, the operating principle is always the same.

Meter Unit Setup

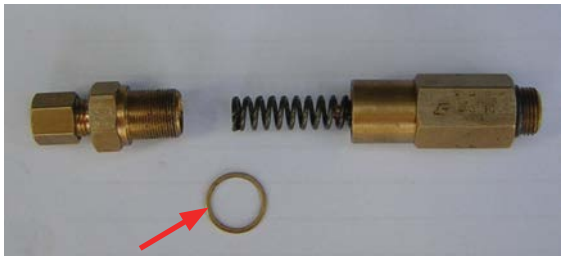
The meter units measure the dose of grease to the grease nipple. The metered dose is varied by a number of shims or spacers. If you look closely at your machine, you will see each meter will have 1, 2 or 3 shims. After that, it moves up to a spacer (equivalent to 4 shims). Then 1 spacer with 1, 2 or 3 shims, followed by 2 spacers, then 2 spacers and 1 shim (9 shim spacing).



Meter Unit fitted with spacer

This has been set by the technician when fitted at the factory and has been tested to ensure each component gets the grease it requires. This will allow enough grease to be pushed into the moving parts, lubricating them as well as keeping dirt and abrasives out. If you believe that any points are not getting enough grease, check the lines for damage. If none is evident, contact your dealer or Groeneveld direct and ask about increasing the meter dose for that particular area.

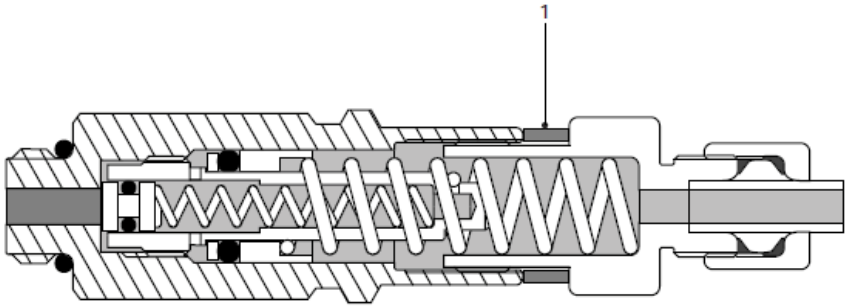
IMPORTANT: It is not advisable to open the metering units as this allows the entry of dirt, and thus is a potential cause of faults and failures.



Meter components showing shim

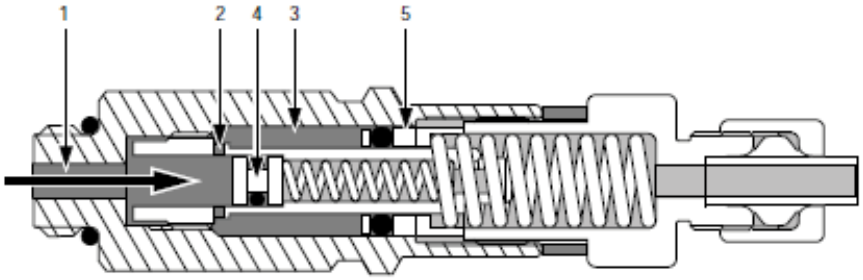
Groeneveld Auto Greaser - Meter Unit Operation

Right: Meter unit & Spacer



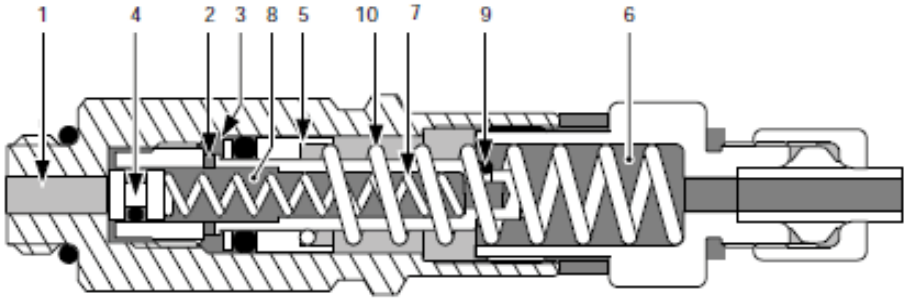
PHASE A. The pump presses the grease into grease channel (1). The grease pushes plunger (4) past channel (2). The grease now fills chamber (3) and pushes plunger (5) to the right. The stroke length of plunger (5) will determine the amount of grease that will be pressed through the secondary grease line to the grease point. This stroke length - hence the capacity of chamber (3) – is determined by the number and thickness of the spacers as shown above.

