# Crop Cruiser G4

## Operator's Manual MY19

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GA8700987 REV 5
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FROM SERIAL #202138

GOLDACRES

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All information in this operator's manual is based on the latest product information available at the time of printing. The policy of Goldacres is one of continuous improvement and as such, Goldacres reserve the right to alter any specifications and designs without notice and without incurring any obligation regarding such changes.



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Under Parts & Service > Parts Manuals:

**GA8700984 - Parts Manual, G4 Crop Cruiser MY19**

# 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.

# Contents

# 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

# 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 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.

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# 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.
- Where fitted, care should be taken to never overfill the diaphragm pump 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.

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# 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.

## Norac System

If Norac 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.

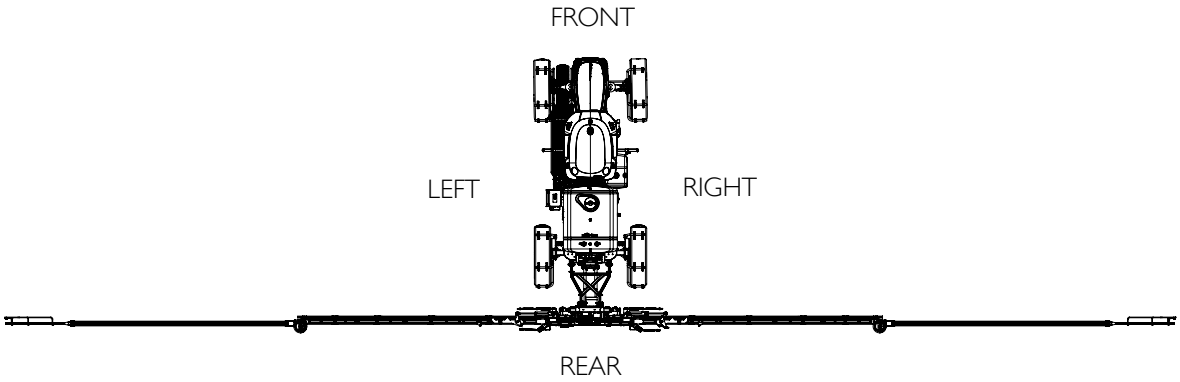
## Towing & Transporting Sprayer

- 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'.

### Boom Nozzle Control

Motorised boom valves for control of boom section on/off function are fitted as standard. These are mounted on the boom centre section at the rear of the sprayer. The number fitted is dependent on the number of boom sections and number of boom lines.

*Continued over page*

Nozzle control can also be achieved using the optional Rapid Fire with Rapid Flow system. In this system, 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.

## Rate Controller

These sprayers are supplied standard with a Raven SCS4400 automatic rate controller or an optional ISOBUS system. The ISOBUS system can be further optioned to include the Raven Rate Control Module (RCM) and/or Raven VT console. Automatic rate controllers will maintain a user defined application rate automatically as the vehicle speed changes. In order to function, the automatic rate controller relies on a flow meter, speed sensor and control valve. For specific information on the Raven controller please refer to Raven operator's manual supplied and Chapter 6 'Calibration' of this manual.

## 3 Tier System (3TS)

The optional 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.

For Raven SCS4400 controlled 3TS system specific calibration and operating instructions, see Chapter 6 'Calibration'.

For Raven RCM controlled 3TS system 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 mesh)

## Pump

A Udor positive displacement and oil backed diaphragm pump is fitted as standard. The normal operating pressure range is 1 - 8 bar which is sufficient for efficient nozzle performance.

## 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

## Booms

The Crop Cruiser can be fitted with a variety of boom sizes from 24 metres up to 36 metres in width. The booms feature hydraulic lift, fold and optional individual wing tilt all 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:

*Continued over page*

# General

TeeJet web site: www.teejet.com

Lechler web site: www.lechler.de

## 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'.

## 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'.

## 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 right hand side of the machine near the bonnet. It has a bottle with a hand pump that can be filled with a liquid hand cleaner. The hand wash tank can be filled with fresh water for the use of the operator.

## Ladder - Cabin Access

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.

## Ladder - Fuel Tank Access

For the convenience of the operator, a fold out ladder has been provided under the fuel tank to allow easier access to the fill point. Always face the ladder and retain three points of contact with the ladder at all times when ascending and descending.

To extend the ladder, give a sharp pull on the handle to release it from the rubber holders on the end. Then slide it forward as far as it will go before lowering it down.

*Continued over page*

# General

To stow the ladder, lift it up until it is horizontal to the ground and then slide it all the way in. Give a sharp push on the handle to secure it in the rubber holders.

NOTE: Do not drive the machine or operate the steering wheel with the ladder extended.

# 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'.

GA8700538_R4
applies from 2016

| G4 MAX SPEED FULLY LOADED IS 25 KM/H | | RECOMMENDED TYRE PRESSURE | |
|---|---|---|---|
| TYRE BRAND | TYRE SIZE | KPA | PSI |
| HARVEST | 380/90R46 (14.9R46) HR45 159A8 | 275 | 40 |
| HARVEST | 380/90R46 AusFlex HR45 173D | 240 | 35 |
| HARVEST | 460/85R38 (18.4x38) 159A8 Cross Ply(16) | 200 | 29 |
| HARVEST | 460/85R38 (18.4R38) HR45 149A8/146B | 158 | 23 |
| HARVEST | 480/80R46 (18.4R46) HR45 166A8/159D | 240 | 35 |
| HARVEST | 520/85R38 (20.8R38) HR45 155A8/152B | 262 | 38 |
| HARVEST | 520/85R46 (20.8R46) HR45 173A8 X-LOAD | 207 | 30 |

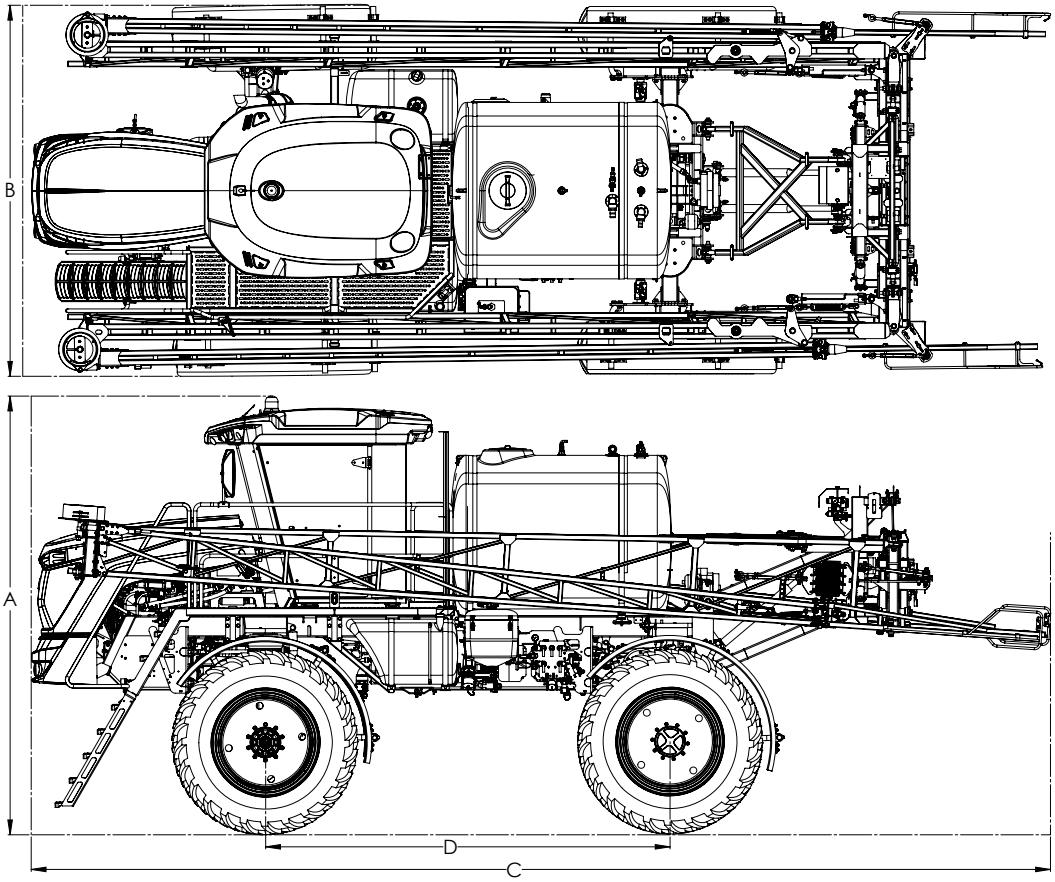
# Dimensions & Weight

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 sprayer is approximately 4.12 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 on roads it may be necessary to remove aerials to meet the required height restrictions.

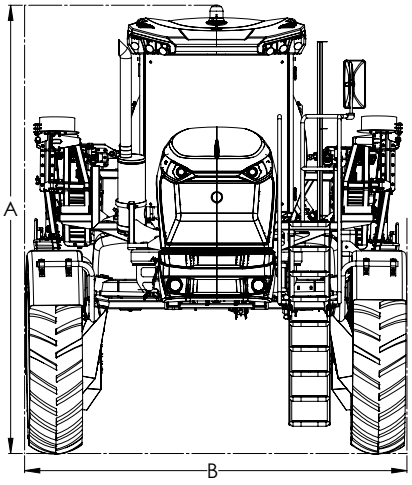
Aerials on the roof may also need to be removed to meet clearance requirements for over head power lines, while on the road and also in some paddocks.




| BOOM SIZE | A FRONT HEIGHT | B WIDTH | C TOTAL LENGTH | D WHEEL-BASE |
|---|---|---|---|---|
| 24 m | 4.12 m | 3.50 m | 8.50 m | 3.82 m |
| 30 m | 4.12 m | 3.50 m | 8.50 m | 3.82 m |
| 33 m | 4.12 m | 3.50 m | 8.50 m | 3.82 m |
| 36 m | 4.12 m | 3.50 m | 9.48 m | 3.82 m |

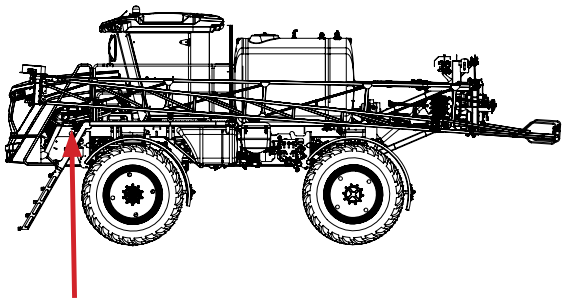
**NOTE:** Spray height is based on 380/90 R46 Harvest tyres fitted & with air bags deflated.

| VARIANT | TARE MASS |
|---|---|
| G4 | 9380 Kg (36 m boom, TriTech centre) |



# 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.



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

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

When ordering parts from your Goldacres dealer, please quote:

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

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

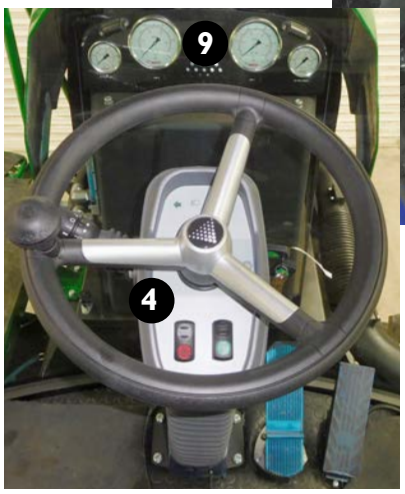
**NOTE:** Please ensure that all parts are clearly labelled with the owner's details, and a brief description of the fault. Dealers are not liable for the return of any goods to a Goldacres Dealer. The goods must be returned to the point of sale.

Genuine Goldacres parts only should be used on Goldacres equipment.

# Chapter 4

# CABIN

## Key Features


| NUMBER | FEATURE |
|---|---|
| 1. | Overhead console |
| 2. | Side arm rest console |
| 3. | Operators seat |
| 4. | Steering wheel & controls |
| 5. | Power distribution box |
| 6. | Storage area under operators seat |
| 7. | Operator seat belt |
| 8. | Hand brake |
| 9. | Boom gauges |
| 10. | Training seat |

# Arm Rest Controls

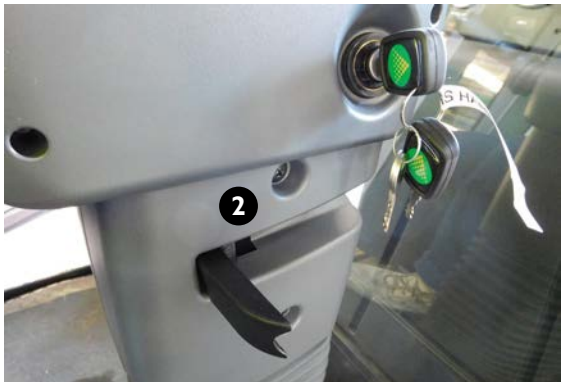
**Above:** Optional Raven VT spray controller console.

**Right:** Arm rest console shown with standard Raven SCS4400 spray controller console. An ISOBUS system can also be optioned with or without Raven VT console


| NUMBER | FEATURE |
|---|---|
| 1. | Rate Controller - Raven SCS4400 or Raven VT or ISO BUS only |
| 2. | Tilt Left Up/Down |
| 3. | Boom Up/Down |
| 4. | Tilt Right Up/Down |
| 5. | GPS Resume/Cruise Cancel |
| 6. | Cruise Control Resume+/Set- |
| 7. | Fenceline Left (On/off)/Right (On/off) |
| 8. | Cruise/RPM Raise |
| 9. | Boom Recirculation On/Off |
| 10. | Spray Pump On/Off |

| NUMBER | FEATURE |
|---|---|
| 11. | Transmission gear selector |
| 12. | Boom Fold In/Out |
| 13. | Boom Bi-fold In/Out (Optional) |
| 14. | Adjustable axle In/Out (Optional) |
| 15. | Spray Mode/Road Mode |
| 16. | Diff Lock On/Off (Optional) |
| 17. | 4WD Engage On/Off (Optional) |
| 18. | Fuel gauge |
| 19. | Auxiliary USB power supply |
| 20. | Engine monitor CAN |

# Steering Column



| NUMBER | FEATURE | INSTRUCTIONS |
|---|---|---|
| 1. | Steering column tilt adjust | • Hold the steering wheel with your hand<br>• Press the lever at the base of the column with your foot. With the lever pressed down, set the steering column to the desired position with your hand<br>• Release lever to lock in final position |
| 2. | Steering column height adjust | • Hold the steering wheel with your hand<br>• Pull the lever out that is on the right side of the column<br>• Set the steering wheel to the desired position by hand<br>• Push the lever back in to lock in final position |

*Continued over page*

# Steering Column

## Multifunction Switch - Lights

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


| NUMBER | FEATURE |
|---|---|
| 1. | High beam flash (Pull up) |
| 2. | Low beam (Center position) |
| 3. | High beam (Push down) |
| 4. | Right turn signal (Push forward) |
| 5. | Left turn signal (Pull back) |

## Multifunction Switch - Horn & Wipers

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


| NUMBER | FEATURE |
|---|---|
| 1. | Not used |
| 2. | Not used |
| 3. | Not used |
| 4. | Not used |
| 5. | Not used |
| 6. | Horn (Press) |

**NOTE:** Wiper functions are controlled by overhead buttons detailed in the 'Overhead Components' section of this chapter.

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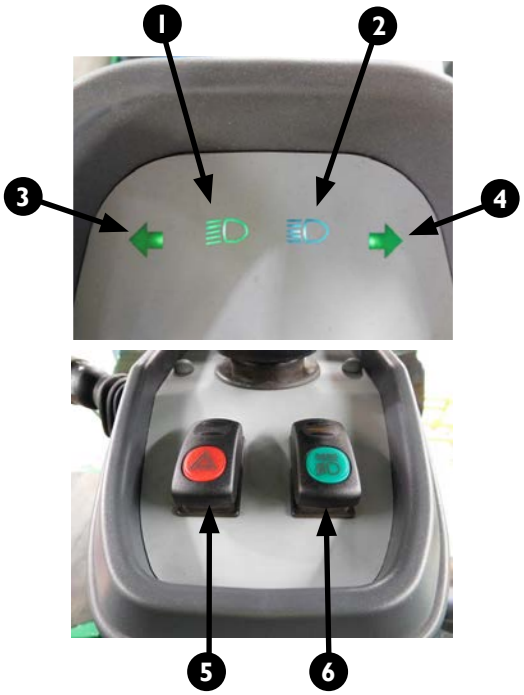
# Steering Column

## Vehicle Information Unit

The vehicle information unit is located on the top front of the steering column.

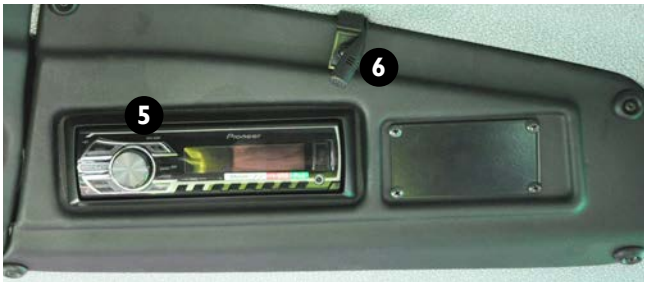



| NUMBER | FEATURE |
|---|---|
| 1. | Low beam indicator |
| 2. | High beam indicator |
| 3. | Left turn signal indicator |
| 4. | Right turn signal indicator |
| 5. | Hazard light switch |
| 6. | Park light and low beam switch |

# Operator Seat

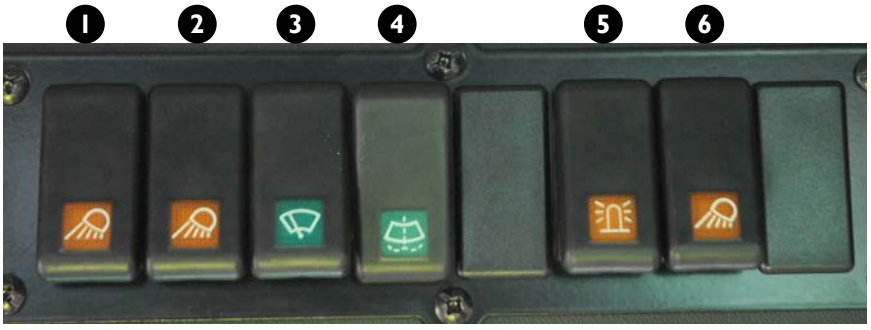

| NUMBER | FEATURE | DESCRIPTION |
|---|---|---|
| 1. | Seat Depth adjustment | To adjust the depth of the seat cushion, pull the handle upwards. By moving the seat cushion backwards the desired seating position can be reached. |
| 2. | Seat pan angle adjustment | To adjust the angle of the seat pan, 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. |
| 3. | Absorber | The cushioning effect can be adjusted for on and off-road driving conditions. 1-Soft, 2-Medium, 3-Hard. |
| 4. | 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 |
| 5. | Lumbar adjustment | The top switch controls upper lumbar support. The lower switch controls the lower lumbar support. |
| 6. | Arm Rest Adjust | By turning this knob the arm rest can be angled to suit. The cover on the side can be removed and loosen the nut, and adjust the armrest up/down to desired position. |
| 7. | Seat Belt | Operator lap seat belt must be fitted when ever the operator is seated in the cabin. |
| 8. | Tilt | The lever on the right hand side of the seat allows the back rest to be tilted forward or rearward. Pulling the lever upwards releases the back rest so it can be repositioned. Release to lock. |
| 9. | Fore / Aft adjustment | By lifting this lever the seat can be slid backwards or forward to the desired position. |
| 10. | Fore/Aft isolator | Shock impacts in the driving direction can be better absorbed by the driving seat. Position 1 Off / Position 2 On |

# Overhead Components


| NUMBER | FEATURE |
|---|---|
| 1. | Cooler bottle storage |
| 2. | Air conditioning control |
| 3. | Lights & wiper switches (See next section below) |
| 4. | 12V outlet |
| 5. | AM/FM Radio/CD player |
| 6. | Bluetooth microphone |

# Lights & Wiper Switches




| NUMBER | FEATURE |
|---|---|
| 1. | Outer front work lights |
| 2. | Inner front work lights |
| 3. | Wipers |
| 4. | Windscreen washers |
| 5. | Rotating beacon |
| 6. | Rear cabin work lights |

**NOTE:** All switches are ON/OFF toggle.

# Air-conditioning

## Overview of Controls

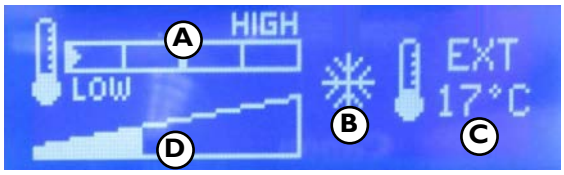
The air conditioner regulates the temperature and humidity of the air in the cabin.

1. Selection knob
2. Display


## Switching Air-conditioner On

- Switch on the ignition and start the engine.
- To start the air conditioner press the selection knob and hold it for two seconds. The display will light up and the screen will be as follows.

After switching on, the operating mode and the display are always identical with the settings before switching off the last time.




**A.** Temperature LOW / HIGH

**B.** Air-conditioning ON/ OFF

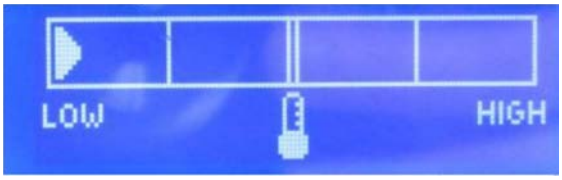
**C.** External temperature

**D.** Fan speed

## Setting Air-conditioner

- To set the Ventilation speed, press the selection knob until this screen is displayed. To set the speed turn the selection knob clockwise will increase the speed and turn anti-clockwise will decrease the speed.

- To set the Temperature, press the selection knob until this screen is displayed. To set the temperature, turning the selection knob clockwise will increase the temperature and turning anti-clockwise will decrease the temperature.




- To turn the Compressor ON/ OFF double press the selection knob, the display will change to show COMPRESSOR: ON or OFF. To change the setting turn the selection knob to switch from the current selection.


To indicate the effective operation of the air conditioning compressor there will be a "click" sound emitted from the control panel and an icon of a snowflake (B) will be located in the leading position in the display.

- To turn the unit OFF press and hold the selection knob down for more than 2 seconds.

## Adjusting Air Vents

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.

# 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.

## Operation

Ambient air from the environment is passed through the carbon filter before being supplied to the air-conditioning blower fan. Therefore the carbon filter doesn't require switching on independently of the air-conditioning fan. They are always active at the same time.

CAUTION: The cabin door should be completely closed with the air-conditioning fan 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 under the top right hand side of the roof behind a panel held on by thumbscrews.

# AM/FM Radio

The entertainment radio is fitted to the panel to the right of the operator on the roof. It consists of a radio tuner as well as single compact disc player. A blue tooth compatible phone system is installed in the unit.


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

# Lighting

## Interior Lighting

There are two overhead lights. They can be operated individually.

Both switches turn on by pressing the front or the rear of the light lens. These lights are fixed and cannot be aimed.

**NOTE:** The overhead lights wont operate unless the ignition key is in the 'accessories' or 'run' position.

**Above:** Cabin interior overhead 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 located in rear left hand side roof area of cabin.

**Above:** Egress lighting timer relay located in rear left hand side roof area of cabin.

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.

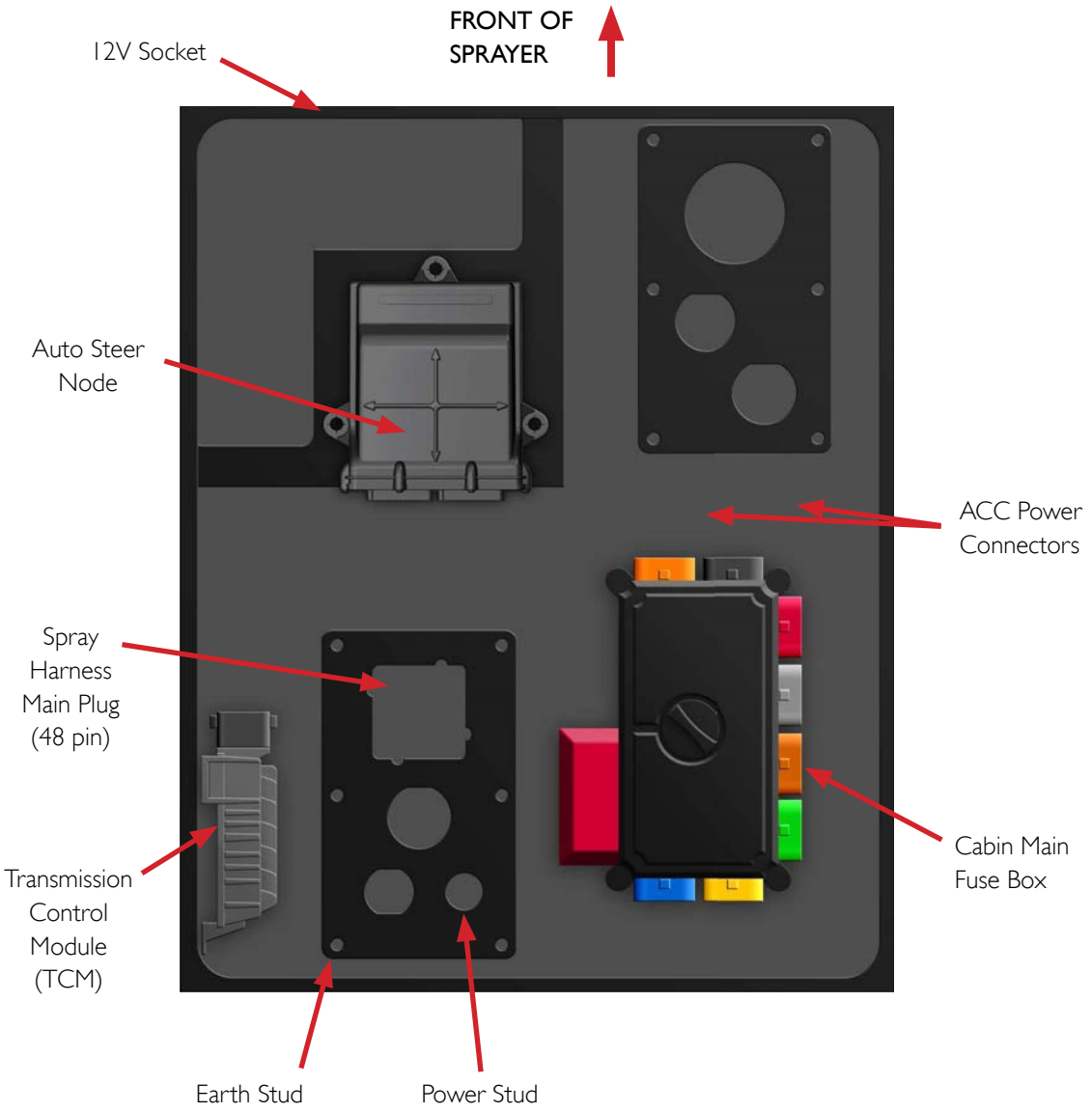
The two dimples in the white adjuster indicate the direction it is pointing in.

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.

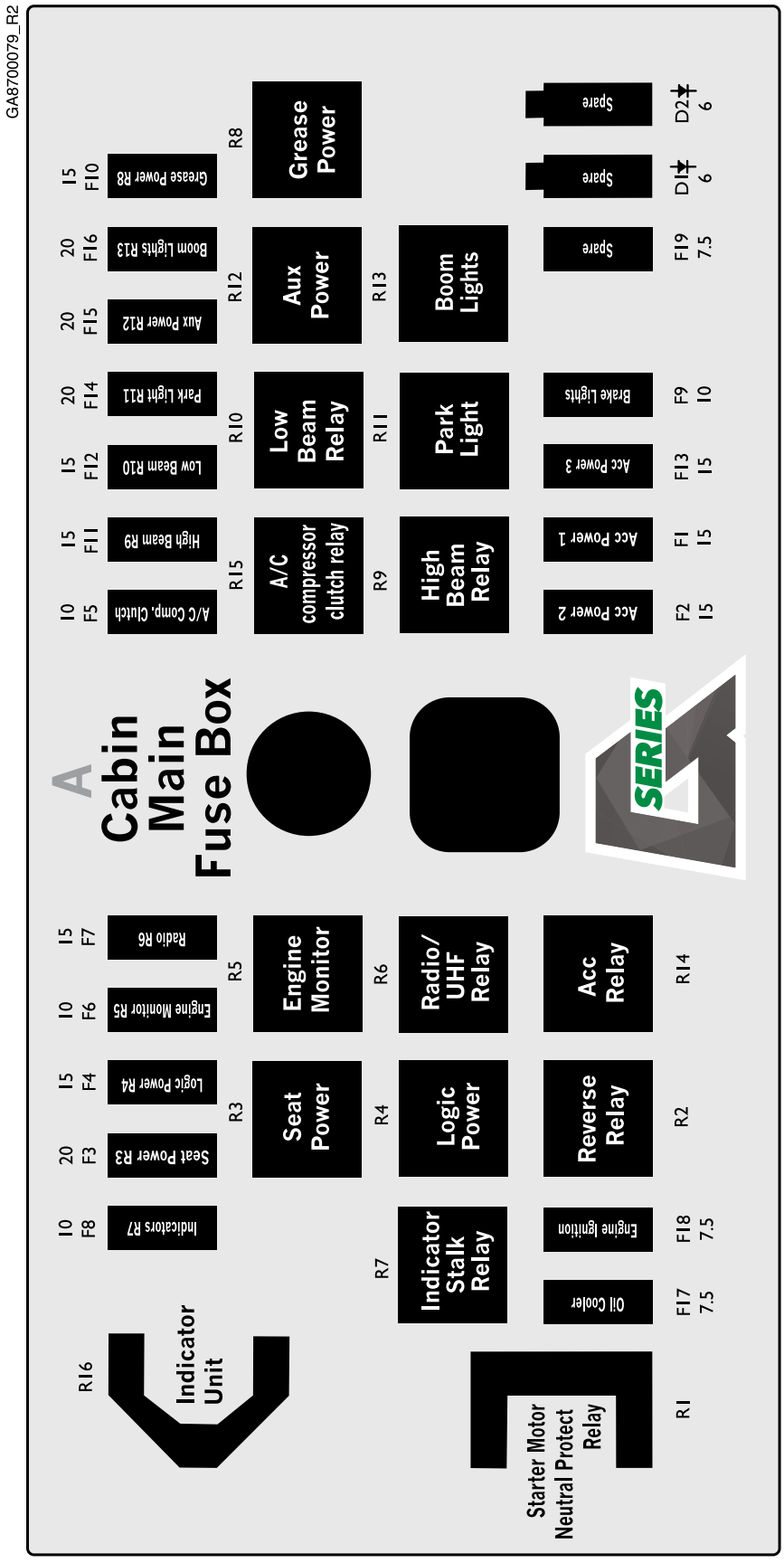

**Above:** Timer relay potentiometer and dip switches.

# 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, pull the lever upwards on the 4 clamps and then lift the cover upwards. The location of the fuses and relays are shown below.



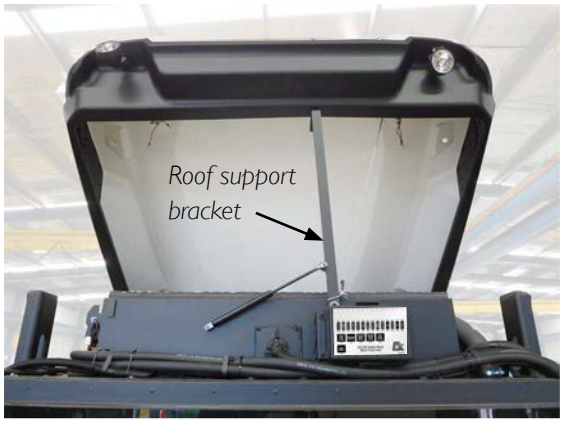
# Cabin Main Fuse Box

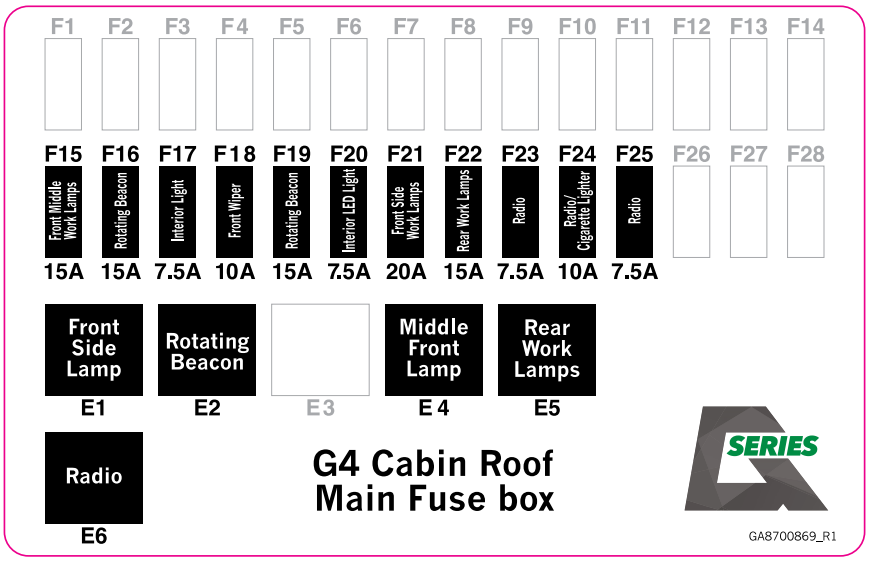


# Cabin Roof Fuse Box

There is also a fuse box under the roof of the cabin that contains the fuses for the cabin functions. There is an access hatch in the rear of the roof held in by four thumb screws. When removed, the fuse panel can be accessed without lifting the roof.

If the entire internal roof area needs to be accessed, the four eye bolts must first be removed. The roof cover can then be tilted open. Use the roof support bracket inside to hold it open for easy access to the fuse box and other components.


**Decal location:**
Cabin roof main fuse box decal is found on the main fuse box lid. It is accessed through the rear access port cover plate by removing the four thumbscrews.

