

Prairie Pro

Operator's Manual



GOLDACRES
Australia's World Class Sprayers

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GOLDACRES - RESELLER TERMS AND CONDITIONS OF SALE Goldacres Goods are only available for purchase upon the terms and conditions set out below.

Interpretation

- (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 (Cth) (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

- (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- (4) Unless previously withdrawn, Goldacres quotations are open for acceptance within the period stated therein or, when no period is stated, with 14 days only of the quotation date.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 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) (i) Goldacres liability for Goods manufactured by it is limited to:
the where the law implies consumer guarantees into these terms and conditions pursuant to Part 3.2 Division 1 of Schedule 2 to the Competition and Consumer Act 2010 (Cth) ("consumer guarantees") which cannot be excluded and Goldacres breaches a consumer guarantee, the loss and damage the Purchaser is entitled to at law which cannot be excluded by these terms and conditions; and, in all other cases
(ii) 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 intattention 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;
- (12) 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;
- (13) In the case of hydraulic systems, Goldacres shall replace defective parts in accordance with clause 11(i) of these conditions, provided that the failure of the part was not related to contamination within the system, Goldacres shall not be liable for labour in the case of repairing hydraulic system defects;
- (14) 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;
- (15) Goldacres shall not be liable for and the Purchaser releases Goldacres from any claims in respect of faulty or defective design of any Goods supplied unless such a design has been wholly prepared by Goldacres and the responsibility for any claim has been specifically accepted by Goldacres in writing and in any event. Goldacres liability hereunder shall be strictly limited to the replacement of defective parts in accordance with paragraph 11(i) of these conditions provided always that this clause does not seek to exclude the consumer guarantees;
- (16) 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;
- (17) 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;
- (18) The warranties provided under these terms and conditions do not extend to second hand or used Goods that may be sold by Goldacres.
- (19) 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:
(i) 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

- (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

- (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.

- (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 damage 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

Introduction	I	Calibration	23
Welcome	I	General	23
Safety	3	Control valve, speed sensor & flow meter locations	24
General	3	Control valve	24
The Operator	3	Flowmeter	24
Machine Orientation	3	Speed sensors	25
Safety Precautions	4	Raven SCS4400 console calibration	26
Notes	4	3TS (Boom Tier Programming)	33
Cautions	4	Jug test procedure	35
Warnings	5	Operation	37
Dangers	7	Key features	37
Safe Use of Chemicals	7	EZ Control	38
Personal Protective Equipment (PPE)	7	EZ Control key functions	38
Safety Decals	8	Filling	39
Parts Ordering	8	Agitation	40
Identification	8	Spray Application	40
General Information & Specs	9	Flushing	41
General	9	Decontamination	41
Axles	10	End of day	41
Wheels and tyres	11	End of program	42
Hydraulics	11	Transporting the sprayer	42
Dimensions	12	Boom	43
Pre-Operation	15	General	43
Drawbar connections	15	Boom key features	44
Connecting to the tractor	16	Boom overview	46
Hydraulic drive pumps	16	Centre Section	46
Fitting the PTO shaft	17	Hydraulic raise and lower	46
Mounting the consoles	18	Hydraulic fold	46
Connecting the consoles	18	Boom balance	46
Raven SCS4400 wiring layout	19	Boom cables	46
Hydraulic Schematic - non spool valve	20	Boom valves	47
Hydraulic Schematic - with spool valve	21	Nozzles	47
		Three dimensional breakaway	47

Boom protection brackets	47	Troubleshooting	65
Boom end protector	47	General	65
Boom options	47	Diaphragm pump	65
Fence line jets	47	Flowmeter and controller	67
Hydraulic yaw suspension (optional)	47	Tanks, chassis and wheels	69
Bi-Fold (optional)	48	Induction hopper	69
UltraGlide (optional)	48	Chem probe and Transcal	70
Hydraulic Boom Wing Tilts (optional)	48	TriTech Boom	71
Three tier system (3TS)	48	Smart Steer	72
RapidFire	49	Lubrication & Maintenance	73
Boom Recirculation (RapidFlow)	49	Maintenance schedule	73
Boom operation	49	Lubrication	74
Folding	49	Chassis and PTO shaft grease points	74
Un-folding	49	Boom centre section grease points	75
Boom adjustment	50	Cable drum grease points	76
Alignment of inner steel boom -		3D Breakaway lubrication points	76
Working position	50	Maintenance	77
Alignment of outer aluminium boom -		Pressure relief valve	77
Working position	51	Pump	77
Alignment of outer aluminium boom -		Chassis, wheels, tyres and axles	77
Folded position	52	Checking brakes & servicing of braked axles	78
Vertical boom alignment - working position	53	Removing a wheel from the sprayer	79
Vertical boom alignment - working position continued	54	Replacing a wheel onto the sprayer	79
Vertical boom alignment - folded position	55	Booms	80
36m & 42m Aluminium Outer Boom	56	Filters	80
Initial Setup	56	Hydraulic fold cylinder re-phasing	81
Three Dimensional Breakaway	57	Hydraulic fold cylinder phasing relief pressure	81
Initial Setup	57	Bleeding the hydraulic fold cylinders	82
Maintenance	57	Airbag suspension	83
Hydraulic Yaw Suspension	58	Adjusting the system pressure	83
About	58	Adjusting the ride height	83
Bleeding the circuit	58	Electric over hydraulic spool valves	84
Charging the system	59	Corrosion Prevention	85
How to re-centre the boom	60	Plumbing schematics	88
Bi-Fold	61	Rinse water delivery - Boom Valves	88
Alignment of outer aluminium boom -		Pressure delivery - Boom Valves	89
Working position	61	Rinse water delivery - with RapidFlow	90
Alignment of outer aluminium boom -		Pressure delivery - with RapidFlow	91
folded position (with Bi-Fold)	62	Pressure delivery - Transcal	92
Hydraulic Adjustments	62		
Centre Level adjustment	63		

Optional Accessories	93	Key Features	123
General Information	93	Operation - Calibration	123
Chemical induction probe	94	Centre Rack Control Calibration	124
Overview	94	Routine Operation	125
Key Features	94	Enabling AutoBoom via the SCS Console	125
Operation	95	Boom Adjustments When Approaching	
SuperFlow chemical induction hopper	96	Headlands (If Equipped with Gauge Wheels)	125
Overview	96	Center Rack Control (AutoBoom Enabled	
Key Features	96	and Center Rack Control On)	126
Operation	97	Center Rack Control (AutoBoom Enabled	
Rinsing	97	and Center Rack Control Off)	126
Chemical Transfer Pump	99	System Adjustments	126
Overview	99	Sensitivity	126
Operation	99	Speed	127
FM-1100 Flow meter	101	Stability	127
Troubleshooting Flowmeter and Pump	104	Min Press %	127
Transcal	105	Ultrasonic Sensor Height Offsets	128
Overview	105	Resetting Defaults	128
Key Features	105	Troubleshooting	129
Transcal Operation	106	Node	129
What to do if the Transcal tank is overfilled	106	Pre Calibration Troubleshooting	129
Transferring chemical from the Transcal tank		Calibration Troubleshooting	131
to the main tank	106	Operation Trouble Shooting	133
Transferring chemical without measuring	107	Smart steer	136
Transcal Operation	107	General	136
Transcal Rinsing	108	Modes	136
Transcal Schematic	109	Operation	136
Hydraulic fill pump	110	Smart Steer - Operation	137
Key Features	110	Calibration	137
Suction and delivery lines	110	Troubleshooting	137
Setting pump RPM	110	Technical Fault Finding	137
Operation	111	70 Series Fill Flow Meter	139
Exacta foam marker	112	RapidFire	143
Using the foam marker	112	Overview	143
Foam marker schematic	113	Key Features	143
Direct Chemical Injection	114	RapidFlow (Boom Recirculation)	148
Operation	114	Key Features	148
Raven SCS4400 DCI programming	115	Operation	148
DCI Quickstart Guide	120		
UltraGlide	123		
Overview	123		

Chapter I

INTRODUCTION

Welcome

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

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

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



Roger Richards
General Manager

Goldacres Ballarat

Chapter 2

SAFETY

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 or machine damage can result if you don't follow instructions

Note

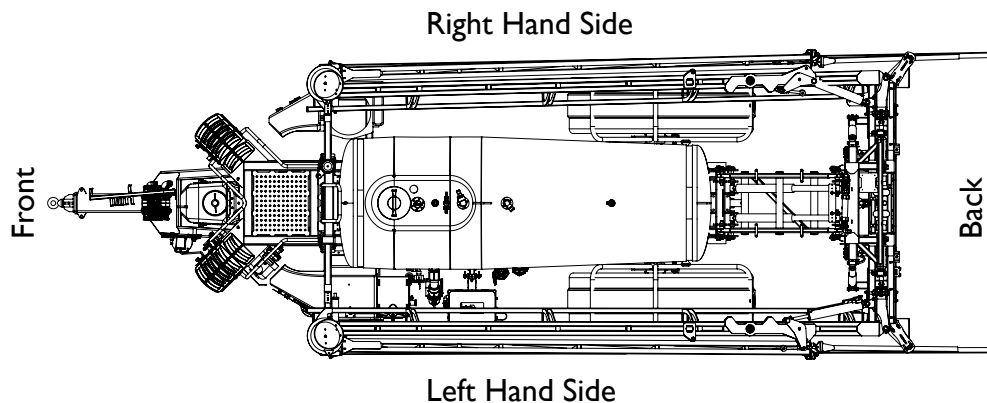
Is used to notify people of installation, operation or maintenance information that is important but not hazard related.

The Operator

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

Machine Orientation



Safety Precautions

Notes

- 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 decals missing from the equipment and that any damaged, or missing, decals are replaced prior to operation.
- Goldacres equipment 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.
- 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.
- Inspect the equipment thoroughly for damage and wear before operation.
- Lubricate the equipment as per recommended requirements before operating.
- Flush chemicals from equipment immediately after use.
- 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.
- Make sure that the equipment complies with all relevant road regulations when transporting.
- 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, brake fluid 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.

- 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.

Cautions

- A supply of fresh water should be with the equipment at all times.
- Water tanks are not designed for use with diesel fuel or any flammable liquid.
- Do not use this machine in ambient temperatures exceeding 40 degrees Celsius.
- Each individual boom section has a maximum delivery of 35 litres per minute with clean filters fitted.
- The maximum combined flow of all boom sections is limited to 140 litres per minute, or 50% of the pump flow whichever is the lesser amount, with clean filters.
- Do not exceed the maximum spraying pressure of 8 Bar.
- Ensure that all bolts are tightened and secured before operation.
- Where fitted, care should be taken to never overfill the diaphragm pump with oil or operate at speeds exceeding 540 rpm.
- Always ensure that the boom is securely supported when travelling.
- 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 on the machine. After impact with gutters, sinkholes, rocks etc. stop the machine and inspect for damage.
- 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.

Cautions (continued)

- Check the wheel nut tension on a regular basis. The torque and inspection frequency is outlined in the maintenance section.

Support Machine Safely

Before raising the machine off the ground;

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

Changing Wheels and Tyres

Changing

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.
- ✗ Do not weld, heat or modify the rim.
- ✓ Be proactive and continually check the condition of your tyres.

Maintenance Warning (Crush Hazard)

Never attempt to maintain axles, wheels or components within the vicinity of the wheels with the engine running.

Burn Risk

- Ensure safety around hydraulic lines when at operating temperature.

Warnings

- Any unauthorised modifications to this equipment may affect its function and create a serious safety risk.
- Do not drink water from the hand wash bottle.
- 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 carrying and braking capacity of the vehicle to which as specified by the vehicle manufacturer.

NOTE: 1 Litre Water = 1 Kg.

- Water weighs 1 kg 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 the Operations chapter 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

Warnings (continued)

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 boom wings.
- Never work under any hydraulically raised boom.

Personal Protective Equipment (PPE)

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

- Exposure to loud noise over an extended period can cause impairment or loss of hearing. 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. Always refer to the chemical manufacturers label for guidelines on the appropriate PPE to use with the chemical/s you are using.

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

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

Airborne Particles

- Always stand well clear of equipment during operation.
- Any spray drift is dangerous and may be hazardous to humans.
- 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.

Do Not Heat Pressurized Fluid Lines

When conducting any process on the machine that involves heat; be aware of pressurized fluid lines in the vicinity of your work area.

Pressurized lines can be easily cut when the heat over shoots the target object.

Do Not Carry Passengers

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

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.

When the repair is complete ensure that all fittings and lines are secured before re-applying pressure.

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.
- 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 Goldacres Prairie Evolution sprayer may become unstable when turning at excessive speed or when operating on excessively steep terrain.

Collision prevention and 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 Prairie Evolution sprayers, are fitted with warning lights and signs in accordance with Vic Roads regulations.

Warnings (continued)

- Keep lighting and signs in good order and replace any damaged or faulty fixtures.

Working at Heights

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

- There is a risk of falling if a person has “climbed” into the machine.
- Do not “climb” on machine to get access.

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.

Entanglement in Rotating Drive Lines

- Rotating drives can cause serious injury or even death when entanglement occurs. Keep hands, feet, hair and clothing away from all moving parts

Safe Use of Chemicals

The safe use of Ag chemicals with this equipment is the responsibility of the owner/operators. All operators should be trained in the safe use of Ag

- 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.

to prevent injury. Never operate this machine with covers, shrouds, or guards removed.

Main Tank

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

chemicals. Goldacres suggest that a relevant course is completed by owners/operators prior to operation of this equipment as a spray unit.

Personal Protective Equipment (PPE)

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

Chemicals can be harmful to humans, appropriate PPE should be used when handling chemicals. Always refer to the chemical manufacturers label for guidelines on the appropriate PPE to use with the chemicals you are using.

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

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

Airborne particles

Always stand well clear of equipment during operation. Any spray drift is dangerous and may be hazardous to humans and animals.

Fluids under pressure

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.

When the repair is complete ensure that all fittings and lines are secured before re-applying pressure.

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 or directly from Goldacres. Part numbers and descriptions of the decals on this machine can be found in the parts manual supplied.