Right: Meter unit in phase A



PHASE B. When the pump stops and as the grease pressure drops, spring (7) will push plunger (4) back to the left, closing off channel (1). O-ring (9) prevents grease from being sucked back from chamber (6). Plunger (5) is pushed back by spring (10) and presses the grease in chamber (3), via channel (2), to chamber (8).

Right: Meter unit in phase B

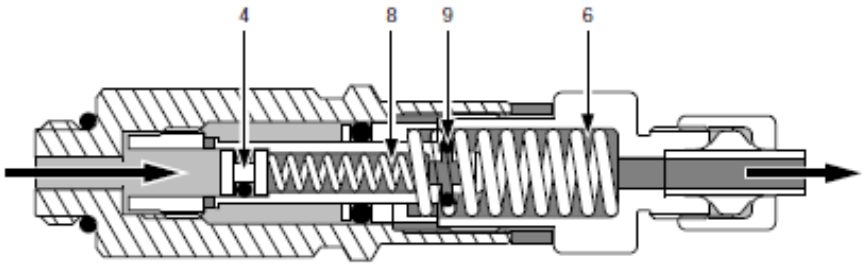


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Groeneveld Auto Greaser - Meter Unit Operation

PHASE C. During the next lubrication cycle, the same happens as in phase A. Chamber (8) however, is now filled with grease. As plunger (4) moves right under influence of the grease pressure, the grease in chamber (8) is pressed, via chamber (6) and the secondary grease line, to the grease point. During all this, O-ring (9) is pressed outward to allow the grease to leave chamber (8).

Right: Meter unit in phase C



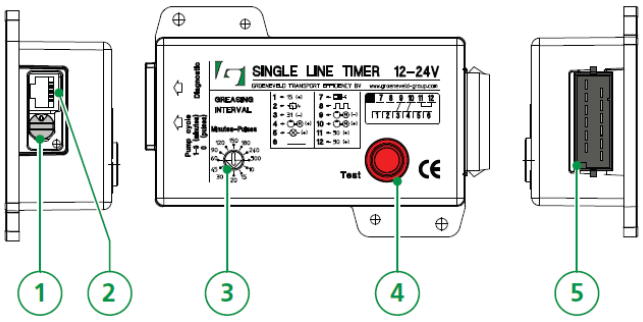
IMPORTANT: It is not advisable to open the metering units as this allows the entry of dirt, and thus is a potential cause of faults and failures.

Groeneveld Auto Greaser - Electronic Timer

The greasing system is controlled by an electronic timer. The timer produces, at set time intervals impulses lasting 3 minutes. These impulses energize the solenoid valve in the air supply to start the lubrication cycle. The interval between successive lubrication cycles is adjusted on the electronic timer.

If during a cycle the power supply is switched off, a complete new lubrication cycle will restart when the power supply is again switched on.

1. Pump cycle rotary switch
2. Diagnostic (Groeneveld only)
3. Grease interval rotary switch
4. Test button
5. Connector



Above: Electronic Timer

IMPORTANT: The timer should initially be preset to 90 minutes intervals as this has been found to be the optimal grease delivery interval for most applications. However, certain operating conditions will require more or less than this amount.

It is the responsibility of the operator to ensure that the machine parts are receiving sufficient lubrication.

Hotter operating conditions cause the grease to become thinner and may therefore require more frequent interval settings.

Over lubrication, as well as under lubrication, can lead to premature failure of machine components and should be avoided.