# Optional Control Systems - Connectors

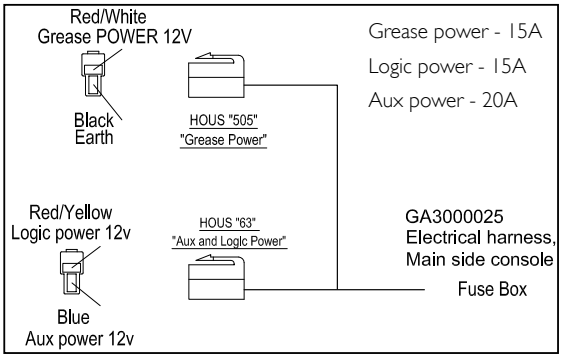
Inside the power distribution box are electrical connectors that have been provided for the connection of optional equipment.

### HOUS 505

For connection of the optional auto greasing system. Grease power - 15A circuit.

### HOUS 63

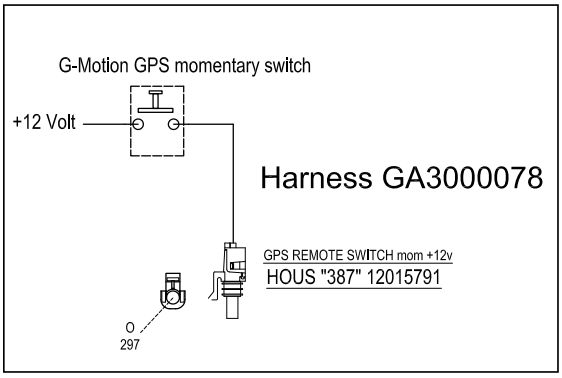
For the connection of an external controller like the Raven SmartBoom system or an auto steer system. Logic power - 15A circuit. Aux power - 20A circuit.




**Above:** Electrical harness for connection of optional boom height control, greasing or auto steer systems. Found inside the main cabin fuse box.

### GPS REMOTE SWITCH MOMENTARY +12V

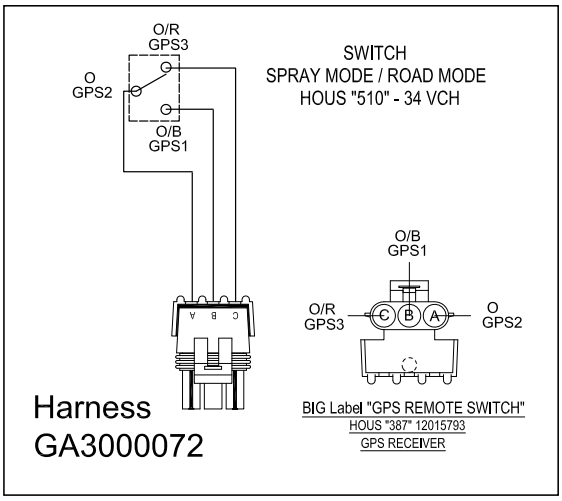
For the connection of the GPS momentary switch button mounted on the side dash. When this single pin connector is connected to the ISOBUS based cabin harness it will be able to communicate directly with the John Deere Autosteer node. To make use of this button circuit for Trimble based Autosteer systems,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




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

### 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.




**Above:** GPS master - remote switch circuit.

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# Optional Control Systems - Connectors

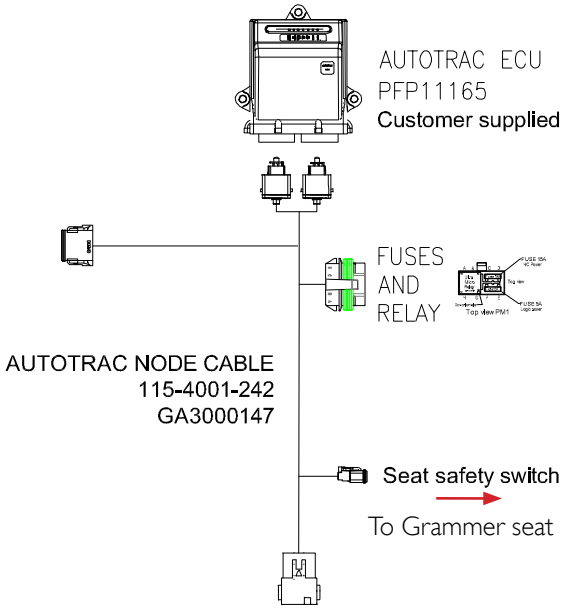
## SEAT SAFETY SWITCH

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.

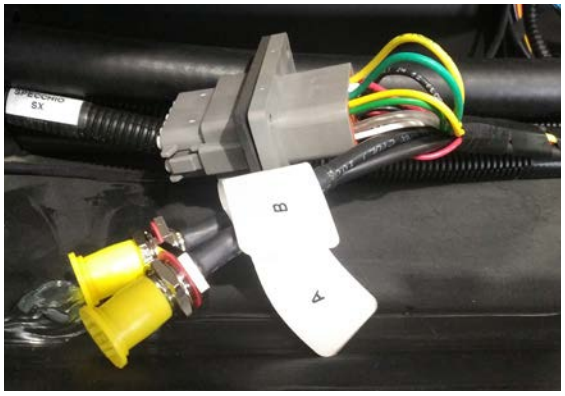
The harness part numbered GA3000147 incorporates a connector for the seat safety switch. This connector is able to communicate directly with the John Deere Autosteer node. This connector (male) on harness GA3000147 will be joined to the Grammer cabin seat harness safety switch connector (female) when 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 directly 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.

## 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 receivers and antennas.

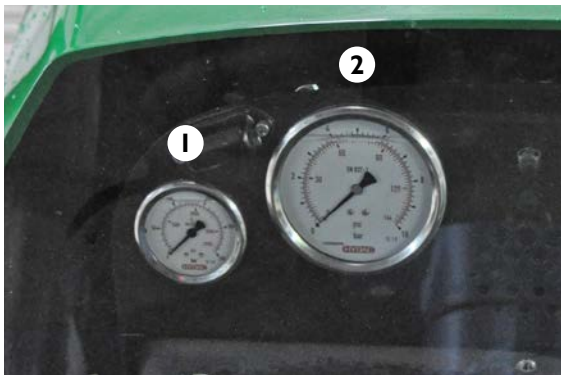


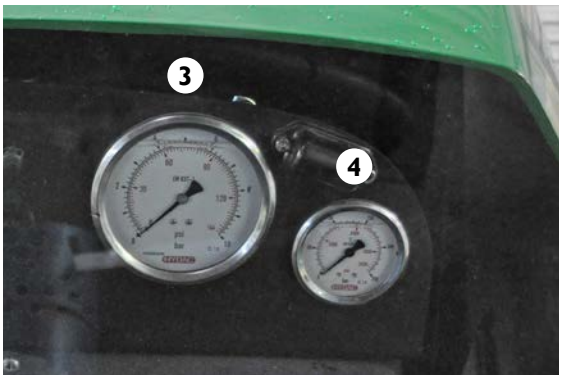

**Above:** Safety switch harness connection to back of Grammer seat.



**Above:** GPS receiver connection points inside the cabin roof near the front, on the left hand side.

# Pressure Gauges




| NO. | FEATURE |
|---|---|
| 1. | Bi-fold hydraulic pressure - Left Side (If optioned) |
| 2. | Second product line pressure (If optioned) |
| 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:

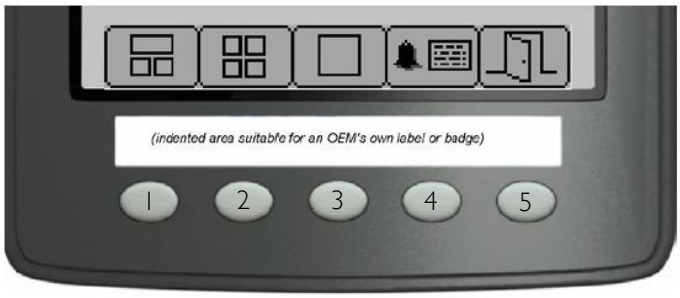
- Analogue gauges
- Digital values
- Multi-gauge/data (a combination of above)
- Historical trend graphs
- Current or stored alarm messages

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).

*Continued over page*

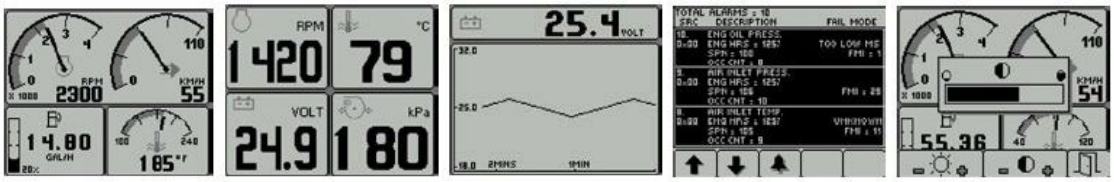
# CANtrak System




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.

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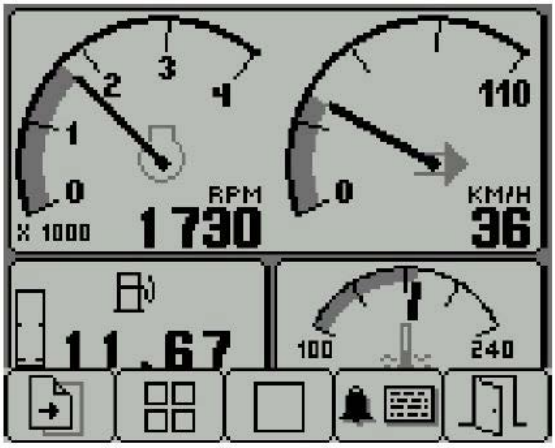



**Key 1:** Pages icon indicating that further presses cycle through options for the screen being viewed (in this instance fuel computer modes for the main engine display)

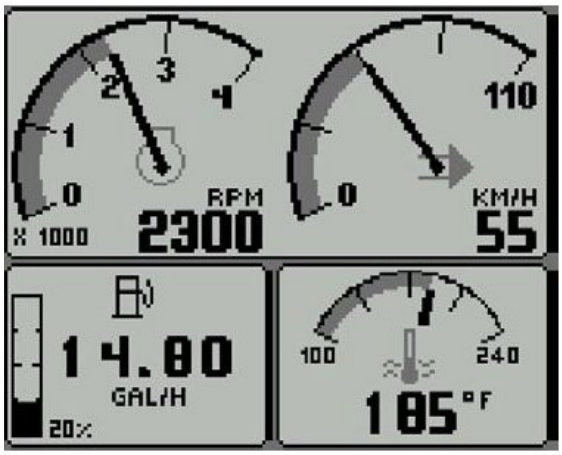
**Key 2:** Quad display mode

**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

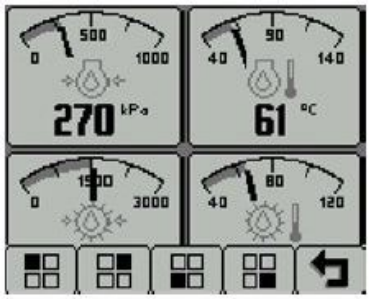
NOTE: Reset - which affects all resettable fuel computer parameters - is performed by allowing the button bar to disappear and pressing and holding key 1 for at least 3 seconds. If the button bar is visible then the display will move to the next parameter before the Reset. Setting Fuel Tank Reset and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



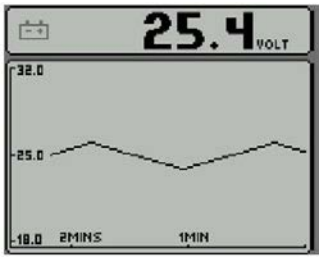
**Above:** Three default display setups available in quad-display mode.




**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>).

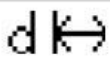
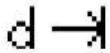
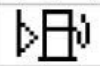
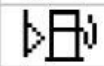
Abbreviations: The units 'MPG' and 'Gal' denote US gallons. For non-US Imperial gallons (UK, Canada, etc) units, these units are denoted as IMPG or IGal. N = nautical. KTS = Knots.

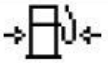
NOTE: If a parameter is not available, it will not be possible to select it. If the parameter becomes unavailable while in view, '- - -' is displayed.

| 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 | | √ | √ | √ |

*Continued over page*

# CANtrak System - Parameters Monitored

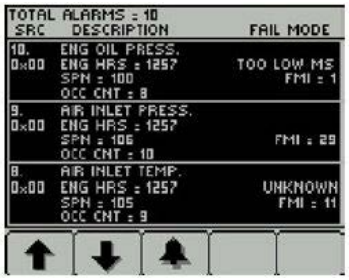
| Icon | Parameter | Tri | Quad | Uni | DB |
|---|---|---|---|---|---|
| | **ELECTRICAL** | | | | |
|  | Internal voltage (V) | | √ | √ | √ |
|  | Battery voltage (V) | | √ | √ | √ |
|  | Battery current (A) | | √ | | √ |
|  | Alternator current (A) | | √ | | √ |
| | **TEMPERATURE (can be ºC or ºF)** | | | | |
|  | 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 | | √ | | √ |

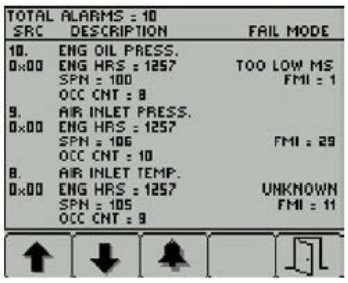
# CANtrak System - Alarms

## 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)

.

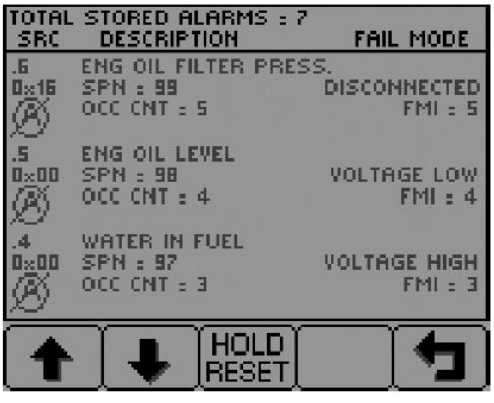




**Above:** Example alarm message plus alarm list screens showing unacknowledged conditions (black background) and acknowledged alarms (grey background). After acknowledgement the return key becomes active ('exit door' icon). J1939 - standard abbreviations are used wherever possible.

**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 |

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# 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 |

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# 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 |

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# 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 |

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# 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 |

*Continued over page*

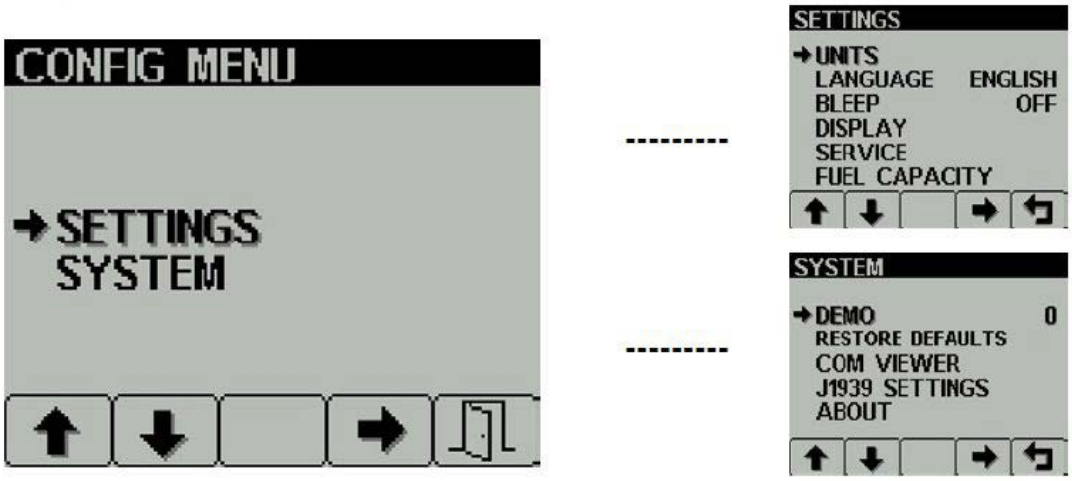
# CANtrak System - Engine Fault Codes

| 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

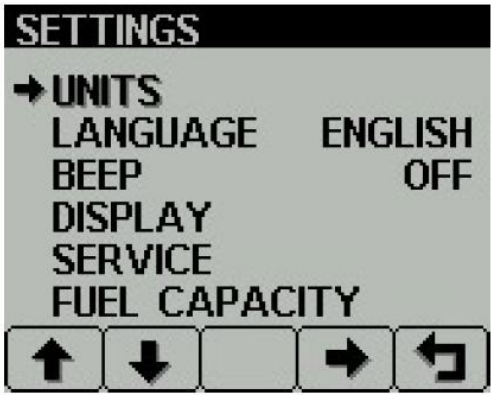
This mode allows users to set various GEM operating parameters such as imperial or metric units, scale limits for the speedometer, engine service interval, etc. The configuration menu is entered by pressing and holding key 5 ('Exit door' icon) for at least 3 seconds while GEM is in normal operating mode. 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

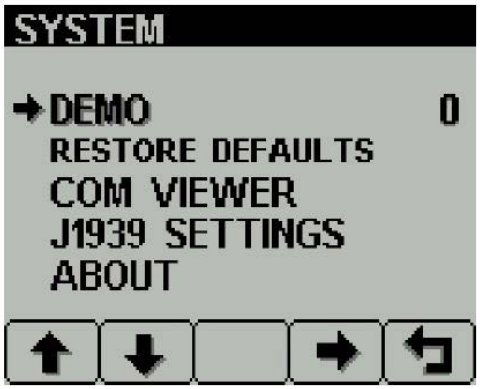
**FUEL CAPACITY:** Adjust tank capacity and reset tank level to full

*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:

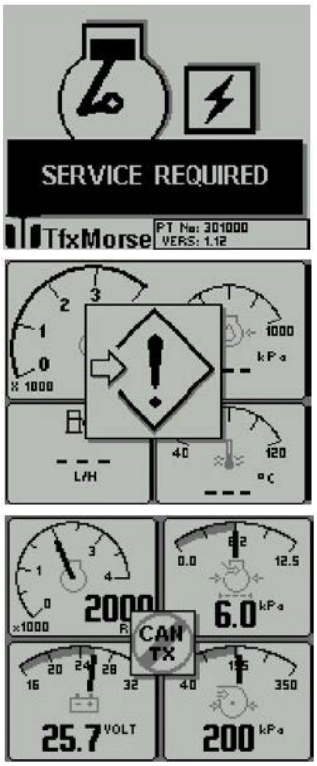
- ID NO: Unique number of the display
- EEPROM: Number of write cycles
- PART No: Software part number
- VERS: Software version number
- CHK: Flash memory checksum
- SOURCE: The source of received data
- LIB1: Low level system library version
- LIB2: Low-level graphical display interface library version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



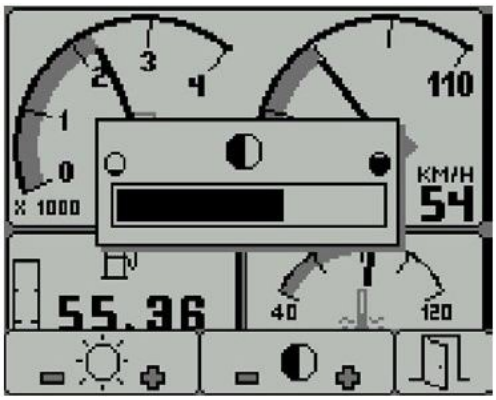

**Above, top to bottom:** Pop up warnings - Engine service required, a data communications failure and CANTX is disabled.

## 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.

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# 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.<br>Ensure power source is present. |
| Display is blank or black | Adjust/ reset lighting and contrast settings.<br>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.<br>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).<br>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

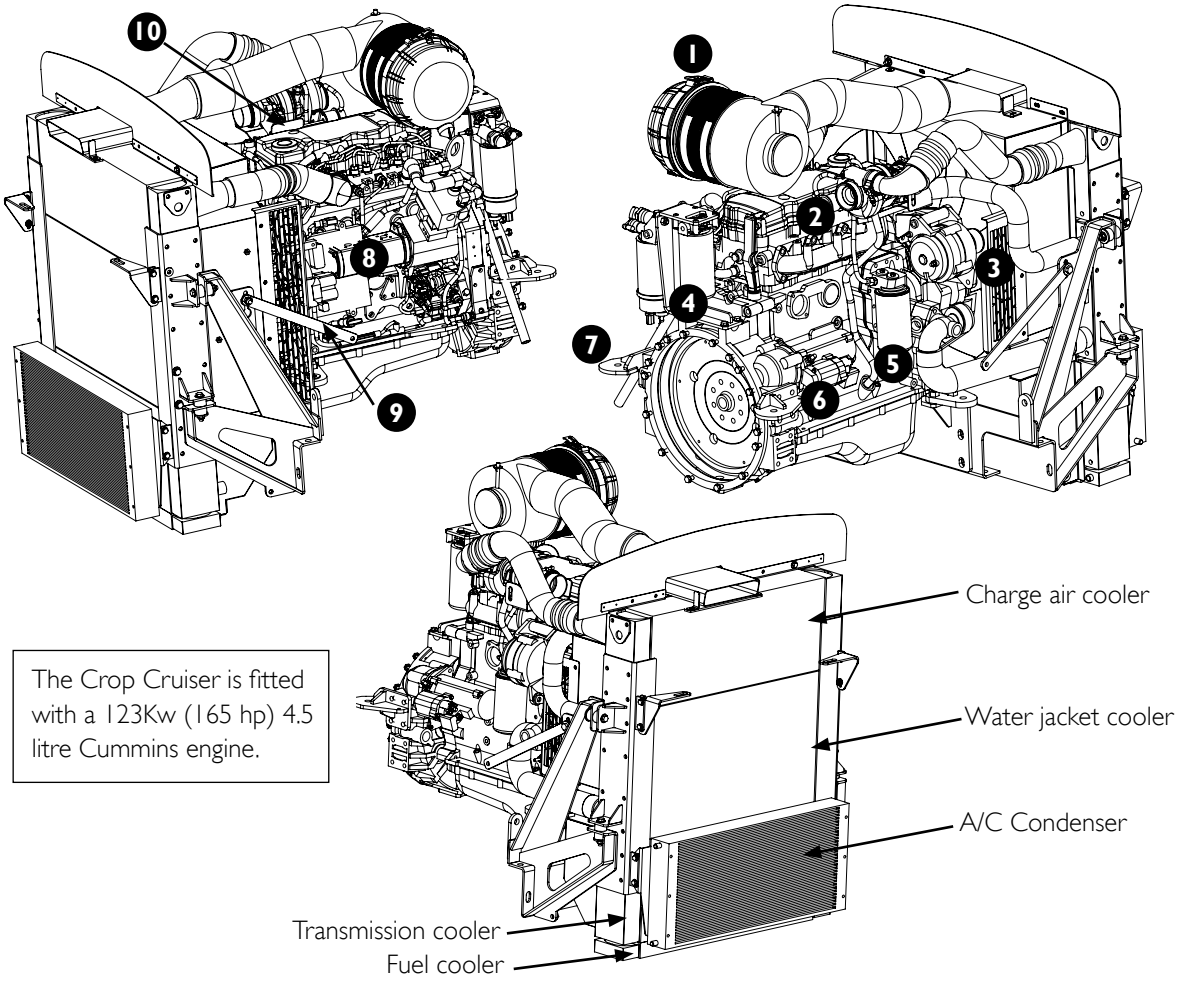
- CAN: Controller Area Network (also referred to as CANbus); serial communications protocol for automotive use
- CANtrak: Intelligent CAN-compatible LCD display module
- GEM: Generic Engine Monitor
- GPS: Global Positioning System
- HMI: Human-Machine Interface
- ISO: International Standard Organisation
- 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



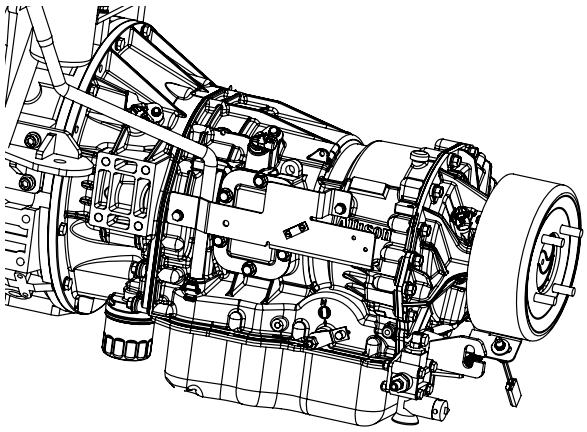

The Crop Cruiser is fitted with a 123Kw (165 hp) 4.5 litre Cummins engine.

| NUMBER | FEATURE |
|---|---|
| 1. | Air cleaner |
| 2. | Turbo |
| 3. | Alternator |
| 4. | Fuel Filter (secondary) |
| 5. | Oil Filter |
| 6. | Starter Motor |
| 7. | Engine Mounts |
| 8. | Hydraulic Pump - Machine Hydraulics |
| 9. | Dip Stick |
| 10. | Oil Filler |

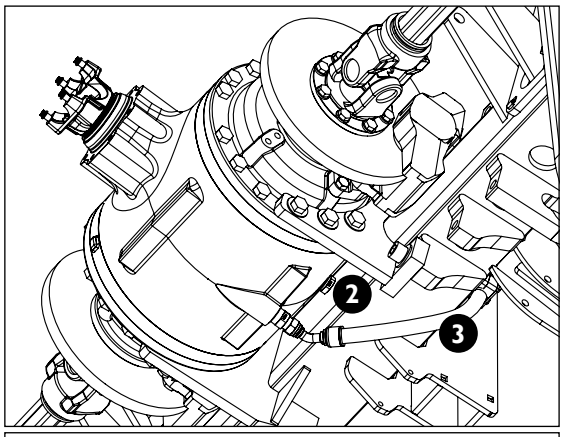
# Transmission

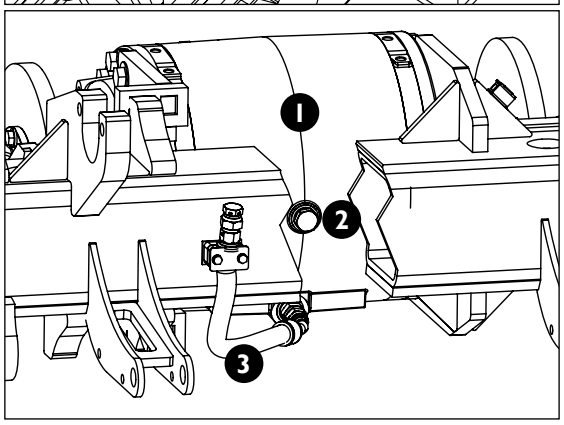
Refer to the Allison Transmission operation and codes manual (supplied) for any information on operation or trouble shooting the Allison transmission.

You can also refer to the Chapter 8 'Operation ' of this manual for information on using the Allison transmission.



# Differential



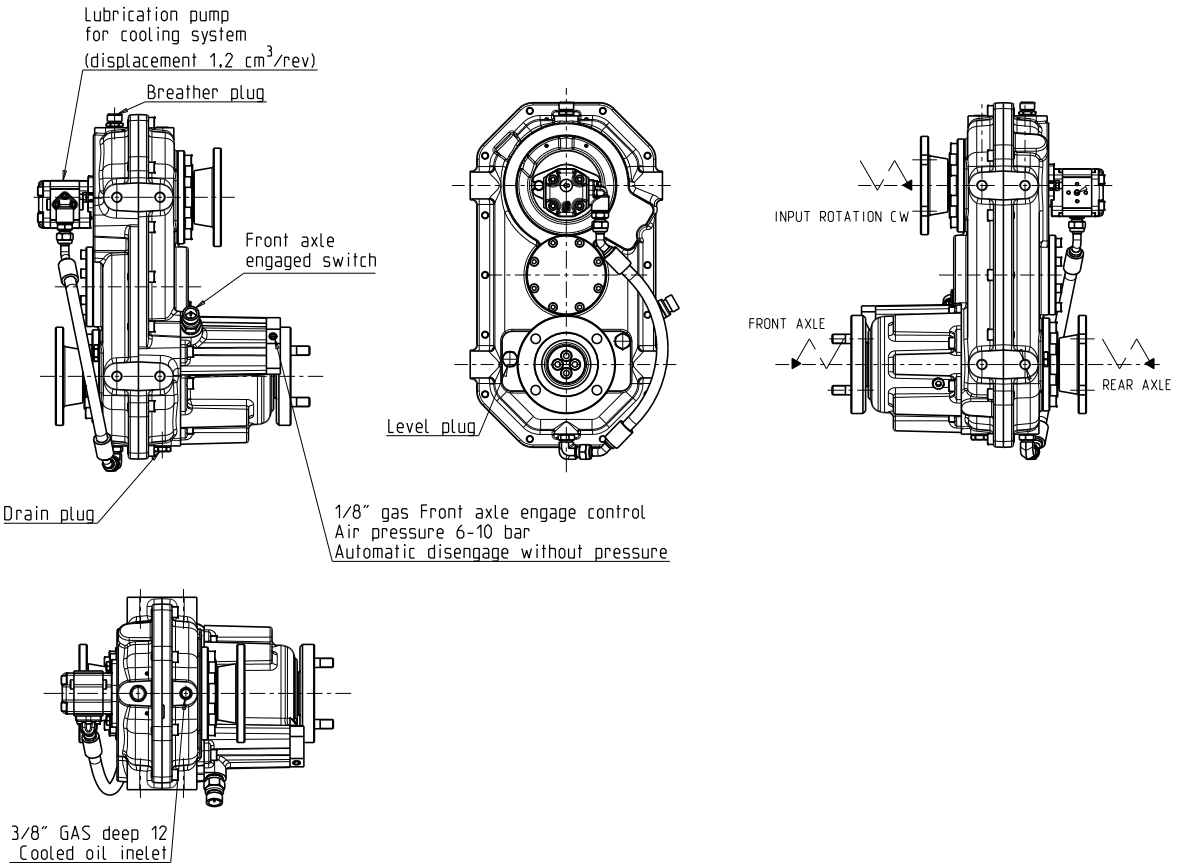

| NUMBER | FEATURE |
|---|---|
| 1. | Differential Centre |
| 2. | Oil Level Plug |
| 3. | Oil Drain / Fill Hose |

The differential runs in an oil bath sump. The oil level can be checked by removing the level plug on the rear of the differential housing. The oil should be replaced as per the service intervals specified in the maintenance chapter.

**NOTE:** See Chapter 10 'Lubrication & Maintenance' for lubrication details.

**NOTE:** This differential does not need a breather fitted.

# Transfer Case




Machines optioned with 4WD normally operate in rear driven 2WD mode.

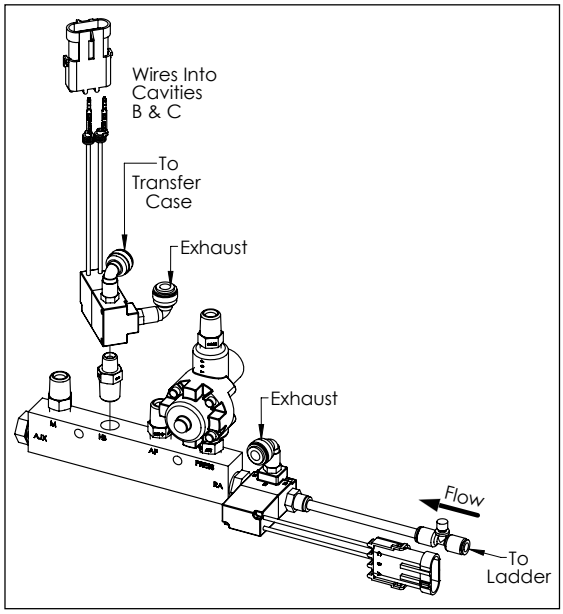
A single speed transfer case directs drive from the transmission to the wheels in the ratio of 50% to the front and 50% to rear when 4WD is selected via the side console switch in the cabin.

The switch activates a solenoid which sends air through a 6 mm line to the transfer case shift cylinder.

The shift cylinder is pushed in by the air and 4WD is engaged. When 4WD is disengaged, air is released from the 6 mm line and a spring pushes the shift cylinder back into the 2WD position on the transfer case.

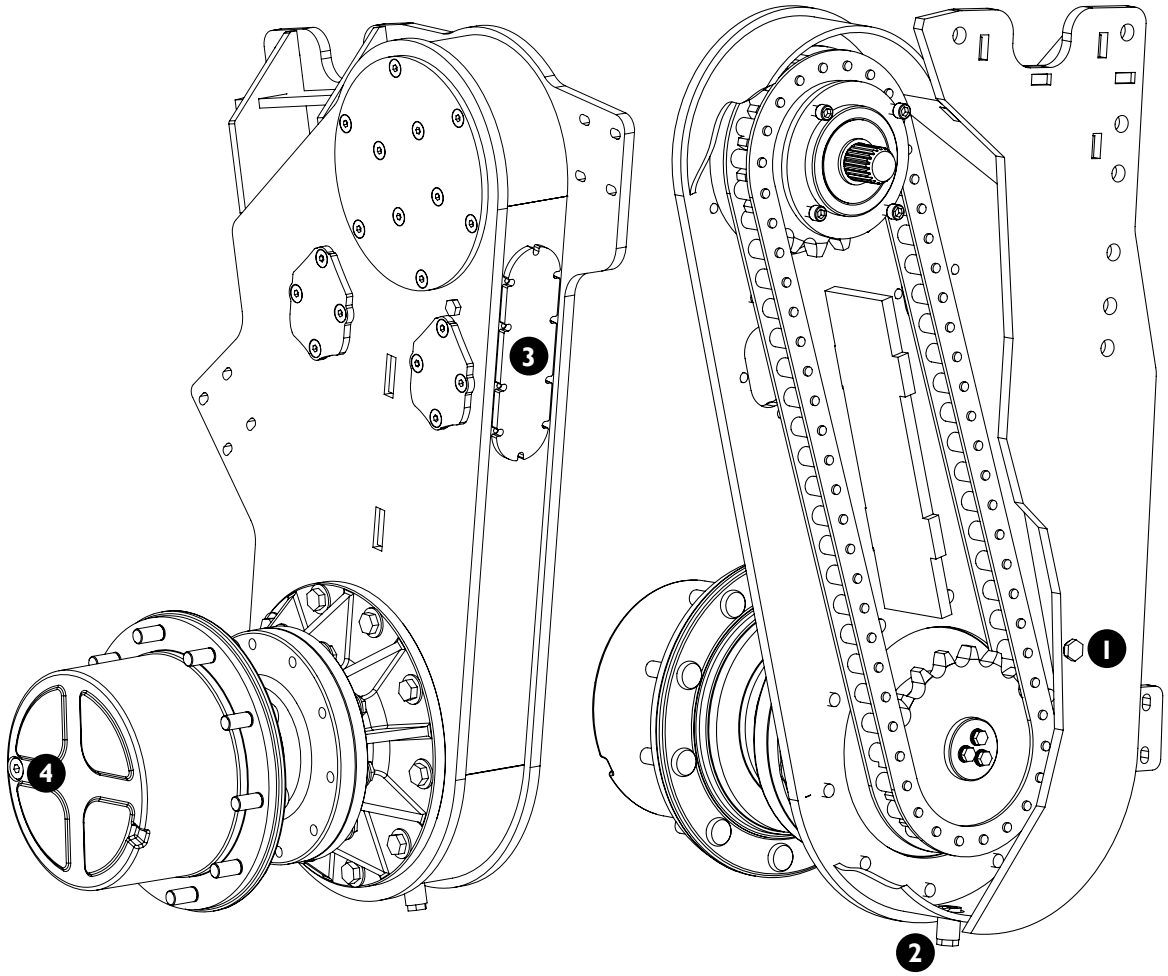
The transfer case incorporates a lubrication pump for cooling the oil. The pump is driven by the input shaft to the transfer case and runs only while the machine is moving.