Parts Ordering

When ordering parts from your Goldacres dealer, please quote:

- Serial No.
- Part No. 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 Goldacres dealer. When returning parts to a Goldacres dealer, for service or repair all parts **MUST** be cleaned thoroughly before sending them. Goldacres cannot expose technicians to the many potentially

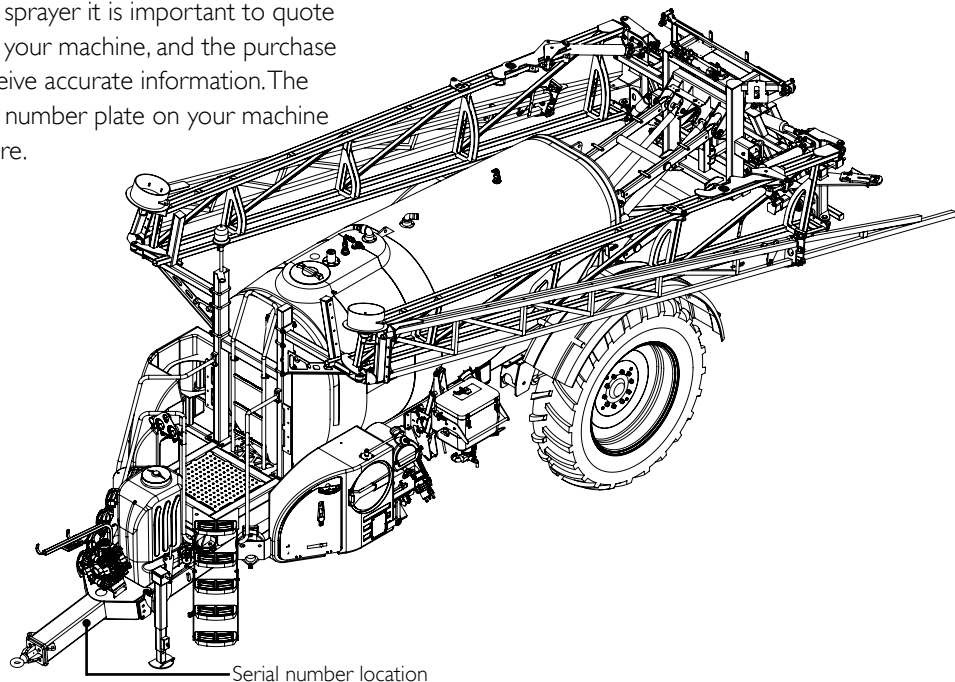
hazardous pesticides and substances that are in use.

NOTE: Please ensure that all parts are clearly labelled with the owner's details, and a brief description of the fault. Goldacres are not liable for the return of any goods to a Goldacres Dealer. The goods must be returned to the point of sale. The customer will be responsible for any cost incurred by a Goldacres appointed person travelling to any site outside the point of sale.

Genuine Goldacres parts only should be used on Goldacres equipment.

Identification

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.



Chapter 3

GENERAL INFORMATION & SPECS

General

Chassis:

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

Paint Colours:

Wheels: N23 Neutral Grey
Steel work: G13 Dark Green

Tank:

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

Agitation:

The Supermix agitator is located at the back of the tank and is used to generate increased agitation within the tank. The pressure line to the Supermix agitator from the control manifold passes through a nozzle and then through the barrel into the tank. This causes extra agitation as flow around the agitator is sucked into the barrel and is then passed back into the tank. To increase this venturi effect, the bypass flow from the electric regulating valve also passes through the barrel, multiplying the agitation effect. The supermix agitator has an approximate capacity of 300 - 1300 l/min depending of the pump size and operating pressure. For further information refer to the "maintenance" chapter.

Boom Valves:

Motorised boom valves, for control of boom section on/off, 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.

Controller:

Prairie Evolution sprayers are supplied standard with a Raven SCS4400 automatic rate controller. Automatic rate controllers will maintain a user defined application rate automatically as the towing 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 "calibration" section of this manual.

Filtration:

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

As standard Prairie Evolution sprayers are fitted with:

1 x Suction filter (30 mesh)
2 x Pressure filters (1 x 80 & 1 x 100 mesh)
Nozzle strainers (50 mesh)

Pump:

Udor, positive displacement, oil backed diaphragm pumps are fitted as standard on Goldacres equipment. The normal operating range is from 1 - 8 bar which is sufficient for efficient nozzle performance. A PTO drive is standard and a hydraulic drive is optional.

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
- Transcal volumetric measuring device
- Direct Chemical Injection modules

Booms:

Goldacres booms are available in a variety of sizes up to 42 metres in width. Tri Tech booms (24 - 42 metres) feature hydraulic lift and fold, with control from the cabin of your tractor. Individual wing tilt is also available.

Goldacres Tri Tech 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 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 nozzle selection catalogue and Users guide to spray nozzles are available from your Goldacres dealer, Goldacres, or as a free download from the TeeJet website: www.teejet.com

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.

Each individual boom section has a maximum delivery of 35 litres per minute with clean filters fitted. With clean filters fitted, the maximum combined flow of all boom sections is limited to 140 litres per minute, or 50% of the pump flow, whichever is the lesser amount.

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.

Axles

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

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

The 12 volt compressor is powered up when the ignition is switched on. A fuse is fitted to the ignition relay box to protect the compressor circuit. The compressor, located in the right hand pod, has a pressure cut out switch fitted to it which cuts the power to the compressor when the reservoir recommended pressure is achieved. When the pressure in the reservoir drops below approx 70psi, the compressor will start again. The pressure cut out switch can be adjusted by turning the nut at the end of the spring to apply more or less pressure to

the contact spring. The recommended maximum pressure to run in the air bag system is 110 psi. Optimum pressure is 100 psi. If the compressor runs continually there may be an air leak present. All hoses and fittings must be checked and repaired if necessary.

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

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

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

Wheels and tyres

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

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

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

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

Tyre Size	Ply	Load Index	Speed Index	Rated Pressure (KPa)	Rated Capacity (Kg) @ 25kph	Cyclic Loading Pressure (KPa)
18.4 x 38	16	159	A8	320	5340	322
20.8 x 42	16	160	A8	220	5490	286
24.5 x 32	16	163	A8	250	5950	286
30.5 x 32	16	164	A8	240	6100	220

To determine the correct tyre pressure:

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

For further information on wheels & tyres please refer to the "maintenance" chapter:

Hydraulics

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

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

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

Open Centre Systems:

Open centre systems have a constant flow of oil

from the tractor. Any flow not being used by the hydraulic circuit will be bypassed through the system and sent back to tank.

Closed Centre (*pressure compensated*) Systems:

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

Closed Centre Load Sensing Systems:

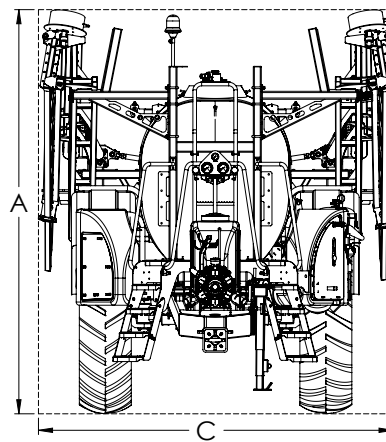
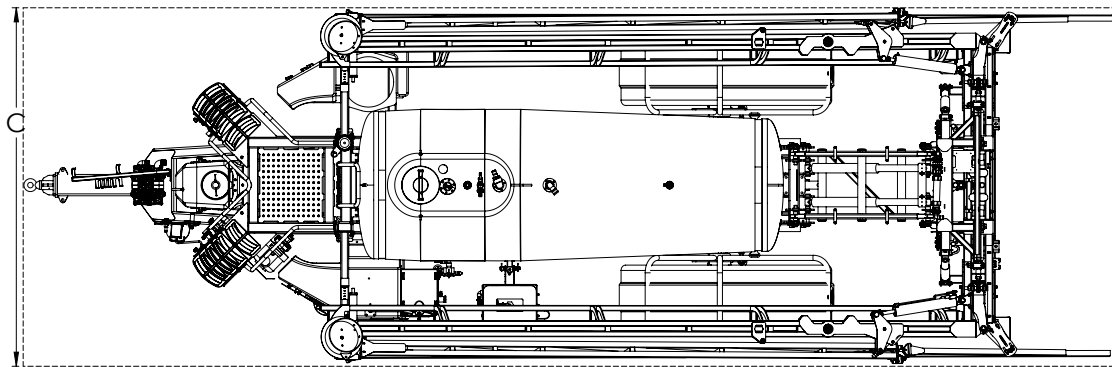
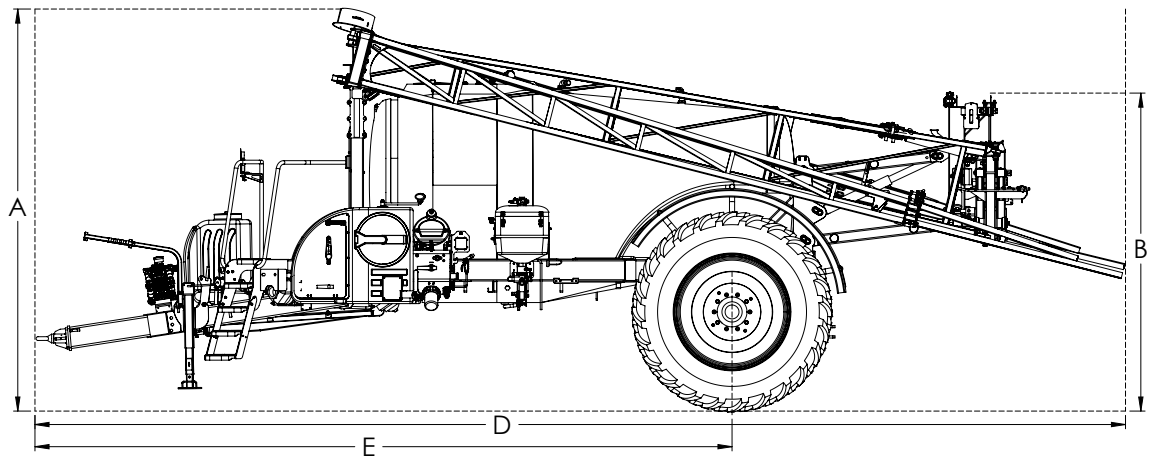
A closed centre load sensing system is a variation of the pressure compensated system and are commonly designed to reduce hydraulic circuit heat generation.

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

Dimensions

The following information is provided as a guide only.

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



Model	Boom size	A Front Height	B Rear Height	C Width	D Total Length	E Wheelbase
4024	24m	2800	3150	3450	8450	5950
4028	28m	3900	3150	3450	8650	5950
4030	30m	3900	3150	3450	9350	5950
4033	33m	4200	3150	3450	9250	5950
4036	36m	4200	3150	3450	9500	5950
5024	24m	2800	3150	3450	8450	5950
5028	28m	3900	3150	3450	9000	5950
5030	30m	3900	3150	3450	9700	5950
5033	33m	4200	3150	3450	9600	5950
5036	36m	4200	3150	3450	9850	5950
6524	24m	3800	3150	3450	9050	6450
6528	28m	3800	3150	3450	9850	6450
6530	30m	3800	3150	3450	9950	6450
6533	33m	4200	3150	3450	9850	6450
6536	36m	4200	3150	3450	9850	6250
7524	24m	3800	3150	3450	9050	6450
7528	28m	3800	3150	3450	10650	6450
7530	30m	3800	3150	3450	10650	6450
7533	33m	4200	3150	3450	10500	6450
7536	36m	4200	3150	3450	10500	6450
8530	30m	3800	3150	3450	11000	6820
8533	33m	4200	3150	3450	10800	6820
8536	36m	4200	3150	3450	10800	6820

Chapter 4

PRE-OPERATION

Drawbar connections

The standard drawbar connections are as shown in the pictures below. It is important that the dielectric grease (supplied with each sprayer) is applied to electrical connections prior to connection. This assists with lubrication and prevention of corrosion on these connections.



Raven SCS4400 male & female connectors



Tail light connection (optional)



Raven male and female speed sensor connections



Hydraulic hose connections



Male and female Deutsch connections



Safety chains (optional)



Draw bar connection mounting plate

Connecting to the tractor

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

Step 1: Ensure that the tractor is suitably rated to safely tow the sprayer and that the drawbar pin size matches the hitch on the sprayer. The standard hole size is 50mm. A replaceable insert (Part number GA4582455) can be purchased to reduce wear if required. A replaceable bush (GA5075075), reduces the size of the hole in the hitch if a smaller pin is to be used.

Step 2: With the sprayer parked on a level surface, use the sprayer jack to raise the sprayer hitch in line with the tractor hitch.

Step 3: Reverse the tractor into sprayer hitch until aligned, and insert drawbar pin (not supplied). Then connect safety chains.

Step 4: With the sprayer securely attached to the tractor, raise the jack until weight is transferred to the tractor. Then raise the jack and store in the transport position.

Step 5: Fit the PTO shaft (if applicable).

- Grease the PTO shaft as per the lubrication schedule
- Ensure that all safety guards and chains are in place

It is important that the instructions "fitting the PTO shaft" are followed for first time PTO shaft setup.

NOTE: The wide angle joint must be connected to the tractor PTO shaft.

Hydraulic drive pumps

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

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

For hydraulic drive pumps - connect hydraulic hoses to tractor remote outlets. (Refer to "general info & specs" chapter for important hydraulic information.)

Step 6: Fit the spray controller and any other switch boxes supplied in tractor cabin. Make sure that all controllers and switch boxes are securely mounted.

Step 7: Connect any power leads from Raven Console directly to battery.

Step 8: Connect drawbar connections.

All except 2 hydraulic hoses have a tag zip tied to them that denotes what they are for. Connect the hoses to the appropriate place on the tractor. Ensure that the connection points are clean before fitting to the tractor.

2 of the hydraulic lines don't have a tag on them, these are the pump lines. The pump can run in either direction so it does not matter which port (pressure or tank) that the hoses go into.

If the sprayer isn't fitted with spool valves, it's very important that the hydraulic lines are connected in the correct pairs to the tractor remotes.

If not already done, apply some dielectric grease to the electrical connections. (wiring loom, speed sensor cable, tail light plug etc) Then connect them to the appropriate plug at the rear of the tractor.

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

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

To set the pump speed:

On the Raven 4000 series consoles this must be set up through the data menu.

Fitting the PTO shaft

Wide angle PTO shafts are fitted as standard to Prairie Evolution sprayers. When using/hitching a sprayer (especially for the first time) the following critical points concerning the PTO shaft must be considered:

Maximum PTO operating length

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

PTO shaft length adjustment

To adjust the length:

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

NOTE: It is important that enough "travel" is allowed in the PTO shaft to ensure that it does not collapse fully when travelling through a ditch etc and cause damage to the pump.