Interval Adjustment

The interval time between two successive lubrication cycles can be adjusted using the step switch. One of ten time intervals can be selected. The standard version has time intervals increasing by 0.5 h steps (0.5, 1.0, 1.5... 5 h). If the power supply is switched off during a cycle the cycle will be ended. When the power supply is switched on again a complete new cycle will be started.

Timer Alarms

Alarm signals can be generated by the electronic timer in various circumstances.

The standard version uses a built-in buzzer. In other versions another (external) alarm indicator can be fitted, for example a lamp.

The alarm signal is generated in the following situations:

- After reaching 70% of the cycle time (70% of 3 minutes = 2 minutes) the pressure switch should have connected to earth. If this is not the case - because insufficient pressure has been built up - then a continuous alarm signal is generated.
- The electronic timer runs a self-test after the power supply is switched on; if there is a fault condition an intermittent alarm is generated. This can occur if no interval is selected by the step switch.

If the electronic timer sounds an alarm to indicate that the timer or greasing system is not functioning properly, it is strongly advised to examine (or have examined) the greasing system and if necessary to make repairs. If this is left too long, damage can be caused to either the sprayer or the greasing system.

Groeneveld Auto Greaser - Maintenance & Testing

Periodic Maintenance

IMPORTANT: All maintenance points must be carefully followed. Failure to do so can cause failure of your auto greasing system or your machine to be under lubricated.

The following maintenance is required to ensure a long and reliable lifespan of the auto greasing system:

1. Do not overfill the main reservoir. Fill only to about 2 cm from the top. You will see this instruction on the reservoir tank. Over filling will cause the reservoir to fracture.
2. Check the lubricant levels daily.
3. Use ONLY HP0 or NLGI0 rated grease. It needs to be Lithium based and contain NO Teflon or Graphite as they stick to the meters and eventually jam them. Use NO Aluminium or Copper compounds as they are abrasive to the seals and lines.
4. Your electronic timer should be set to 90 minutes to properly lubricate the connected points on your machine.
5. Inspect grease points daily. If there is no indication of grease at the components, there may be a break in the line between the meter and the grease nipple.
6. Inspect pump unit and airlines / power cables for external damage.
7. Inspect all grease lines weekly for damage. If a brake or puncture occurs between the tank and meter units, there will be a buzzing alarm in the cabin. Your system may not be able to lubricate the machine effectively. However, if a brake occurs between a meter unit and a grease nipple, there will be no alarm. Grease will be lost at the break and the component will not be lubricated.
8. Do not make alterations to your system. Call your local Groeneveld dealer for technical advice.
9. Do not use high pressure or steam cleaners on the pump unit as it may force water into the system.
10. Drain the pneumatic system regularly to prevent water build up. Water entering under the piston CAN NOT drain away. Eventually this will fill the area under the piston and the amount of lubricant delivered will reduce and eventually cease.
11. Do not forget that the auto grease doesn't cover every grease point on the machine. Ensure you check and grease those parts that are not connected to the auto greaser as per your operators' manual.

Filling

IMPORTANT: Do not overfill the main reservoir. Fill only to about 2 cm from the top. You will see this instruction on the reservoir tank. Over filling will cause the reservoir to fracture.