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




**Above:** Pneumatic manifold located under the cabin. The transfer case 4WD solenoid has an override screw in the bottom that can be overridden with a flat head screwdriver.

# Chain Drive & Droplegs




| NUMBER | FEATURE |
|---|---|
| 1. | Oil level plug |
| 2. | Oil drain |
| 3. | Chain inspection cover |
| 4. | Planetary fill/drain plug |

The Crop Cruiser run chain driven drop legs. Drive is transferred from the differential through drive shafts to the input shaft of the drop leg. A 120 Super HT 1"1/2 drive chain is between the input shaft and the bottom output axle shaft with a 1:1 ratio which drives into a planetary hub.

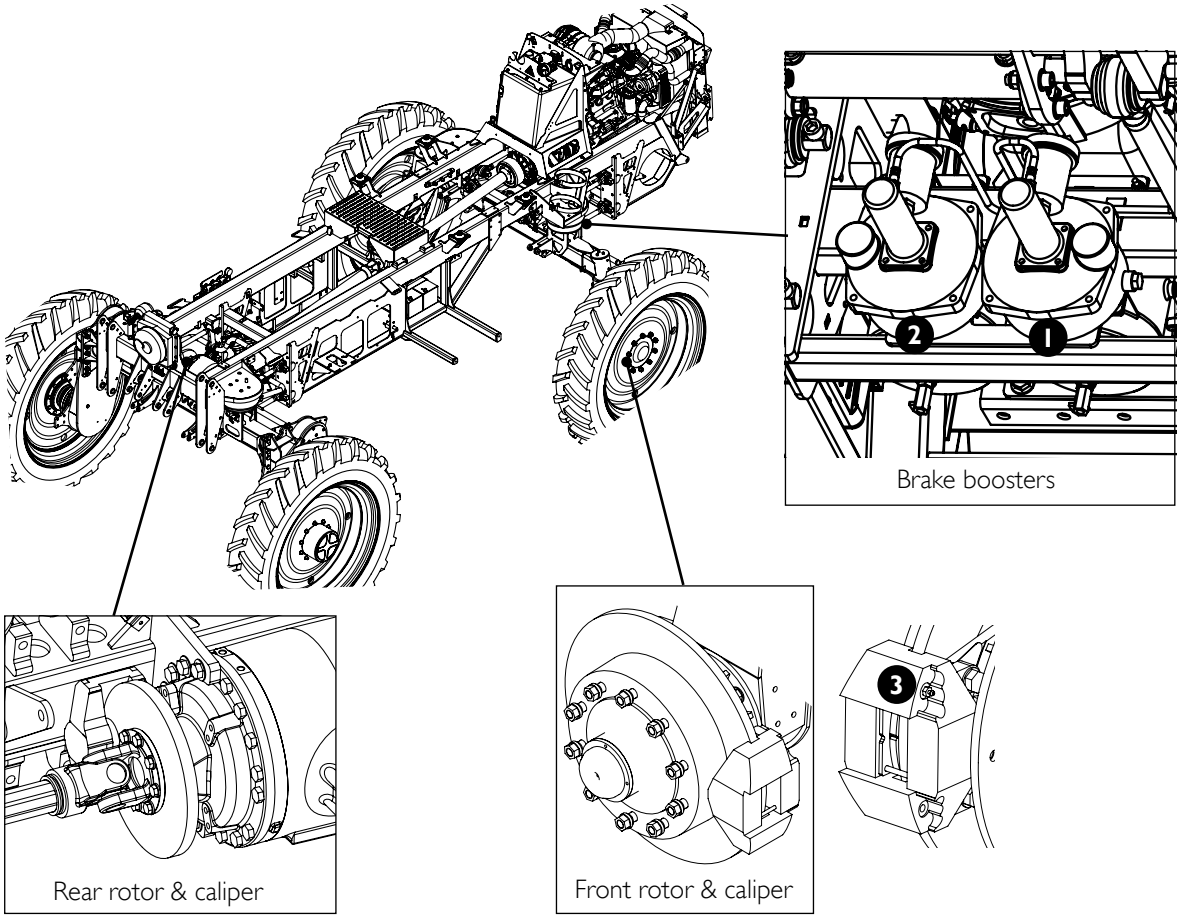
The drop legs have an oil bath sump which the chains run in and carry the oil to the bearings. The planet hubs run in oil and have a separate oil fill/ drain plug.

The oil level can be checked by removing the level plugs.

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




| NUMBER | FEATURE |
|---|---|
| 1. | Master cylinder (rear brakes) |
| 2. | Master cylinder (front brakes) |
| 3. | Bleed nipple (one per caliper) |

The braking system used on the G4 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.

### BRAKE BOOSTERS

Both brake boosters are located under the transmission on the chassis on the sprayer. The booster on the right is used to power the rear brakes and the left booster powers the front brakes. To maintain sufficient brake fluid in the system, each brake booster reservoir must be checked regularly.

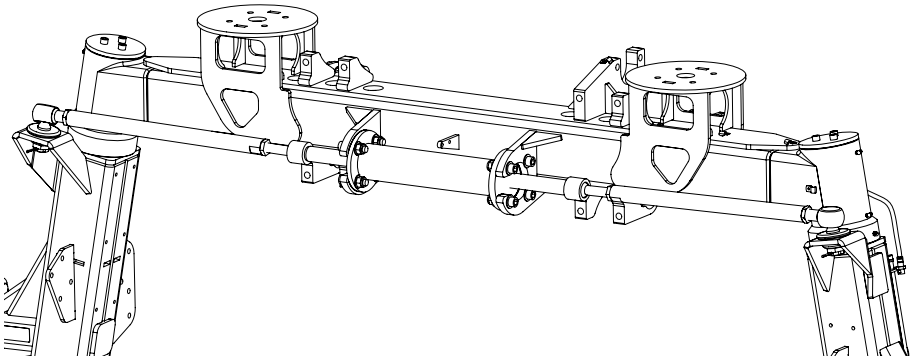
### ROTORS

The rotor used on the front of the sprayers are a customized construction and are a 600mm diameter rotor that is fitted to the hub on the inside of the wheel. The rear are a 310mm diameter steel rotor and are mounted on the differential.

### CALIPERS & PADS

The calipers used on the 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 calipers must be kept clean at all times.

# Steering System



CAMBER

The wheel camber is a factory set parameter and cannot be adjusted.

STEERING TOE IN

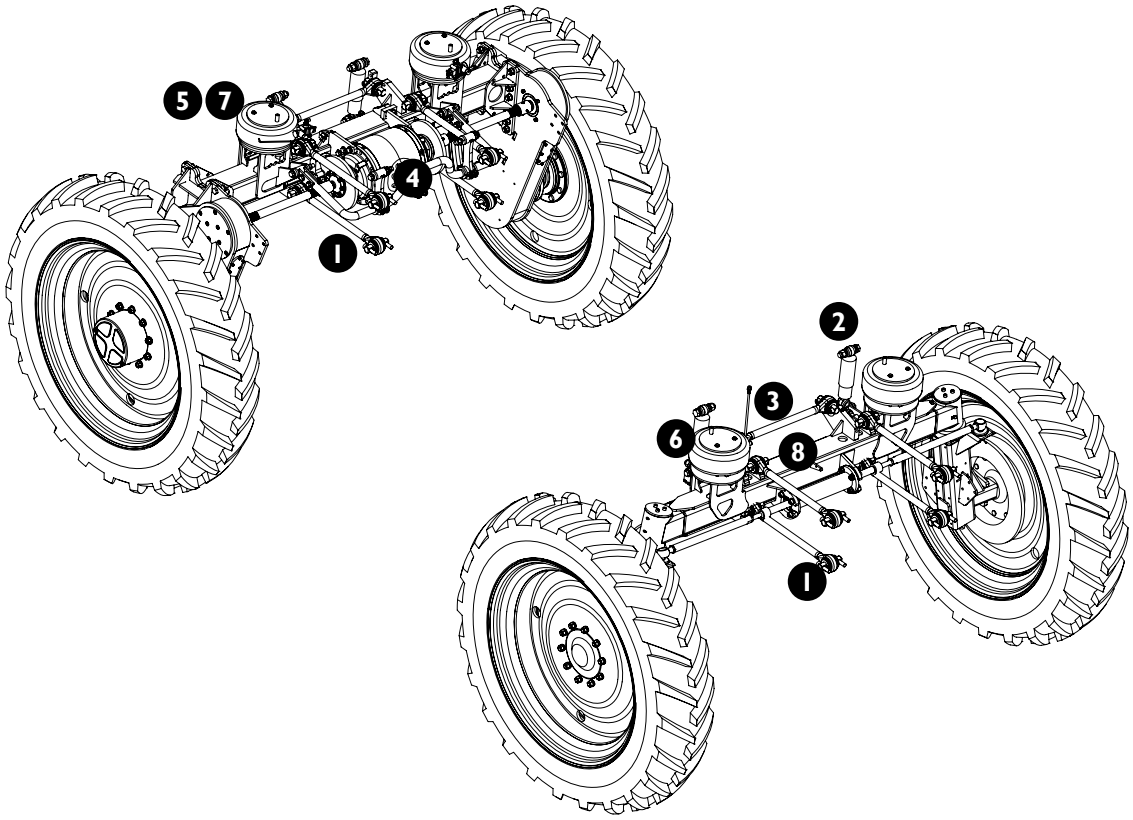
The wheels of the sprayer should toe in 0-5mm.

Information on checking toe can be found in Chapter 10 'Lubrication & Maintenance' for lubrication details.

STEERING KING PINS

The king pins need to be greased as per the maintenance schedule found in Chapter 10 'Lubrication & Maintenance' for lubrication details.

# Suspension System




| NUMBER | FEATURE |
|---|---|
| 1. | Parallel link |
| 2. | Shock absorber |
| 3. | Panhard rod |
| 4. | Sway bar (rear only) |
| 5. | Air bag (rear) |
| 6. | Air bag (front) |
| 7. | Ride height valve (right rear) |
| 8. | Ride height valve (front centre) |

SUSPENSION

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 on 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 in 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 stated in Chapter 10 'Lubrication & Maintenance'.

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

# 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 |

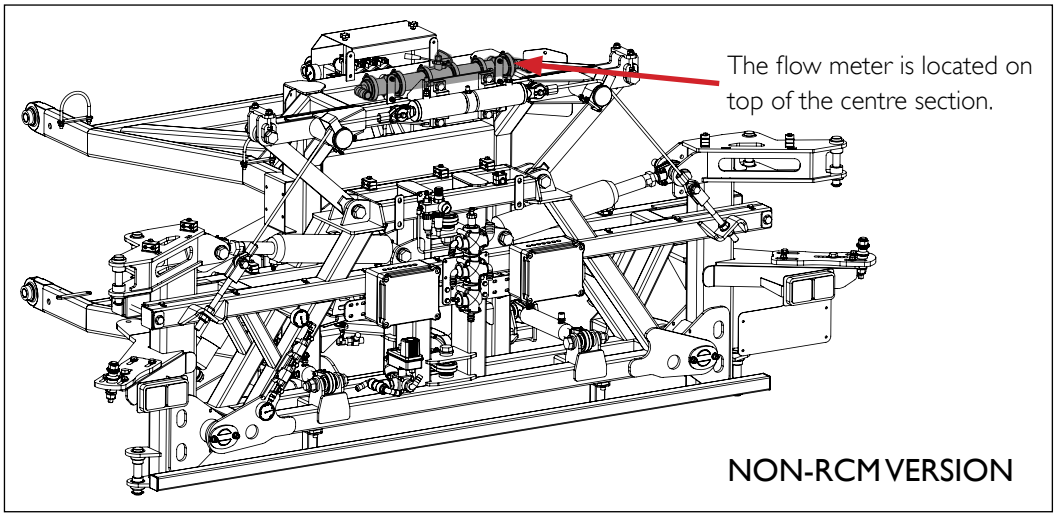
| PARAMETER | VALUE | UNIT |
|---|---|---|
| Speed Cal | | - |
| Meter Cal | | - |
| Valve Cal | | - |
| Rate 1 | | L/Ha |
| Rate 2 | | L/Ha |
| Tier 1 | | L/min |
| Tier 2 | | L/min |
| Tier 3 | | L/min |
| Pump Cal | | RPM |

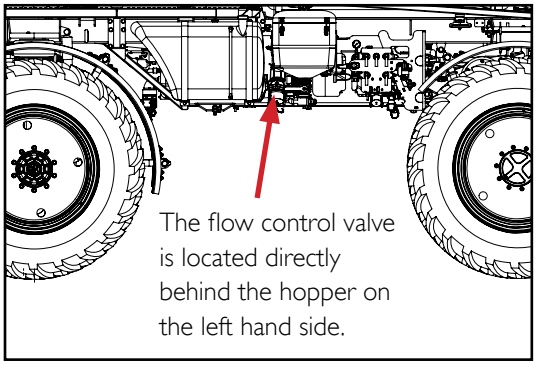
$$\text{L/min (per nozzle)} = \frac{\text{L/ha x km/hr x W}}{60{,}000}$$

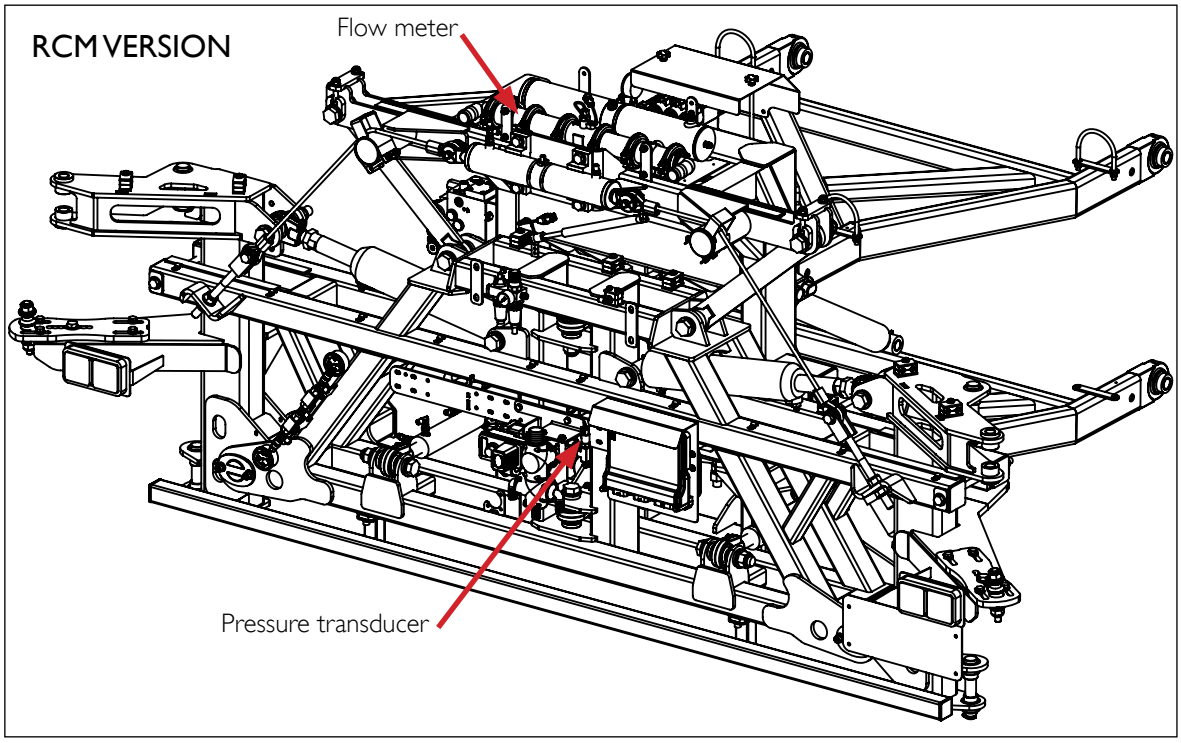
$$\text{L/ha} = \frac{60000 \text{ x l/min (per nozzle)}}{\text{Km/hr x W (metres)}}$$

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

# Key Spray Components Locations

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# Rate Control Module (RCM)

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

# Flow Control Valve

If a SCS4400 controller is used then the regulator is a Raven Fast Close Valve. The Fast Close Valve uses a 743 control constant.

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 Raven Fast Close Valve can be operated in manual mode from the console for boom priming, flushing and also troubleshooting.

Each valve is treated differently in terms of the rate controller.

# 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'.
- Perform a self test, choose a high speed and high rate so that the tank will empty relatively quickly but make sure the pressure does not exceed 60 psi.
- When the tank is empty, on the Raven controller press 'Total Volume' to read what the Raven flow meter has output to the boom. Record the reading.
- Check the volume of the tank to see what has been sprayed out to the boom. Record the reading.
- Compare the reading from the controller with the known volume from the tank. If there is a relatively large discrepancy (i.e. more than 50 litres out of a 3000 litre tank), the flow meter should be removed from the sprayer, disassembled and the condition of the turbine checked and cleaned. It should be able to spin freely.
- The flow meter should then be reassembled and replaced on the sprayer. Perform the volume check again and if there is still a discrepancy, the 'Meter Cal' value can be changed

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

**New 'Meter Cal' value = (185 x 3100) / 3000 = 191**

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

# 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 %.

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

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# 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.

# Raven SCS4400 Console Calibration

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

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

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

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

### STEP 1 - TURNING THE CONSOLE ON

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

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

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

### STEP 2 - UNITS OF MEASURE

1. Momentarily depressing the [CE] key repeatable at this stage toggles the console through the "UNITS OF MEASURE" selection.
2. To operate in litres/hectare ensure "UNITS SI METRIC HECTARES" is display.
3. Then depress the [ENTER] key to lock it in.
4. The console will now prompt for a "PRODUCT TYPE" to be selected.

### STEP 3 - PRODUCT TYPE

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

### STEP 4 - VALVE TYPE

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

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

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

### STEP 5 - METER CAL

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

To enter the meter calibration figure first:

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

*Continued over page*

# Raven SCS4400 Console Calibration

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

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

### STEP 6 - VALVE CAL

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

To enter the value calibration figure:

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

### STEP 7 - APPLICATION RATE

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

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

To enter a [RATE CAL]:

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

**NOTE:** If the console detects the presence of a 2nd product it will automatically interrupt the programming procedure at this point and request values be entered for PRODUCT TYPE, VALVE TYPE, METER CAL, VALVE CAL, and RATE for this 2nd product. The console will then revert back to STEP 8 if a 3rd product is not detected. If a 3rd is detected the console will automatically request the information be entered for this product before continuing no to STEP 8 below.

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

### STEP 8 - SPEED SENSOR TYPE

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

**Transmission output or Raven GPS:**

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

### STEP 9 - SPEED CAL

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

**For consoles connected to a transmission output:**
Use an arbitrary [SPEED CAL] value of [200]

To enter this value:

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

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

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

1. Accurately mark and measure 100 metres.

*Continued over page*

# Raven SCS4400 Console Calibration

2. With the power switch "on" and all other switches "Off"

3. Depress the [DISTANCE] key.

4. Depress the [ENTER] key to display the "E" enter symbol.

5. Key in a "0" value.

6. Then depress the [ENTER] key again to lock it in.

7. Drive the 100 metres, being careful not to accelerate or decelerate too suddenly.

8. Record the distance that the console displays once the 100 metres has been travelled.

9. The distance should read 100. If it reads between 99 or 101 this calibration value will be correct. If the distance reads any other valve perform the following procedure.

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

RECORDED DISTANCE

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

**For consoles connected to a Raven GPS:**

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

To enter this value:

1. Depress the [ENTER] key to display the "E" enter symbol.

2. Key in the appropriate [SPEED CAL] number.

3. Depress [ENTER] again to lock it in.

4. The console will now prompt of a "BOOM CAL 1" value to be entered.

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

**STEP 10 - BOOM SECTIONS**

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

1. The total flow rate required.

2. The area applied.

As boom sections are turned on or off the console increases or decreases the theoretical width of the boom accordingly in order to calculate the correct flow rate (total L/min to the boom) and the total area sprayed.

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

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

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

1. Ensure boom 1 is displayed.

2. Depress the [ENTER] key to display the "E" enter symbol.

3. Key in the boom width in centimetres for boom 1.

4. Depress the [ENTER] key to lock it in.

**NOTE:** At this point the console does not proceed automatically to boom 2.

5. To proceed to Boom 2 depress the [UP] key momentarily.

6. Depress [ENTER] and key in the calibration figure for boom 2.

7. Depress the [ENTER] key again to lock it in.

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

INITIAL PROGRAMMING IS NOW COMPLETE.

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

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

To change to the "AUTO" mode:

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

2. If it reads "MAN NOBM" (manual no boom)

*Continued over page*

# Raven SCS4400 Console Calibration

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

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

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

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

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

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

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

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

To activate the pump RPM display on the console screen:

1. Depress the [DATA MENU] key to display the data sub menu at the bottom of the screen. The word "SERIAL" will be highlighted.
2. Depress [DATA MENU] key again and the highlight will move down to "PRODUCT".
3. Momentarily depress the [DOWN] key repeatedly to move the curser down until page 2 is displayed.
4. Continue momentarily depressing the [DOWN] key repeatedly until the curser is adjacent to "PUMP CAL".
5. Depress the [ENTER] key to display the to display the "E" (enter symbol).
6. Key in a value of pulses per revolution (normally one)
7. RPM should now be displayed in the top right hand corner of the screen.
8. Depress a volume or area key to exit the data sub menu and return to the operational screen.

### STEP 12 - LOW FLOW LIMIT

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

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

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

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

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

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

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

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

*Continued over page*

# Raven SCS4400 Console Calibration

ENTERING A LOW FLOW LIMIT VALUE:

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

### STEP 13 - TO ZERO INFORMATION WHEN STARTING A NEW LOAD

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

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

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

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

TO ZERO OUT DATA IN AREA AND VOLUME:

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

To reset an Area or Volume value:

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

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

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

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

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

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

TO SIMULATE A SPEED:

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

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

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

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

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

*Continued over page*

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

USING THE FLOW METER TO CALIBRATE THE TANK:

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

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

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

**New 'Meter Cal' value = (185 x 3100) / 3000 = 191**

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

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

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

# 3TS - Boom Tier Programming

For calibration and operating instructions where Raven RCM is used to control 3TS system, see Raven RCM operation manual supplied.

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

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

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

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

For example: If you had XR110015 and XR110025 nozzles fitted to the sprayer the minimum pressure that the XR110025's can cut in at is 1.0 bar. The flow rate for an XR110025 nozzle at 1.0 bar is 0.57 L/min. The maximum operating pressure for an XR110015 is 4.0 bar, at which point the flow rate is 0.68 L/min, so this combination of nozzles overlap nicely. In actual fact the XR110025 would cut in at slightly less than 3 bars if the first set point was programmed at the 0.57 L/min.

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

For example: If you wanted the 3rd tier to cut in at one bar you would add the flow rates for the XR110015 and XR110025 at one bar together (0.34 + 0.57 = 0.91L/min) Again care must be taken to ensure this minimum pressure/flow rate setting does not exceed the maximum recommended operating pressure/flow rate of the preceding nozzle. At 0.91 L/min the preceding XR110025 nozzle would be operating at slightly over 2.5 bars before the 3rd tier would cut in. Again a nice overlap.

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

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

The tier 2 max rate would be 60 x 0.91 L/min = 54.6 L/min.

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

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

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

**NOTE:** The consoles won't accept tier values containing decimal points so values calculated with decimal points require rounding off to the nearest whole figure before entering.

**TO ENTER THE TIER VALUES:**

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

*Continued over page*

# 3TS - Boom Tier Programming

4. To enter the second tier interchange point depress the key and "TIER 2 HIGH VOL PER MIN" will be displayed.

5. Depress the [ENTER] key again to display the "E" (enter symbol).

6. Key in the second tier interchange value and depress [ENTER] again to lock it in.

7. Depress the key again and "PERCENTAGE TIER DISABLE" will be displayed.

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

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

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

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

1. To enter a "PERCENT TIER DISABLE" value depress the [ENTER] key to display the "E" (enter symbol).

2. Key in the desired percentage overlap and depress the [ENTER] again to lock it in.

3. Press a volume or area key to exit this function and return to the operational screen.

## SCS4400 & 2TS

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

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

### TO SET THE CONSOLE UP IN THE 2TS MODE:

1. Depress and hold down the [BOOM CAL] key for 5 seconds until "TIER 1 HIGH VOL PER MIN" is displayed.

2. Depress the [ENTER] key to display the "E" (enter symbol).

3. Key in a value of "1".

4. Depress the [ENTER] key again to lock it in.

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

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

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

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

For example: Using a 30 m broad acre boom fitted with XR11002 nozzles.

The minimum recommended pressure for an XR nozzle is 1 bar. The flow rate for an XR11002 nozzle at 1 bar is 0.46 L/min. Thus the second tier interchange value will be 0.46 X 2 X 60 (2 nozzles/meter) = 55.2.

*Continued over page*

# 3TS - Boom Tier Programming

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

So the value entered in this example would be 55.

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

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

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

# Chapter 7

# PRE-OPERATION

## Preparing Sprayer For Use

### 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 540 RPM.
- 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 Crop 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.

# 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. Also refer to your supplied spray controller manual.

# Maintenance

Correct servicing and maintenance of the machine will ensure ongoing safe and efficient operation. 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 in front and 300 ft/lb in rear 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 sprayer, all fluid levels must be checked in accordance to this manual.

The 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 steering console.

## Key Positions

The key has 5 positions, however only 3 are used on this machine.

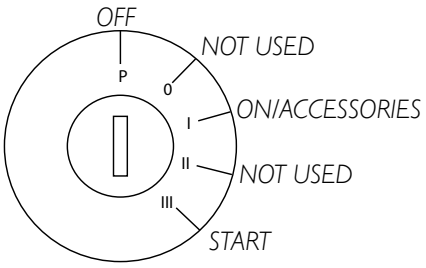
**P** - Off, vertical position.

**0** - Not used.

**I** - On/accessories; in this position all cabin components will be energised.

**II** - Not used.

**III** - 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.



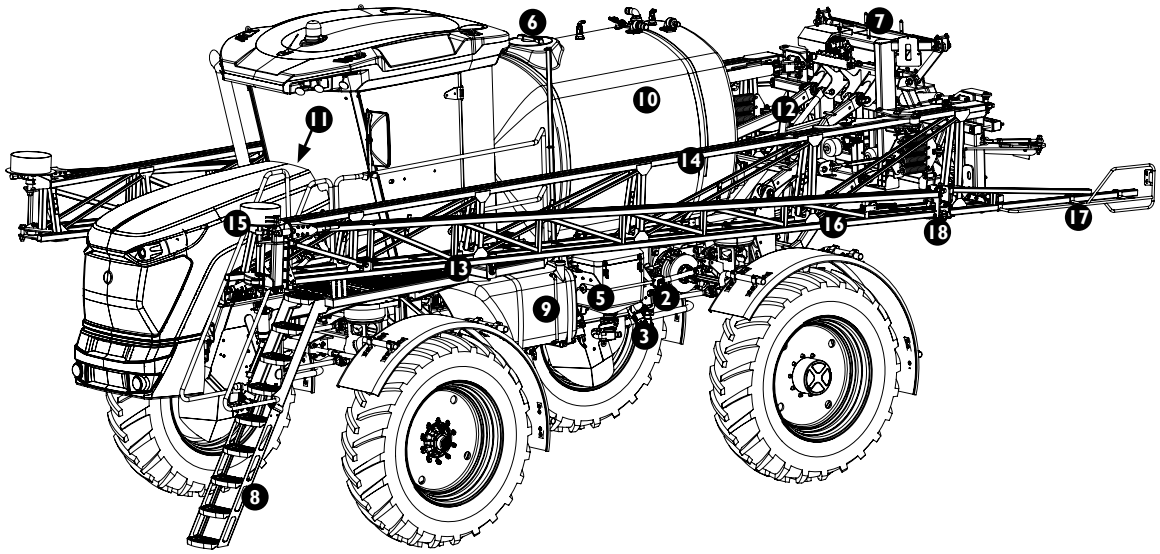

# Shut Down

1. Bring the machine to a complete stop.
2. Place the gear selector in NEUTRAL.
3. Then pull the hand brake on. 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

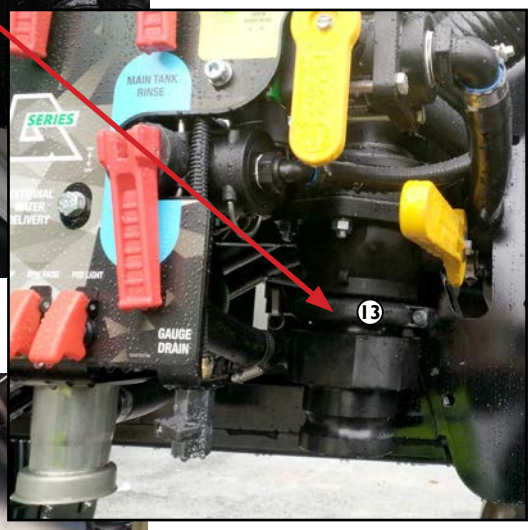
# OPERATION

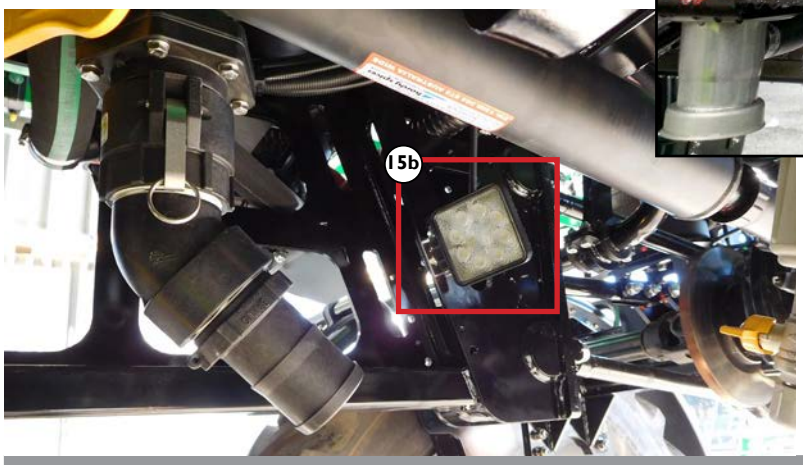
## Machine Key Features




| NUMBER | FEATURE | NUMBER | FEATURE |
|---|---|---|---|
| 1. | Diaphragm pump (on right side) | 10. | Main tank |
| 2. | EZ control station | 11. | Pressure gauges (view from inside cab) |
| 3. | Fill point | 12. | Boom para lift |
| 4. | Hand wash tank (on right side) | 13. | Boom rest |
| 5. | Induction hopper | 14. | Boom inner wing |
| 6. | Main tank lid | 15. | Boom cable drum |
| 7. | Flow meter | 16. | Boom outer wing |
| 8. | Access steps | 17. | Boom tip |
| 9. | Flush water tank | 18. | 3-D breakaway |

# EZ Control Station - Key Functions


**Left:** Underbody work light. Both this light and the pod mounted work light are controlled via the hat switch on the pod (no. 11).

| NUMBER | FEATURE | NUMBER | FEATURE |
|---|---|---|---|
| 1. | Main suction control | 9. | Fill pump switch (optional) |
| 2. | Manifold pressure gauge | 10. | RPM raise switch |
| 3. | Vortex induction hopper | 11. | Pod light switch (see no. 15) |
| 4. | Chemical probe venturi | 12. | Bypass |
| 5. | Main tank agitation | 13. | Main tank fill point - 3" |
| 6. | Rinse tank fill | 14. | Chemical probe venturi cam lock |
| 7. | Main tank rinse | 15 a & b. | Work lights (see no. 11) |
| 8. | Spray pump switch | 16. | Micromatic rinse socket |

# EZ Control Station - Key Functions

| EXTERNAL WATER DELIVERY FUNCTIONS | USE |
|---|---|
| Main tank fill | Used to direct external water delivery, coming from quick fill, to main tank. When main tank fill is ON the other functions of the external water delivery station can be used, however they will not be under pressure as only a small amount of flow will be directed to the external water delivery station. |
| 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. |
| Pressure regulator | The pressure regulator allows the operator to set the relief pressure of the pressure manifold (max 110-130 PSI) |
| Manifold pressure gauge | Indicates the manifold pressure |

**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 a 3-way ball valve.

**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.

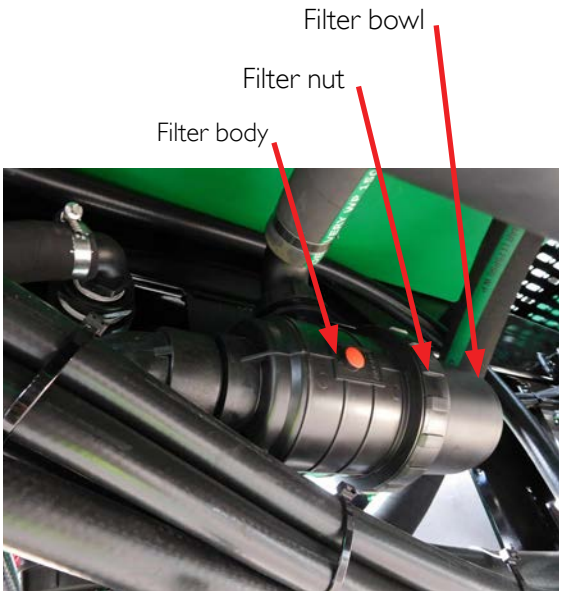
**WARNING:** Always wear the recommended personal protective equipment and use caution while working with chemicals.