Maximum PTO joint operation

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

Continuous operation - 25 degrees

Short duration - 80 degrees

Stationary - 80 degrees

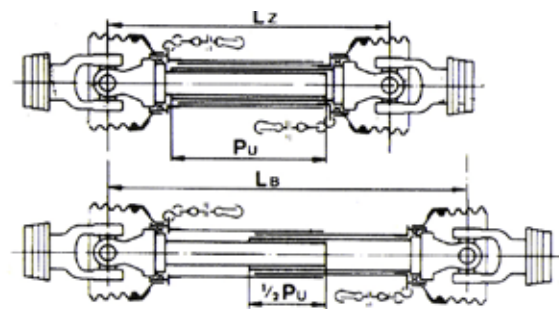
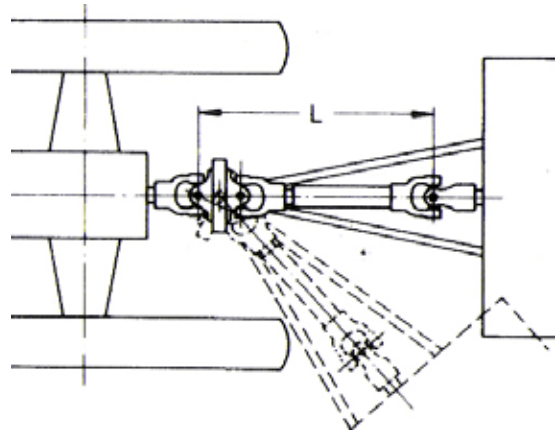
Coupling the PTO shaft

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

Chains

Chains must be fitted so as to allow sufficient articulation of the shaft in all working positions.

NOTE: The PTO shaft must not be suspended from the chain.



Mounting the consoles

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

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

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

An example of console mounting in the cab can be seen below.



Console mounted on accessory bar.

Connecting the consoles

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

To connect to the battery:

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

If, as shown below, there are mounting holes in the pillars of the tractor; a bracket (GA4522930) is supplied with the console mounting kit to allow the console to be mounted to these.



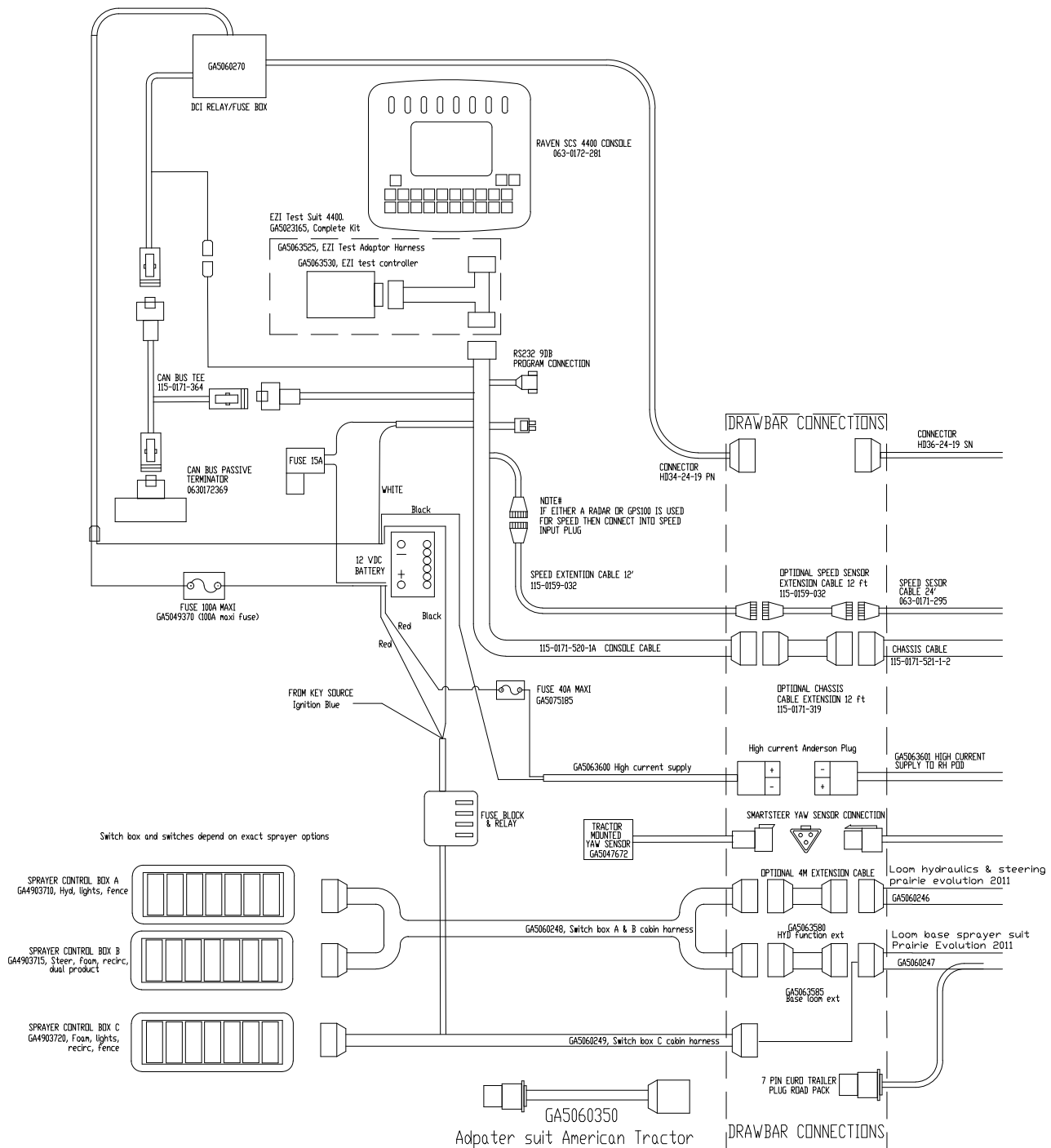
black battery wire to a negative terminal and the red battery wire to a positive terminal.

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

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

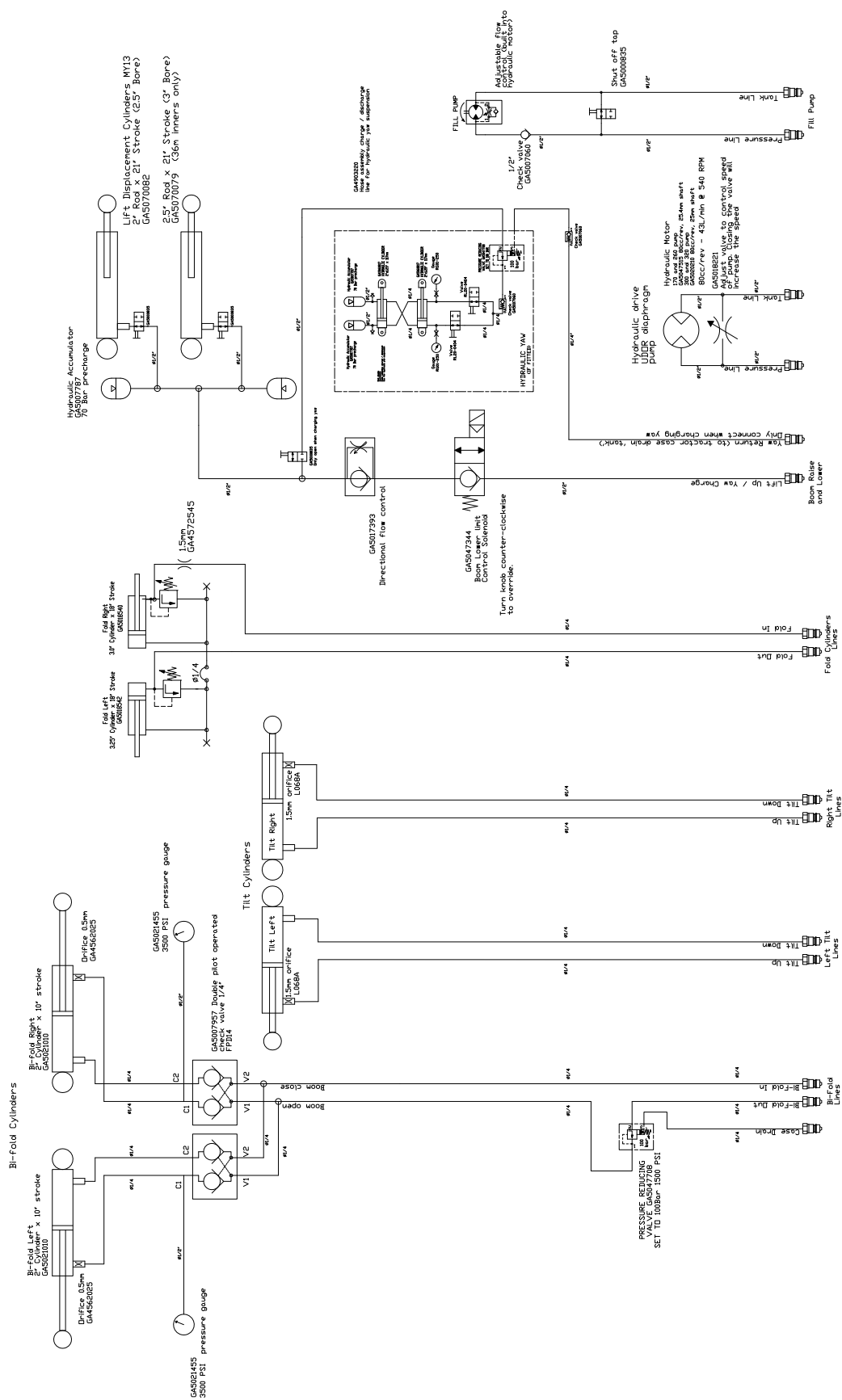


Raven SCS4400 wiring layout



CONSOLE AND DRAW BAR CONNECTIONS

Hydraulic Schematic - non spool valve



Tractor connections

Chapter 4 - Pre-Operation - 21



Chapter 5

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. (Refer to Teejet catalogue)
The Raven system comprises a console, flowmeter, 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 flowmeter 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 by-pass and thus the volume being applied.

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:

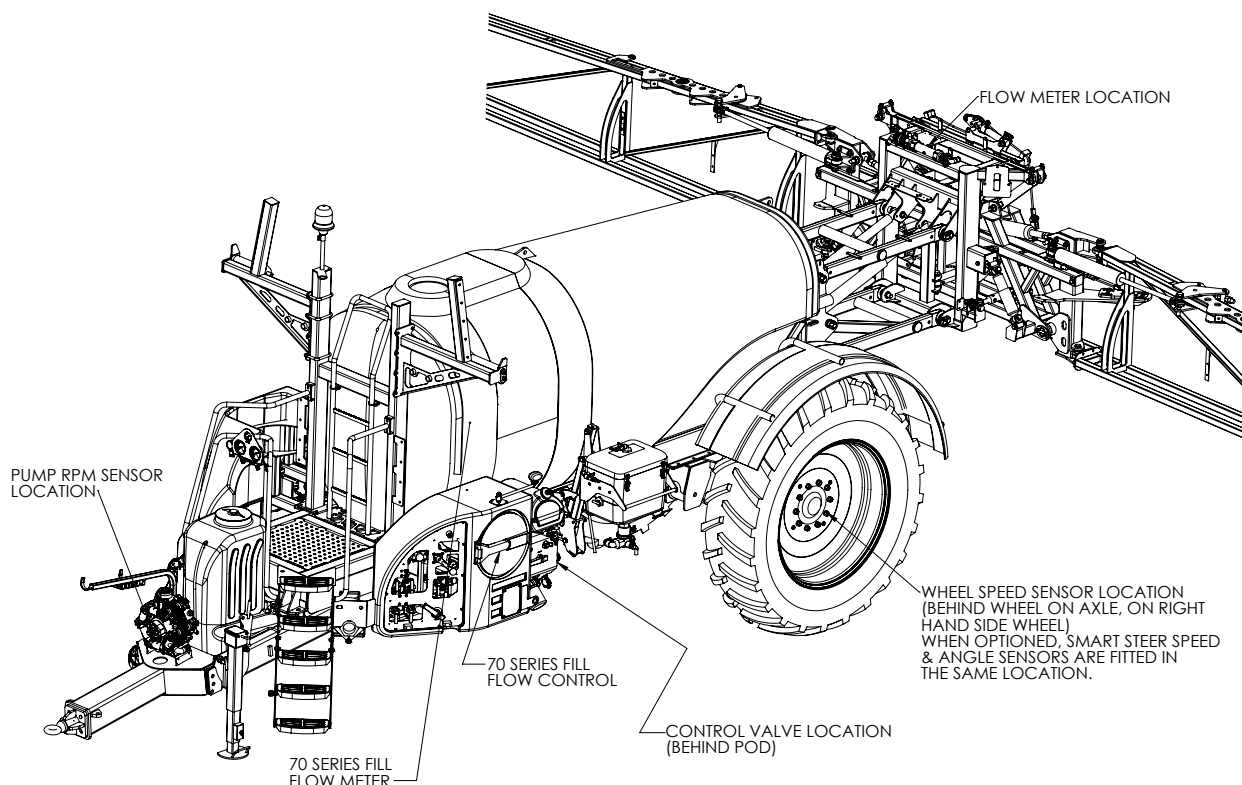
Boom 1 Cal	
Boom 2 Cal	
Boom 3 Cal	
Boom 4 Cal	
Boom 5 Cal	
Boom 6 Cal	
Boom 7 Cal	
Speed Cal	
Meter Cal	
Valve Cal	
Rate 1	
Rate 2	
Tier 1	
Tier 2	
Pump Cal	

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

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

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

Control valve, speed sensor & flow meter locations



Control valve

The fast close valve is located behind the left hand side pod.

The fast close 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 fast close 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.

The fast close valve can be operated in manual mode from the console for boom priming, flushing and also trouble shooting.

The standard fast close valve calibration number is 743 and is written on the valve.

Flowmeter

There is a flowmeter on the sprayer; with a calibration number attached to it on a white tag. 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 flowmeter must be flushed with fresh water before the sprayer is left unused for an extended period of time. Also do not allow water to freeze in the flowmeter as this can damage the housing.

The Flowmeter should be checked at the start of

every spraying season and periodically during the season. The simplest way to check the accuracy of the flowmeter is to fill the tank to a previously determined volume mark (usually top fill marking) and then empty the tank through the flowmeter (i.e. via a self-test). Compare the reading from the flowmeter with the previous known volume. If there is a relatively large discrepancy (i.e. more than 50 litres out of a 3000 litre tank), the flowmeter should be removed from the sprayer; disassembled and the condition of the turbine checked and cleaned (make sure it spins freely). The flowmeter should then be reassembled and replaced on the sprayer.

Perform the volume check again and if there is still a discrepancy, the Meter Cal No. can be changed.

Example:

Meter Cal	=185
Volume of liquid measured	=3100
Known volume of liquid	=3000

Corrected meter Cal:

$$\frac{185 \times 3100}{3000} = 191$$

The flow meter is located at the rear of the sprayer; on the boom centre section, above the boom valves.

Speed sensors

Raven automatic rate controllers can utilise a speed reading from:

A wheel speed sensor
GPS receiver
Radar speed sensor

Wheel speed sensor:

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

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

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

If the ground speed display reading is incorrect the calibration and sensor condition must be checked (see the troubleshooting section)

GPS receiver

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

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

Radar speed sensor:

The console can also utilise a radar signal for ground speed reading.