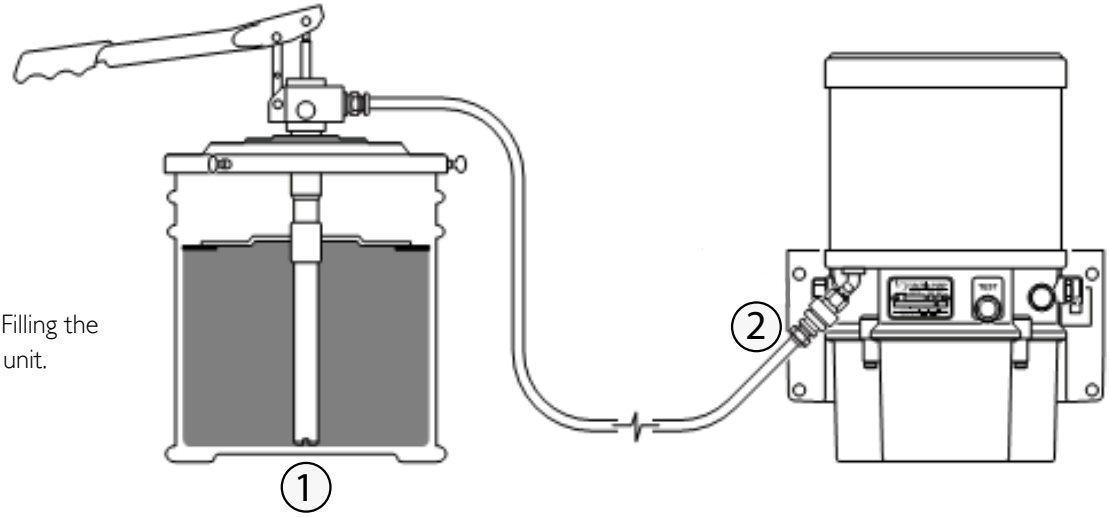
IMPORTANT: Use ONLY HP0 or NLGI0 rated grease. It needs to be Lithium based and contain NO Teflon or Graphite as they stick to the meters and eventually jam them. The grease must NOT contain Aluminium or Copper compounds as they are abrasive to the seals and lines.

When the lubricant in the reservoir has fallen to the minimum level it must be re-filled. Generally a filler pump is used for this purpose. The procedure is as follows:

1. Ensure there grease drain hole on the right of the pump unit is not blocked.
2. With a new filler pump (or filling hose) the hose should first be primed with lubricant. This avoids the pumping of air into the reservoir. For this the ball (1) in the snap-on connector on the filler hose should be depressed while pumping lubricant through the hose until it is filled with the lubricant.
3. Remove the dust cap from the filler connector.
4. Carefully clean the filler connector and the connector on the filler hose.
5. Secure the filler hose to the filler connector.
6. Fill the reservoir to not more than the maximum level (2 cm below the top of the reservoir) or until the follower plate meets its stop. If you slightly overfill, you will see grease flow from the drain hole on the right of the pump unit. This will take about 3 days to complete draining.

Continued over page

7. Replace the dust cap on the filler connector.
8. There is a filter within the filler connector in the reservoir. If pumping is very difficult, the filter could be blocked. In this case, dismantle and clean the filter.



Right: Filling the pump unit.

Testing Electronic Timer

STEP SWITCH TEST

This checks the step switch contacts in all positions.

1. Set the step switch to position 'test A'.
2. Activate the electronic timer by switching on the ignition.
3. Press the 'test' button.
4. Wait for the audible alarm signal then release the 'test' button.
5. Within 5 seconds turn the step switch to the required interval time position. Each position produces a number of signals: position 1 gives one signal, position 2 two signals etc.
6. The switch can be set to all positions. Positions 'test A' and 'test B' will not produce an alarm signal.
7. End the test by switching off the ignition.

ACCELERATED CYCLE TEST

This allows you to test a timing cycle without waiting the full set time interval. It sets the time interval at 1/20th of its duration.

1. Set the step switch to position 'test A'.
2. Press and hold the 'test' button.
3. Switch the ignition on while still keeping the 'test' button pressed in.
4. The alarm signal buzzer will now sound. The 'test' button must be pressed as long as the alarm signal continues.
5. Within 5 seconds of the end of the alarm signal turn the step switch to the required position.
6. The electronic timer is now fully operational; the time intervals are now 1/20th of their usual times.
7. End the test by switching off the power supply.

NORMAL SYSTEM TEST

1. Switch the ignition on.
2. Press the 'test' button; a normal lubrication cycle will then follow. The switch can be set in any position except 'test A' or 'test B'.

After this test the electronic timer will work at the interval set.

The 'test B' position is only for use with the test or read-out unit.

Groeneveld Auto Greaser - Warnings Summary

NOTE: Instructions given to the operator to better enhance the system.

IMPORTANT: Instructions that if ignored will cause damage to the system or machine.

WARNING: Instructions that if ignored will cause personal injury or death to the operator or bystanders.