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

**NOTE:** A quantity of fresh water will need to be in the rinse tank in situations where the filter bowl is difficult to remove.

1. Set the suction filter 3-way ball valve tap handle to the central OFF position.
2. Loosen the nut holding the filter bowl slowly; about half way. Take care as some chemical may dribble out.
3. If the filter bowl does not immediately become loose, or resists being pulled out, suction on the filter bowl can be relieved by briefly turning the suction tap handle to the rinse position 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.


Suction filter ball valve tap handle. Place in centered OFF position when removing suction filter bowl.



# 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. Open the vortex induction hopper flip valve and (if required) the main tank agitator flip valve.
5. Ensure the bypass line ball valve and the chemical probe venturi flip valves are closed.
6. 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 540 RPM.

**NOTE:** The higher the pump delivery pressure, the greater the venturi suction and the quicker the hopper will transfer the chemical. The delivery pressure should not exceed 110 PSI as determined by the pressure relief valve setting.

8. Put the required amount of chemical into the hopper (liquid or granular). Wear the necessary protective clothing and use the required safety equipment to avoid exposure to chemicals.
9. Open the hopper tank ball valve at the bottom of the hopper by turning the yellow handle down. The chemical should be now transferring to the main spray tank.
10. Rinse all chemical drums and the hopper as per the rinsing instructions.

When finished using the hopper:

- Close the hopper tank ball valve at the bottom of the hopper by turning the yellow handle so that it is horizontal.
- Turn the bypass valve OPEN.
- Flip the induction hopper valve OFF.
- 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 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 Pod's external water delivery station (blue) 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. Turn ON the 'Spray Pump' switch and then the 'RPM Raise' switch to operate the fresh water pumping system at between 70 and 100 psi.
6. Flip the vortex Induction Hopper valve ON.
7. Open the hopper tank valve at the bottom of the hopper by turning the yellow handle DOWN.
8. Ensure that the hopper drain tap, also located at the bottom of the hopper, remains CLOSED.
9. To rinse a drum, push the drum over the rinsing nozzle located in the top of the hopper.
10. To rinse the hopper, turn the Hopper Rinse valve on the top of the hopper ON. Close this valve when the hopper has been rinsed.

When the hopper is empty:

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

*Continued over page*

# Chemical Induction Hopper

- Flip the vortex Induction hopper valve OFF.
- Drain the hopper of any remaining liquid using the hopper drain tap at the bottom of the hopper.

RINSING OUT THROUGH DRAIN

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

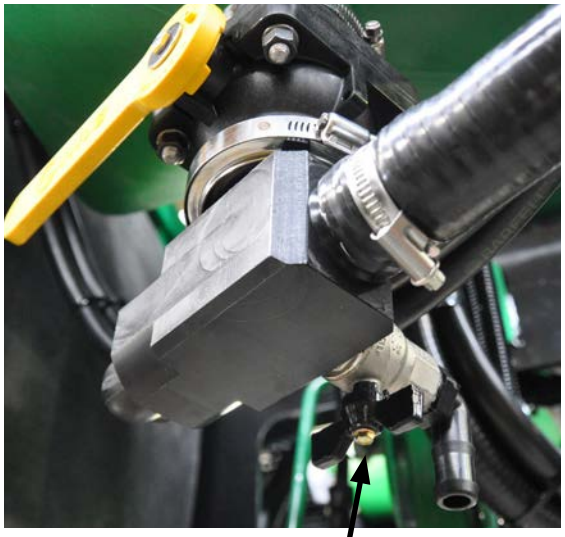
**CAUTION:** Spray pump should be turned off.

To do this:

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

NOTE:

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



*Hopper Drain Tap - Photo look up from underneath the hopper*

# Fuel Tank Ladder

For the convenience of the operator, a fold out ladder has been provided under the fuel tank to allow easier access to the fill point.

To extend the ladder, give a sharp pull on the handle to release it from the rubber holders on the end. Then slide it forward as far as it will go before lowering it down.

To stow the ladder, lift it up until it is horizontal to the ground and then slide it all the way in. Give a sharp push on the handle to secure it in the rubber holders.

**NOTE:** Do not drive the machine or operate the steering wheel with the ladder extended.


**Above:** Access ladder shown in stowed position.

**Left:** Access ladder shown in extended position.

# 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. Holding the switch for an extra 20-30 seconds allows both fold cylinders to reach their maximum extents. If bi-fold is fitted the boom outers must first be folded. The boom must be at full height before folding. Stopping while the booms are folding will stress the boom.

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 held until the booms fold all the way out and come to a stop, holding the switch for an extra 20-30 seconds phases the fold cylinders. If bi-fold is fitted the booms must be folded out before bi-folding the outers. The boom must be at full height before folding.

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 folded all the way out or boom stress can occur. When the booms are all the way out hold the switch down until the bi-fold pressure gauges read 1500-1700 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.

FENCE LINE JETS RIGHT

Press this on/off/on style switch to the right to activate the right end fence line nozzles. This switch will remain in the on position until it is centred by the operator to OFF.

FENCE LINE JETS LEFT

Press this on/off/on style switch to the left to activate the left end fence line nozzles. This switch will remain in the on position until it is centred by the operator to OFF.

SPRAY PUMP ON / OFF

Pressing the top of the switch activates the product pump. The pump will remain operating until the switch is returned to the SPRAY PUMP OFF location.

TILT LEFT UP / DOWN

This raises and 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 disabled from automatic mode when this switch is activated in this direction.

TILT RIGHT UP / DOWN

This raises and 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 be disabled from automatic mode when this switch is activated in this direction.

BOOM UP / DOWN

Use this switch to activate the boom raise circuit. Releasing the switch will return the switch to the neutral, centre position. Boom lowering is limited by the adjustable lower height switch, which is mounted on the lower paralift arm on the left hand side.

*Continued over page*

# Arm Rest Controls

### BOOM RECIRC ON / OFF

Pressing the switch to the on position allows an agitated chemical mix to be run through the boom lines prior to spraying - pre-charging them and eliminating waste. It takes approx 1 minute to flush 60 L through the boom lines. The boom recirculation must be in the OFF position to begin spraying.

### CRUISE CONTROL / RPM RAISE

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

When the switch is in this position the cruise control can be set, resume, increased or decreased by using the switch CRUISE RESUME(+) / SET(-). To disable cruise control this switch can be cycled to the off position or the foot brake can be engaged.

Pressing 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.

**NOTE:** The transmission will not engage any gear from neutral if the engine is running over 900 RPM.

### CRUISE SET -

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 +

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 RESUME + / SET - (IDLE SPEED CONTROL)

In addition to cruise control functions, this switch can be used to control idle speed. When cruise is not engaged pressing Cruise 'Res +' will increase the idle speed above the set idle of the electronic control module (ECM). Pressing 'Set -' will bring the RPM down to the set idle of the ECM.

### GPS RESUME / CRUISE CANCEL

Press switch forward to resume autosteer function. Press this switch backward to cancel the cruise function.

### SPRAY MODE / ROAD MODE

Pressing this switch forward it will engage the spray (field) mode in which the highest gear that can be attained is 4th. Engaging spray mode also enables the autosteer system where fitted. Pressing the bottom of the switch will engage road mode, which allows overdrive to be selected by the transmission. Engaging road mode also disables the autosteer system where fitted.

### DIFFERENTIAL LOCK ON / OFF

Pressing the switch forward will engage the differential lock. The differential lock should only be used when needed and never left engaged for long periods. For use in poor ground conditions only. Not to be used on hard surfaces e.g. concrete, asphalt etc. Do not engage during wheel spin. Should not to be used at road speed. Use first or second gear at most. The differential lock needs to be disengaged when cornering to minimise extra load on the tyres and driveline.

### AXLE

For machines fitted with optional adjustable axles, pressing this switch in the IN or OUT direction can be used to control the wheel track width.

### 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.

# Adjustable Axles - Optional

Adjustable axles may be optionally fitted to a machine to enable the operator to change the track width to best suit the requirements at hand. Track widths can be specified as 2-3 m or 3-4 m configurations depending on the option chosen. Therefore adjustable axle machines have a total range of track adjustability of 1 m.

The front and rear adjustable axles are fitted with two ball valves each that allow for the isolation of the hydraulic circuit controlling each side. This allows the operator to run a staggered or offset track as required. For example the rear axle can be fully extended while the front axle remains at the minimum track width and vice versa. It is also possible to extend only the right side axles while keeping the left sides at their narrowest extents and vice versa. Another important role of the isolating taps is safety. All four axle corners should be isolated during machine transport. The isolating taps should also be engaged while the machine is operating and no adjustments are being made. This eliminates accidental/undesired operation of the button on the side console during normal operation.

### ADJUSTMENT PROCEDURE

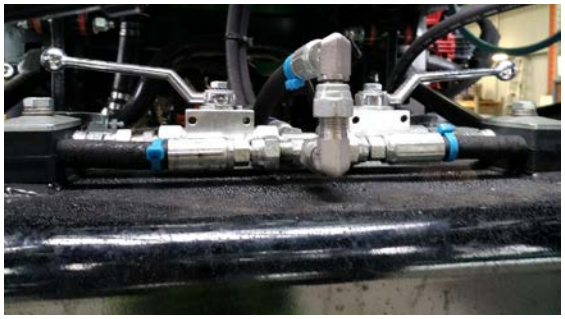
1. Identify a run of loose ground surface to drive over while the axles are being adjusted and park the machine at one end.
2. Decide on which axles to adjust and check that the isolating taps on top of the axles are OPEN for those axles to be adjusted. Make sure that the isolating taps are CLOSED for all others.
3. Start driving off slowly at a steady walking pace while using the 'Axle' button on the side console to adjust in or out. Be sure to check that the desired axles have reached their maximum or minimum extents. Hold the button down for as long as necessary for all the axles to 'catch up' to each other.
4. Stop the machine and isolate all axle taps.
5. The adjustment is now complete.

**NOTE:** Axles should be adjusted on a loose ground surface to minimise stress on the tyres, hydraulic system, axle extensions and wear pads.

**NOTE:** All adjustable axle isolating taps should be CLOSED during normal machine operation and during machine transport.

**NOTE:** See 'Axles & Drop Leg' section in Chapter 10 'Lubrication & Maintenance' for servicing information on the adjustable axles.

**Above:** Machine fitted with optional adjustable axle.



**Above:** Adjustable axle isolating taps on top of axle.


**Above:** Adjustable axle button on side console in cabin.

# 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, first apply the foot service brake located on the right of the console, release the park brake, push the lock button on the gear selector inward and move the gear selector to the desired position.

| GEAR POSITION | DESCRIPTION |
|---|---|
| R | Reverse |
| N | Neutral, the gear selector must be in this position for starting. |
| OD | Over drive, in this position all the forward gears are available and will be selected by the electronic control module (ECM) when required. The over drive disable switch can be used to lock out Over Drive. |
| D | Drive, in this position 1st- 3rd gears are available and will be selected by the ECM when required. Overdrive gear will not be selected. |
| 2 | This position limits the shifting range between first and second gears by the ECM. |
| 1 | This position limits the shifting range to first gear only by the ECM. |

When the lever is in the OD position and the switch is in FIELD MODE, the highest gear that can be attained is 4th. When the switch is in position for ROAD MODE, over drive will be able to be selected by the transmission.

Once the desired gear is selected release the foot service brake. If OD is selected the transmission electric control module will select the required gear as the engine revs are increased.

If the gear selector is moved to D while the park brake is still engaged, no gear will be engaged by the transmission. The gear selector needs to be moved back into N then the park brake released and then a gear can be selected.

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

**NOTE:** The transmission will not engage any gear if the engine is over 900 RPM.


Spray Mode / Road Mode

Diff Lock ON / OFF

# Controller - Raven SCS4400 - Standard


## The Raven SCS 4400 Auto Section Controller

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

For more information please see your Raven operation manual.

# Controller - ISOBUS - Optional

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 up to 16 sections in any combination of groups or individually. Note that the Raven RCM and Rapidfire system must be optioned for 16 section booms.

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. Many other UTs by other manufacturers are also compatible.


**Above:** An optional Raven 6 section control box can be programmed to control the 16 sections in any combination of groups or individually. Note that Raven RCM and Rapidfire must be optioned for 16 section booms.

# Controller - Raven Rate Control Module - Optional


## Raven Rate Control Module (RCM)

The RCM is optional when the ISOBUS system has also been optioned and uses Raven's innovative control algorithms to make it the most precise application controller on the market today. Sixteen-section control eliminates expensive skips and overlaps during spraying.

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

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

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

For more information please see your Raven operation manual.

# 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').

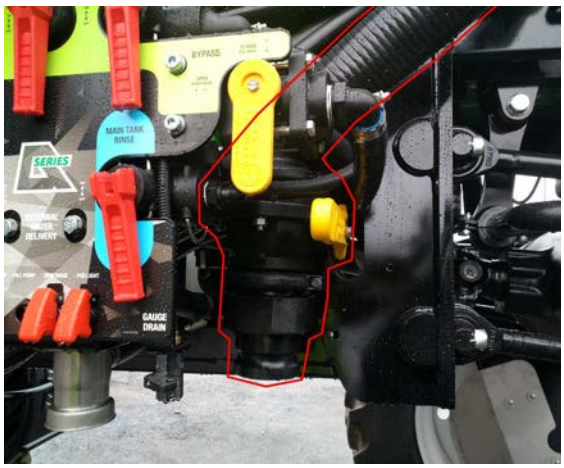
**WARNING:** Water weighs 1 kg per litre. Conversion factors must be used when spraying liquids that are heavier than water. The total weight of the liquid being sprayed should not exceed the equivalent weight of a full tank of water. Exceeding this weight, can lead to sprayer damage.
ie: Liquid nitrogen has a density of 1.28 kg per litre. Tank size is 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




**Above:** Main tank fill 3" inlet mounted to right hand side pod. This fill point is plumbed into the pod and can be used to fill the rinse tank. See section 'Rinse Water Tank Fill' for more details.

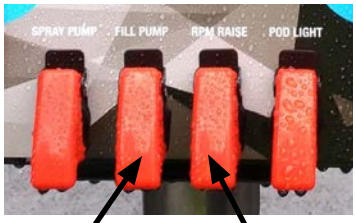
### PUMPING WITH EXTERNAL PUMP

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 located just above the 3" quick fill coupling to ON.

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




Fill pump switch — RPM raise switch

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

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

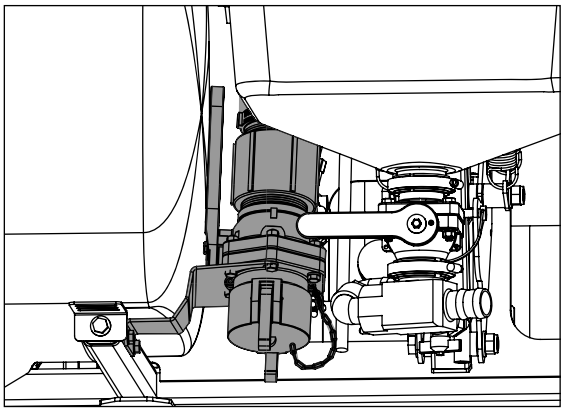
1. Start by ensuring that all flip valves on the fill station are turned off.
2. Connect the fresh water fill hose to the quick-fill coupling.
3. The tank lid may need to be loosened to help air escape.
4. Operate the fresh water pumping system. (Make sure pressure does not exceed 75 PSI)
5. Flip the rinse water tank fill valve. (There should now be flow transferring to the rinse water tank)
6. When the required amount of water has been transferred to the rinse water tank, shut the rinse water tank fill valve and stop the flow by turning off the external water supply.
7. Tighten tank lid.

## Remote Tank Fill Points - 3"

A remote 3" tank fill point can be optioned on the left hand side of the machine, mounted to the rinse tank support. There is also the option to fit a remote fill on the right hand side of the chassis just in front of the front axle. These fill points are routed straight into the main tank, bypassing the pod.

Therefore the tank rinse and/or rinse tank fill 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.



**Above:** Remote fill 3" inlet on left hand side of machine mounted to rinse tank support and behind hopper.

**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 tank volume of fresh water to the main tank.
2. Add all chemicals.
3. Add the remaining quantity of water required.
4. Turn the agitator on with the pump at operating speed. (may need RPM Raise ON)

NOTE: Check to ensure that the Supermix agitator is working (there should be a visible circulation of water near the rear of the tank near the agitator).

5. If the tank has been filled and the spray mixture has been allowed to settle, agitate for as long as it takes the pump to pump the quantity of water in the tank. For example: with 4000 litres in the tank with a 260l/min pump agitate for 4000/260 = 16 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 400 - 540 rpm with the agitator running in order to ensure that the chemical mix is adequately agitated prior to spraying.

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

NOTE: The 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.

# 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. This will allow rinse water back into the main spray tank.

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

**NOTE:** To rinse out a system with RapidFlow see Chapter 12 'Optional Accessories' RapidFlow section.

# 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 PROCEDURE

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

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

8. Open the boom section drain valves and empty the contents of the main tank through the boom.

DO NOT open the boom section drain valves while there is pressure in the boom lines.

9. Once the main tank has emptied, flush the system again using fresh water to ensure the decontaminating agent is removed from the system.
10. Once the main tank is empty, the hose between the tank and the 3 way suction valve also needs to be drained. The valve is located on the EZ Control. Turn the 3 way valve off.
11. Remove the filter bowl. As per filter removal instructions.
12. Turn 3 way valve 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

# BOOMS

## 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.

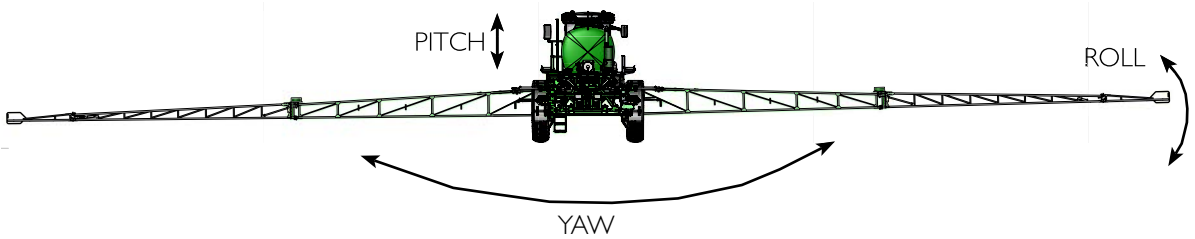
TriTech booms feature a unique (patented) boom suspension system.

This system provides suspension in three directions:

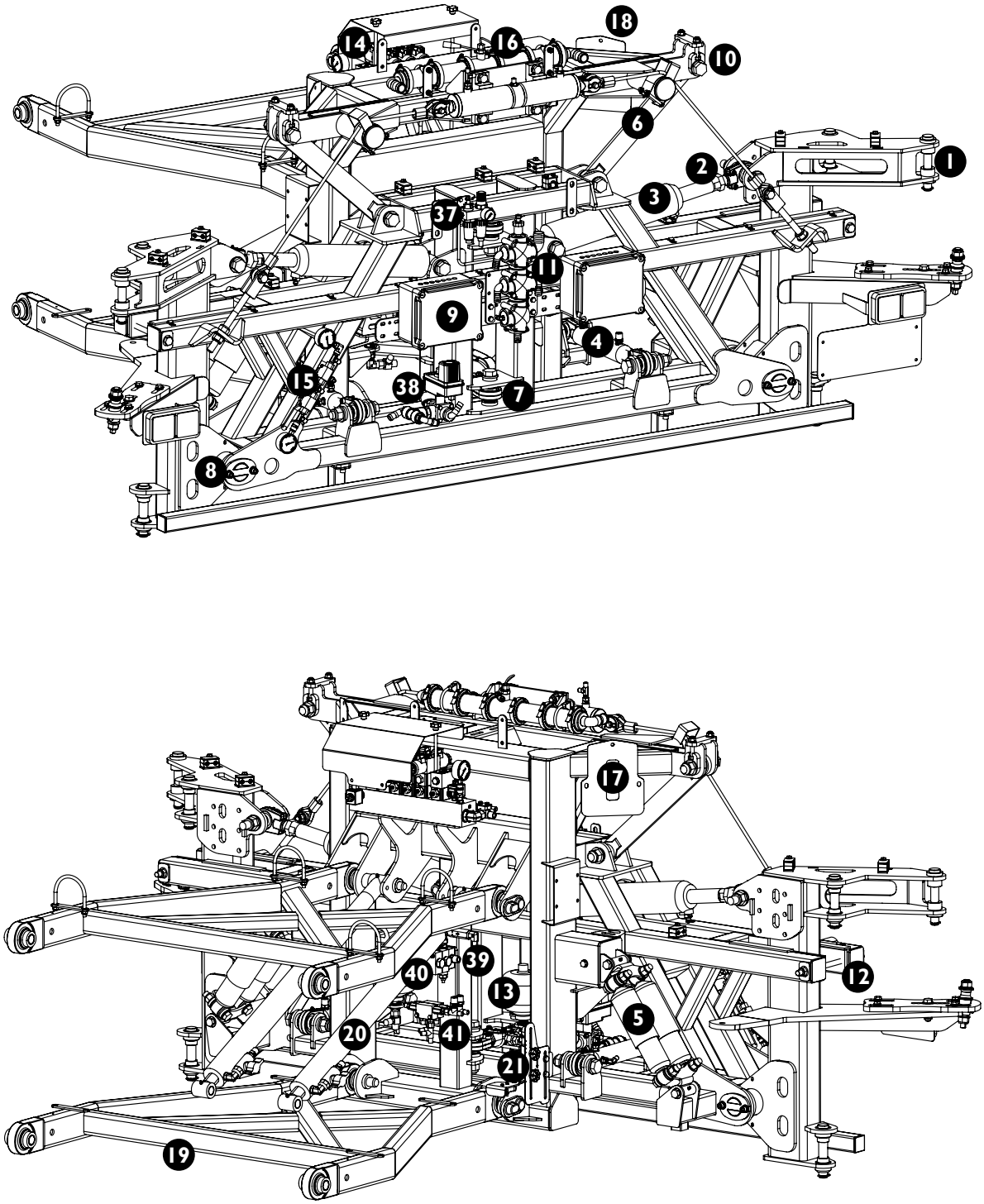
**PITCH** Hydraulic cylinders and accumulators dampen the vertical boom movement encountered over rough ground conditions.

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

**YAW** Shock absorbers and springs, over come the erratic whipping movement, which creates undue stress on the boom frame and uneven spray application. (Hydraulic Yaw suspension is an option)



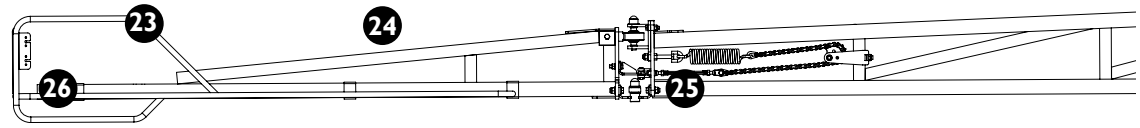
# Boom Overview - Non RCM



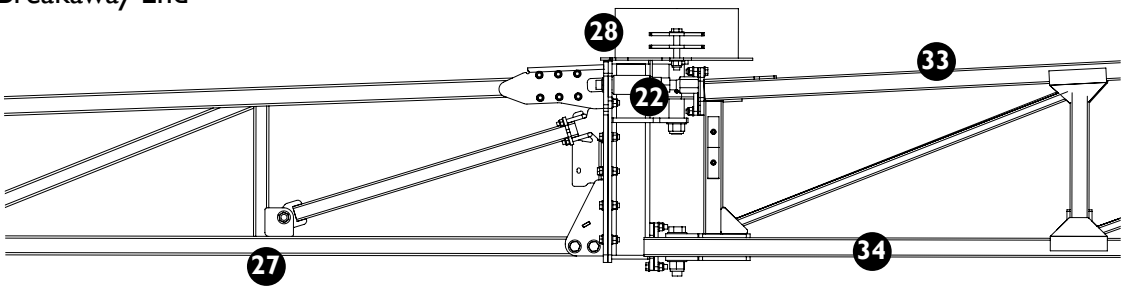

TriTech Centre Section & Paralift

*Continued over page*

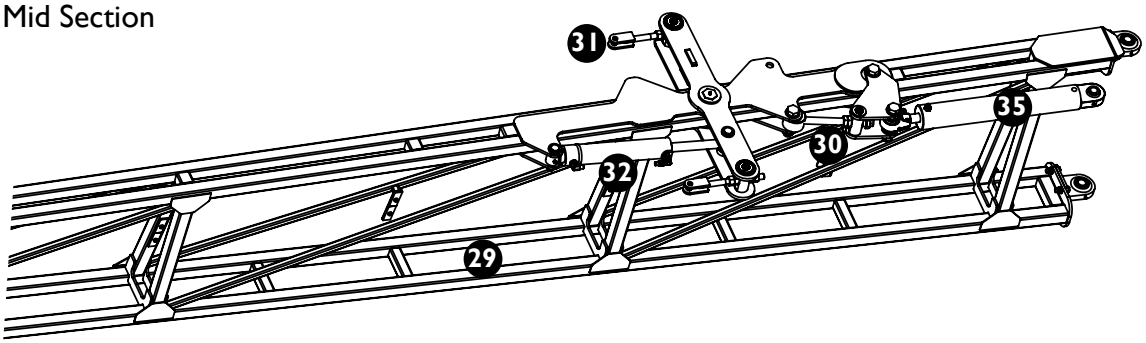
# Boom Overview - Non RCM




Breakaway End




Mid Section

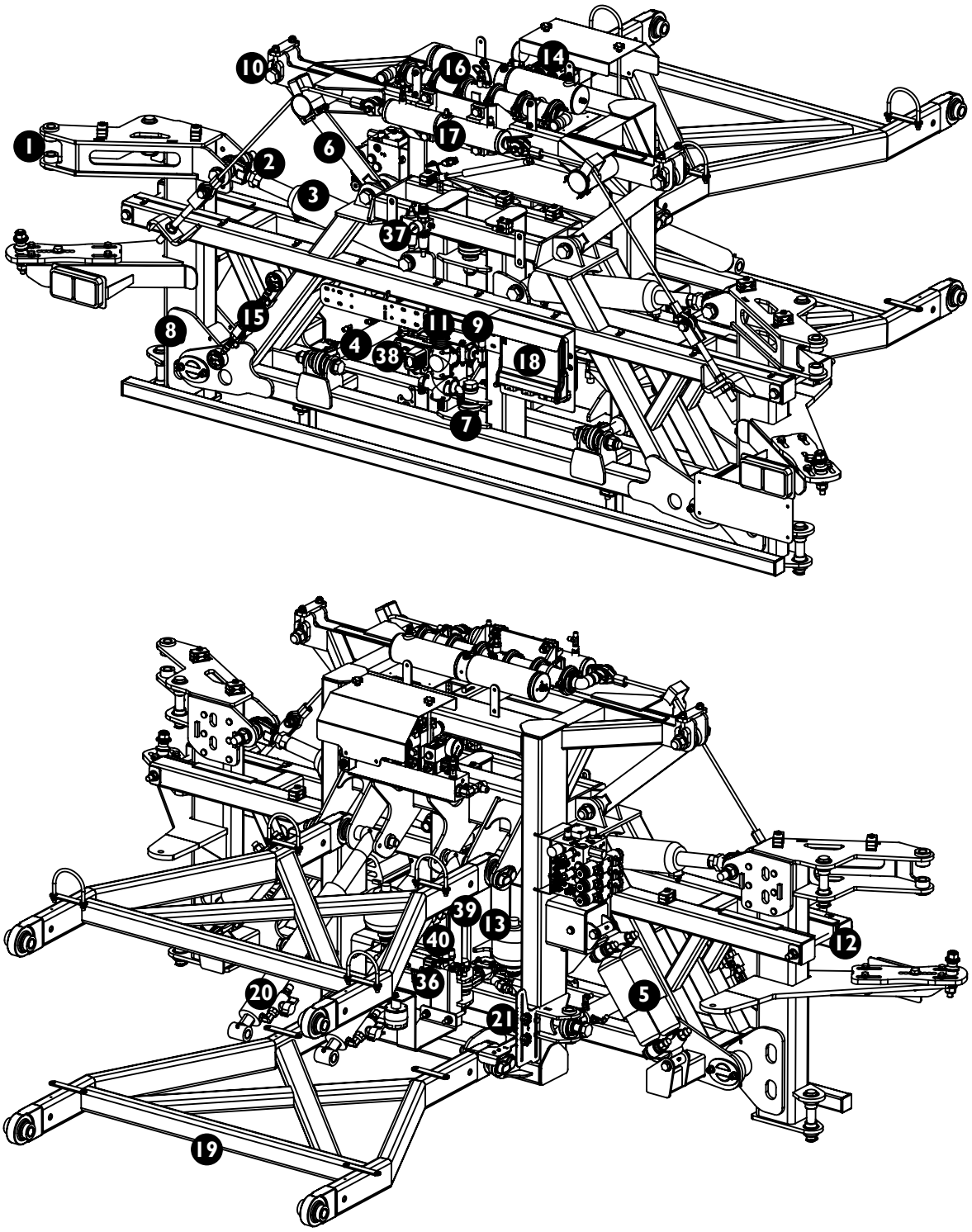



Inner Boom Wing End

| NO. | FEATURE |
|---|---|
| 1. | Boom rose end |
| 2. | Tilt arm adjuster |
| 3. | Tilt cylinder (Optional) |
| 4. | Yaw cylinder |
| 5. | Roll shocker |
| 6. | Diagonal delta links |
| 7. | Lineal delta links |
| 8. | Tilt pin (60 mm) |
| 9. | Rapidfire solenoid boxes |
| 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. | Node mount |
| 18. | Node mount |
| 19. | Paralift arms |
| 20. | Lift cylinders |
| 21. | Boom lower limit switch |

| NO. | FEATURE |
|---|---|
| 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 ram |
| 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. | Centre Leveling system |
| 37. | Rapidfire oiler & dryer |
| 38. | Rapidflow valve |
| 39. | Hydraulic yaw - Pressure reducing valve |
| 40. | Flow dividers |
| 41. | Bi-fold - Double pilot operated check valves |

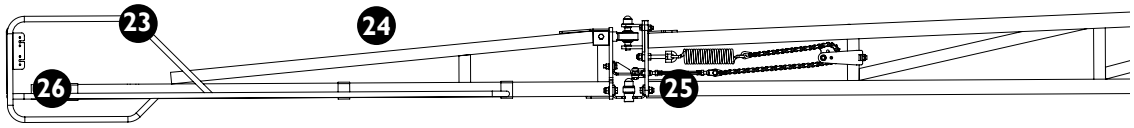
# Boom Overview - RCM



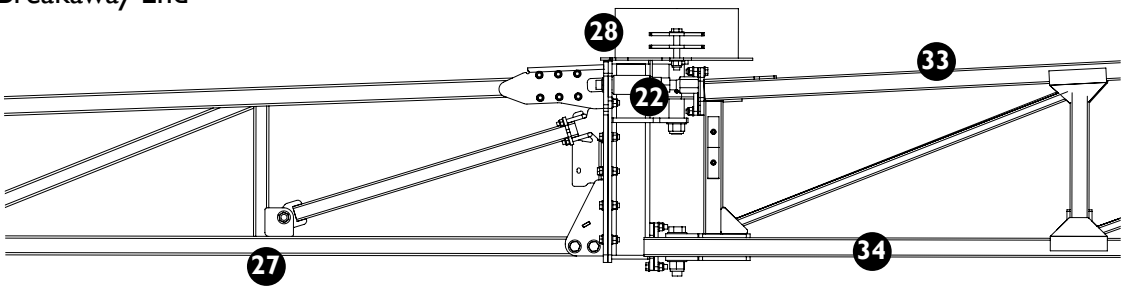

TriTech Centre Section & Paralift

*Continued over page*

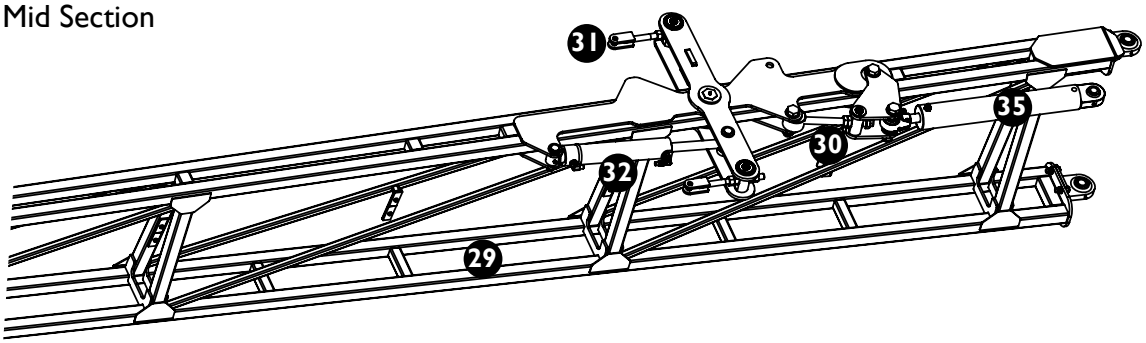
# Boom Overview - RCM




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

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

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

## Boom Cables

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.