A "T harness" can be fitted to the tractor radar harness to send a pulsed signal to the console speed harness. The console must be setup to receive speed as "Radar."

When using a radar the console speed cal figure is 200 initially and then can be fine tuned from this figure. See "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.

Press Enter to start

3. Adjust the screen contrast, as directed by the console.
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).

Momentarily depressing the [CE] key repeatedly at this stage toggles the console through the various valve types.

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.
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 Lt/ha).
3. Depress [ENTER] again to lock it in.

4. The console will now prompt for a "SPEED SENSORTYPE" 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.

Radar speed sensor 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.

For sprayers fitted with a Wheel Drive or Tail Shaft speed sensor:

1. Momentarily depress the [CE] key repeatedly to toggle through the selection of "SPEED SENSOR TYPES" until "SPEED SENSOR WHEEL SPEED SP-1" is displayed.
2. Depress the [ENTER] key to lock it in.
3. 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 radar speed

sensor: Use an arbitrary [SPEED CAL] value of [152]

To enter this value:

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

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

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

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

$$\text{New [speed cal] value} = \frac{\text{Old [speed cal] value} \times 100}{\text{Recorded distance}}$$

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

FOR CONSOLE 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 I" 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.

For consoles connected to wheel drive speed

sensors: A wheel speed calibration value is calculated by measuring 10 revolutions of the wheel. This is best done with half a tank of water to simulate an average between full and empty and measured on ground that is typical to what will be encountered when spraying (not on a hard road). Also ensure the tyres are inflated correctly as tyre pressures play a large part in influencing the rolling circumference of the wheels and correspondently the [SPEED CAL] value. The [SPEED CAL] figure should be checked at the start of every season and adjusted if necessary to compensate for tyre wear.

To measure 10 revolutions of the tyre:

1. Mark the bottom of the tyre and the ground at the corresponding point then drive the sprayer forward until the wheel has completed 10 revolutions and the mark on the tyre is at the bottom again.
2. Mark the ground again at this point then measure the distance between the two marks on the ground in meters.
3. Multiply this figure by 10 (to convert into decimetres).
4. The result is the [SPEED CAL] value to be entered into the console.

For example: if a distance of 47.7 metres is measured for the 10 revolutions (between the two marks on the ground) then the [SPEED CAL] value to be entered into the console will be $47.7 \times 10 = [477]$.

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 for "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.

For sprayers fitted with tail shaft speed sensor:

Use an arbitrary [SPEED CAL] value of [155]

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 for a "BOOM CAL 1" value 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.
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 value of "0".
6. 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.

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

$$\text{New [speed cal] value} = \frac{\text{Old [speed cal] value} \times 100}{\text{Recorded distance}}$$

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 Lt/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) 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 if pump is hydraulically driven).

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

To activate the pump RPM display on the console screen:

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

Entering a Low Flow Limit value:

1. Depress the [DATA] key to bring up the data submenu at the bottom of the screen. The word "SERIAL" will be highlighted.
2. Depress the [DATA] key again to highlight "PRODUCT".
3. Momentarily depress the key repeatedly to move the cursor adjacent to "LOW LIMIT".
4. Depress the [ENTER] key to display the "E" (enter symbol).
5. Enter the "LOW FLOW LIMIT" value calculated.
6. Depress the [ENTER] key again to lock it in.
7. Depress a volume or area key to exit the data 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 WARNING: the [self test] feature should never be used with chemical in the tank 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 used 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 used 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 speed sensor at the back of the console whilst using this function.

Using the flowmeter to calibrate the tank:

1. Enter in the Meter Cal value as given on the white Calibration sticker on the Flowmeter.
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 Flowmeter says the tank holds.

7. If there is a large discrepancy (i.e. the difference between theoretical tank volume and Flowmeter volume is greater than 100 litres), alter the Meter Cal value accordingly. For example: If volume reads 3100 litres instead of 3000 litres and the original Meter Cal value is 185.

New Meter Cal value = $185 \times 3100 \div 3000 = 191$

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 the tank to indicate where the actual tank calibration levels are.

3TS (Boom Tier Programming)

NOTE: 3TS boom tier programming can only be carried out if initial console programming has been completed (see SCS 4400 console programming).

For boom tiering to operate flow rate values (litres/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 values have to be entered.

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

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

For example: If you had XRI 10015 and XRI 10025 nozzles fitted to the sprayer the minimum pressure that the XRI 10025's can cut in at is 1.0 bar. The flow rate for an XRI 10025 nozzle at 1.0 bar is 0.57 Lt/min. The maximum operating pressure for an XRI 10015 is 4.0 bars at which point the flow rate is 0.68 Lt/min so this combination of nozzles overlaps nicely. In actual fact the XRI 10025 would cut in at slightly less than 3 bars if the first set point was programmed at the 0.57 Lt/min.

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

For example: If you wanted the 3rd tier to cut in at one bar you would add the flow rates for the XRI 10015 and XRI 10025 at one bar together ($0.34 + 0.57 = 0.91$ Lt/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

Lt/min the preceding XRI 10025 nozzle would be operating at slightly over 2.5 bars before the 3rd tier would cut in. Again a nice overlap.

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

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

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

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

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

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

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

TO ENTER THE TIER VALUES:

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

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

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

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

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

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.

SCS 4400 and 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 (Lt/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 Mt broadacre boom fitted with XRI 1002 nozzles.

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

NOTE: The console will not except 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 "TEIR 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.

Jug test procedure

The method of carrying out the jug test is as follows:

NOTE: There may be a noticeable difference between pressure shown on main spray pressure gauge on sprayer and the gauge installed on the boom. This is due normal pressure loss through the circuit.

There is only one pressure gauge fitted to the sprayer; this gauge is reading the return pressure.

You will need:

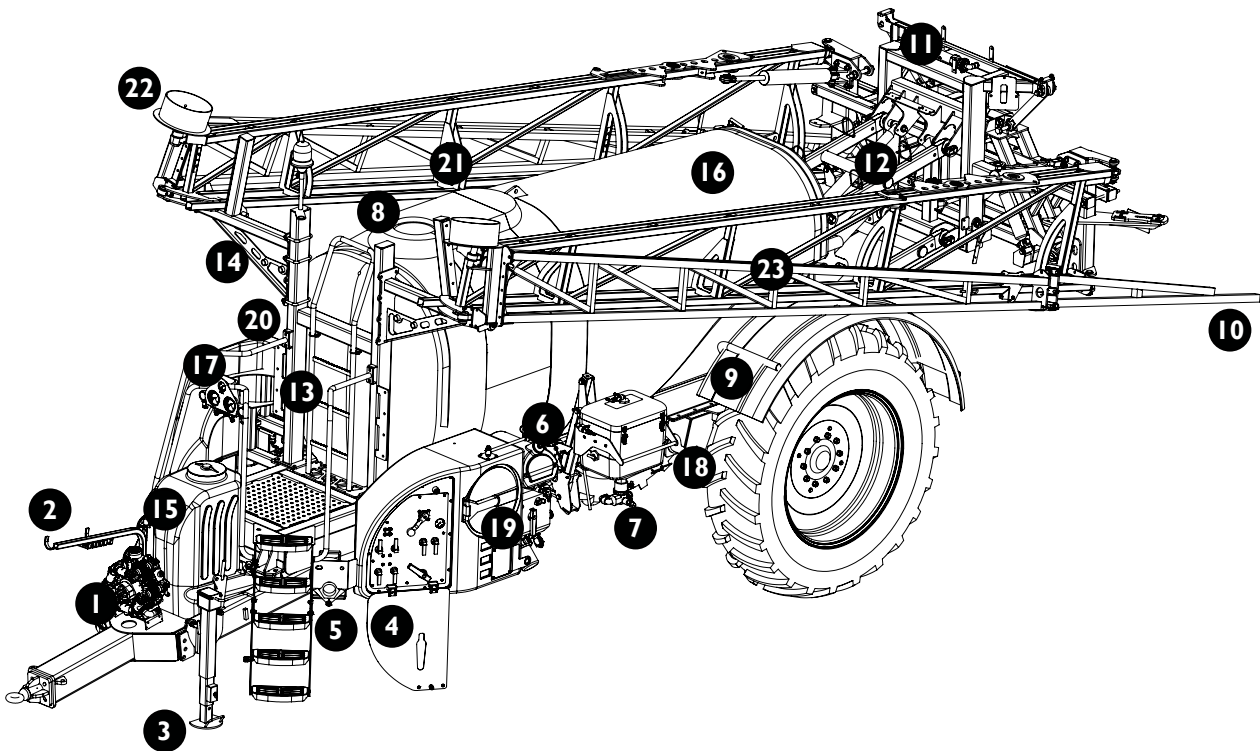
- A calibrated measuring container that can measure the medium in litres, in 10 ml increments. e.g. 0.45 Lt.
 - A timing device showing seconds.
 - A pressure gauge mounted at the nozzle tip to verify the system pressure being delivered at the nozzle. Pathway/Goldacres part numbers QJ4676-45-1/4-NYR & Q590-2-NY will mount a suitable gauge to the nozzle body bayonet fitting. (Not including gauge).
1. Check the plumbing system for kinked or obstructed hoses and repair or replace any hoses that restrict the normal flow of the liquid.
 2. Start your sprayer
 - a. For sprayers not fitted with a spray application controller; set the boom operating pressure to the pressure at which you expect to spray.
 - b. For sprayers fitted with a spray application controller; initiate a 'self test' procedure and set the application rate and speed to the settings depicted in your "Rate Chart" at which you expect to spray.

3. Then place the jug under one of the nozzles, for 1 minute (exactly) and then 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 rate chart. It should be no more than plus or minus 10% of the volume stated in your Nozzle Supplier's rate chart
6. In the event that any of your nozzles do not deliver the required volume, a further investigation is required which may include, but not be limited to:
 - a. Cleaning the nozzles, using the method recommended by the nozzle supplier.
 - b. Replacing the nozzles. (Teejet advise that nozzles that flow greater than +10% of their stated volume are 'worn out' and should be replaced.)
 - c. Cleaning nozzle filters.
 - d. Replacing filters.
 - e. Replacing pump diaphragms.
 - f. Replacing the pump.
 - g. Ensuring that the application rate required does not exceed the maximum flow and pressure parameters of the sprayer.

Chapter 6

OPERATION

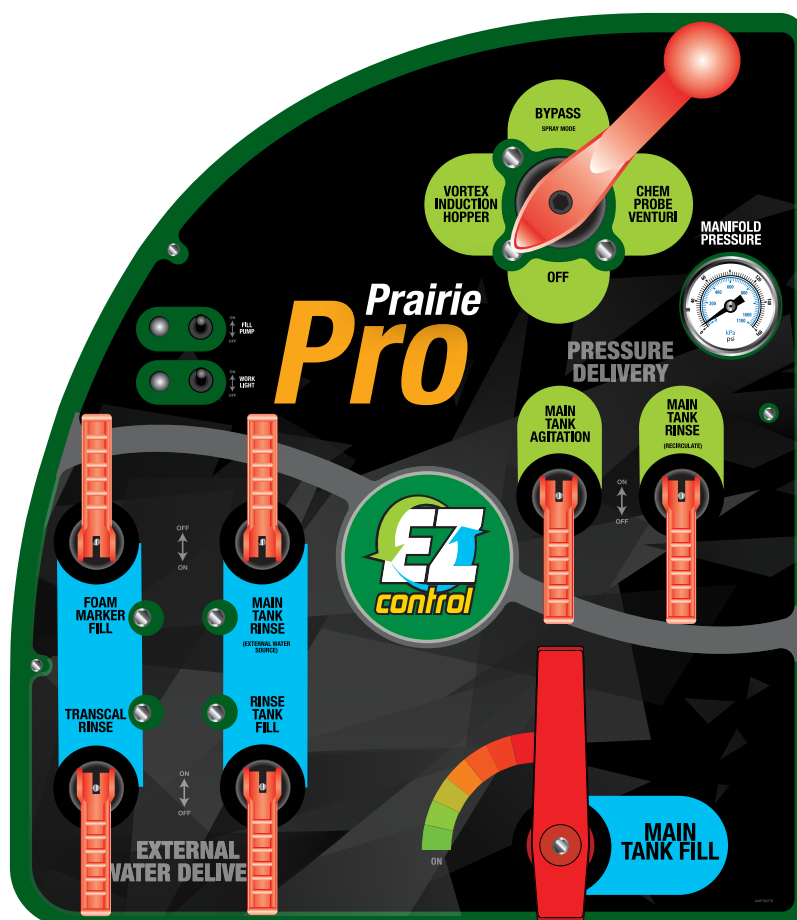
Key features



Number	Feature
1	Diaphragm pump
2	Drawbar connection arm
3	Mechanical jack
4	EZ control
5	Fill point
6	Hand wash tank
7	Induction hopper
8	Main tank lid
9	Mudguard <i>(optional)</i>
10	Boom tip
11	Flow meter & hydraulic spool valves <i>(where fitted)</i>

Number	Feature
12	Boom paralift
13	Ladder
14	Boom rest
15	Flush water tank
16	Main tank
17	Pressure gauge
18	Pressure filters
19	Storage locker
20	Right hand pod
21	Boom inner wing
22	Boom cable drum
23	Boom outer wing

EZ Control



EZ Control key functions

External water delivery functions. (These functions are only available when external water is being pumped into the system)	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. With the main tank fill tap off - the pressure will go up.
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 water fill	Used to fill the rinse water tank.
Foam marker fill	Used to fill the foam marker tank.
Foam marker remote breather	Prior to filling the foam water tank, opening this breather will allow the tank to vent when filling.
Transcal rinse	Allows external fresh water to be used in rinsing the Transcal circuit.
Enviro drum coupling rinse	With the micromatic/envirodrum coupling connected to the enviro rinse coupling, having this function ON, will allow fresh water to circulate through the coupling.

EZ Control key functions (continued)

Pressure delivery <i>(These functions only available when the main spray pump is operating - pressuring the system)</i>	Use
Vortex induction	Turn ON to use vortex induction hopper
Venturi	Turn ON to use chemical probe or Transcal
Agitator	Turn ON to activate agitator
Bypass	Turn ON bypass when in spray mode
Pressure regulator	The pressure regulator allows the operator to set the relief pressure of the pressure manifold (max 110psi)
Manifold pressure gauge	Indicates the manifold pressure
Main tank rinse (recirculate)	Turning ON allows flow to recirculate through system for a more thorough flushing/decontamination.

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 (for hydraulic fill pump information refer to chapter at the rear of this manual). If a fill flow meter has been fitted, refer to the operation chapter at the rear of this manual for further information.

WARNING: Water weighs 1kg 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 1.28kg per litre. Tank size is 6500L

$$6500L / 1.28kg = 5078L$$

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

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

The following steps should be used as a guide to filling the machine:

Main tank fill:

1. Connect the fill hose (not supplied) to 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) & that other fill functions are OFF.
3. Turn the fresh water pumping system on (make sure the pressure does not exceed 100psi)
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.