IMPORTANT: When you take delivery of your sprayer, ensure you check the right hand side of the pump unit and look for a red tag or an over flow hole. If the red tag is still fitted, REMOVE IT now. If it is left in place, the reservoir may fail on refilling due to pressure build up.

NOTE: The fill point requires a Groeneveld female fill pump adaptor. You can purchase these via your local Groeneveld dealer or contact your Goldacres dealer to order.

IMPORTANT: Do not overfill the main reservoir. Fill to about 2 cm from the top only. This instruction is also on the reservoir tank. Over filling will cause the reservoir to fracture.

IMPORTANT: Use ONLY HP0 or NLGI0 rated grease. It needs to be Lithium based and contain NO Teflon or Graphite as they stick to the meters and eventually jam them. The grease must NOT contain Aluminium or Copper compounds as they are abrasive to the seals and lines.

IMPORTANT: The timer should initially be preset to 90 minutes intervals as this has been found to be the optimal grease delivery interval for most applications. However, certain operating conditions will require more or less than this amount.

It is the responsibility of the operator to ensure that the machine parts are receiving sufficient lubrication. Hotter operating conditions cause the grease to become thinner and may therefore require more frequent interval settings.

Over lubrication, as well as under lubrication, can lead to premature failure of machine components and should be avoided.

NOTE: Removing this blank is not advised. There is a check ball held in under spring tension that will come out at some speed. If this is lost, the return valve and non return valve will not work and the system will pump the grease back to the reservoir. If you believe there is a problem with this part of the system, contact your Groeneveld dealer direct.

WARNING: Removing this blank is not advised. There is a check ball held in under spring tension that will come out at some speed. Eye injury may result from the ball bearing if the blank is removed. If you believe there is a problem with this part of the system, contact your Groeneveld dealer direct.

NOTE: If you decide you want to run a second grease outlet line, please contact your Groeneveld dealer directly for technical advice.

IMPORTANT: The main lines from the pump unit to the single or banks of metering units are monitored for pressure. Should one of these lines brake or leak, there will be a notable pressure drop in the system and a buzzer will sound in the cabin to alert you. The system will no longer be operating effectively and some or all areas may not be lubricated.

IMPORTANT: These lines do not have their pressure monitored. Should a line after its meter unit be broken, the system will not sound the alarm buzzer. The grease will flow out of the point of least resistance, which is the hole or brake in the hose. It is important to make regular inspections of these lines to ensure they are not damaged. Also inspect the grease point for evidence of lubrication.

IMPORTANT: Do not open any of the blanked ports or meter units. This can allow contaminants into the lines and thus be a potential cause of faults or failures.

NOTE: There is NO maximum level mark.

IMPORTANT: It is not advisable to open the metering units as this allows the entry of dirt, and thus is a potential cause of faults and failures.

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IMPORTANT: All maintenance points must be carefully followed. Failure to do so can cause failure of your auto greasing system or your machine to be under lubricated.

IMPORTANT: Do not overfill the main reservoir. Fill only to about 2 cm from the top. You will see this instruction on the reservoir tank. Over filling will cause the reservoir to fracture.

IMPORTANT: Use ONLY HP0 or NLGI0 rated grease. It needs to be Lithium based and contain NO Teflon or Graphite as they stick to the meters and eventually jam them. The grease must NOT contain Aluminium or Copper compounds as they are abrasive to the seals and lines.

Groeneveld Auto Greaser - Technical Data

Pump Unit

Your sprayer is fitted with model part number 36201 on this table.

	part number			
	36201	35501	37101	43001
reservoir capacity	4 liters	8 liters	4 liters	8 liters
delivery	42 cc / stroke		60 cc / stroke	
ratio	9:1			
grease pressure	72 bar (for an air pressure of 8 bar)			
maximum grease pressure	100 bar			
temperature range	-25 °C to +80 °C (NLGI 0 grease)			
weight	6.3 kg	7.2 kg	7.52 kg	8.42 kg

Electronic Timer

Your sprayer is fitted with part number 0099.01 on this table.