*Continued over page*

# Boom Features

## 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.

## Boom Valves

Motorised boom valves are fitted as standard and are mounted on the boom centre section at the rear of the sprayer. Motorised boom valves feature a 12 volt motor that opens or closes a stainless steel plunger and thus opening or closing flow to the boom sections as required.

In the event of a valve failure, unscrew the top cap of the valve to check if the 3A fuse is blown and replace as necessary.

## Nozzles

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

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

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

TeeJet web site: www.teejet.com

Lechler web site: www.lechler.de

## Three Dimensional Breakaway

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

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

## Hydraulic Yaw Suspension

Hydraulic yaw suspension is designed to control the yaw movement of the boom centre section. Two hydraulic cylinders with individual nitrogen filled accumulators connected to each, centre and dampen the yaw movement.

The two hydraulic cylinders and accumulators are charged with hydraulic pressure and then closed off to create a separate circuit which acts as the yaw suspension.

# Boom Options

## Fence Line Jets

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

This should prevent operators from putting the boom into the fence, especially important when the 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).

## 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.

*Continued over page*

# Boom Options

## 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.

## RapidFire & RapidFlow

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.

The RapidFlow system is complimentary to RapidFire and is fitted at the same time.

## 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.

## 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.

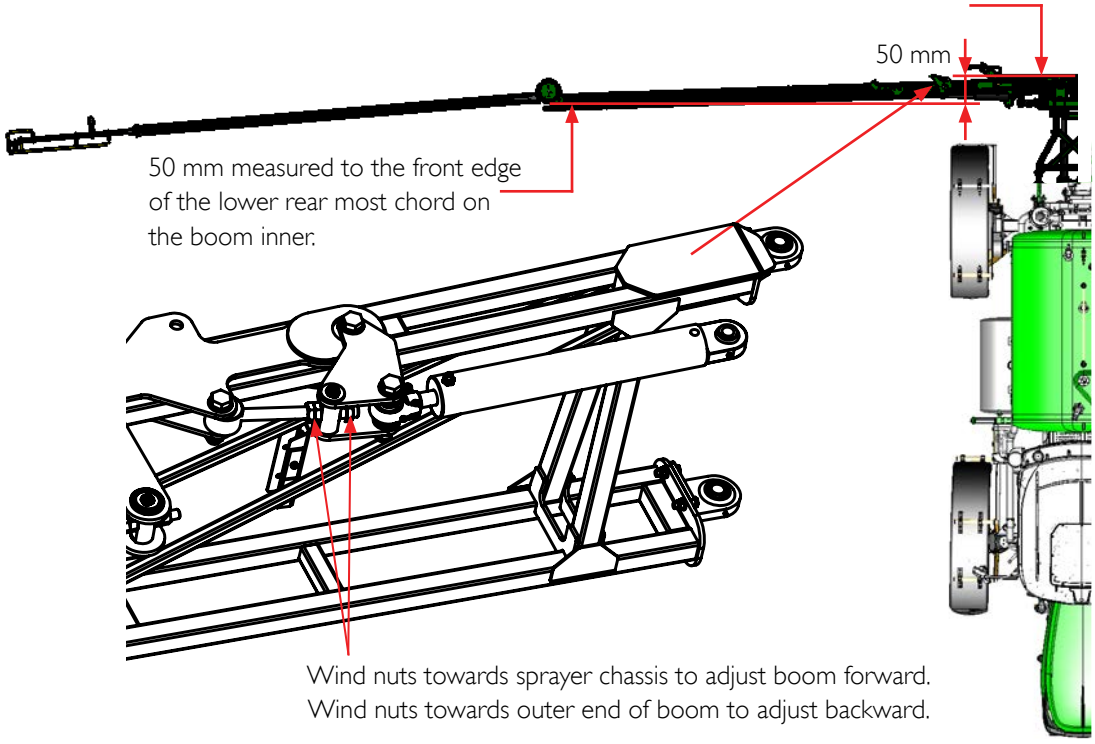
Further information on ultrasonic boom height levelling can be found in the Norac section in Chapter 12 'Optional Accessories'.

# Boom 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

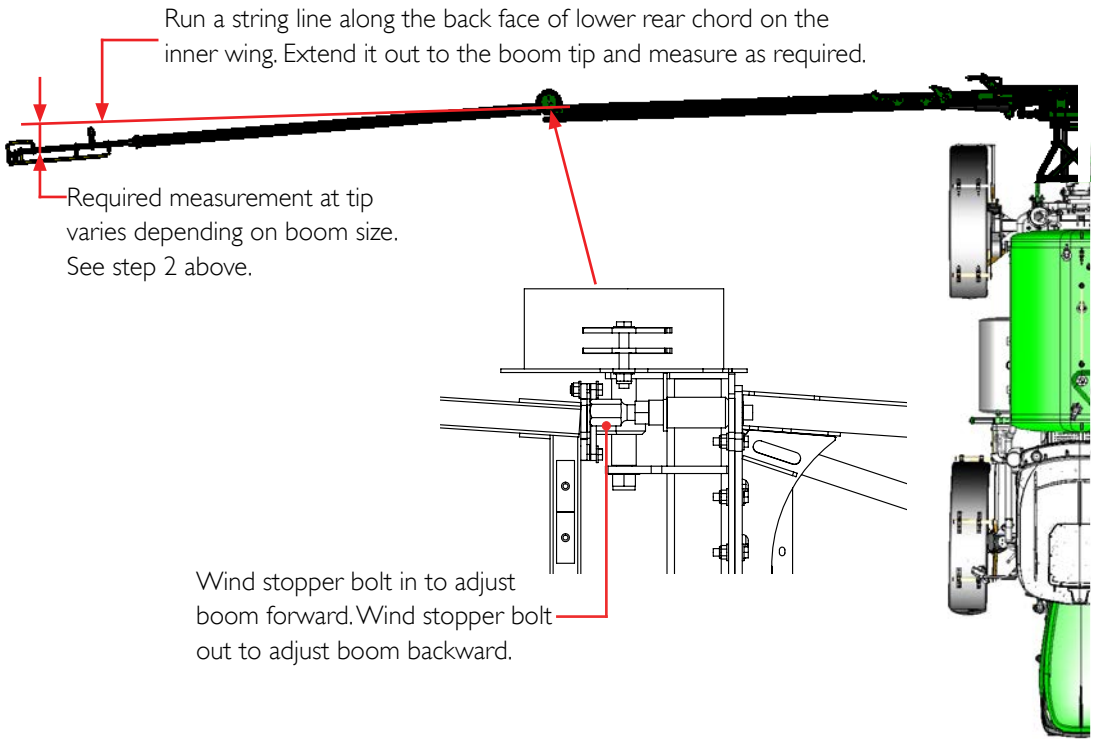
1. When adjustment of the inner booms is complete the outer booms can now be aligned.
2. 24-30 m TriTech booms must be 30-50 mm and 33-36 m booms must be 50 mm forward of the inner booms. Use a string line to assist with achieving the correct measurements.
3. To align the outer booms, the cable adjusters 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.

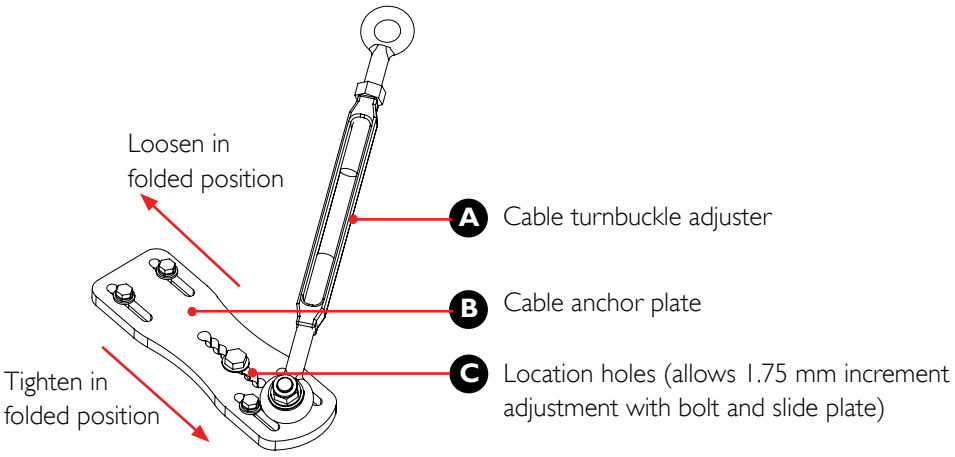


# Boom Adjustment

## 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.



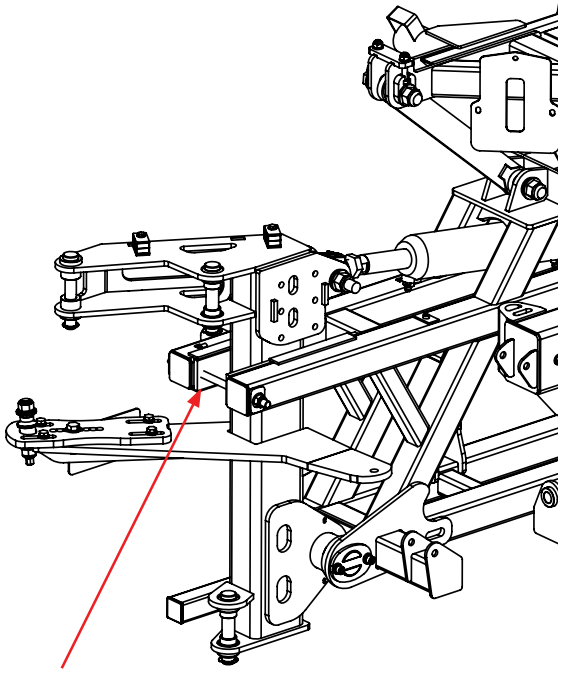
# Boom Adjustment

## Vertical Boom Alignment - Unfolded Position

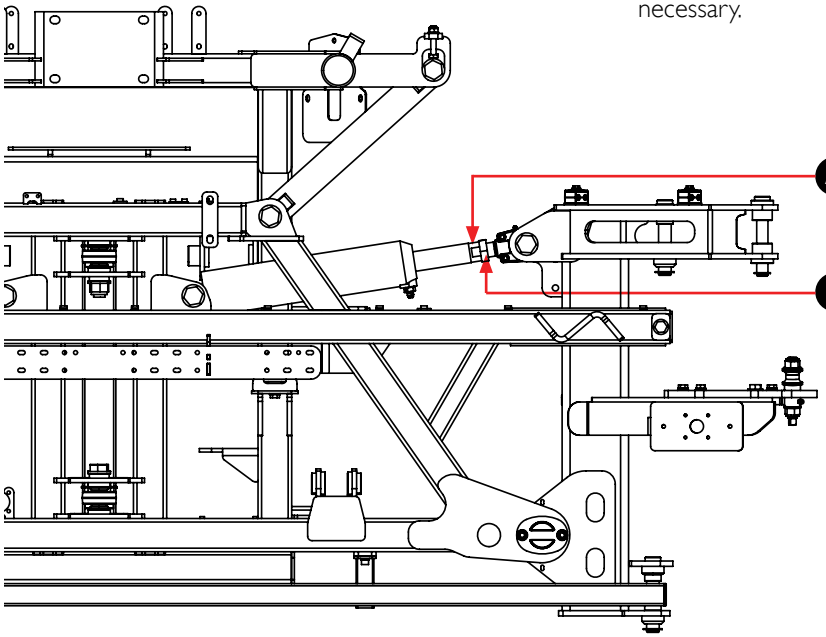
When the boom is in the working position, the inner and outer boom should be level or slightly increasing in height from the centre section to give a consistent and even spray application height. A new boom may be susceptible to stretching or sagging as the components are worn in. Several adjustment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

*Continued over page*

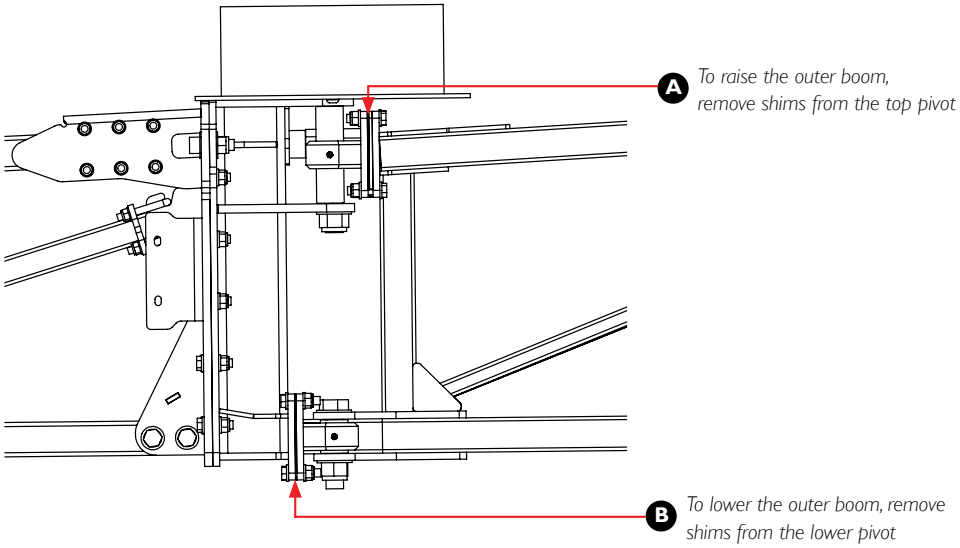
# Boom Adjustment

## 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.

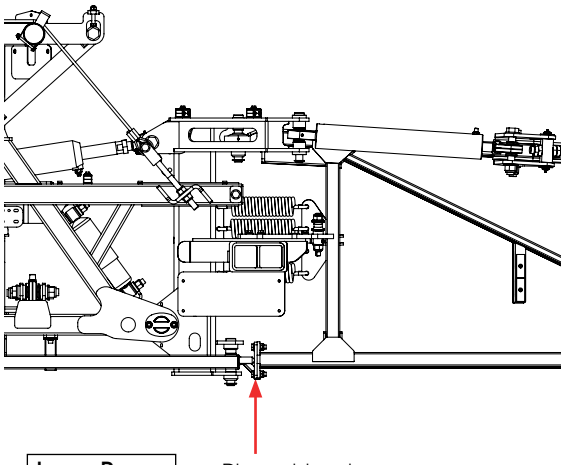
When the booms are folded up in the transport position, the outer boom must saddle onto the inner boom. If this alignment of out the outer boom will not saddle correctly and will not be supported in transport.

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.

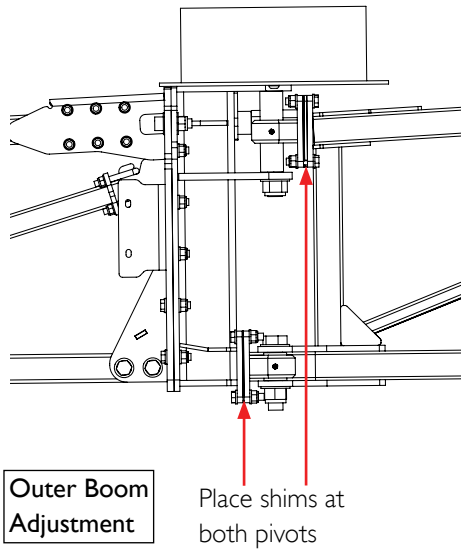
**NOTE:** This process will be require in the first 6 months of operation as the booms stretch an ware in.

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




Outer Boom Adjustment

# Boom Adjustment

## Aluminium Outer Wing

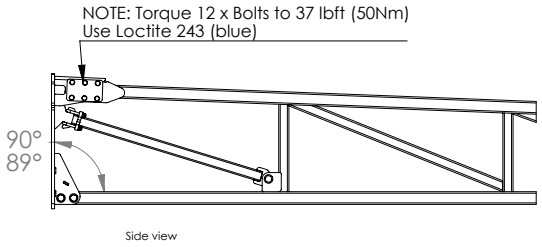
When the booms are fitted at the factory, they are made level or slightly increasing in height from the centre section. Under working conditions the aluminium outer booms will need to be checked at every 50 hour intervals as per the Maintenance Schedule.

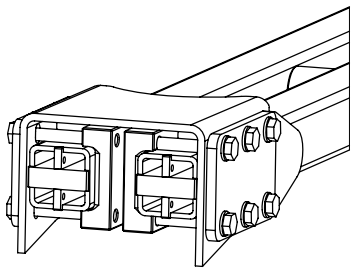
If the aluminium outer boom is not level in the working position, then a likely cause of this may be sagging or stretching.

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.

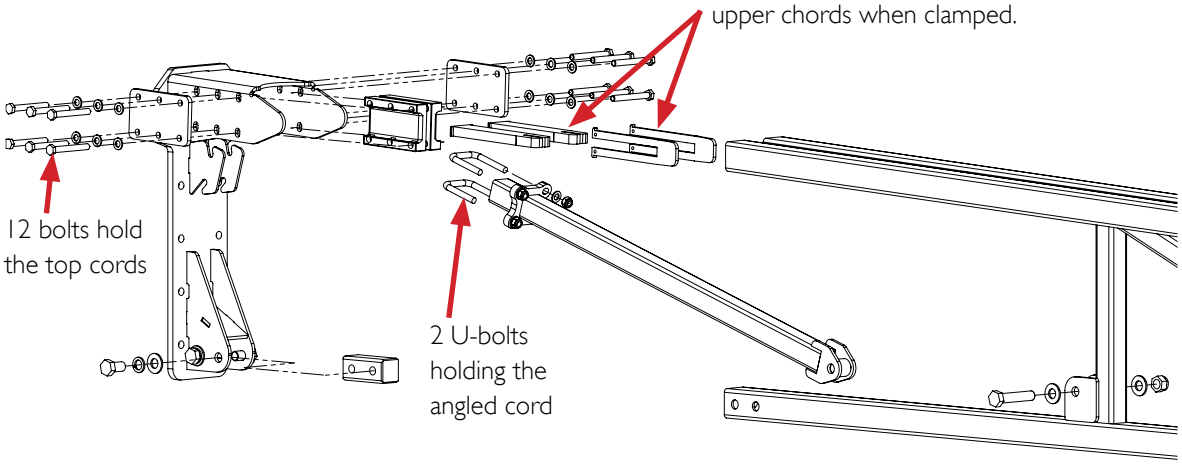
If the aluminium top cords around the bolts show any signs of movement, then the bolts will need to be tightened.

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.



# 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.

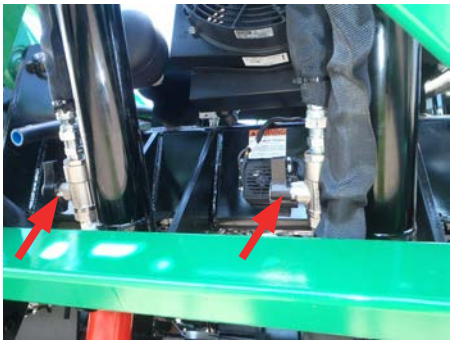
**NOTE:** When the hydraulic yaw system is installed or any components are replaced, the closed loop hydraulic circuit needs to be bled of any air. The maximum pressure needs to be set, the system charged and the booms aligned.

## 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

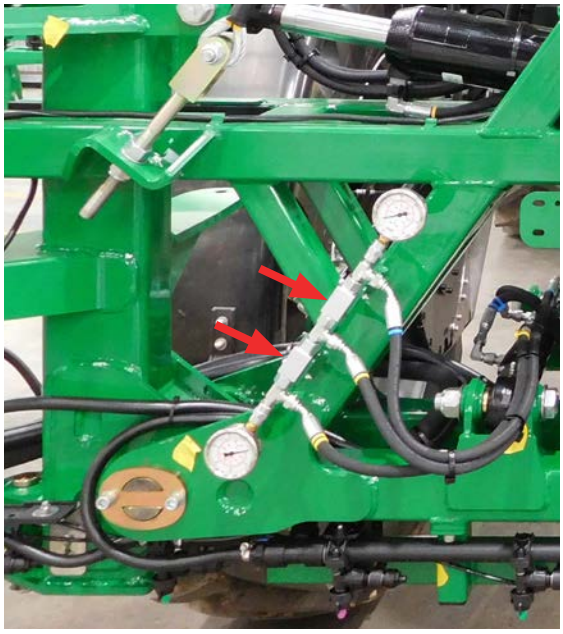
1. Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
2. Open the boom into the working position and lower to the minimum working height.
3. Isolate the boom lift cylinders by rotating the Paralift cylinder valves to the off position.



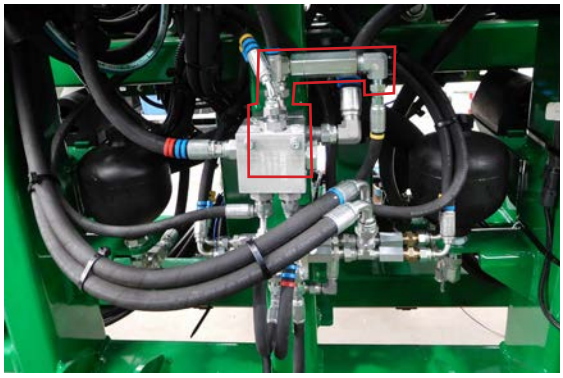
*Continued over page*

# 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.

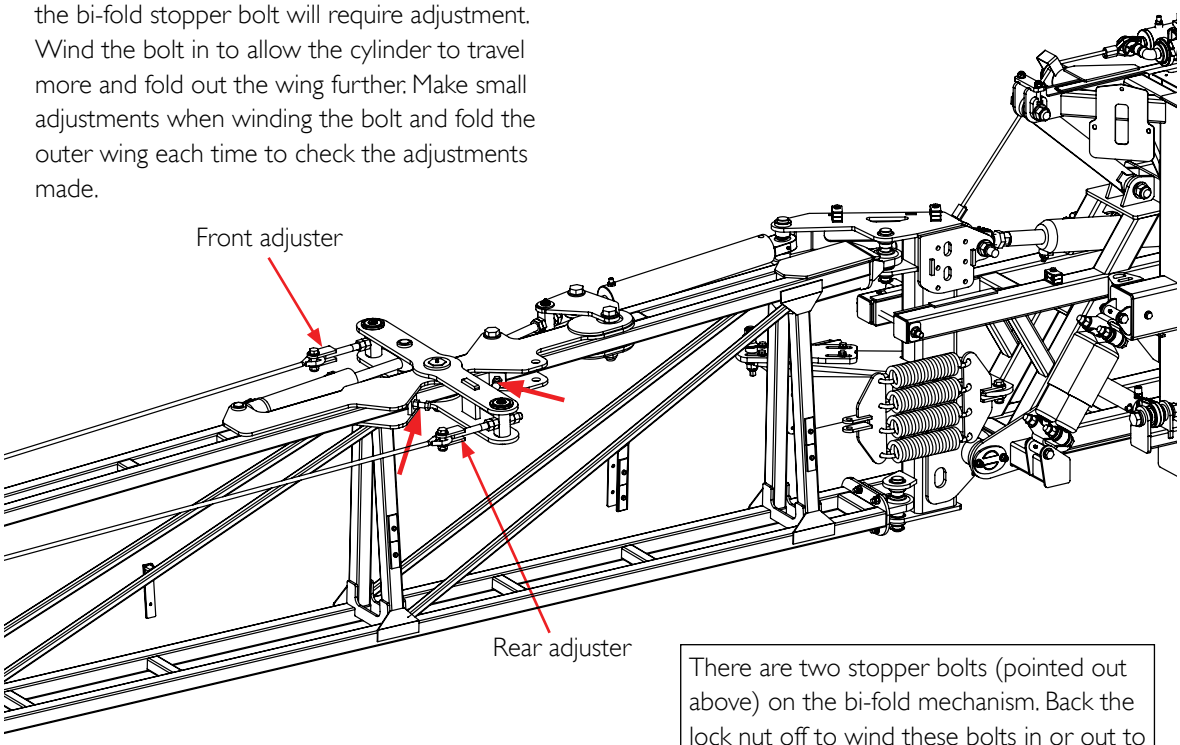
## Alignment - Outer Aluminium Boom - Folded Position

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.

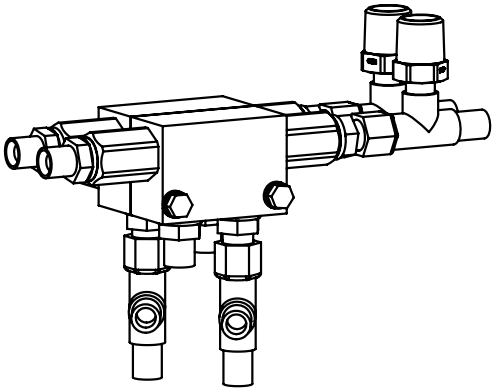
The bi-fold pressure is adjusted at the spool block. See Chapter 10 'Lubrication & Maintenance for more information on the spool block.

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 the outers only 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.

# 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.

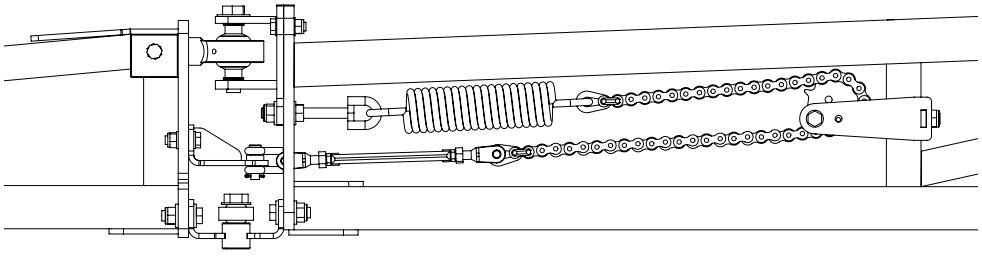


Figure A

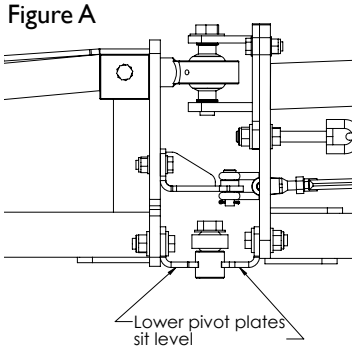



Figure B

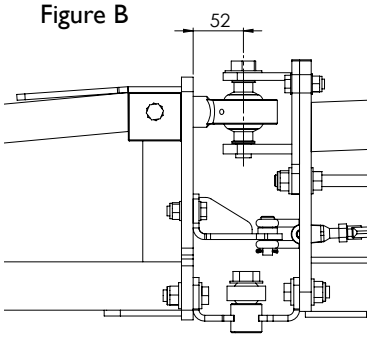
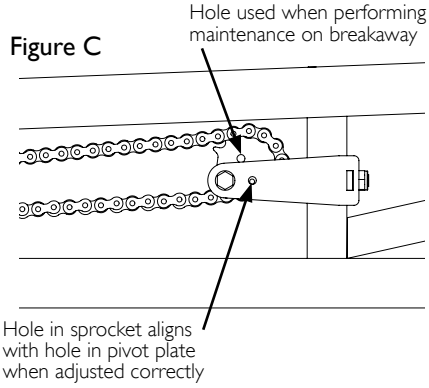



Figure C



# 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.

UNFOLDING PROCEDURE:

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

WARNING: 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.

WARNING: 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.

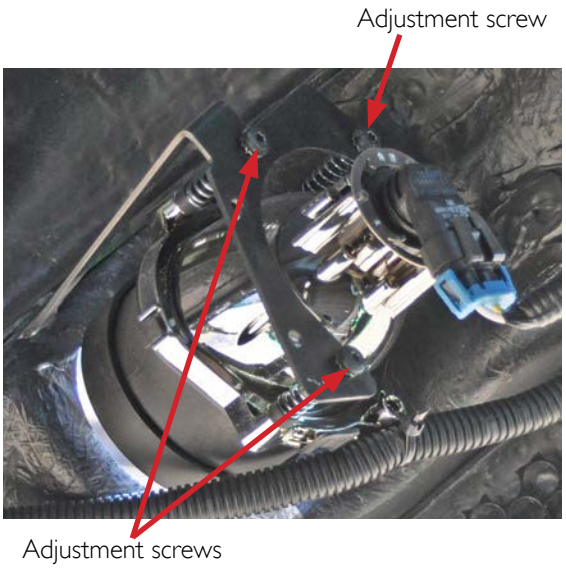
# Chapter 10

# 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 - Low 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 on top of the fuel tank near the right hand chassis rail.

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 'Recommended Lubricants' section at the beginning of this chapter.

## 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 front on the left hand chassis rail, 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 'Recommended Lubricants' section at the beginning of this chapter.

## Coolant

The Crop Cruiser radiators are fitted with a expansion 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.

NOTE: Coolant level must be checked DAILY.

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

The expansion 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 Air Cleaner

The air cleaner is mounted above the engine near the expansion header tank. Mounted on the right hand side of the air cleaner is a vacuum gauge. 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.

NOTE: Filter specifications can be found in 'Recommended Lubricants' section at the beginning of this chapter.

# Transmission

The Allison 5 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 C) the oil level must be close to the lower range marking. If the oil temperature is warm (above 70 degrees C) the oil level must be close to the upper range marking.

## Transmission Oil Cooler

The transmission oil cooler is integrated into the cooling package.

Refer to the maintenance schedules and the Lubricants and Filters charts for servicing requirements near the end of this chapter.

Refer to the Allison Transmission operator's manual (supplied) for oil filter change and any information on operation or troubleshooting the Allison transmission.

# Transfer Case

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

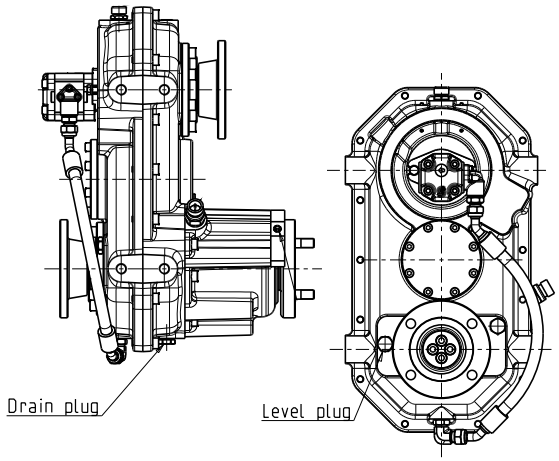
The transfer case runs an oil bath sump. The oil level can be checked by removing the oil level plug located on the side of the transfer case.

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.



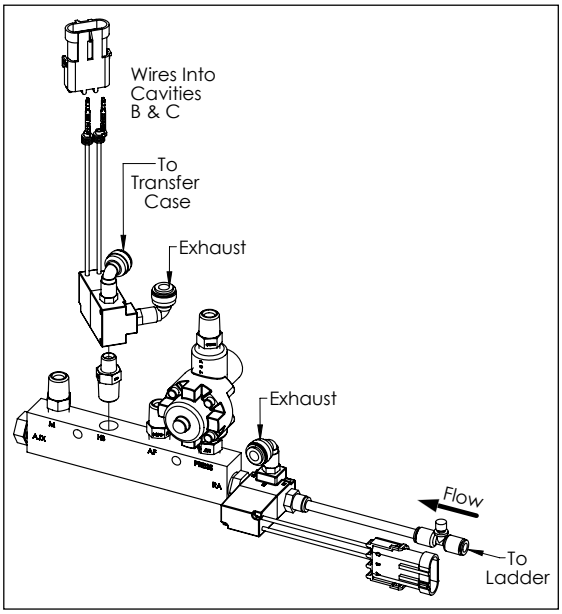

An air solenoid used for engaging the transfer case is located under the cabin. When the 4WD switch is activated in the cabin, the solenoid is in turn activated.

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 4WD mode is engaged.

This solenoid can be manually overridden if required. Locate the pneumatic manifold with the solenoid under the cabin as shown below. 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.

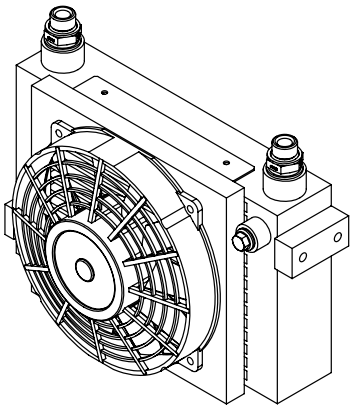
Air should now be flowing through the solenoid and the 4WD mode should be engaged.

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




**Above:** Pneumatic manifold located under the cabin. The transfer case 4WD solenoid has an override screw in the bottom that can be overridden with a flat head screwdriver.

The transfer case incorporates a lubrication pump for cooling the oil. The pump is driven by the input shaft to the transfer case and runs only while the machine is moving. There is a radiator with electric fan mounted below the cabin as part of the transfer case cooling circuit. Check the fan and fins of the cooler periodically for debris and clean them as necessary to ensure optimal cooling of the transfer case.



**Above:** Transfer case cooler mounted below cabin. Keep clear of debris.

# Drive Shafts

Fixed drive shafts are used to transmit drive between the transmission and the differential. These drive shafts 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 drive shafts should be inspected for wear and greased at regular service intervals found in Chapter 10 'Lubrication and Maintenance'.

# Differential

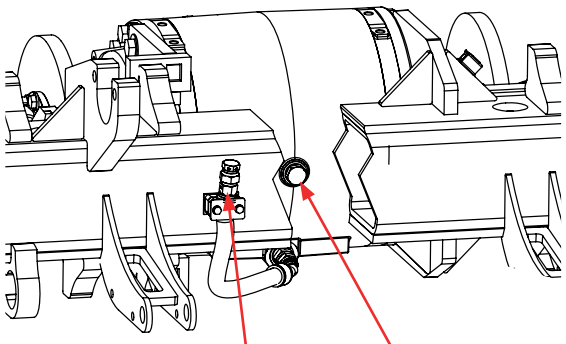
The differential runs in an oil bath sump. The oil level can be checked by removing the level plug on the rear of the differential housing.

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

To drain the oil, remove the hose from the clamp, remove the cap and point down into collection container.

There is no breather fitted to this differential.

**NOTE:** The lubricant specification can be found in Chapter 10 'Lubrication and Maintenance'.



# Drop Legs

The Crop Cruiser run a 1:1 chain driven drop leg. 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 bottom axle shaft.