Caution: Turn tap off slowly to avoid large pressure spikes which may cause damage.

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 coming into the system as per "Main tank fill" instructions, ensure that all fill functions 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 lever as labelled.
3. When filling the foam marker tank, ensure that the foam marker breather has been turned to OPEN - or the cap has been removed (Prairie EF models)
4. When the required amount of water has been transferred, turn the appropriate valve to OFF.
5. When all functions have been performed, turn the fresh water pumping system OFF.

Agitation

To achieve satisfactory agitation, the following guidelines are recommended.

1. Add 20 percent of the tanks 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.

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

Spray Application

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

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

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

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

Adding chemical to the main tank:

Where chemical induction equipment (chemical probe, induction hopper, Transcal or DCI) has been fitted, please refer to the instructions on operating this equipment at the rear of this manual.

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 5000 litres in the tank with a 250l/min pump agitate for $5000/250 = 20$ minutes.

To agitate while spraying: Have the bypass ball valve and agitator lever ON.

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

operators manual supplied.

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

Flushing

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

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

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

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

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

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

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).

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

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

being applied should be provided by your agronomist or chemical supplier.

Follow the flushing instructions above, while using the appropriate decontaminating agent for the chemicals being used.

2. Clean all filters.
3. Clean all nozzles.
4. Wash down unit
5. Drain main tank

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

If the sprayer is to be disconnected from the tractor:

1. Ensure the main tank and any other tanks are empty.
2. Lower the jack and wind up until weight is taken off tractor.
3. Remove drawbar pin.
4. Remove safety chains.
5. Disconnect all drawbar connections between the sprayer and the tractor (i.e. tail lights, foam marker lines, electric controls etc.)

End of program

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

- Clean the sprayer thoroughly as described under "END OF DAY" tasks.
- With the sprayer attached to the towing vehicle, carry out a thorough observation to determine if there is any damage to the sprayer.
- Park the sprayer in a position where it will not be affected by frosts, and preferably out of direct sunlight.
- Ensure the main tank and any other tanks fitted are empty.

Transporting the sprayer

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

6. Where fitted, remove the PTO shaft from both the sprayer and the tractor.
7. Protect hydraulic hoses and electrical connections.

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

Make sure any ice has thawed before using sprayer.

- Lower the jack and wind until weight is taken off tractor.
- Remove drawbar pin.
- Remove safety chains.
- Disconnect all drawbar connections between the sprayer and the tractor (i.e. tail lights, foam marker lines, electric controls etc.)
- Where fitted, remove the PTO shaft from both the sprayer and the tractor and store with the sprayer.

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

5. Where a road pack has been installed connect tail light plug.

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

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

Chapter 7

BOOM

General

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

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

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

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

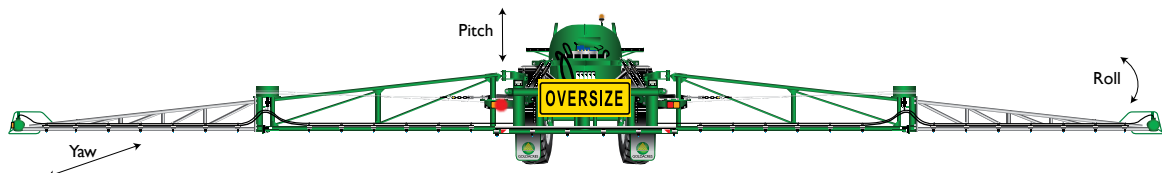
CAUTION: All chemicals have corrosive properties to some degree. Prevent damage to the machine by always consulting the chemical MSDS or the chemical supplier for advice concerning the corrosive properties of the chemical. It is the responsibility of the operator to carry out

preventative and ongoing maintenance to the machine, particularly while applying chemicals with highly corrosive properties. Machine components should be coated with a suitable protectant prior to use, and then washed down, thoroughly, immediately after every application. Consult the supplier of the substance if you require specific advice about the effectiveness of any particular protectant to prevent premature degradation of machine components.

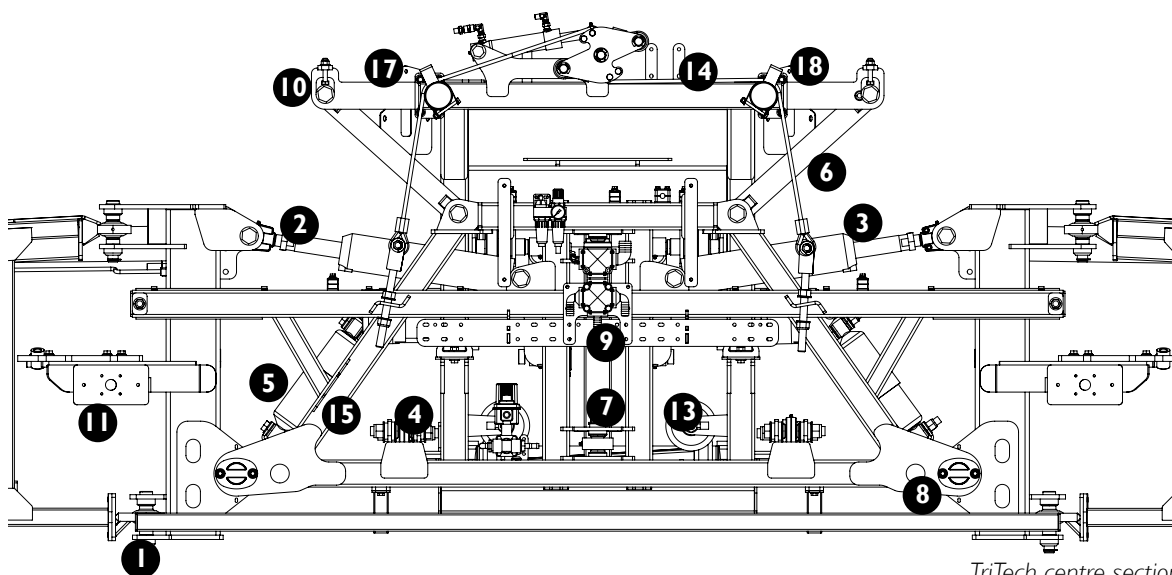
TriTech booms feature a unique (patented) boom suspension system.

This system provides suspension in three directions:

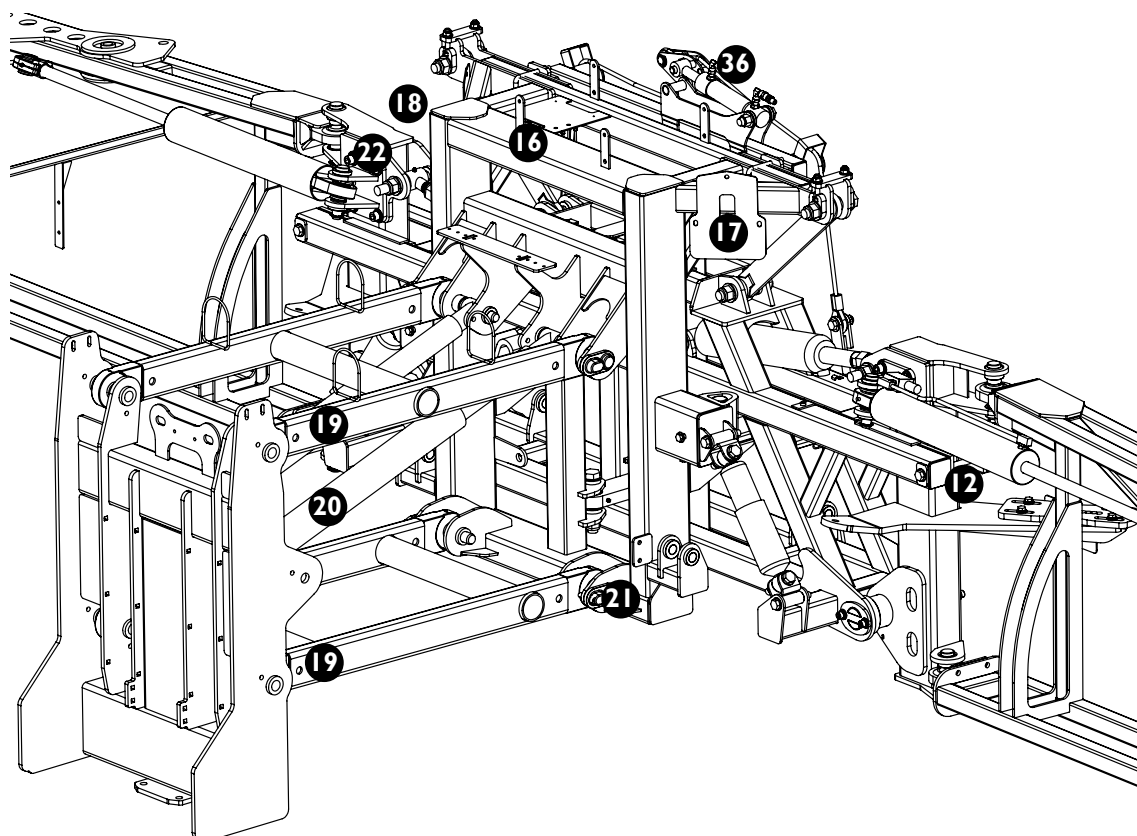
- Pitch:** Hydraulic cylinders and accumulators dampen the vertical boom movement encountered over rough ground conditions.
- Roll:** Shock absorbers help maintain constant boom height over sloping and uneven ground.
- Yaw:** Shock absorbers and springs overcome the erratic whipping movement, which creates undue stress on the boom frame and uneven spray application. (Hydraulic Yaw suspension is an option)



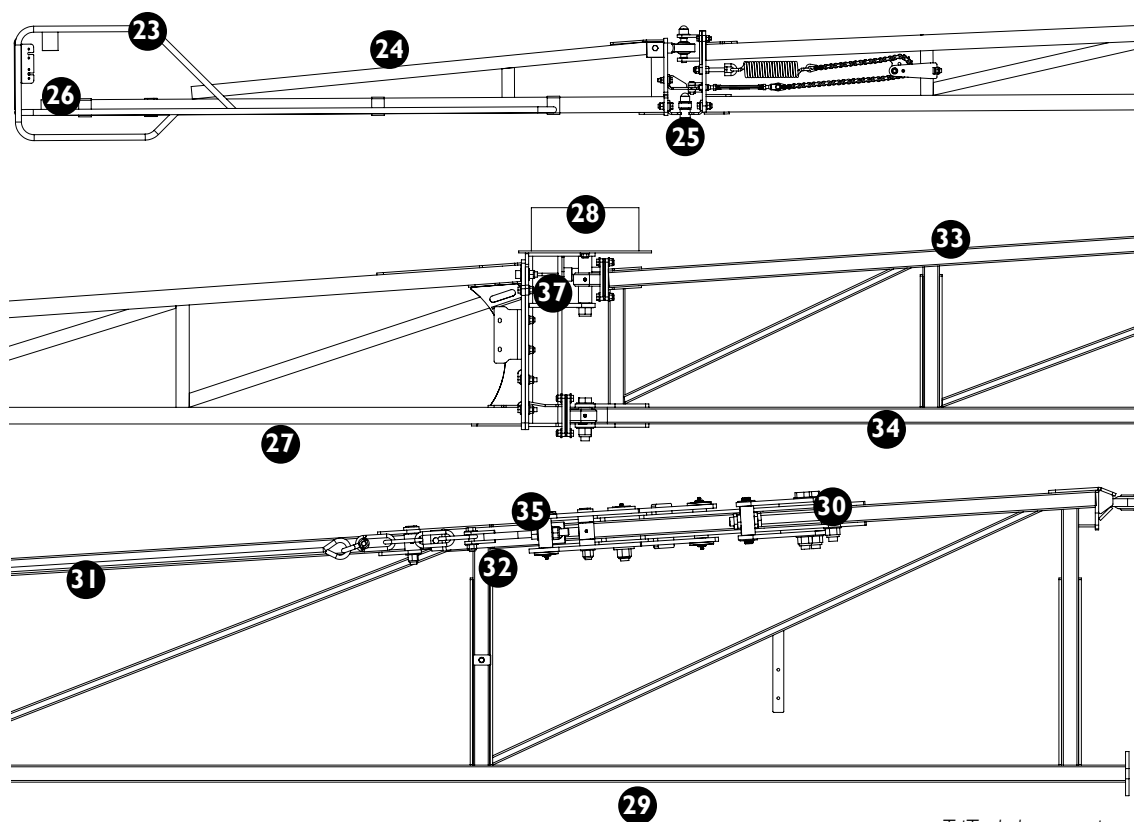
Boom key features



TriTech centre section



TriTech centre section & paralift



TriTech boom wings

Number	Feature
1	Boom rose end
2	Tilt arm adjuster
3	Tilt cylinder (option)
4	Yaw spring (or cylinder) mount
5	Roll shocker
6	Diagonal delta links
7	Lineal delta links
8	Tilt pin (60mm)
9	Boom section controls
10	Boom alignment adjuster
11	Tail light mounting plate
12	Tilt arm wear strips
13	Hydraulic yaw accumulators (option)
14	Hydraulic spool valves (option)
15	Hydraulic yaw controls (option)
16	Flow meter
17	UltraGlide node (option)
18	UltraGlide node (option)
19	Paralift arms

Number	Feature
20	Lift cylinders
21	Boom lower limit switch
22	Bolt on fold cylinder mount
23	Boom end protector
24	Boom wing tip
25	3D breakaway
26	Fenceline jet
27	Boom aluminium outer
28	Boom cable drum
29	Boom steel inner
30	Adjuster for fold ram
31	Boom cable
32	Hydraulic fold cylinder - for bi-fold
33	Boom top chord (R.H.S)
34	Boom bottom chord (R.H.S)
35	Cable adjuster
36	Centre Leveling system
37	Boom stopper bolt

Boom overview

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 centre of the sprayer but the boom centre section will remain static or level as it rotates around the delta links connecting it to the paralift rear.

The boom yaw is dampened by 2 large springs (1 each side) and 2 dampener shockers to limit the recoil of the yaw springs. These springs must be tensioned all the way. If the springs are not tensioned correctly the boom will be able to yaw excessively and the springs may be damaged. If a spring is damaged, both opposing springs must be replaced at the same time.

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 and lower

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

TriTech booms 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 "maintenance" chapter of this manual.

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 TriTech booms hydraulic fold feature, allows the boom to opened and closed from within the tractor cabin via the tractor hydraulic system.

Hydraulic phasing cylinders 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.