	part number					
	099.01 (12 V)	032.01 (24 V)	676.02 (12V)	675.02 (24V)	678.02 (12V)	677.02 (24V)
cycle time	3 minutes		2 minutes		3 minutes	
cycle intervals	steps of 30 minutes (0.5 - 5 h)		steps of 5 minutes		steps of 30 minutes	
alarm	built-in buzzer		internal relais (16A)		internal relais (16A)	

Pressure Switch

Your sprayer is fitted with part number 184.08 on this table.

	part number
	225.01
type	normally-open
switching pressure	40 bar
connection	2-wire
screw thread	M24

Solenoid

Your sprayer is fitted with part number 184.08 on this table.

	part number	
	184.08 (12 V)	183.08 (24 V)
type	normally-closed with open venting	normally-closed with open venting
operating pressure	maximum 10 bar	maximum 10 bar
power requirement	maximum 8 W	maximum 8 W
screw thread	M24	M24

Meter Units

The metering units as mentioned are altered using combinations of shims and spacers (a spacer being equivalent to 4 shims) to a maximum of 9 shims (2 spacers and 1 shim).

Metering unit nr.	Delivery [cc]
0	0.025
1	0.050
2	0.1
3	0.15
4	0.2
5	0.25
6	0.3
7	0.35
8	0.4
8,5	0.7
9	1.0

Groeneveld Auto Greaser - Troubleshooting

Fault	*Cause*	*Action*
1. All points to be lubricated are dry.	a. Pump reservoir is empty.	a. Fill the reservoir (see section 9).
	b. Reservoir filled with grease that is too thick and unsuitable for the system.	b. Remove and clean the reservoir. Refit and fill the reservoir with the correct grease. Remove the end plugs from the distribution blocks and pump the old grease out of the system.
	c. Main pipe leaking.	c. Repair the line and bleed the system if a new piece of piping has been fitted.
	d. Electronic timer, PLC or pneumatic impulse counter not set correctly.	d. Reset the electronic timer, PLC or brake impulse counter.
	If there is another cause, please consult your dealer.	
2. Pump does not work or does not reach working pressure.	a. Pneumatically operated pump: No or too-low air pressure.	a. Ensure there is an air pressure of 6 to 8 bar.
	b. Piston does not rise.	b. Dismantle the cover of the pump casing and clean the piston.
	If there is another cause, please consult your dealer.	
3. One or more lubrication points are dry while the others receive sufficient grease.	a. Break in the secondary piping.	a. Repair or replace the line.
	b. Inoperative metering unit.	b. Remove the metering unit and fit a new unit.
4. A lubrication point receives too much grease.	a. Internal leak in the metering unit.	a. Remove and clean the metering unit or fit a new unit.
5. Pneumatically operated pump: Solenoid valve fails to operate or does not operate correctly.	a. Bad or open electrical connections.	a. Check the electrical circuit and connections to the solenoid valve. Check the valve with direct current bypassing the electronic timer. Watch out for short-circuits!
	b. Solenoid valve internally fouled with water and/or rust from the vehicle air system.	b. Dismantle, clean and refit the valve or fit a new valve. Clean the vehicle air system.
6. Continuous buzzing from the electronic timer.	a. Short circuit.	a. Check wiring and test solenoid.
7. Electronic timer does not operate.	a. Fuse blown.	a. Fit new fuse.
8. Too much grease at all lubrication points.	a. System greasing frequency does not correspond with vehicle operating conditions.	b. Reduce the greasing frequency. Do not be too sparing, it is better to grease too much than too little.
9. Alarm buzzer in electronic timer sounds intermittently.	a. Grease level in the reservoir below the minimum.	a. Fill the reservoir (see section 9).
	a. System not reaching working pressure.	a. Top up the reservoir with grease and/or repair the main pipe, check the pump pressure with a manometer.
	c. No cycle time interval selected on the electronic timer.	c. Set a cycle time interval on the electronic timer.

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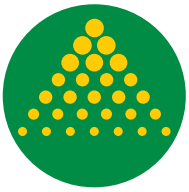
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