The drop legs have an oil bath sump which the chains run through to carry oil to the bearings. The oil level can be checked by removing the level plug.

## Drive Chain Maintenance

Crop Cruisers are fitted with quality Tsubaki Super 120 HT 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.

Even the best chains eventually stretch over time and become loose however. 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.

The maximum allowable chain stretch is 1.5%. The amount of chain stretch can be measured with the chain stretch tool supplied with the sprayer. Each chain should be checked with a matched chain gauge made for that specific chain.

CHAIN INSPECTION PROCEDURE

1. Apply hand brake and chock all wheels
2. Remove rear drive leg inspection cover.
3. Place a jack with suitable lifting capacity under the drive leg and lift the wheel just off the ground.
4. Rotate wheel so that the chain is tensioned on the inspection cover side.
5. Select the lowest stretch gauge (0.5%).
6. Sit the lower point of the chain gauge onto a chain roller and tilt the top point forward trying to slide it under the roller three positions away. Always try the chain in at least three places. If it fits under the roller easily go to step 7, if not, then the chain has acceptable stretch and does not require replacement.
7. If the gauge fitted under the roller, repeat steps 5 & 6 using the next sized chain gauges (1.0 &1.5%). If the 1.5% chain gauge fits then the chain is outside the allowable limit and must be replaced. Always try the chain in at least three places.

**NOTE:** The part number for the gauge set is GA5068320.

**Above:** Chain gauge being used to assess chain stretch percentage.

## Bottom Sprocket Inspection

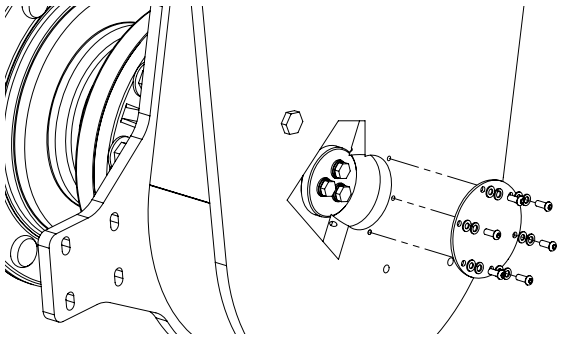
On the inside of the rear drop legs are inspection covers to allow access to the 3 bolts retaining the bottom sprocket.

The oil will need to be drained to below the inspection port into a suitable container before removing the cover.

Next remove the 6 socket head cap screws and remove the cover from the drop leg.

Then check that the M10 bolts are still torqued up to 46 ft/lbs and then clean the surface around the inspection port and clean the cover plate too.

Apply a suitable sealant or gasket to the surface and screw the cover plate back into place. Tighten the socket head cap screws up to 9 ft/lbs. Refill the drop leg up to the level hole using the recommended oil as listed at the start of this chapter.



# 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.

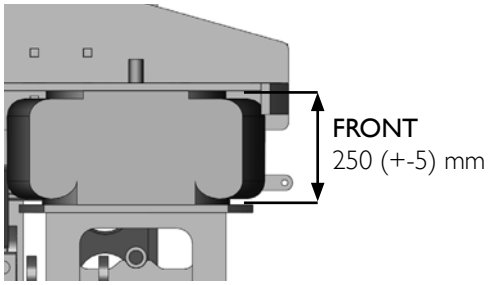
The rear axle has two ride height valves which level the sprayer, the front axle has one ride height valve in the middle of the axle which maintains the required height and allows it to pivot freely.

## Airbag Height settings

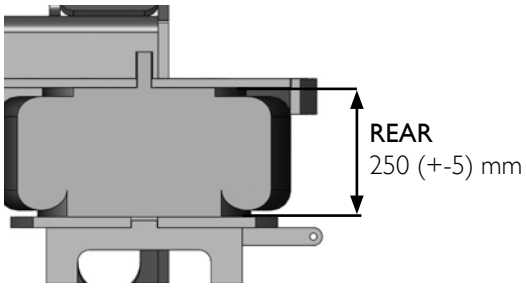
The distance setting for the air bags should be 250 (+-5) mm for both front and rear. If this distance is not maintained the angle of the drive shaft changes to cause a vibration and possible damage to the drivetrain.

*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 top of the small arms protruding from the bottom mount.

PROCEDURE TO EVACUATE AIR BAGS FOR TRAILER TRANSPORT

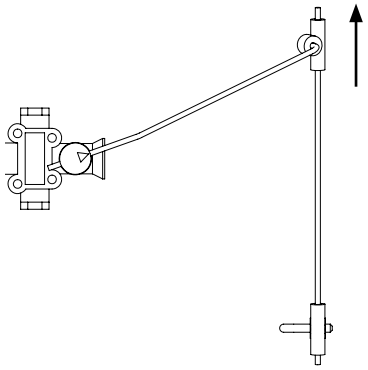
Loosen the drain tap on the air tank and drain the air. Loosen the fitting on the top of the air bag mount and release the air in the air bags. The air bags will lower on to the bump stops. Once the machine is on the bump stops tighten up the air tank valves and the fittings to the air bags. Don't alter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

## Ride Height Valve Adjustment

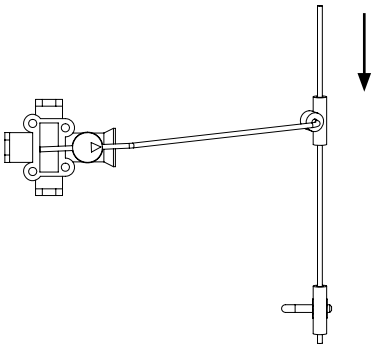
The ride height valves are used to adjust the air pressure within the air bags to maintain the correct ride height. There are two ride height valves located on each side of the rear axle and one located in the centre of the front axle.

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.



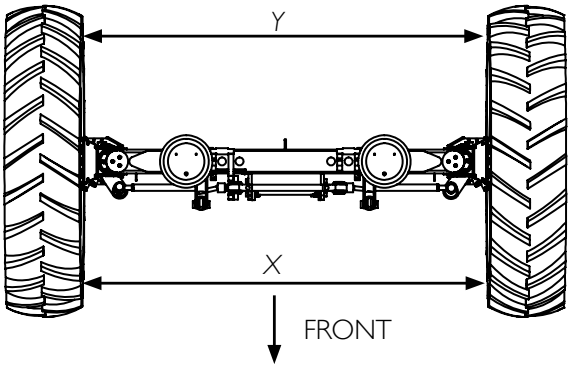
**Above:** To lower the machine, move the arm down the vertical rod.

# Steering

## Steering Toe In

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

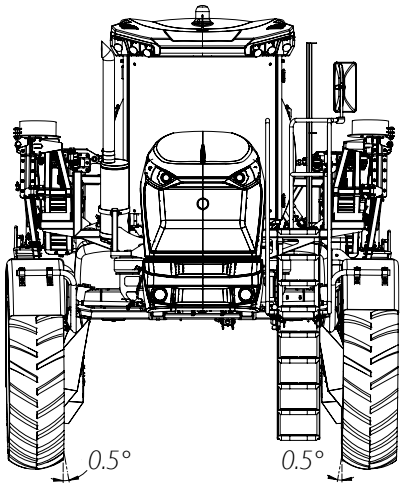
1. Stop the machine on a flat level surface, apply the parking brake and remove the keys from the ignition.
2. Measure up from the ground 900 mm on the front of the steer tyre and mark.
3. Repeat for the rear of the steer tyre.
4. Measure between the front of the left and right steer tyres at the mark 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 +0.5°.



# Braking system

The braking system used on a G4 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 front of the sprayers are a customized construction and are a 600 mm diameter rotor that is fitted to the hub on the inside of the wheel. The rear are a 310 mm diameter steel rotor and are mounted on the differential.

## Calipers and 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 under the transmission in the centre of the chassis. The right hand side booster is used to power the rear brakes and the left hand side booster is used to power the front brakes. To maintain sufficient brake fluid in the system, each brake booster reservoir must be checked regularly.

## Bleeding the Brakes

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 under the transmission in the centre of the chassis. If there has been a brake pad change, a leak in the lines or for any reason the brake lines or calipers have been removed then the system need to be bled.

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 as shown below.

**Left:** Front brake caliper bleeding setup

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.

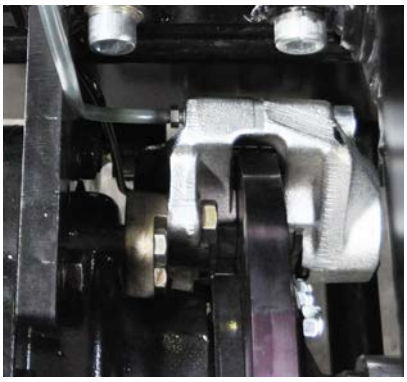
2. With an assistant, loosen the bleed screw and then slowly depress the brake pedal. When the brake pedal reaches its full travel re-tighten the bleed screw before allowing the pedal to return to its released position. Continue this process until the air in the system stops bubbling up in the container 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.

*Continued over page*

# Braking System



**Left:**
Rear Caliper mounted to differential

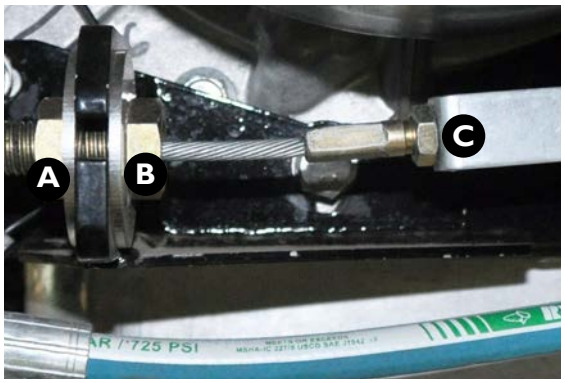
## Park Brake

The park brake is mounted at the rear of the transmission. It is a drum brake that is applied using a cable mounted to a hand operated lever at the left hand side of the driver seat.

PARK BRAKE ADJUSTMENT

- Park the sprayer on even level ground. Leave the park brake on so the cabin access ladder remains down.
- Turn engine OFF.
- Chock all wheels of the sprayer, ensuring it cannot roll while it is being worked on.
- 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.
- In the cabin, release the hand brake. Undo the screw that is in the head of the lever shown below.

- Rotate the top knurled section of the lever to adjust the tension on the cable.
- Test the tension by pulling the hand brake ON. If the lever comes up into the ON position with small amount of effort, the adjustment has made the cable more slack. If the lever comes into the ON position with more effort than before then the cable has been tightened.
- If there is no more adjustment in the lever in the cabin then the adjuster at the park brake on the transmission can be used.
- 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 not be spun by hand.
- Once adjustments have been made, tighten lock nuts (A & B).




To test the park brake, start the machine and drive to a small embankment or hill, stop and put the machine in neutral, apply the park brake with your foot brakes on. Slowly release your foot from the foot brake and see if the machine starts to roll backwards. If the machine does start to roll apply the foot brakes to stop, the cable still needs to be adjusted more until it can hold the machine.

There is also a switch fitted to the park brake in the cabin. This switch controls the position of the cabin access ladder. When the park brake is engaged the switch dumps air from the ladder cylinder allowing the ladder to lower, when the park brake is disengaged the switch supplies air to the cylinder positioning the ladder up in the transport position. The switch is also used to ensure that the transmission is in neutral.

# 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.

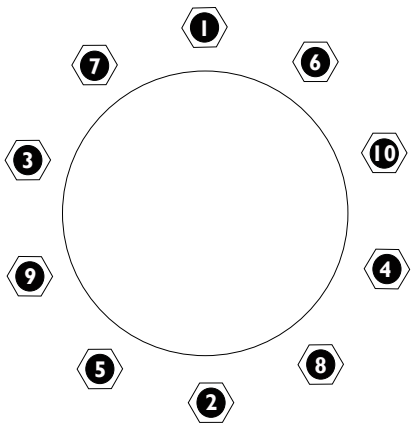
Tyre Pressures must be checked daily to maintain a satisfactory working life.

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 for front wheels is 350 ft/lb and for rear wheels is 300 ft/lb.




Above: Follow this tightening sequence to ensure even wheel nut torque distribution (Front 350 ft/lb, Rear 300 ft/lb).

# Hydraulics

Crop Cruiser sprayers are fitted with two hydraulic systems. The first is used to operate the steering & hydraulic cylinders on the boom. The second system is used to operate the liquid spray pump.

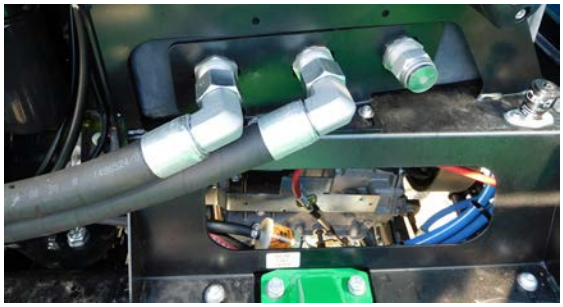
These systems operate from a common hydraulic reservoir. The reservoir has a sight tube mounted on the side with a temperature gauge fitted. The oil level must always be visible in top third of the tube. The oil temperature will normally run at 60-80 degrees Celsius. The oil should be checked as per the maintenance schedule.

**WARNING:** Working with hydraulics is dangerous. Ensure the machine is switched of and the ignition source is isolated before working near the centre section.

**NOTE:** The lubricant specification can be found in the first table of this chapter.

## 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 liquid 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. The cooler fins should be kept clear of debris.

## 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.

# Hydraulics

| 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.

## 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.

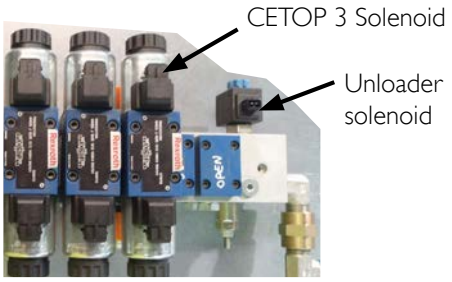
The boom functions are controlled by the solenoid block mounted at the top of the boom centre section. This hydraulic block is plumbed as an open centre circuit. The oil from the priority valve flows through the block continuously. When a hydraulic function is activated the unloader solenoid closes providing 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 |

## 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.



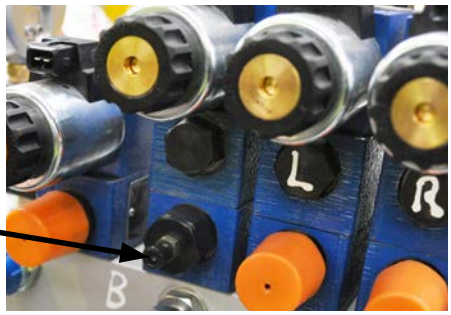
# Hydraulics

## 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.

Flow control spool




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.

Red knob

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.

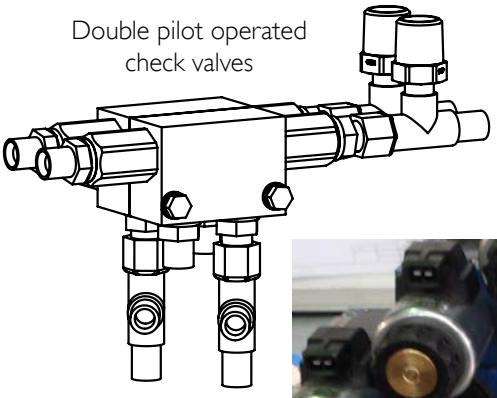
## Tilt Left/Right Solenoid

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.

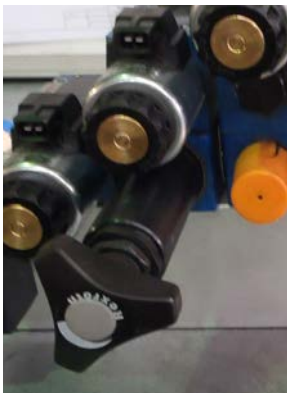
## Bi-fold Circuit

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

Double pilot operated check valves



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 pilot operated check valves in the system to maintain the pressure in the boom lines when it is folded out in the working position.

# 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.

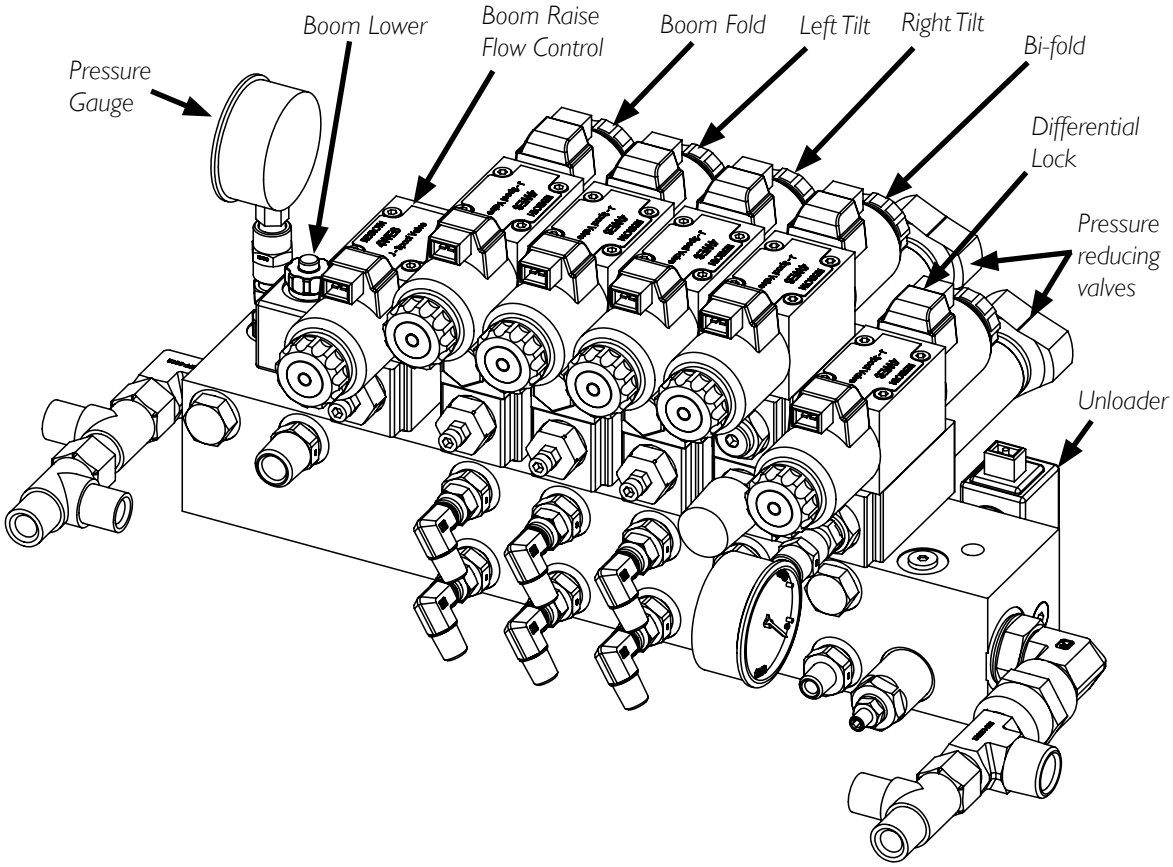
The solenoid valve blocks have various functions.

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

## 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.

## 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.

## 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.

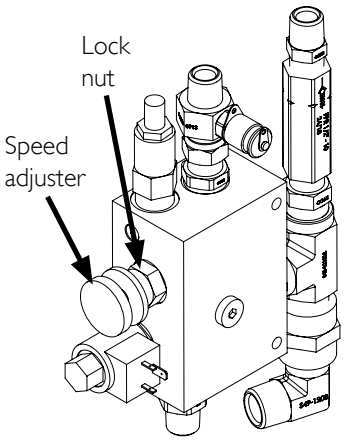
## Spray Pump Needle Valve

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. Maximum pump speed is factory set at 540 rpm and must not be exceeded.

If the pump still rotates when the pump has been turned off, the 10 bar check valve that is in the tank line from the pump needs replacing.

## 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 540 rpm. 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.




**Left:** Liquid spray pump control manifold. Located on the right hand chassis rail behind the front axle.

# Hydraulics

## 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.

## 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").

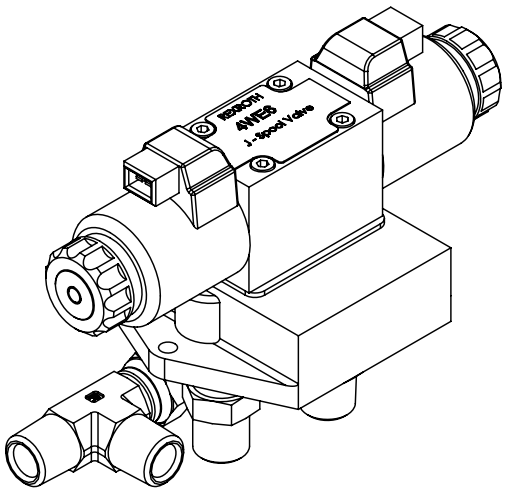
A smaller size delivery line can be used but will reduce pump output.

## Differential Lock

Hydraulic pressure to the differential lock is controlled on the spool block. This is done by a pressure reducing valve which is fitted with a dedicated pressure gauge. Use the knob on the back to set the pressure no higher than 35 BAR (500 PSI).

## Hydraulic Fill Pump (Optional)

The fill pump is controlled by the electric over hydraulic valve block mounted in the middle of the chassis and behind the front axle.



# Pneumatic System

The pneumatic system on this machine is used to actuate the brakes, operate the air bags, control the cabin access ladder and RapidFire system if optioned.

## Air Tanks

The air system fitted to this machine incorporates two air tanks all located on the cross rail under the engine. The first tank on the left collects the air from the compressor and feeds air to the rear brakes and then on to the second tank through a one way valve. These valves are designed to prevent de-pressurisation of the second tank if a fault develops upstream of these points in the system. The second tank, located on the right, is used as a reservoir for the front brakes and also supplies air for the front and rear air bags and ladder.

Due to condensation in the tanks, they must be drained daily. The first tank in the system after the compressor receives the majority of the fluid entering the system. To drain fluid from both tanks a drain tap has been placed into the bottom of each. They must be drained on a 10 hour or daily basis.

To drain the air, open the manual drain taps 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 cold

## 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 opens when a pressure of 150 PSI is reached and vents the excess 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.

## 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 of tank 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 1.

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.

## 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.

# Electrical System

## Batteries

The electrical system operates on 12 Volts. To provide a 12V supply with sufficient current two 12V batteries have been used in parallel. This means that the 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 right hand chassis rail behind the fuel tank.
- 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. **Ensure the TCM is disconnected.**
- 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 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 located on the right hand chassis rail behind the fuel tank.

After engine shutdown, wait for a minimum of 30 seconds before turning OFF the isolator switch. This allows the engine data to be saved back to the ECM.

CAUTION: Not to be used as emergency stop.


## Electrical Components

The Electrical control panels are 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 upwards.

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 'Cabin' chapter.

When a fault occurs, the corresponding circuit fuse will blow and disconnect the circuit.

If a fuse has been blown identify the corresponding device and investigate the cause before replacing with a 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

## General 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 coils 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.

The compressor drive 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. There should be no more than **12 mm deflection** in the belt when it is tensioned correctly. When the belt is correctly tensioned tighten the retaining hardware.

The compressor belt should be replaced every 1000 hours.

## 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 the condenser is cleaned.

## 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 heater 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.

## Cabin Air Cleaner

A carbon air cleaner is located in the right hand side of cabin under the roof. 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 which pressurises the cabin and prevents impure air entering the cab through any holes or seal leaks from outside.

To access the area under the roof, remove the 2 screws at the rear of the roof, lift the rear of the roof and place the support bracket in the locator. Remove the 4 thumb screws and remove cover, remove the old filter. Remove the new filter from the plastic bag. Place new filter in with the seal face to the inside. Replace the outer cover and refix the thumb screws. Lower roof and refix the 2 screws to hold roof.

NOTE: Filter specifications can be found at the beginning of this chapter.

# First Service - 50 Hours

**ENGINE**

| SERVICE ITEM | TYPE OF SERVICE | PART NO. - GOLDACRES | PART NO. - GENERIC |
|---|---|---|---|
| Engine oil | Drain & Replace | GA5012457 (20L)<br>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 (2WD ONLY)**

| SERVICE ITEM | TYPE OF SERVICE | PART NO. - GOLDACRES | PART NO. - GENERIC |
|---|---|---|---|
| Front wheel bearings | Check Pre-load & Inspect | GA5052200 | - |
| Toe in (1-5 mm) | Measure | - | - |

**FRONT AXLE (4WD ONLY) & REAR AXLE**

| SERVICE ITEM | TYPE OF SERVICE | PART NO. - GOLDACRES | PART NO. - GENERIC |
|---|---|---|---|
| Differential oil | Drain & Replace | GA5047310 (200L) - JCB non adj. axle | - |
| | Drain & Replace | GA5072325 (20L) - Dromos adj. axle | |
| Drop leg oil | Drain & Replace | GA5047310 (200L) | - |
| Planet hub oil | Drain & Replace | GA5047310 (200L) | - |
| Drive chains | Inspect & Measure | GA5075260 | - |

**HYDRAULIC OIL TANK**

| SERVICE ITEM | TYPE OF SERVICE | PART NO. - GOLDACRES | PART NO. - GENERIC |
|---|---|---|---|
| Hydraulic oil return filter | Replace | GA5069056 | - |

**AIR-CONDITIONING**

| SERVICE ITEM | TYPE OF SERVICE | PART NO. - GOLDACRES | PART NO. - GENERIC |
|---|---|---|---|
| Compressor drive belt | Check & Re-tension | GA5071435 | - |

# 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 | 11L | GA5012457 (20L)<br>GA5017913 (200L) |
| Hydraulic oil | 46W Dedicated hydraulic oil<br>eg: Total Equivis ZS 46 | 90L | GA5017199 (200L) |
| Transmission | Castrol Allison Transynd - TES295 | 20L approx. (dry) | GA5006959 (20L)<br>GA5006960 (208L) |
| Transfer Case | SYN FE 75W-90 | 1.7L (Case volume only - use fill plug level as reference when replacing full circuit oil) | GA5072325 (20L) |
| Differentials | 80W90 API GL-5 -<br>JCB Non-adjustable axle | 9L | GA5047310 (200L) |
| | 75W-90 API GL-5 Full Synthetic -<br>Dromos adjustable axle | 4.5L | GA5072325 (200L) |
| Driven drop leg oil | 80W90 API GL-5 | 10L (per leg) | GA5047310 (200L) |
| Planetary hubs | 80W90 API GL-5 | 5L approx. | GA5047310 (200L) |
| General grease points | Multi-Purpose Grease | - | - |
| Steering pivot points | Molybdenum Based Grease | - | - |
| Coolant | TEC PG XL Cummins | 36L approx. | GA5008311 (205L) |
| Brake fluid | DOT 4 Synthetic | 0.5L per booster approx. | GA5016739 (5L) |
| Spray pump | SAE 15W40 | 1.28L for Zeta 170 | GA5012457 (20L) |
| | | 2.68L for Zeta 260 | 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)<br>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 Return Filter | GA5069056 | - |
| A/C Carbon Filter | GA5075310 | 102.01 |
| Air Cleaner Primary Element | GA5071700 | AF26120 |
| Air Cleaner Secondary Element | GA5071705 | AF26121 |
| 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 - Low 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

GA8700538_R4 applies from 2016

**G4 MAX SPEED FULLY LOADED IS 25 KM/H**

| TYRE BRAND | TYRE SIZE | RECOMMENDED TYRE PRESSURE KPA | PSI |
|---|---|---|---|
| HARVEST | 380/90R46 (14.9R46) HR45 159A8 | 275 | 40 |
| HARVEST | 380/90R46 AusFlex HR45 173D | 240 | 35 |
| HARVEST | 460/85R38 (18.4x38) 159A8 Cross Ply(16) | 200 | 29 |
| HARVEST | 460/85R38 (18.4R38) HR45 149A8/146B | 158 | 23 |
| HARVEST | 480/80R46 (18.4R46) HR45 166A8/159D | 240 | 35 |
| HARVEST | 520/85R38 (20.8R38) HR45 155A8/152B | 262 | 38 |
| HARVEST | 520/85R46 (20.8R46) HR45 173A8 X-LOAD | 207 | 30 |

NOTE:
PSI = kPa x 0.145

Example:
240 kPa x 0.145 = 34.8 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.

## Transfer Case

| SERVICE ITEM | DAILY (10Hrs) | WEEKLY (50Hrs) | 250hrs/ 3 months | 500hrs/ 6 months | 750hrs/ 9 months | 1000hrs/ 1 year |
|---|---|---|---|---|---|---|
| Oil | Inspect | Inspect | Inspect | Replace | Inspect | Replace |
| Bolts | - | Inspect | Inspect Tension | Inspect Tension | Inspect Tension | Inspect Tension |
| Oil Lines | - | Inspect | Inspect | Inspect | Inspect | Inspect |
| Electrical connection | - | Inspect | Inspect | Inspect | Inspect | Inspect |
| Cooling System | - | Inspect | Inspect | Inspect | Inspect | Inspect |
| Input output seals | Inspect | Inspect | Inspect | Inspect | Inspect | Inspect |
| Breather | Inspect | Inspect | Inspect | Inspect | Inspect | Inspect |

*Continued over page*

# Maintenance Schedules

## Transmission

| SERVICE ITEM | DAILY (10Hrs) | WEEKLY (50Hrs) | 250hrs/ 3 months | 500hrs/ 6 months | 750hrs/ 9 months | 1000hrs/ 1 year |
|---|---|---|---|---|---|---|
| Oil | Inspect | Inspect | Inspect | Inspect | Inspect | Inspect |
| Internal Filter | Replace on rebuild | | | | | |
| External Spin-on Filter | - | Inspect | Inspect | Inspect | Inspect | Inspect |
| 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 |

**NOTE:** The external filter should be changed every 2000 hours. Transmission oil should be replaced every 3000 hours with TES295 approved oil.

## 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 |
| Planetary hub oil | - | Inspect | Replace | Replace | Replace | Replace |
| Drive chains | - | - | Inspect Measure | Inspect Measure | Inspect Measure | Inspect Measure |
| Extendable axle drive shafts[1] | - | Lubricate Inspect | Clean & Lubricate | Clean & Lubricate | Clean & Lubricate | Clean & Lubricate |
| Extendable axle wear pads[2] | - | Inspect | Inspect | Inspect | Inspect | Re-adjust w/shims |
| Steering pins/bearing | - | Lubricate Inspect | Lubricate Inspect | Lubricate Inspect | Lubricate Inspect | Lubricate Inspect |
| Tie rod ends and ball joints[3] | - | 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[4] | - | Inspect | Inspect | Inspect | Inspect | Replace |
| Axles | - | Inspect | Inspect | Inspect | Inspect | Inspect |
| Toe In (1-5mm) | - | - | Measure | Measure | Measure | Measure |

**NOTE[1]:** Extendable axle drive shafts should be throroughly cleaned with a degreasing solvent before being liberally re-greased every 250 hours.

**NOTE[2]:** Extendable axle wear pads should be shimmed every 1000 hours to reset wheel camber as necessary. The wear pads should be replaced at 3000 hours.

**NOTE[3]:** 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.

**NOTE[4]:** Bearings in drop legs need to be replaced at 3000 hours.

# Maintenance Schedules

## Drive Shafts

| SERVICE ITEM | DAILY (10Hrs) | WEEKLY (50Hrs) | 250hrs/ 3 months | 500hrs/ 6 months | 750hrs/ 9 months | 1000hrs/ 1 year |
|---|---|---|---|---|---|---|
| Transmission, Axle Input, Centre Bearing & Transfer case (Opt.) | - | 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 |

## 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 |

**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.

## 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 |

# Maintenance Schedules

## 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 (F 350 ft/lb, R 300 ft/lb) | Tension | Tension | Tension | Tension | Tension | Tension |
| Tyre pressure | Inspect | Inspect | Inspect | Inspect | Inspect | Inspect |
| Tyres | Inspect | Inspect | Inspect | Inspect | Inspect | Inspect |

## 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 |

## 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 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 |

## 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 |

# 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 | See below | See below | See below | See below | See below | See below |
| Carbon filter inlet | - | Inspect | Inspect | Inspect | Inspect | Inspect |
| Compressor drive belt | - | Inspect | Inspect | Adjust | Adjust | Adjust |

**NOTE:** Carbon filter should be replaced every 200 hours.

## 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 | 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 |

# Maintenance Schedules

## 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 |
| Tilt wear pads | | Inspect | Inspect | Inspect | Inspect | Inspect |
| 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 |
| Flow meter (where fitted) | 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 |

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

*Continued over page*

# Spray Pump

| PROBLEM | COMMON CAUSES | COMMON SOLUTION |
|---|---|---|
| The flow rate is correct but my pressure is too low or high. | Nozzles | Check nozzle chart for correct nozzle size. |
| Pressure fluctuation | Air leak on suction side of pump | Check suction pump for air leaks. |
| | Incorrect pump speed | Adjust pump speed so it is between 400 - 540 rpm |
| | 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 so it is between 400 - 540 rpm |
| | 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<br>Faulty valve | Replace control valve |
| | | Temporary solutions:<br>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:

### BOOM VALVE OVERRIDE

1. Disconnect console from console cable.
2. Remove cap from boom valves.
3. Remove shaft locking screw.
4. Wind plunger shaft anti-clockwise to open valve.

To start and stop spraying through the nozzles, start and stop the pump.

**NOTE:** If the sprayer is fitted with Rapid fire, then the air valves located on the centre section can be operated by turning the small screw on the top of the solenoid (circled). The nozzles will now turn on. For more information on overriding the rapid fire solenoids, see 'Rapid Fire' section in 'Optional Accessories' chapter.