As hydraulic fluid enters one hydraulic cylinder, it acts upon the first ram and causes it to move. This motion results in an amount of fluid entering the second hydraulic cylinder which causes it to move an equivalent distance. There is also a flow restrictor for each cylinder so that the hydraulic fluid will enter and leave the respective cylinders at a controlled rate. This has the effect of slowing down the rate of fluid transfer and thus causes the boom to open and close more slowly - protecting the boom from damage. If the phasing cylinders do not fold together, information on re-phasing the rams can be found in the "maintenance" chapter.

Boom balance

The TriTech 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 counterweight can be included on the boom and placed strategically so that it compensates and balances the boom. The counterweight can have more weight added and/or be moved to balance the boom correctly.

Boom cables

Boom cables are a critical part of the TriTech boom 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 sprayer's 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 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 valve then check that the fuse (3 amp) is ok.

Nozzles

The standard nozzle spacing on Goldacres booms is 500mm. 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 catalogue and Users guides to spray nozzles are available from your Goldacres dealer, or as a free download from the TeeJet web site: www.teejet.com
Lechler web site: www.lechler.de

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.

Boom protection brackets

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

Boom end protector

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

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.

The angle of the off-centre jet can be altered to suit particular applications but it should enable the boom to be inside the fence by about 1 metre and still be able to spray 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 yaw suspension

(optional)

Hydraulic yaw suspension is designed to control the yaw movement of the boom centre section. In place of the conventional system, which uses 4 springs and 4 dampers, the hydraulic yaw option uses 2 hydraulic cylinders and nitrogen filled accumulators to 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.

For further information, refer to the hydraulic yaw suspension section in this chapter.

Bi-fold

(optional)

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

For example a 36 metre TriTech boom fitted with the bi-fold option would fold back into 18 metres swath 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.

UltraGlide

(optional)

The Goldacres 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. UltraGlide 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 "UltraGlide" section at the rear of this manual.

Hydraulic Boom Wing Tilts

(optional)

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 a lever or switch in the cabin. (depending on hydraulic system fitted).

The use of tilt cylinders should be kept to a minimum as the tilt operation affects the balance of the boom causing rocking of the whole boom assembly.

Where hydraulic tilts are not fitted, a manually adjustable link is placed in substitute for the tilt cylinder.

Three tier system (3TS)

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.

When a conventional boom starts spraying at low speeds, the pressure at the nozzle is correspondingly low. As the sprayer accelerates the pressure at the nozzles also increases as the Raven controller adjust the flow rate to maintain the correct application rate. As you may be aware, nozzles have a suggested maximum pressure range in which they should be operated. For example: The suggested minimum and maximum pressure range of an XR 11002 TeeJet nozzle is 100 kPa to 400 kPa. If the nozzle is operated above this range then the potential for spray drift is dramatically increased due to the excessive number of finer droplets produced. The rate of nozzle orifice wear also rises as the pressure extends outside the optimum range. The conventional boom therefore has a limitation as to the maximum speed it can operate before the nozzles start to work outside their optimum pressure range.

A 3TS utilises two different sized nozzles in each of its two lines. It starts off on the boom line with the smaller nozzles i.e. 110015's in the same manner as the conventional boom. This is referred to as the first tier. As the sprayer accelerates the pressure at the nozzle increases to maintain the given spray rate, but at a predetermined flow rate (example 350 kPa) the Raven controller simultaneously turns off this first line whilst turning on the second boom line containing larger nozzles i.e. 110025's. This is referred to as the second tier. If the sprayer continues to accelerate the pressure in this second

line also increases to a second predetermined point and the Raven controller then turns both lines on i.e. 110025's + 110015's. This is referred to as the third tier. The combined flow rate of the two sets of nozzles 110025 + 110015 = 11004 allows scope for the sprayer to accelerate even further if required.

As the sprayer slows the reverse occurs. The Raven controller turns off the 110015's leaving only the 110025 operating then turns off the 110025's whilst simultaneously turning back on the 110015's as the sprayer slows.

Not unlike automatic gear changes in a vehicle, where the transmission selects gears to maintain engine RPM's in the optimum range, the 3TS automatically select nozzle sizes to maintain the pressure in the optimum range.

The whole system is controlled by the Raven SCS4400 which has 3TS compatibility as a standard feature. It's simply a matter of programming into the SCS4400 console the two predetermined flow rates at which point you wish the tiers to change. Nothing else needs to be done by the operator, and it is a very simple system to operate.

For information on 3TS boom tier programming refer to the "calibration" section of this manual.

Boom operation

Folding

The boom fold sequence is as below:

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

NOTE: Booms must not be folded, or unfolded, while the sprayer is moving. When the boom is between fully open and fully closed, there can be

RapidFire

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 autoboom shut off systems.

Boom Recirculation (RapidFlow)

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.

This option is not available unless rapid fire is also fitted.

large stresses placed on many boom components. If the sprayer is moving and hits a bump, severe damage to the boom can occur:

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

Un-folding

The boom unfold sequence is as below:

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

NOTE: The booms must be folded continuously without stopping and starting during the sequence.

Boom adjustment

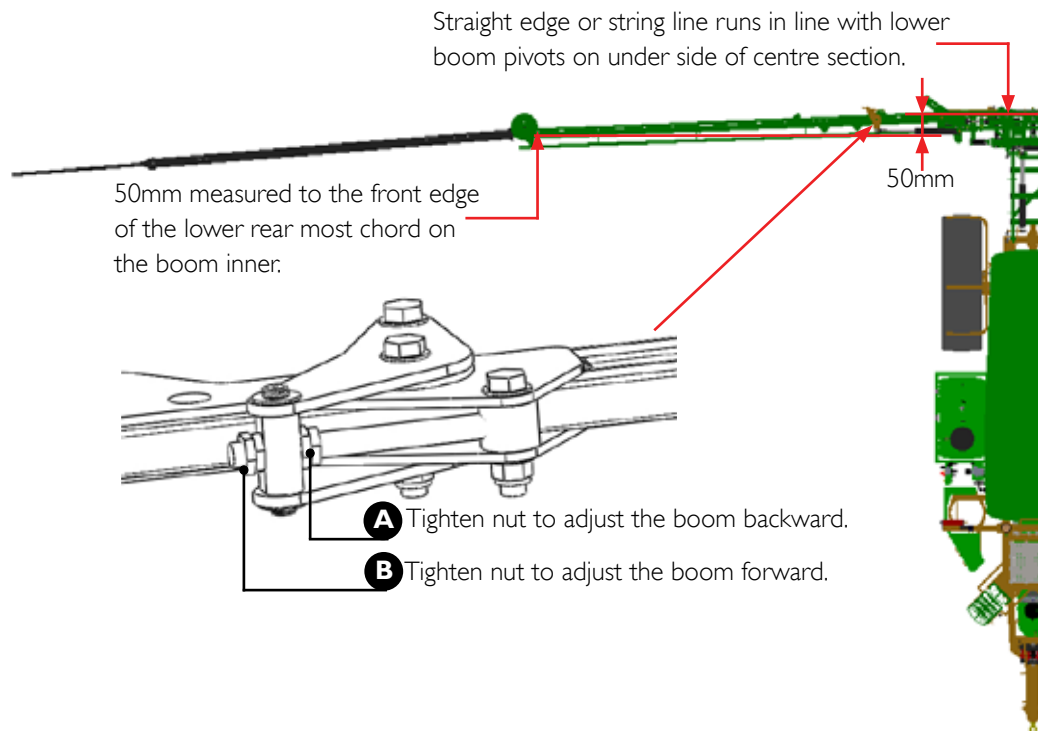
Alignment of inner steel boom - Working position

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

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

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

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



Boom adjustment (continued)

Alignment of outer aluminium boom - Working position

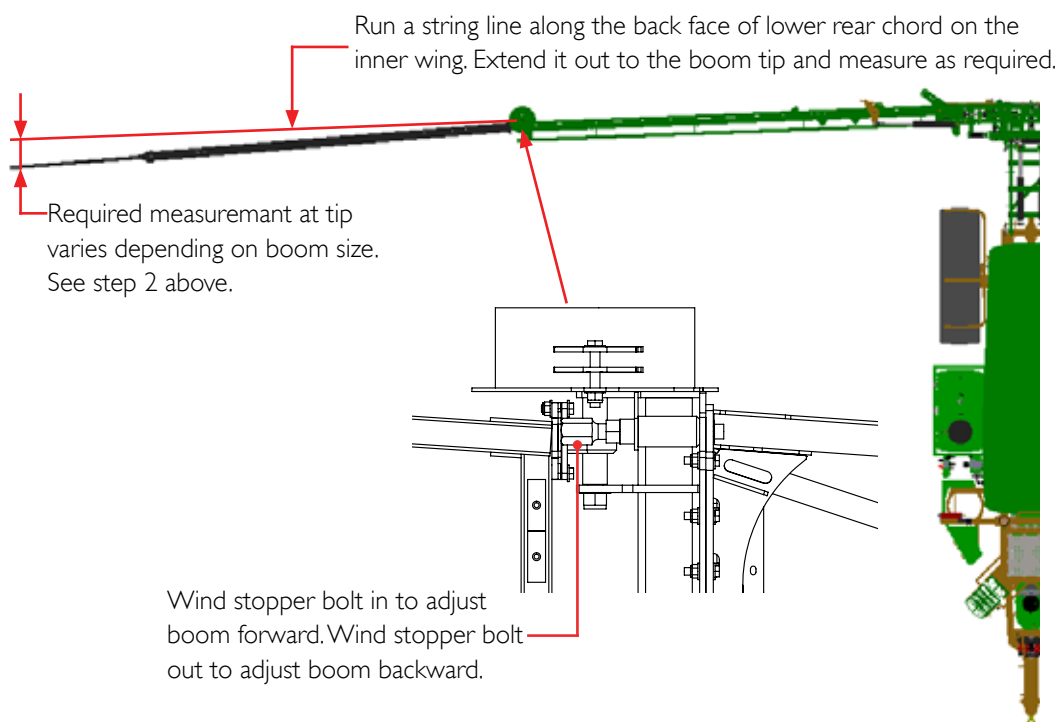
1. When adjustment of the inner booms is complete the outer booms can now be aligned.
2. 24-30m Trittech booms must be 30-50mm and 33-36m booms must be 50mm forward of the inner booms. Use a string line to assist with achieving the correct measurements.
3. To align the outer booms, the cable adjusters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

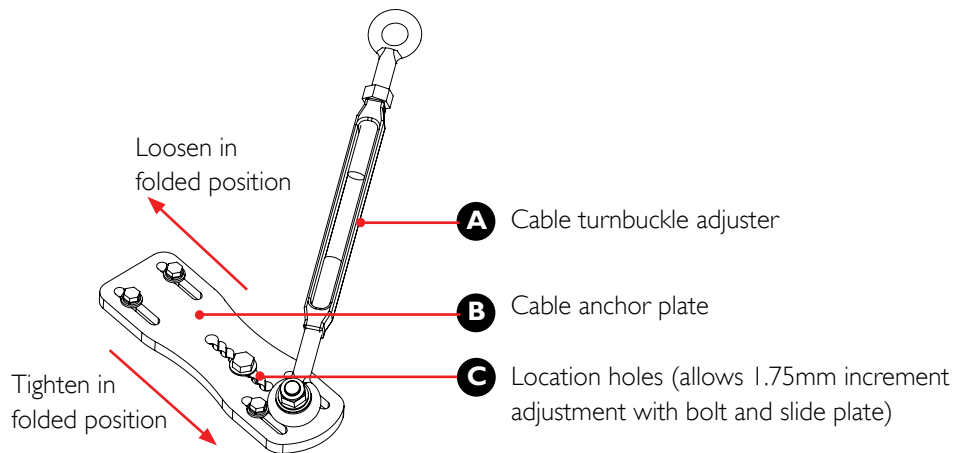
Note: It is important that both wings are adjusted the same. If one wing is adjusted further forward or back than the other, the boom may not sit level.



Alignment of outer aluminium boom - 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 3mm 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



Vertical boom alignment - working position

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

Inner Booms

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

- To lengthen or shorten the tilt adjusters, the weight of both the booms will need to be supported.
- When any adjustments are completed. Ensure the lock nuts are tight.

Outer Booms

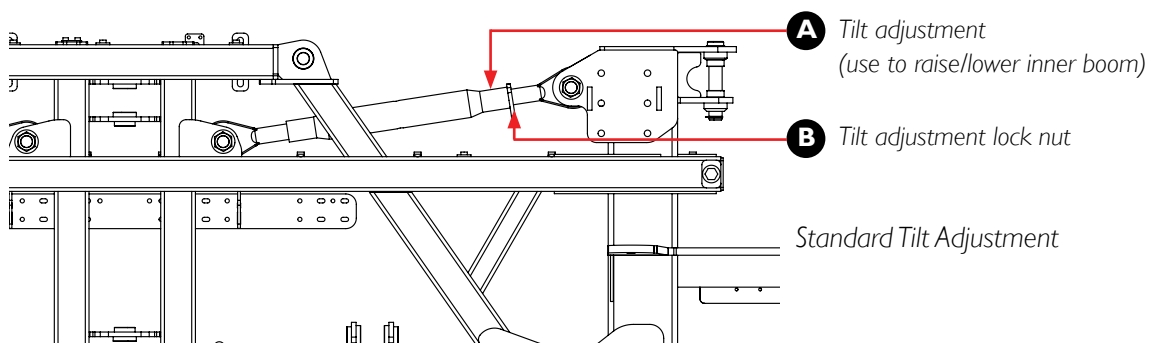
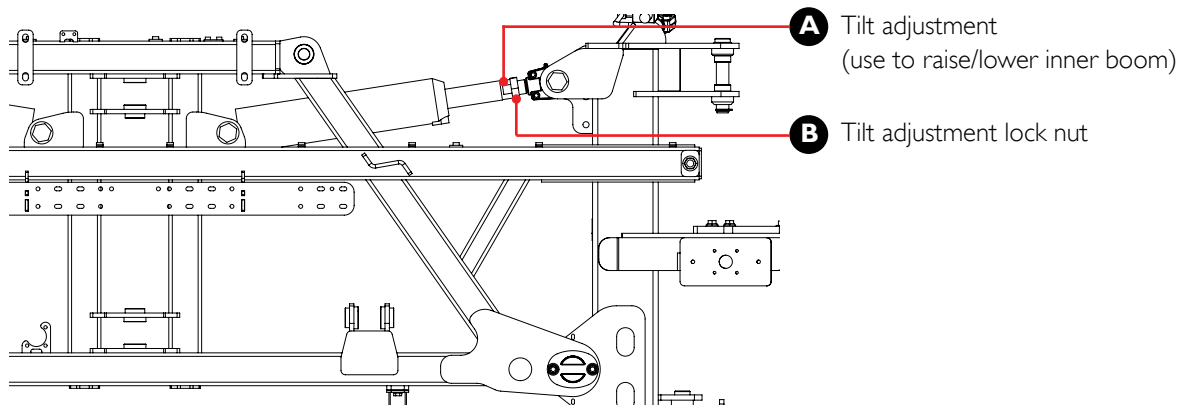
- The height of the outer booms in the working position are adjusted by adding or removing shims at the cable drum.
- The cable drum mounts are assembled in manufacturing with 6-7 shims at the upper and lower bearing blocks.
- If the outer boom hangs lower than the inner boom, remove shims from the upper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