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

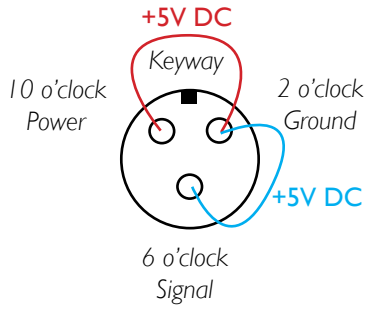
### CONTROL VALVE OVERRIDE

- 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.<br>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. |

# TriTech & Delta 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 |
|---|---|---|
| Boom valves fail to open. | Insufficient power. | Check all wiring and connections to ensure there is 12 volts at the valves. |
| | System pressure greater than 150 PSI. | Reduce the system pressure |
| Boom valves fail to close. | Insufficient power. | Check all wiring and connections to ensure there is 12 volts at the valves. |
| | Foreign objects blocking plunger from seating. | Clean the inside of the boom valves. |
| No water at boom. | No Tier valve entered or is at 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. | Inspect brake pads and replace immediately if worn beyond wear indicators. |
| | Brake pad rubbing on piston | Fit Anti-squeal liners on pads |

# Hydraulic & Pneumatic

| PROBLEM | COMMON CAUSES | COMMON SOLUTION |
|---|---|---|
| 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.

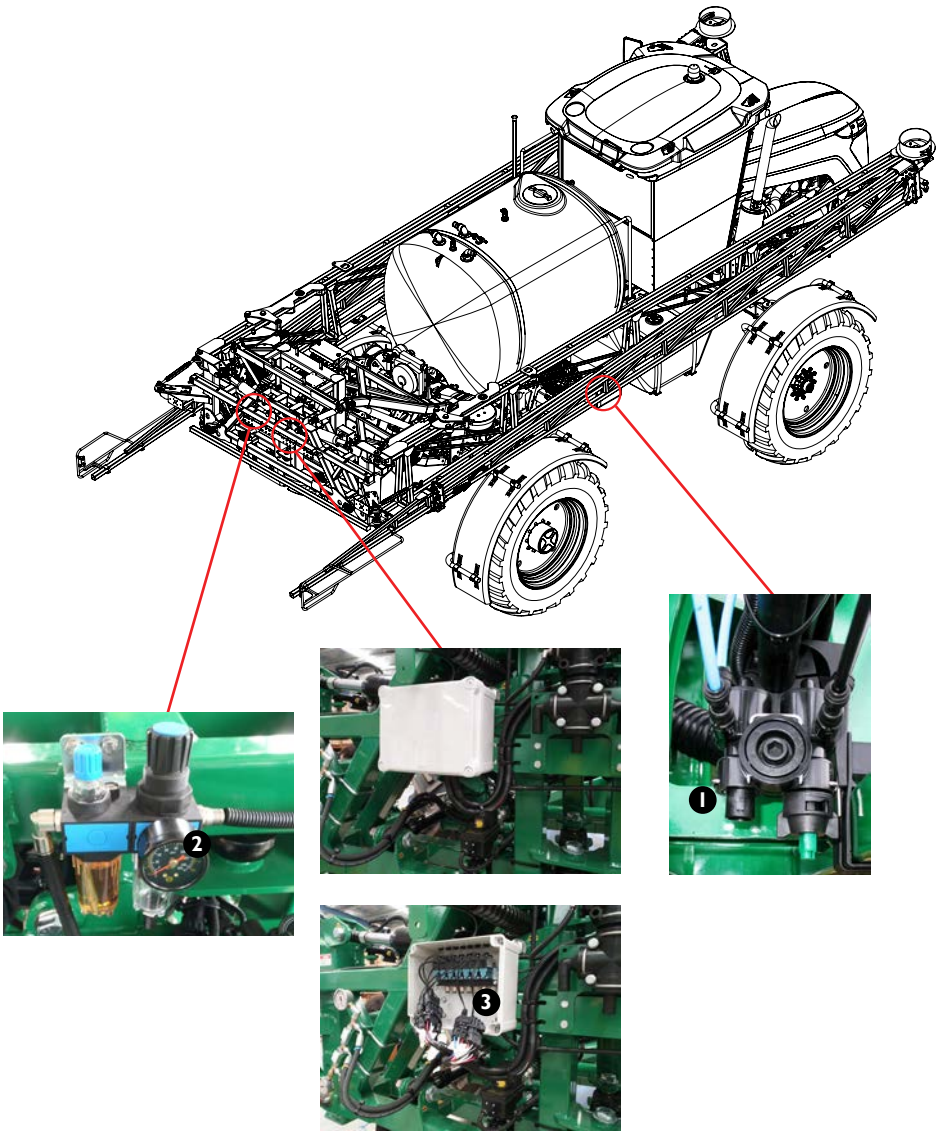
**NOTE:** These options may not be fitted to your equipment unless ordered.

# RapidFire - Non RCM

## Overview

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

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




| NUMBER | FEATURE |
|---|---|
| 1. | Air Check Nozzle Body |
| 2. | Air Dryer/Oiler |
| 3. | Air Solenoids |

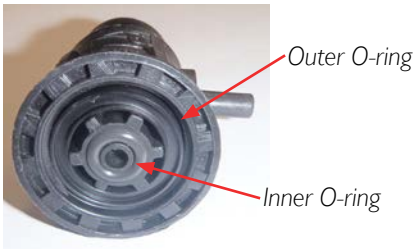
# RapidFire - Non RCM

## Nozzle and Air Check

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

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

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




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

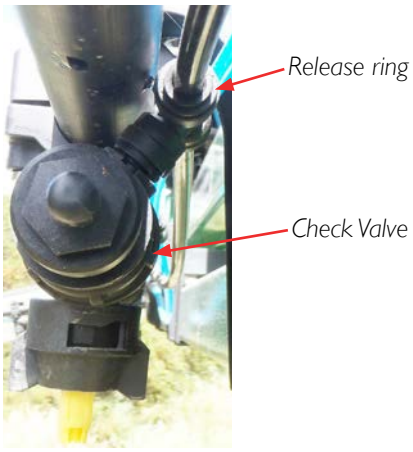
To remove the air hose from the check valve, push down on the release ring on the air fitting and at the same time, pull the hose.

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

Screw the air check valve back onto the main nozzle body.

When re-fitting the hose, simply push it into the fitting.

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




## Air Dryer and Oiler

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

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

The oil lubricates the air as it passes through to the RapidFire system. In turn, this lubricates the RapidFire seals and O-rings. The oiler must be checked weekly and serviced at approximately 250 hours or when required. The amount of lubricant drawn into the air supply can be increased or decreased depending on requirements.

The pressure regulator is used to set the maximum pressure available to the rapid fire system. This should be set to 80 PSI.

The black knob located above the water trap is used to set the air pressure. To unlock it, lift the black knob. Looking from above, turning the knob clockwise will increase pressure. Turning anti-clockwise will decrease pressure.

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

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

*Continued over page*

# RapidFire - Non RCM

*Lock* *Unlock*

*Increase pressure*

*Decrease pressure*

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 shown below. 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. A full bowl of oil should last about 250 hours. The oiler requires regular inspection and topping up every 250 hours or when required.

Moisture trap drain
- Right chamber


Oil flow adjustment screw
- Blue

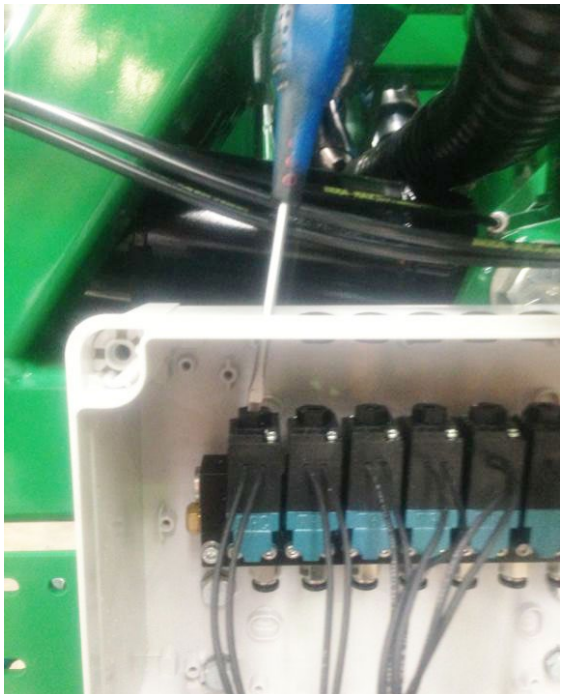
# RapidFire - Non RCM

## Solenoid Valves

The solenoid valves are, electrically, turned on and off to control the flow of air to the nozzles.

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

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

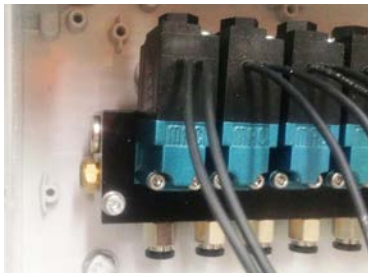


The valve should now be allowing air to flow out to the nozzle and if there is fluid in the lines, it should be coming out of the nozzle.

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

On the solenoid bank there are two exhaust ports. These must be kept clean so that the air can expel from these when the RapidFire nozzles are turned off. If these ports are blocked the air can not release from the air checks, through the solenoids to atmosphere and the nozzles will continue to spray.

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

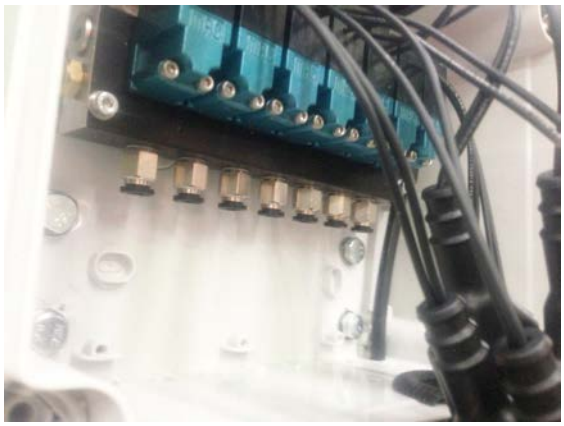


Exhaust port; one located on each end of the manifold.

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

*Continued over page*

# RapidFire - Non RCM



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


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

# RapidFire - RCM

## 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 can be fitted with up to 16 sections when RCM is fitted.

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 - RCM

## Air Solenoid Nozzles

The machine can be fitted with up to 16 sections when RCM is fitted. 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.

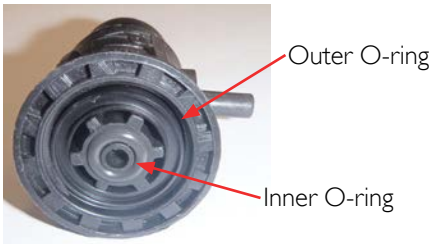
In the event that nozzles do not operate as expected there are some checks that can help diagnose and solve the problem. First check the electrical connections to the master air solenoids. There should be power at the connector when the nozzles are activated from the cabin and the connectors should be 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

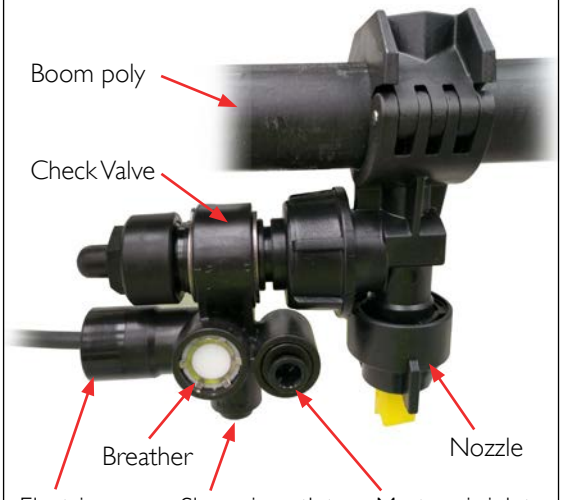
The air check nozzles allow for instantaneous response at the nozzle tip. The lines can be at spraying pressure and when switched on or off, the nozzle responds quickly with no dribbling, as pressure builds up or subsides.

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 - RCM

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.

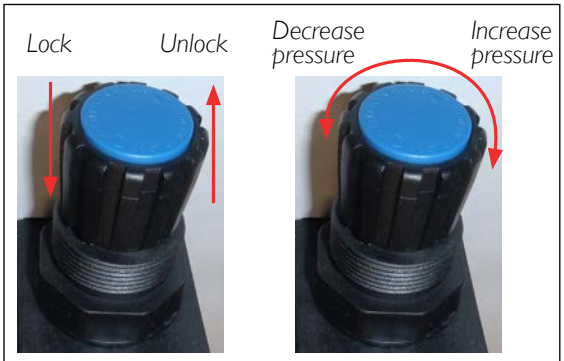
To drain the trap, turn the black knob at the bottom of the clear bowl and push it up. Air and moisture will be expelled from the bowl. Keep the knob pressed up until all the moisture has been released. Once finished, release the knob and turn it back until it stops. Ensure correct safety equipment is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

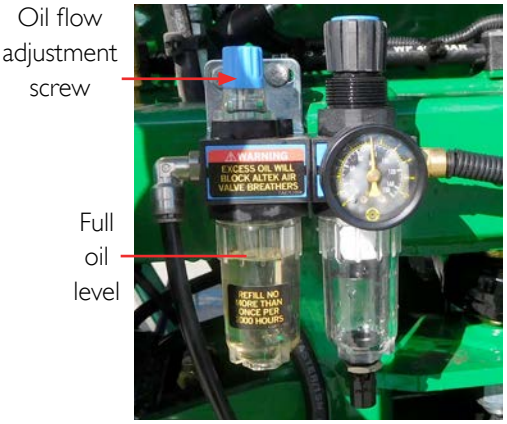
Fill the oil to within 5 mm of the top of the oil bowl. Use an air tool oil or equivalent.

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.

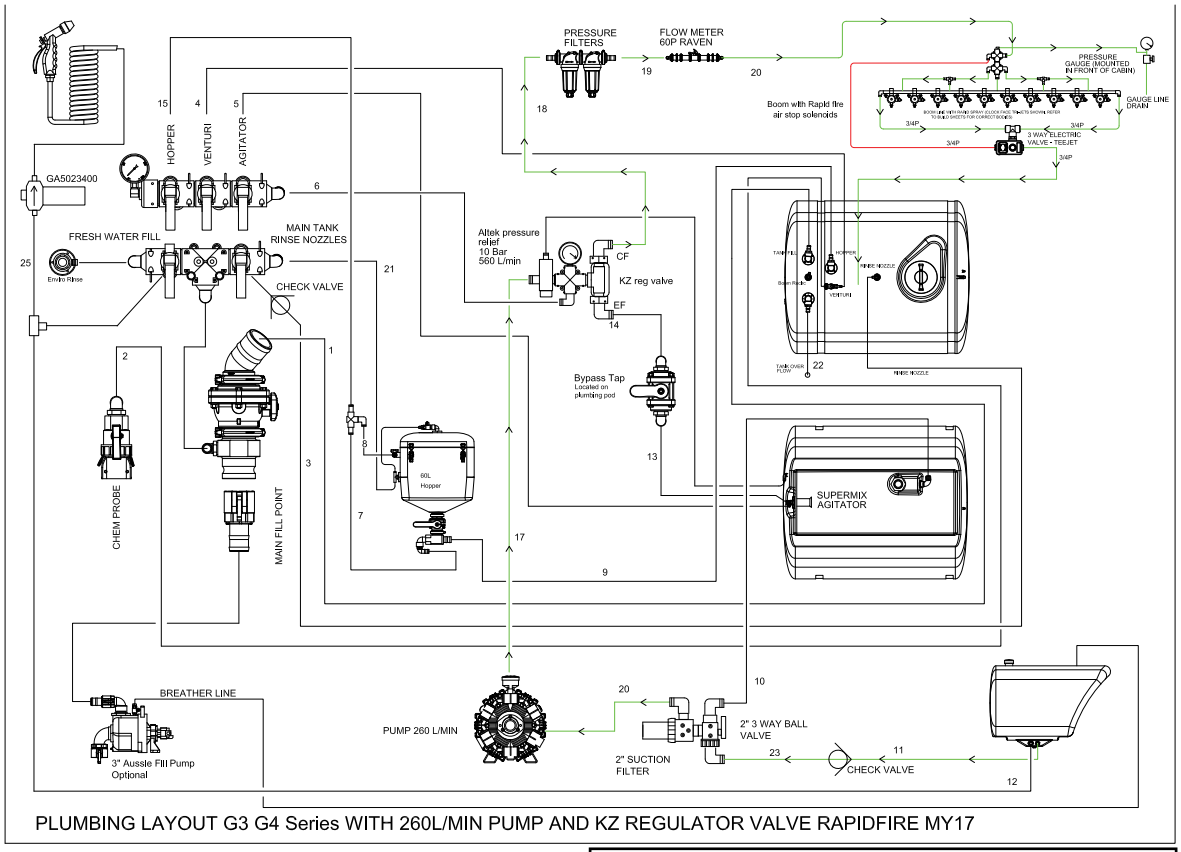
AFTER SPRAYING (RINSING)

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.

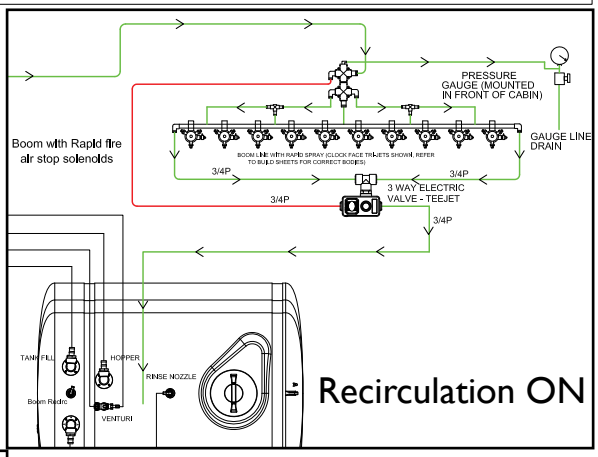
NOTE: The boom sections can be pulsed on/off to flush/rinse the tips and nozzle bodies.

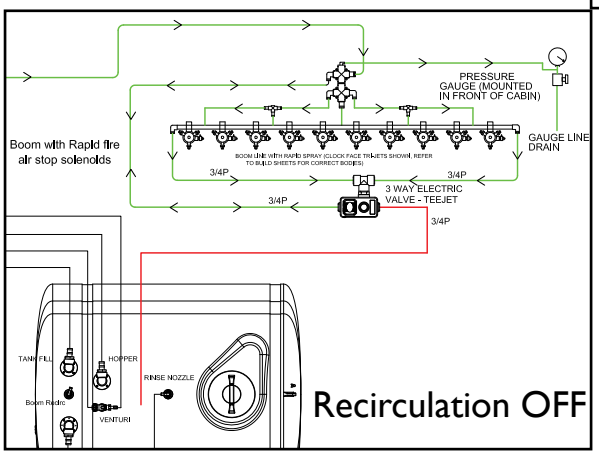
5. Turn off boom recirculation switch.
6. Turn spray pump off.
7. Reset spray pump suction mode back to main tank.

# RapidFlow - Pressure Delivery Schematic

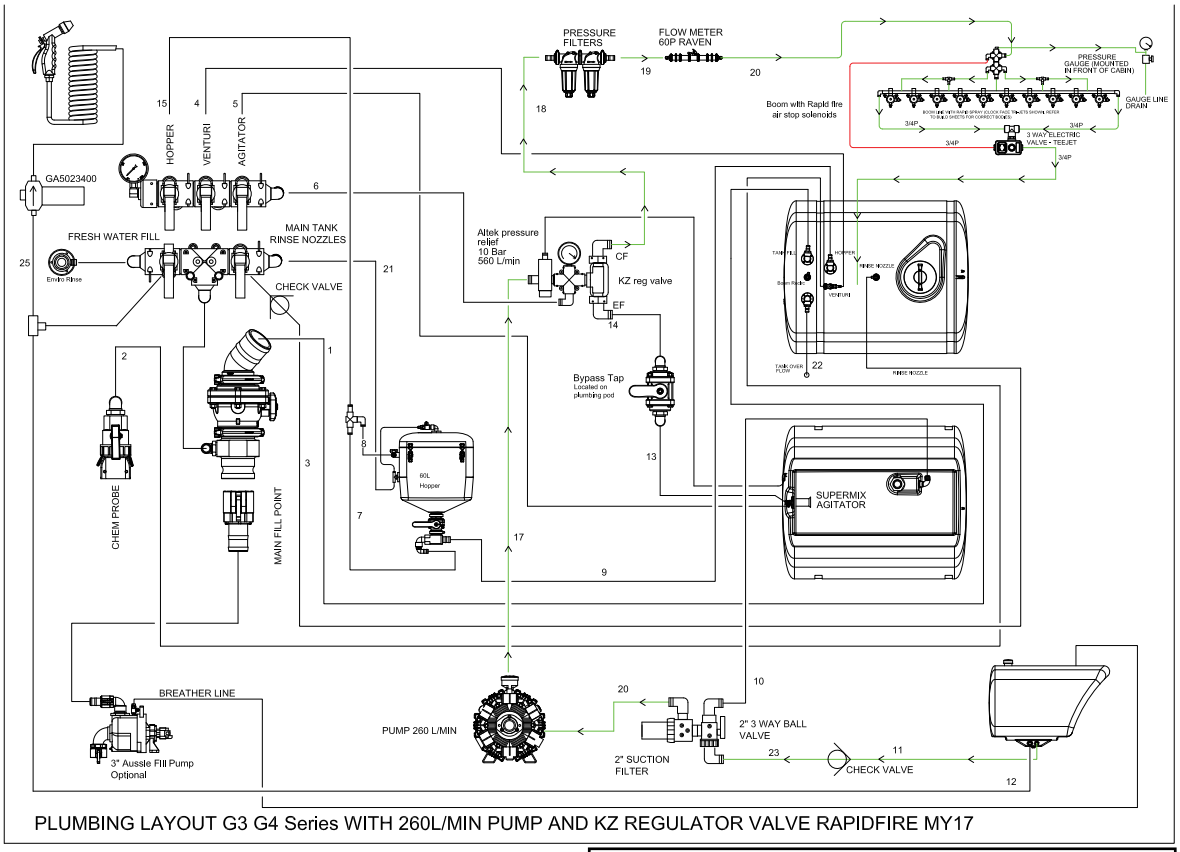



PLUMBING LAYOUT G3 G4 Series WITH 260L/MIN PUMP AND KZ REGULATOR VALVE RAPIDFIRE MY17

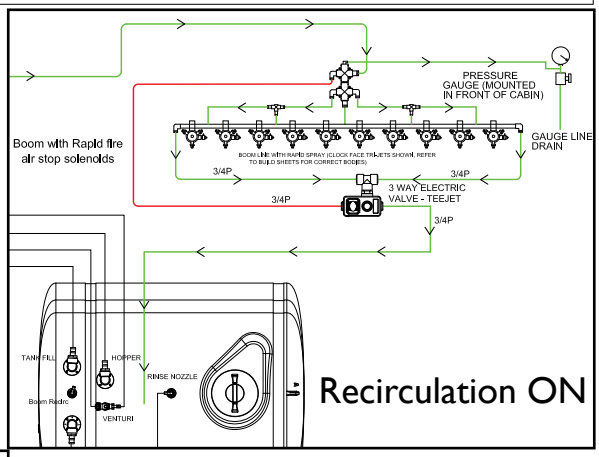


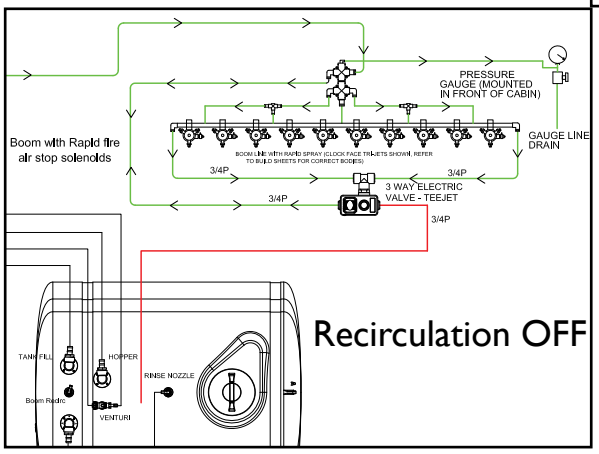



# RapidFlow - Rinsing Schematic




PLUMBING LAYOUT G3 G4 Series WITH 260L/MIN PUMP AND KZ REGULATOR VALVE RAPIDFIRE MY17



# Chemical Induction Probe

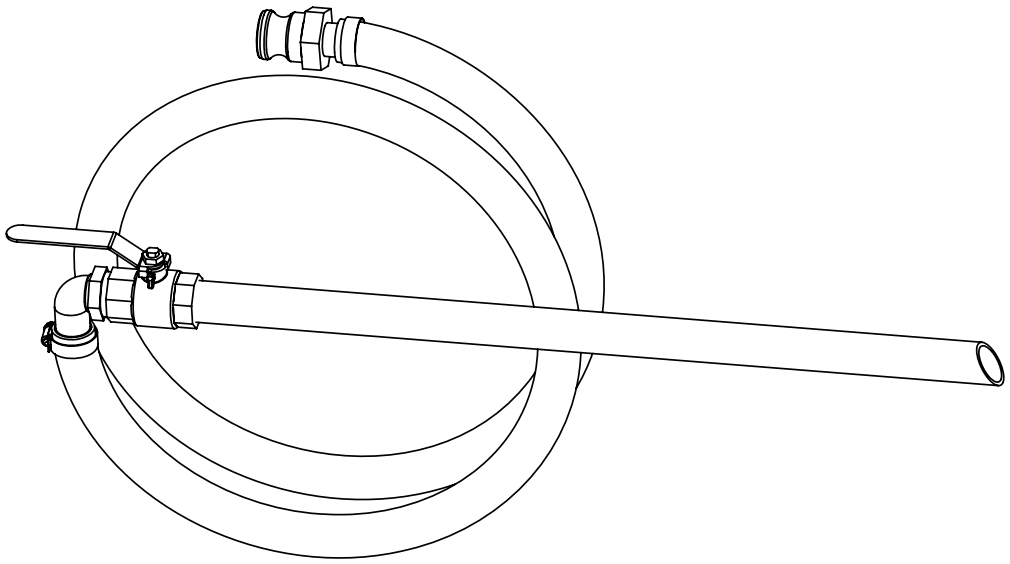
## Overview

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.



# 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.

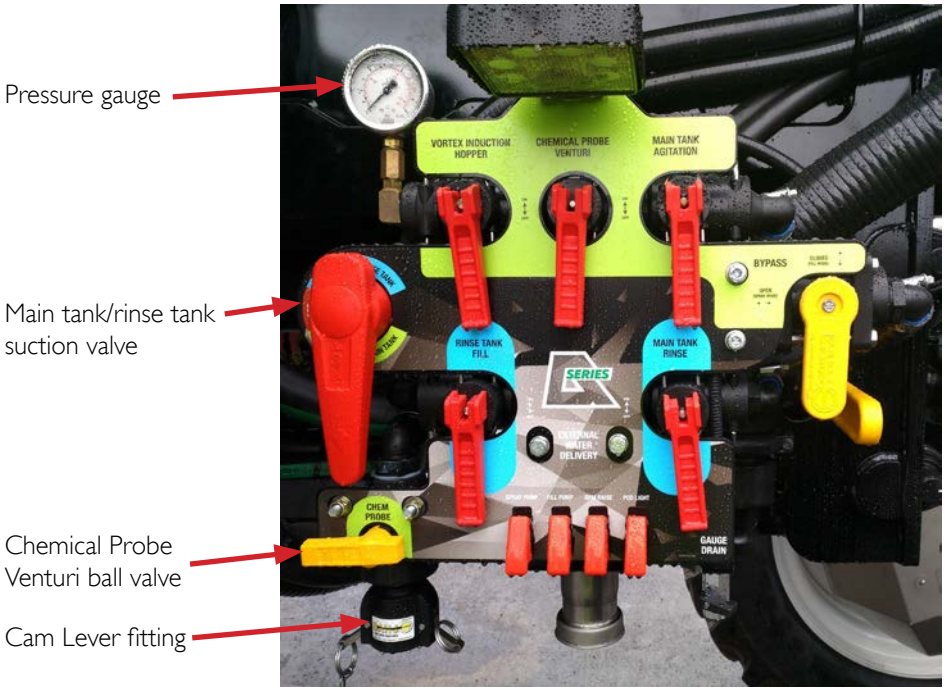
**NOTE:** This item is intended for the induction of liquid chemicals only.

**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 suction valve is pointing towards the 'Suction from main tank'.
3. Connect probe via cam lever fitting.
4. OPEN the ball valve above the cam lever fitting
5. Close all flip valves and set 'Bypass' valve to CLOSED.
6. 'OPEN' the chemical probe venturi flip valve.
7. Turn on the 'Spray pump' and 'RPM raise' switches to generate the speed necessary to produce a delivery pressure of at least 100 PSI. Do not run the pump faster than 540 RPM.

   The higher the pump delivery pressure, the greater the venturi suction effect and the faster the probe will transfer the chemical. The delivery pressure should not exceed 120 PSI as determined by the pressure relief valve setting.
8. Place probe in chemical.
9. OPEN the valve on the probe.
10. The chemical should be now transferring to the sprayer tank via the venturi filler.
11. 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.
12. When finished, rotate the 'Bypass' valve to OPEN/ spray mode, then flip open the Main Tank Agitator valve and flip the Chemical Probe Venturi OFF.
13. CLOSE the ball valve above the cam lever fitting, and disconnect the probe from the cam lever.

**NOTE:** 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.

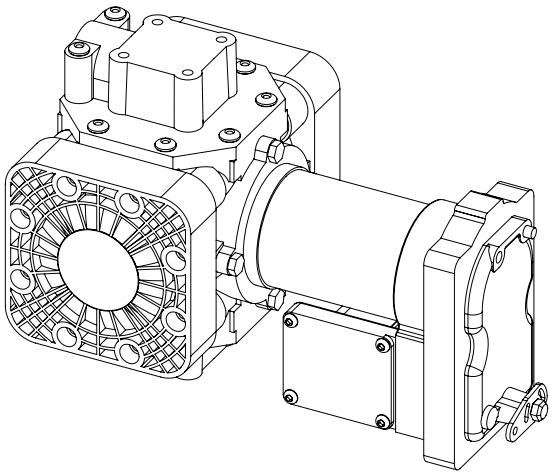
NOTE: Do not use the pump to transfer flammable petroleum products.

## 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).

# Flow Meter - FM-1100


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

# Flow Meter - FM-1100

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*

# Flow Meter - FM-1100

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.

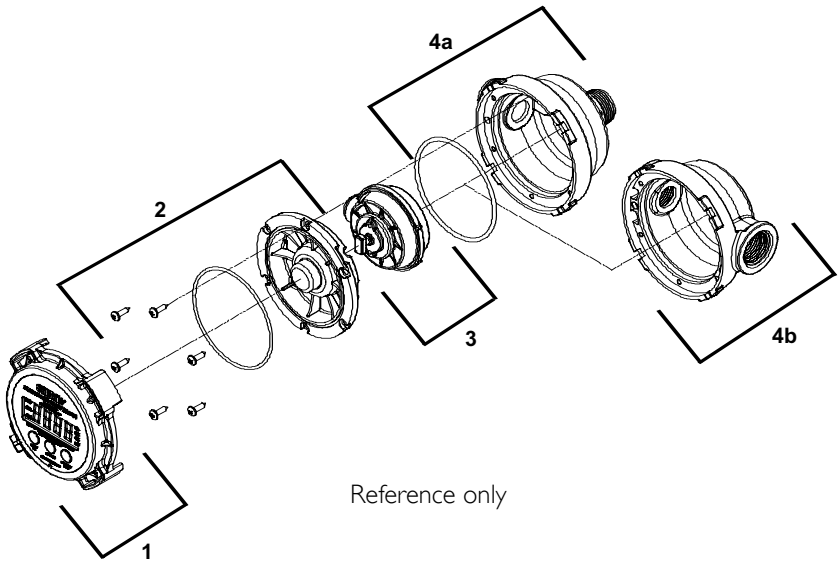
## To Display Software Revision Number

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

# 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.

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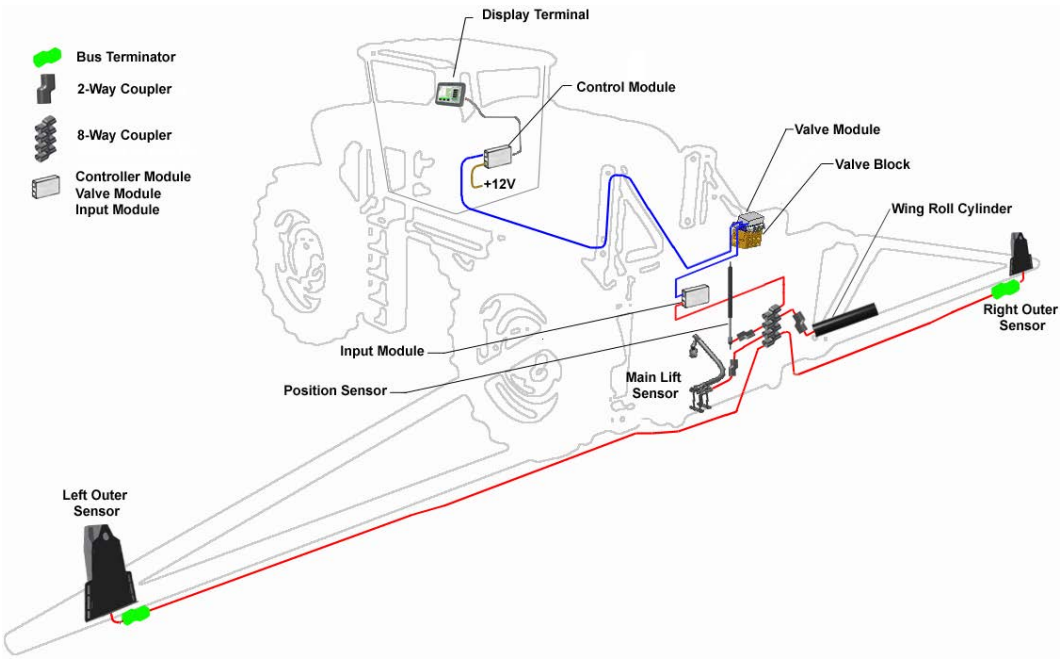
**PRECISION DEFINED**

## Goldacres UC5 Active Wing Roll



# Hydraulic Fill Pump

## Suction & Delivery Lines

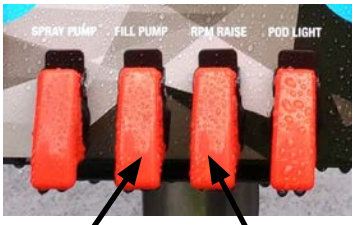
- Use good quality suction hose and fittings that will not collapse or leak air under suction.
- If pumping water from structures other than storage tanks, we recommend the use of an appropriate sized floating filter equipped with a check valve.
- It is essential the suction line to the pump is the same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

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

### 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 located just above the 3" quick fill coupling to ON.

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



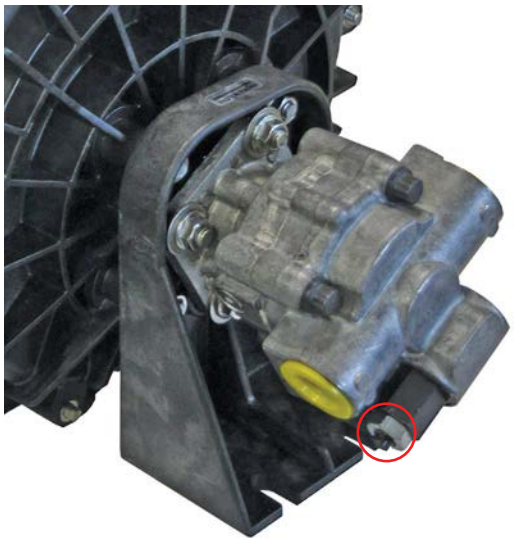

Fill pump switch — RPM raise switch

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.



# 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.

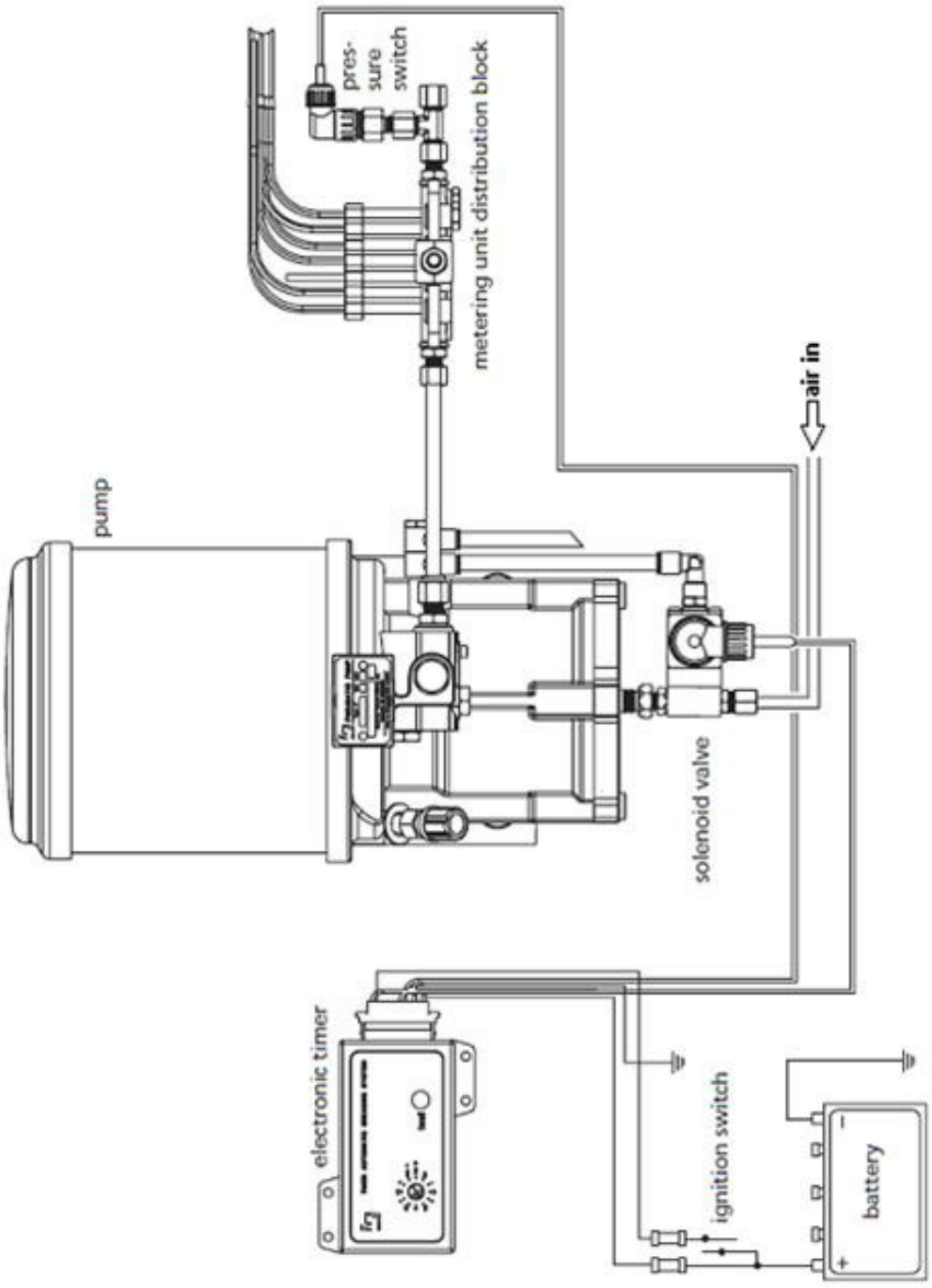
## Definitions

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.

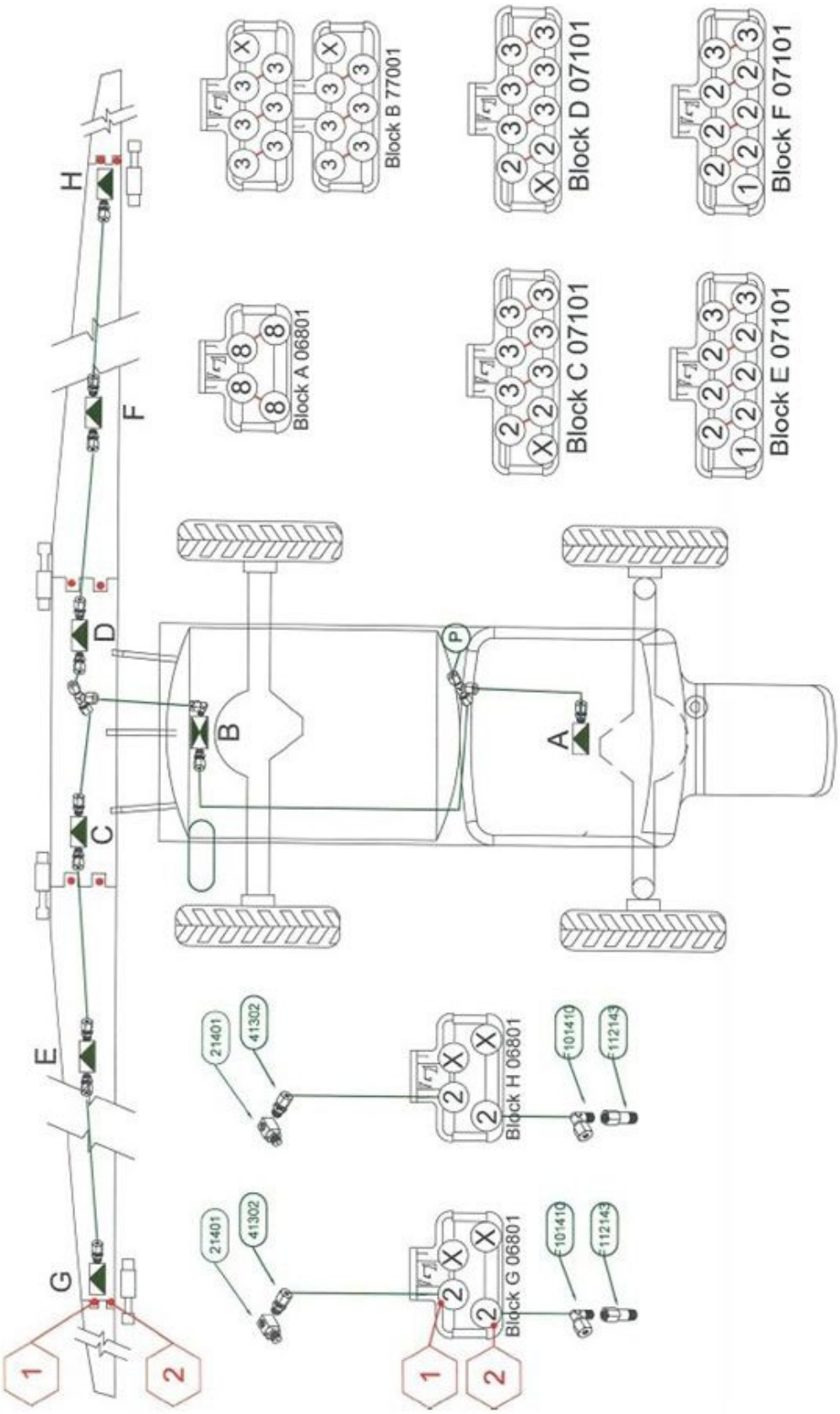
WARNING: Instructions that if ignored will cause personal injury or death to the operator or bystanders.

# Groeneveld Auto Greaser - Overview I




**Above:** System Overview

# Groeneveld Auto Greaser - Overview II




**Above:** System layout for crop cruiser

# Groeneveld Auto Greaser - Components

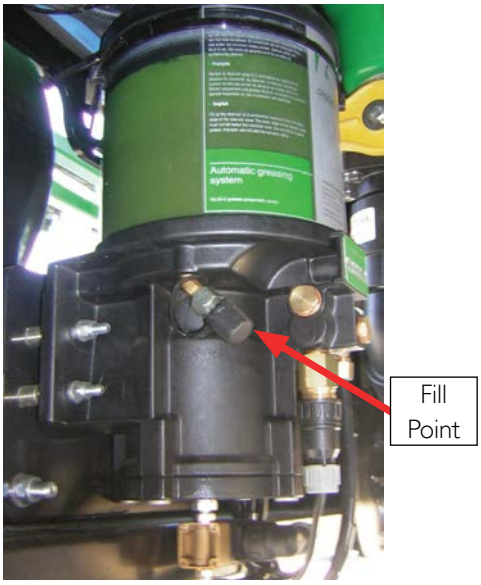
The COMPONENTS section will give you a basic run down of the components, their location and their purpose. A full operational description of the system is in the OPERATION section. Some settings, tips and words of advice and caution are also listed where applicable at each component's section. Please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

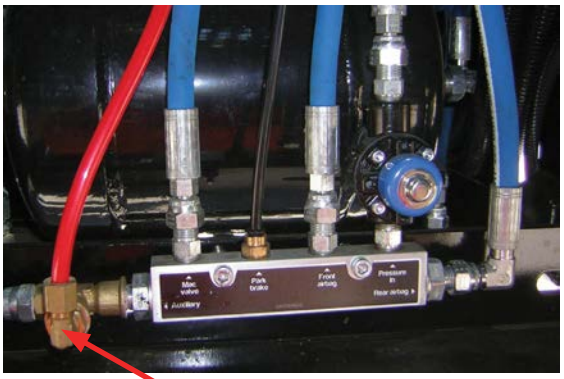
**IMPORTANT:** Do not overfill the main reservoir. Fill to about 2 cm from the top only. This instruction is also on the reservoir tank. Over filling will cause the reservoir to fracture.

**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.

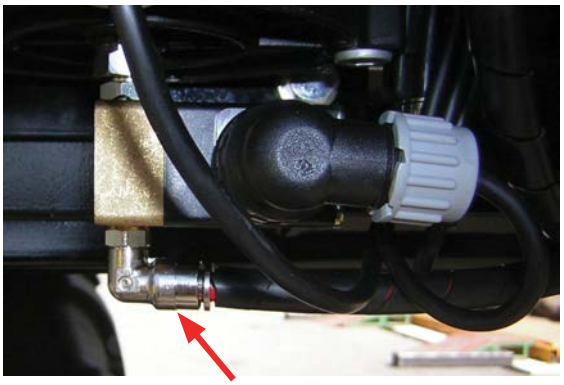
If you should happen to slightly overfill the reservoir, grease will overflow from the hole on the right of the pump unit. This will continue for about 3 days until the overflow channel is clear.

## 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.



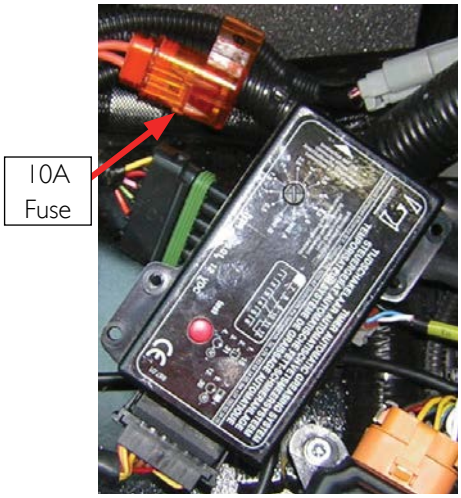
Main air supply from manifold



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.

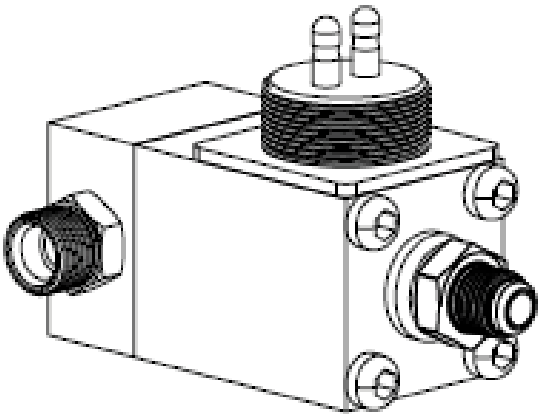
*Continued over page*

# Groeneveld Auto Greaser - Components

## Solenoid

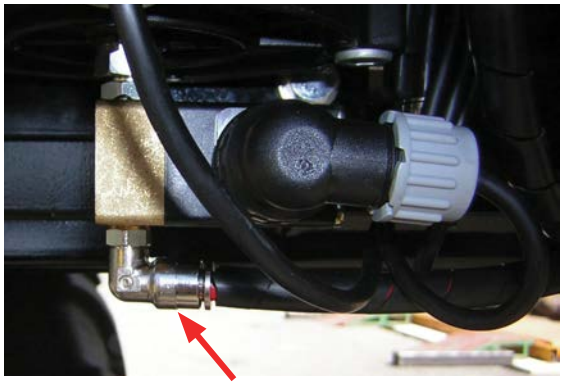
The solenoid at the bottom of the grease dispenser opens the valve, allowing air pressure to enter through the compressed air connection and push against the main piston.

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



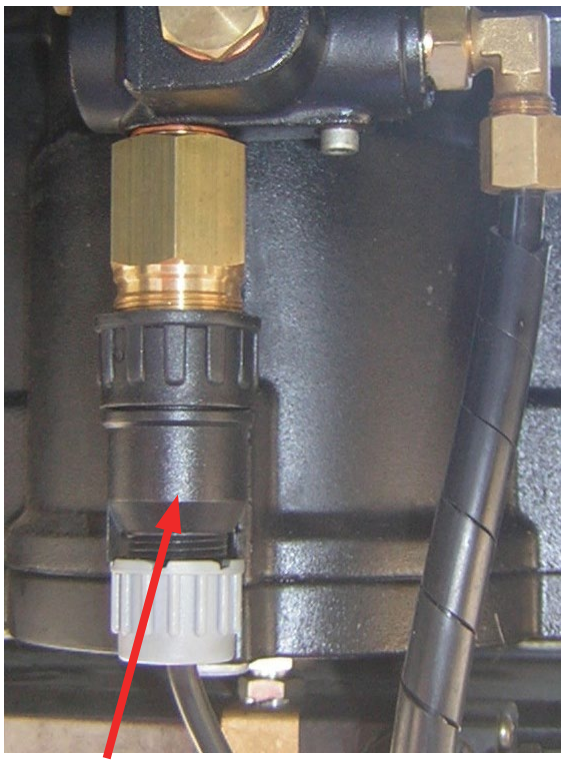
Main air supply input to pump unit solenoid

*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.



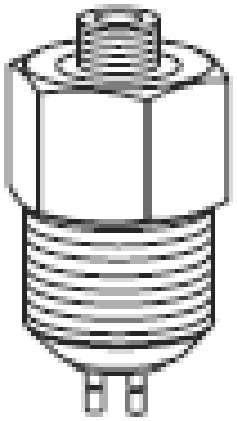
Pressure switch location

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.

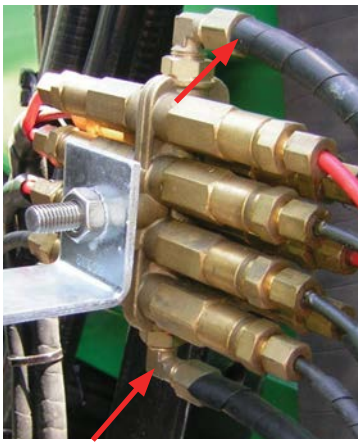

**Above:** Second grease outlet

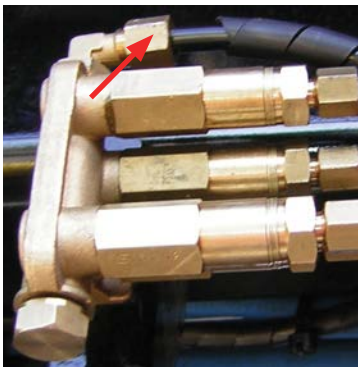
*Continued over page*

# 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.





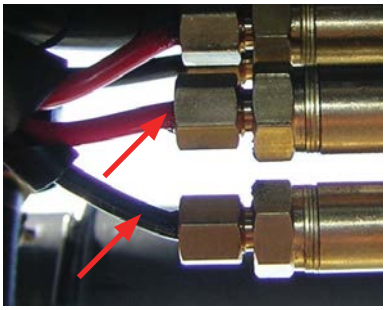
**Above:** Main Grease Lines

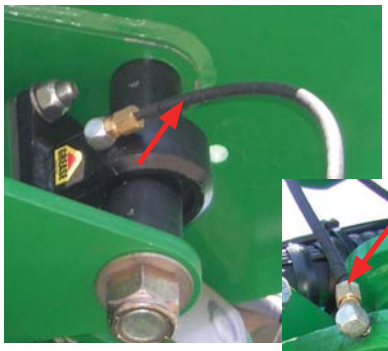
**IMPORTANT:** The main lines from the pump unit to the single or banks of metering units are monitored for pressure. Should one of these lines brake or leak, there will be a notable pressure drop in the system and a buzzer will sound in the cabin to alert you. The system will no longer be operating 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.

*Continued over page*

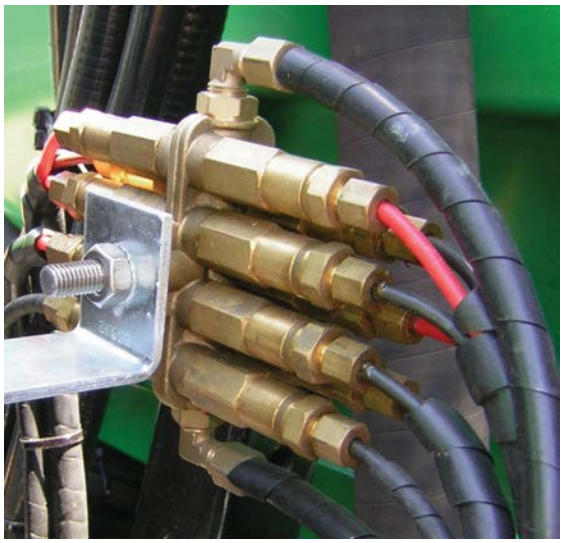
# Groeneveld Auto Greaser - Components

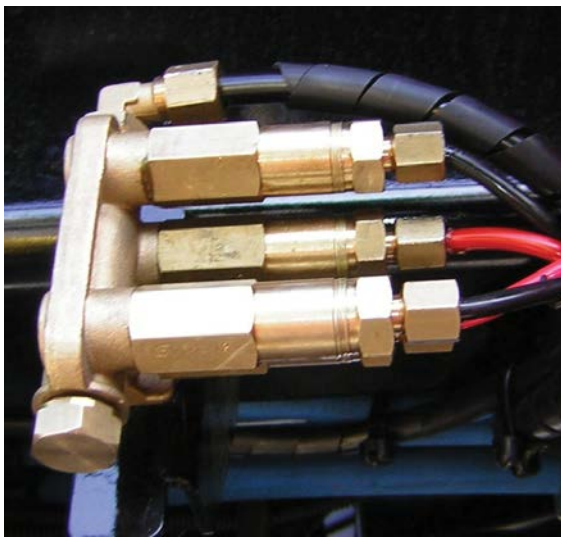
## Meter Distribution Block

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

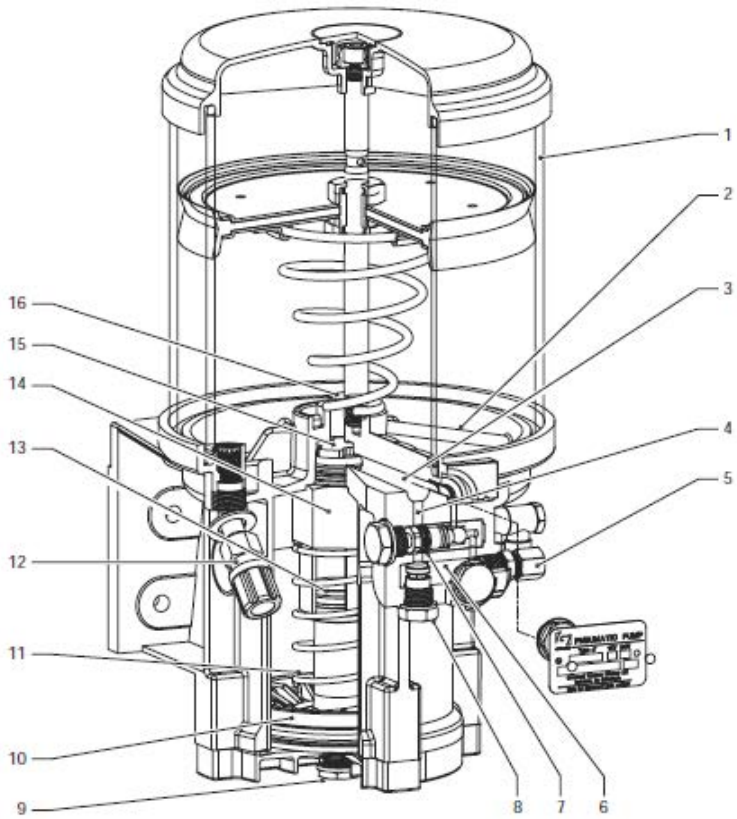




**Above & Right:** Fully fitted meter distribution block

# 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.

*Continued over page*

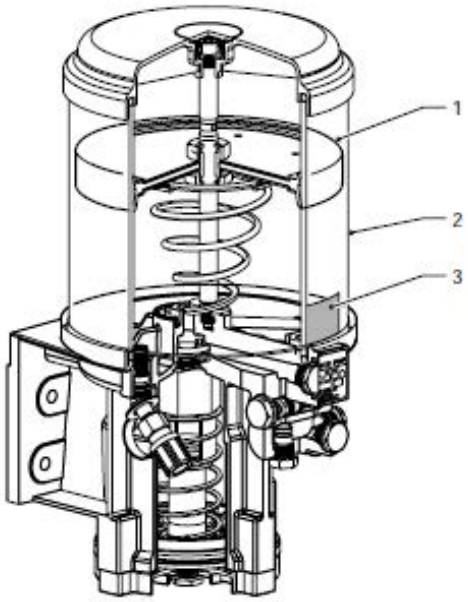
# Groeneveld Auto Greaser - Pump Unit

## 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

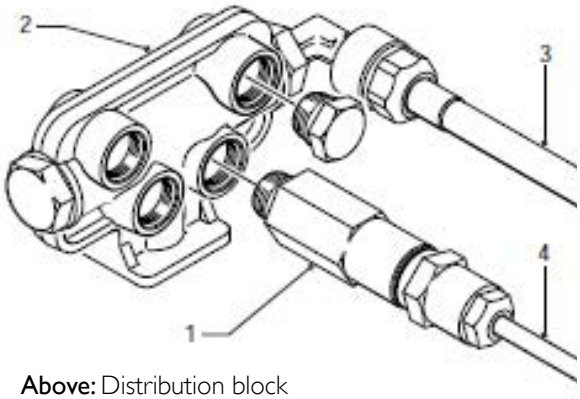
In the standard reservoir a follower plate is placed above the level of the lubricant. This plate follows the level of the lubricant; as the level falls the follower plate falls with it under the action of a tension spring. The follower plate prevents the increase of air into the lubricant and any consequent 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.



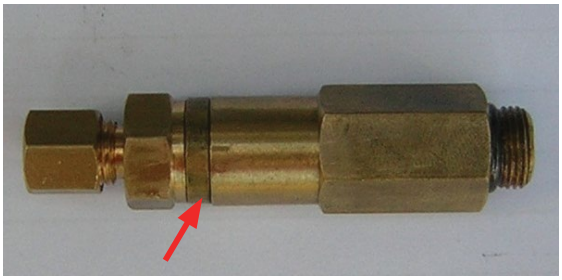

**Above:** Distribution block

**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

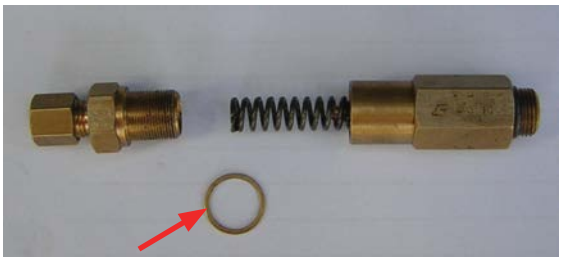
The meter units measure the dose of grease to the grease nipple. The metered dose is varied by a number of shims or spacers. If you look closely at your machine, you will see each meter will have 1, 2 or 3 shims. After that, it moves up to a spacer (equivalent to 4 shims). Then 1 spacer with 1, 2 or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



Meter Unit fitted with spacer

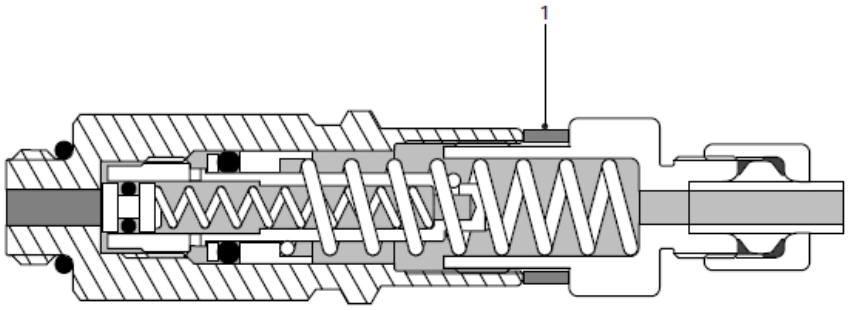
This has been set by the technician when fitted at the factory and has been tested to ensure each component gets the grease it requires. This will allow enough grease to be pushed into the moving parts, lubricating them as well as keeping dirt and abrasives out. If you believe that any points are not 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.



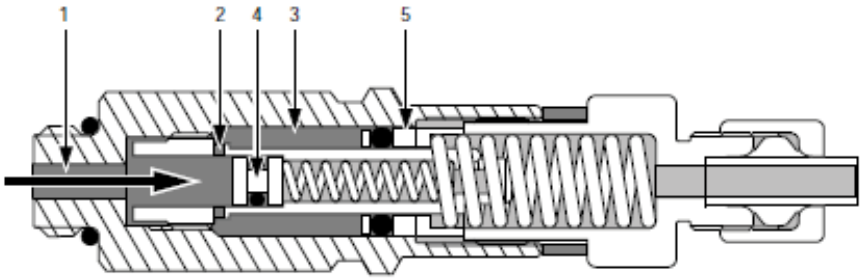
Meter components showing shim

# Groeneveld Auto Greaser - Meter Unit Operation



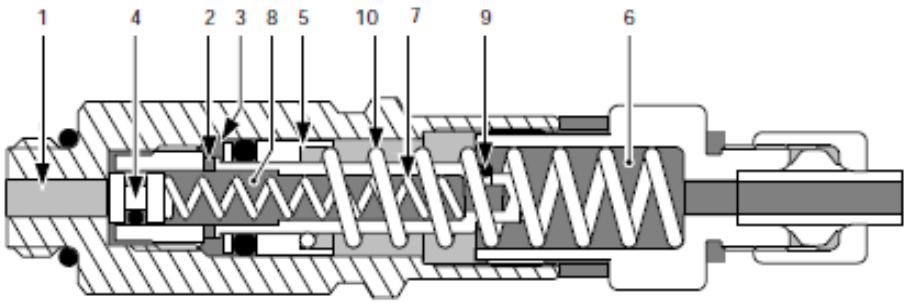

**Right:** Meter unit & Spacer

**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).

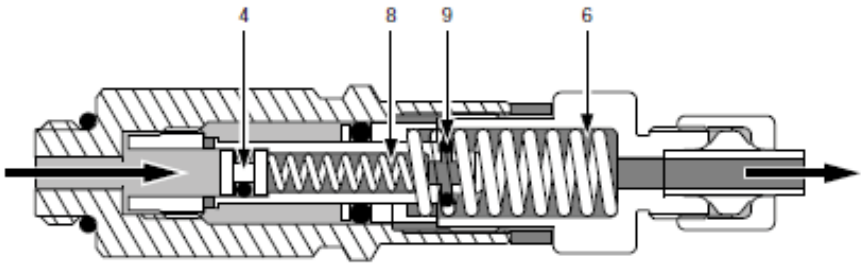



**Right:** Meter unit in phase B

*Continued over page*

# 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

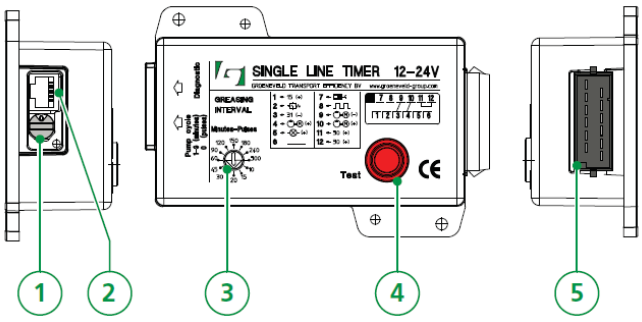
**IMPORTANT:** It is not advisable to open the metering units as this allows the entry of dirt, and thus is a potential cause of faults and failures.

# 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.

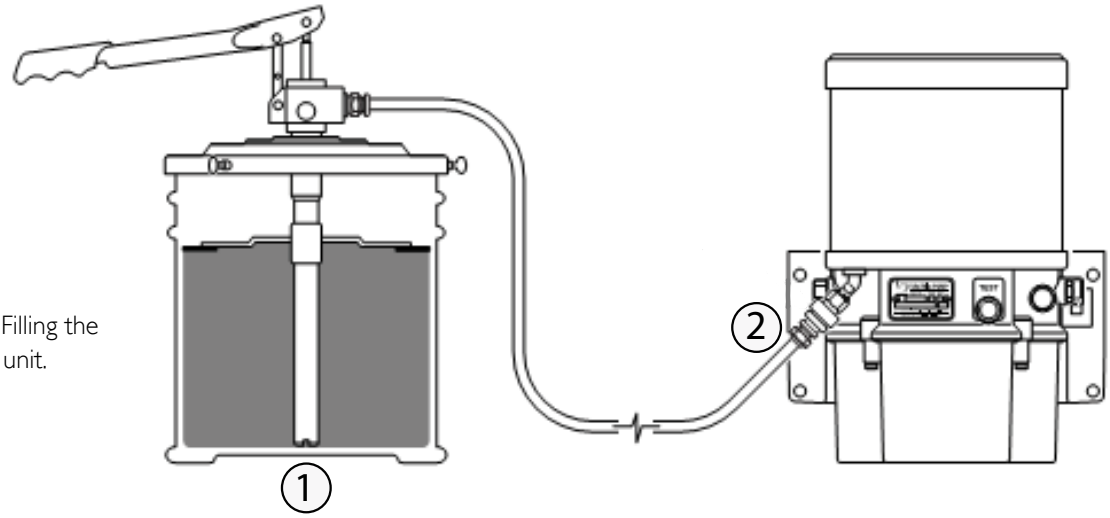
**IMPORTANT:** Use ONLY HP0 or NLGI0 rated grease. It needs to be Lithium based and contain NO Teflon or Graphite as they stick to the meters and eventually jam them. The grease must NOT contain Aluminium or Copper compounds as they are abrasive to the seals and lines.

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. |

# Groeneveld Auto Greaser - Dealer Contacts

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Tel: 03 8329 4333
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Fax: 08 9477 2688

**Adelaide Branch**
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Wingfield, SA 5013
Tel: 08 8349 6322
Fax: 08 8262 1783

**Groeneveld Tasmania**
8 Devonport Road
Devonport, TAS 7310
Tel: 03 6423 4256
Fax: 03 6424 9772

**Brisbane Branch**
1818 Ipswich Road
Rocklea, QLD 4106
Tel: 07 3272 7975
Fax: 07 3272 7534

**Groeneveld Central QLD**
193-195 Wade Street
Nth Rockhampton, QLD 4701
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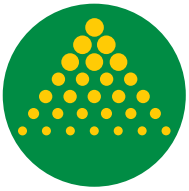
Fax: 07 4936 4822

**Sydney Branch**
1/36 Lidco Street
Arndell Park, NSW 2148
Tel: 02 9831 4933
Fax: 02 9831 4966

**Townsville Branch**
Unit 10 72-78 Crocodile Crescent
Townsville, QLD 4810
Tel: 07 4774 3056
Fax: 07 4774 3824



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