24-30m booms:

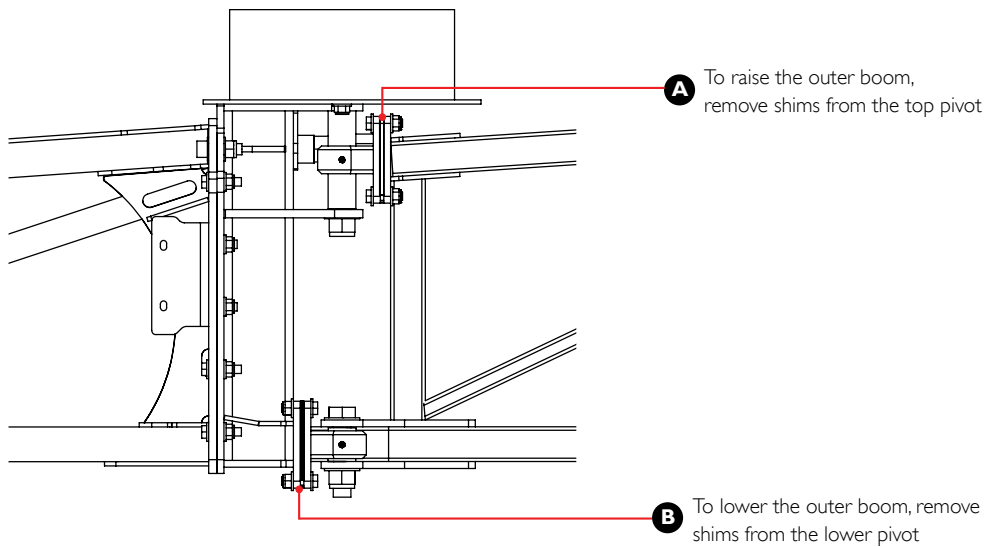
1 shim added = 10-20mm @ boom end

33-36m booms:

1 shim added = 20-30mm @ boom end



Vertical boom alignment - working position continued

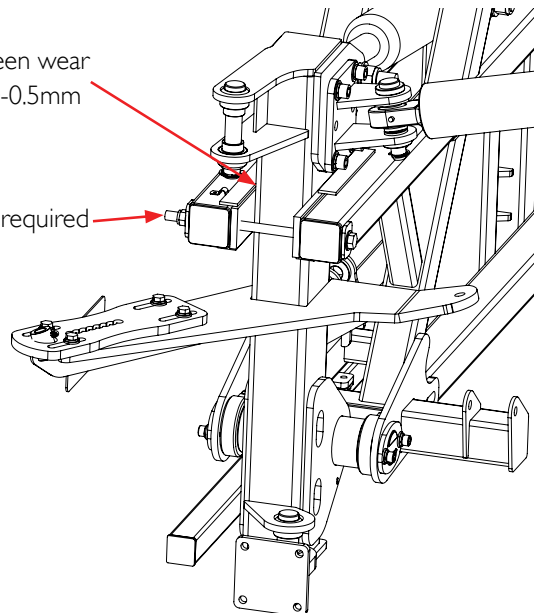


The tilt arm guide arms are fitted with wear strips. It is important that these strips are maintained and that the gap between them and the tilt arm is kept between 0-0.5mm either side. This ensures the tilt

arm cannot twist, prolonging the life of the product. To adjust the clamp pressure tighten or loosen the clamping bolt.

Keep distance between wear pad and tilt arm at 0-0.5mm

Adjust clamp bolt as required



Vertical boom alignment - folded position

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

Inner Booms

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

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

When the booms are folded up in the transport position, the outer boom must saddle onto the inner boom. If this alignment 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 required in the first 6 months of operation as the booms stretch and wear in.

Outer Booms

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

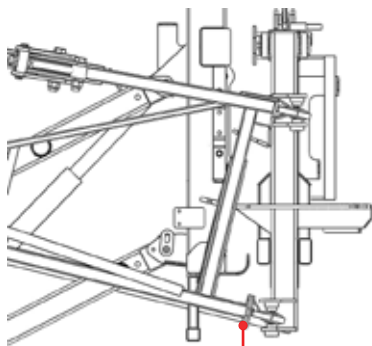


Diagram A

Place shims here

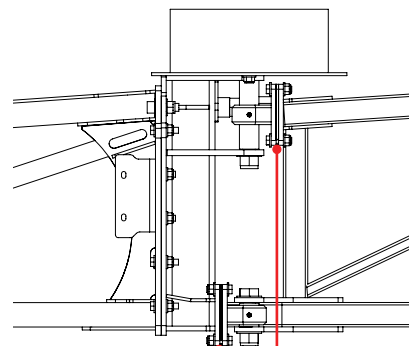
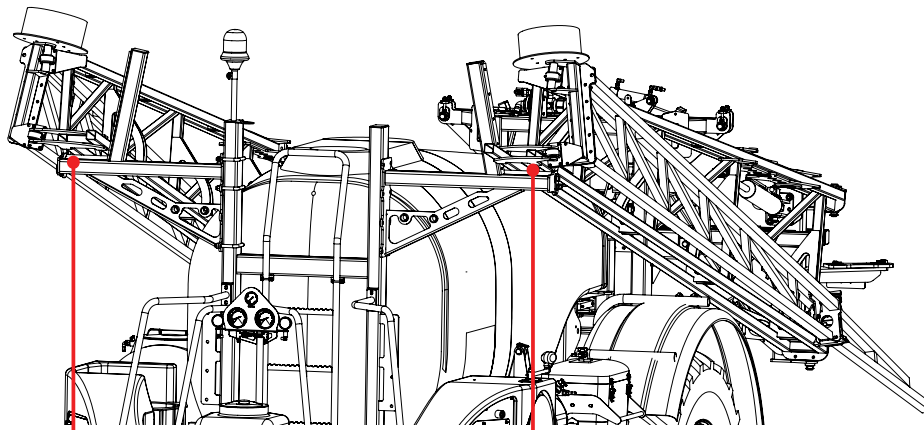


Diagram B

Place shims at both pivots



Booms must contact rests at the same time

36m & 42m Aluminium Outer Boom

Initial Setup

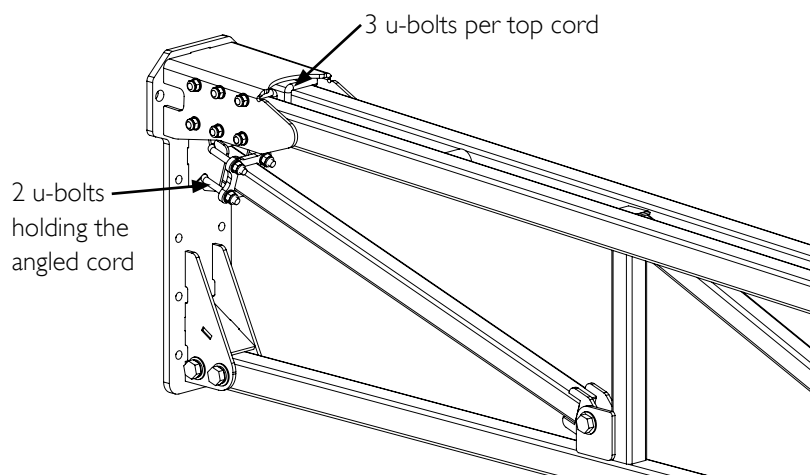
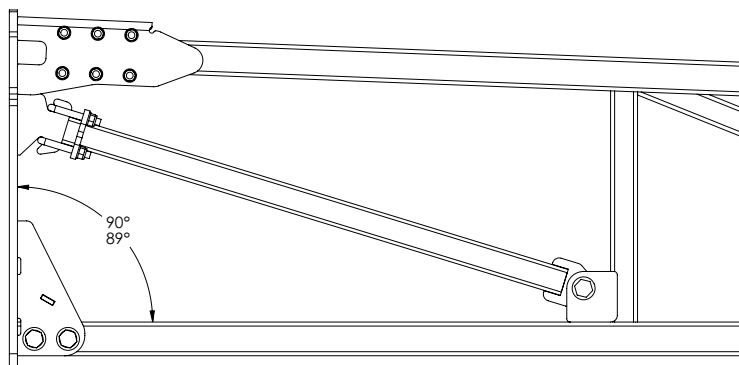
When the booms are fitted at the factory, they are made level or slightly increasing in height from the centre section. Under working conditions the aluminium outer booms will need to be checked at every 50 hour intervals as per the Maintenance Schedule.

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 cable drum bearing blocks to get the booms level. Refer to Vertical boom alignment - working position.

If the aluminium around the u-bolts shows any signs of movement, then the u-bolts will need to be tightened.

Ensure the boom is level in the working position, and that the end plate to cords are at 89-90 degree, then tighten all the u-bolts upto 30 lbft.



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 52mm 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). To adjust the turnbuckle;
A) 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.
B) Make adjustments to turnbuckle.
C) Pull tip back and remove the pin. Release the tip and check alignment of small hole in sprocket with pivot plate.
D) Repeat steps A-C until the small hole in the sprocket and hole in the side plate align.
6. The spring tension must be adjusted so there is a 1-2mm 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.

Maintenance

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

1. 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) and the spring tension. Check these on a regular basis and adjust as required.
2. 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.
3. To ensure the smooth and long lasting operation of the breakaway mechanism, they must be lubricated on a regular basis. The sprocket pivot, chain and lower rose joints should be oiled with a wet lubricant every 8 hours. The upper rose joint should be greased every 8 hours.

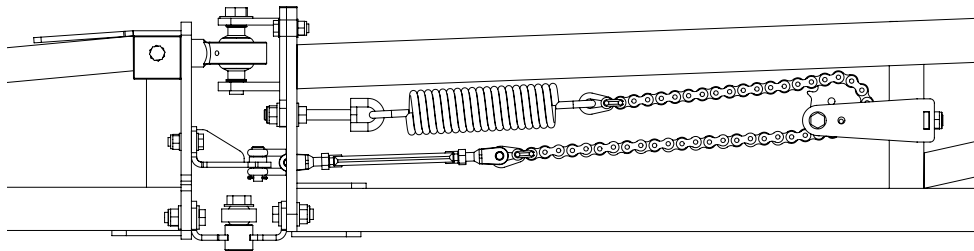


Figure A

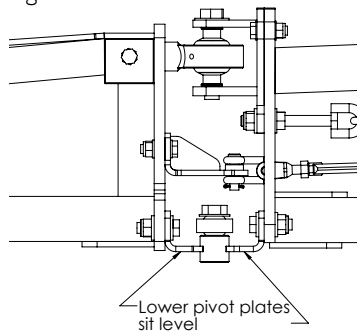


Figure B

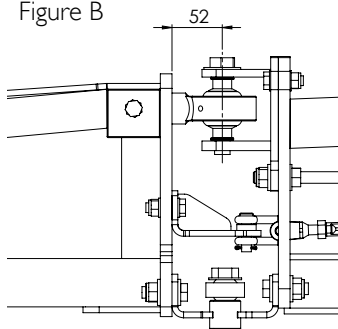
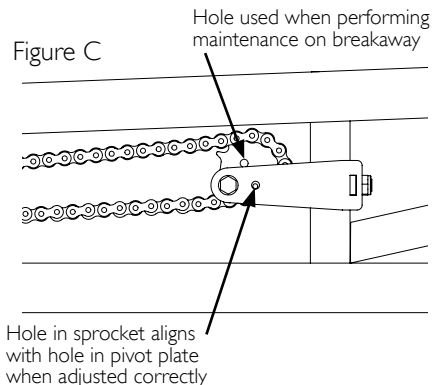


Figure C



Hydraulic Yaw Suspension

About

Large booms, and booms fitted with Weedseeker sensors, may have hydraulic yaw suspension fitted. This is a system that replaces the yaw springs and dampers with hydraulic cylinders and nitrogen filled accumulators. This system maintains a more rigid ride in the centre section therefore limiting small variations in the yaw on heavier booms.

The hydraulic yaw system is a closed hydraulic circuit. The base of the right hand yaw cylinder is connected via hydraulic hoses to the rod end of the left hand cylinder 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 accumulators display the closed loop hydraulic yaw pressure. This pressure should be maintained at 100 bar.

Bleeding the circuit

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

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

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



4. Remove the covers from the inline test point on the accumulators.



5. Connect the bleed hose (supplied in the sprayer kit) to inline test point on the accumulators.



6. Couple the bleed hose quick connect end to an external hydraulic source, such as a tractor.
7. Using the external hydraulic source, oscillate the boom back and forth ensuring to hold the boom at its extremities for approximately 30 seconds. 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.



10. Check that the pressure gauges in the hydraulic yaw circuit are reading below 100 bar.
11. Close the hydraulic yaw "charge" ball valves.
12. Disconnect the bleed hose from the tractor or external hydraulic source, and then remove the hose from the inline test points. Replace the cover on the test point.
15. Next see "Charging the system"

Charging the system

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

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



This picture shows the yaw charge ball valves in the "OPEN" position

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 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.



7. Ensure that the boom is sitting level and aligned correctly. If one side of the yaw is sitting forward of the other "open" the "charge" ball 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.

How to re-centre the boom

1. Park the machine on a flat level surface, engage the parking brake and chock the sprayer wheels.
2. Open the boom into the working position and lower to the minimum working height. (Ensure 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. Open the hydraulic yaw "charge" ball valves.

This picture shows the yaw charge ball valves in the "OPEN" position



5. Oscillate the boom by hand and then move the boom into a perfect centred position.



6. The pressure gauges in the hydraulic yaw circuit should be reading 100 bar.
7. Close the hydraulic yaw "charge" ball valves.



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 above for a regular boom.

Alignment of outer aluminium boom - Working position

1. When adjustment of the inner booms is complete the outer booms can now be aligned.
2. 24-30m Tritech booms must be 30-50mm and 33-36m booms must be 50mm 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 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

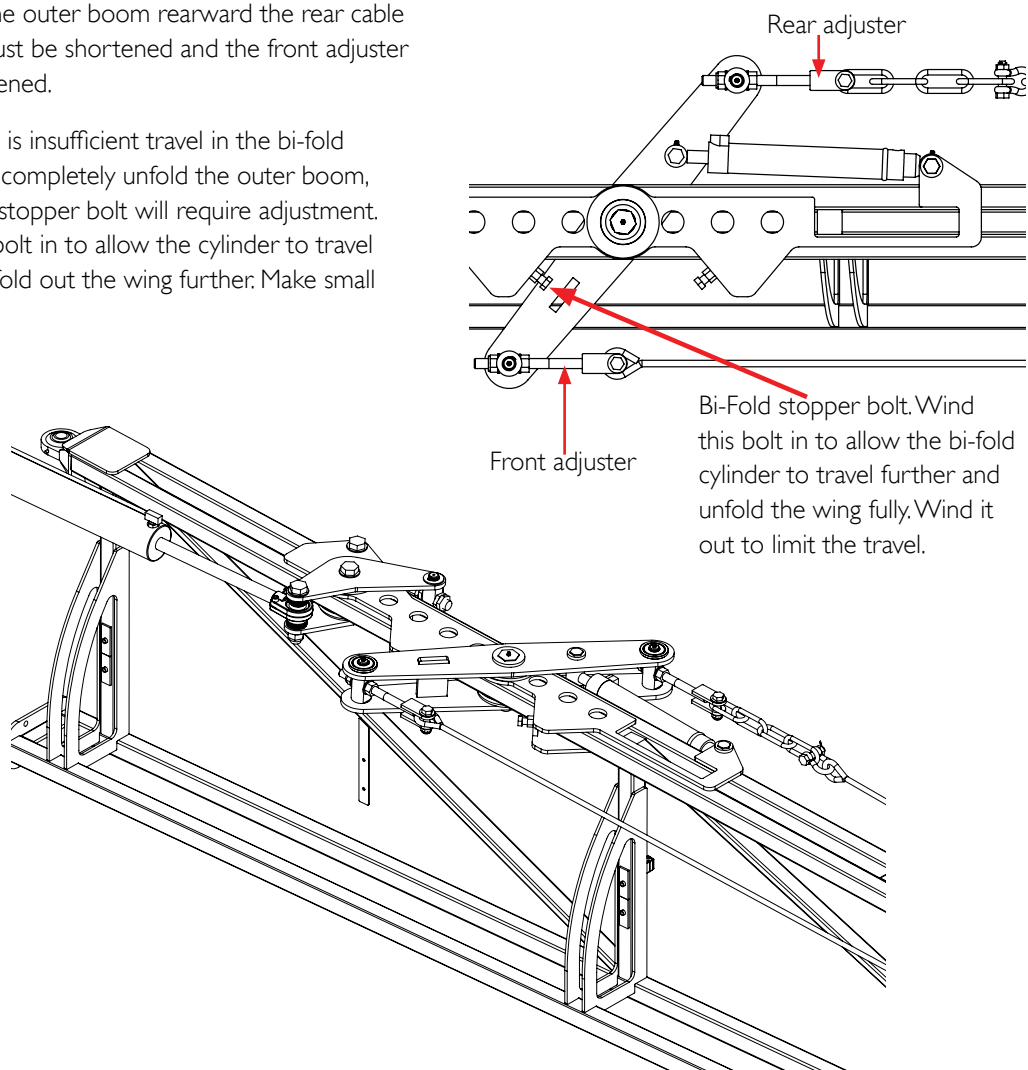
adjustments when winding the bolt and fold the outer wing each time to check the adjustments made.

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 50mm deflection in the cable when a force of 15kg is applied to it.

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

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



Alignment of outer aluminium boom - folded position (with Bi-Fold)

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

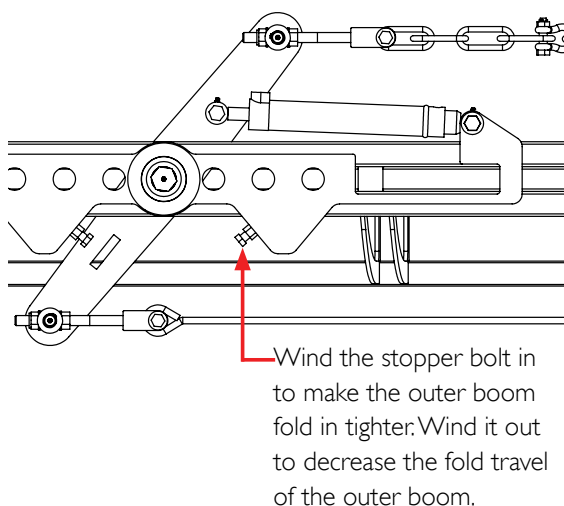
2. To increase to fold pressure of the outer boom, the bi-fold stopper bolt must be shortened. This will increase the travel of the bi-fold cylinder allowing the outer boom to fold around tighter.

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

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

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

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



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
24m	1500 psi
28m	1550 psi
30m	1600 psi
33m	1650 psi
36m	1700 psi

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

The bi-fold pressure is adjusted at the spool block (for more information on the spool block, see the lubrication and maintenance chapter).



Bi-Fold pressure reducing valve

With the boom fully folded out, check the bi-fold pressure on the gauges at the front of the sprayer. Note if the pressure needs to be increased or decreased. Bi-fold the boom so that 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.

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.

If the Bi-fold losses pressure while operating, the check valves may be leaking. If they are leaking, they should be replaced. (check valves shown below).

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



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.



Chapter 8

TROUBLESHOOTING

General

The following troubleshooting information is provided as a reference when your sprayer is not functioning correctly.

To ensure that you receive the best possible service, it is recommended that you exhaust all applicable

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

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

Diaphragm pump

Pressure and flow rate are too low?	
Common causes	Common solutions
Excessive bypass on pressure manifold	<ul style="list-style-type: none">• Verify console calibration settings
Supply to pump is restricted	<ul style="list-style-type: none">• Check the pressure relief valve setting on pressure manifold
Pump	<ul style="list-style-type: none">• Close the ball valve labelled bypass, 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 fast close valve is rotating the full 90 degrees when the boom valves are switched off.• Suction filter may be blocked• Check tank sump and suction line blockages• Check suction line for air leaks• Check pump speed• Check oil for colour change. If the oil appears milky, a diaphragm will be damaged and needs to be replaced• Check valves in pump

Pressure and flow rate are too high?	
Common causes	Common solutions
Bypass line is restricted or blocked.	<ul style="list-style-type: none">• Verify console calibration settings.• Check for restriction in bypass line.• Check pump speed is not too fast.

The pressure on my gauge is higher than the nozzle flow indicates?	
Common causes	Common solutions
Blocked filters of nozzles	<ul style="list-style-type: none">• Check and clean all pressure and nozzle filters
Flow loss due to resistance in lines, valves and filters.	<ul style="list-style-type: none">• Recalibrate console to allow for pressure loss

The flow rate is correct but my pressure is too low or high?	
Common causes	Common solutions
Nozzles	<ul style="list-style-type: none">• Check nozzle chart for correct nozzle size

Pressure is fluctuating?	
Common causes	Common solutions
Air leak on suction side of pump	• Check suction pump for air leaks
Incorrect pump speed	• Adjust pump speed so it is between 400 -500rpm
Faulty pump valves	• Replace pump valves

Pump pressure is pulsating?	
Common causes	Common solutions
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 - 500rpm
Air leak on suction side of pump	• Check pump suction for air leaks

Pump oil is becoming milky?	
Common causes	Common solutions
Cracked diaphragm	• Replace all diaphragms

Pump oil is changing colour and becoming black or dark grey?	
Common causes	Common solutions
Old oil	Replace oil

Pump is noisy?	
Common causes	Common solutions
Low oil level	• Refill or replace oil
Air accumulator pressure set incorrectly (if fitted)	• Recharge air accumulator to specified pressure
Insufficient lubrication on PTO shaft	• Grease PTO shaft
Worn bearings	• Replace all bearings
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 mountings are cracked?	
Common causes	Common solutions
PTO shaft not sliding freely or incorrect length	• Check PTO shaft length and lubricate
Extremely cold weather can cause liquid in the pump to freeze	• Check for ice in the pump and let defrost if required

Damaged universal joint?	
Common causes	Common solutions
The shaft is too long	• Shorten shaft
PTO shaft is inadequately lubricated	• Lubricate PTO shaft and uni joints

PTO shaft bent or excessively vibrating?	
Common causes	Common solutions
PTO shaft is too short	• Replace PTO shaft

Flowmeter and controller

Application rate is inaccurate, unstable or zero?	
Common causes	Common solutions
Incorrect console calibration	Recalibrate console
Inconsistent wheel speed reading	Test wheel speed sensor
Inconsistent spraying volume	Replace flow meter
Faulty control valve. Check by using manual inc/dec flow control	Replace control valve

Speed sensor display is inaccurate, unstable or zero?	
Common causes	Common solutions
Incorrect speed calibration	Recalibrate console speed
Corroded wheel speed sensor cable pins	Clean cable pins
Wheel speed sensor not set up correctly	Ensure that wheel speed magnets are on wheel and that clearance is 12-19mm
Faulty cable	Test cable as per instructions following

Volume display is inaccurate, unstable, zero or not changing?	
Common causes	Common solutions
Incorrect speed calibration	Recalibrate console speed
Corroded wheel speed sensor cable pins	Clean cable pins
Wheel speed sensor not set up correctly	Ensure that wheel speed magnets are on wheel and that clearance is 12-19mm
Faulty cable	Test cable as per instructions following

Flowmeter appears to be not working?	
Common causes	Common solutions
Flowmeter is seized or blocked	Remove and clean any foreign materials so the turbine spins freely

Application rate or pressure will not alter?	
Common causes	Common solutions
Flowmeter is seized or blocked	Test valve manually and replace if required

Control valve has failed?	
Common causes	Common solutions
Replace control valve	<p>Temporary solutions:</p> <p><i>Fast Close Valve:</i> Remove the motor from the 3 way ball valve and manually adjust the flow by turning the shaft with a spanner.</p> <p><i>Standard Valve:</i> Close the bypass line ball valve in front of the control valve. Adjust the ball valve in front of the electric control valve until the desired spraying pressure is shown on the pressure gauge. If the desired spraying pressure is not able to be achieved with the ball valve, adjust the relief valve setting in order to achieve the desired pressure.</p>

Flowmeter failing to give accurate readings?

If the flowmeter fails to give accurate readings, the following procedures should occur:

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 tests can be performed in order to correct the problem. Repair or replace the flowmeter as soon as possible.

Console is not working?

Common causes	Common solutions
No power supply	<p>Check loom connection at the back of the console</p> <p>Check connection to battery terminals</p> <p>Check the fuse in the back of the console is not blown</p> <p>With a multi meter, check the voltage potential across pins 1 (-) and 37(+) on the 37 pin plug going into the console (should be at least 12v)</p>

If the Raven console fails so that it is not able to control the boom valves, and control valve, the following procedures should be adhered to:

1. Disconnect console from console cable.
2. Disconnect console cable from power source (i.e. battery).
3. Remove the plunger and spring from the solenoids. (This will open the boom valves)

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

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

For base model sprayers:

- Adjust the manual pressure relief valve to alter the spraying pressure to the desired pressure as shown by the pressure gauge on the sprayer. If the desired spraying pressure is not able to be achieved, alter the pressure relief valve setting so as to achieve the desired pressure (i.e. alter the adjusting stem).

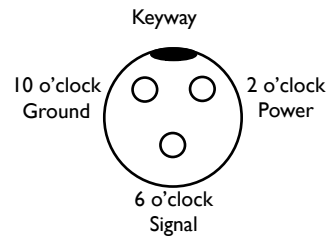
For sprayers fitted with a dual boom:

- 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 (as measured by the tractor) 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 the speed sensor cable:

1. Change speed cal number to 1000 with the [Speed Cal] key
2. Press [distance] key
3. With a jumper wire (ie: paper clip) short between 6 o'clock and 10 o'clock sockets with a "short" then "no short" motion. Each time contact is made the [distance] total should move up in increments of 1 or more.
4. If the distance 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 above voltage checks
6. Change [speed cal] number back to previous number



Voltage readings

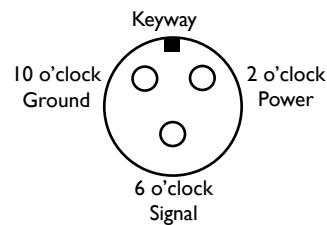
10 o'clock to 6 o'clock (+5v DC)

10 o'clock to 2 o'clock (+5v DC)

NOTE: Speed sensor is not repairable and will need to be replaced if faulty.

Testing the flow meter cal 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 (ie: 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 above voltage checks
6. Change [meter cal] number back to previous number



Voltage readings

2 o'clock to 6 o'clock (+5v DC)

2 o'clock to 10 o'clock (+5v DC)

Tanks, chassis and wheels

The drawbar of the sprayer has become noisy and loose?

Common causes	Common solutions
Worn, or missing, plastic insert in towing eye	Replace plastic insert

Induction hopper

Induction hopper is not performing as well as it should?

Common causes	Common solutions
Insufficient flow to venturi in the hopper bottom	Check the pressure supplied to the hopper bottom about is 560KPa (81psi)
Air leaks on induction system	Check all hoses, clamps, and cam lever fittings are sealed

Chem probe and Transcal

Transcal is not working or is working too slow?	
Common causes	Common solutions
Air leak in the vacuum system	Check all hose clamps and fittings are tight
The volume of water supplied to the Venturi	Check there are no kinked hoses and the water pressure is about 100psi

To isolate the area of possible air leak:
<p>Step 1: First check the operation of the chemical probe only. That is by-pass the Transcal tank. If this will transfer water at a minimum of 30lt/min then this part of the system is okay.</p> <p>If not check for air leaks at:</p> <ul style="list-style-type: none"> • 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. <p>Step 2: Check Transcal tank. If the probe is working successfully but the Transcal tank system won't work then the air leak areas to check are:</p> <ul style="list-style-type: none"> • The Tank lid. This lid may tighten against the metal bracket above the tank and not the tank itself. Also the top of the tank needs to be clean and smooth for the lid to seal. Also check the lid for cracks and condition of the seal. • Fitting at the base of the Transcal tank. • Any hoses and connectors. <p>Step 3: If probe works correctly and Transcal tank works correctly when using suction probe 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.</p> <p>IN SUMMARY:</p> <p>First: Check the flow of water into venturi.</p> <p>Then:</p> <ol style="list-style-type: none"> 1. Check the probe only. 2. Check the probe and Transcal. 3. Check Transcal and envirodrum section. <ul style="list-style-type: none"> • Tests must be done with water because the speed of the transfer is affected by the increased viscosity of the chemical. • The old foot valve at the bottom of the drop pipe caused some problems, and this has been replaced by 'lay flat' tube on all new sprayers. GoldAcres can supply a service kit to retro-fit old sprayers to the new 'lay flat' tube. • When fitting lay flat do not distort the drop pipe when tightening clamp or an air leak can develop. It will not be possible to fit the back nut to the venturi when lay flat is fitted. <p>Do not remove drop pipe from venturi except for resealing.</p>

The Transcal tank has deformed and sucked in?	
Common causes	Common solutions
Residual vacuum left in tank when it is not in use. This is especially important when spraying in warm weather or when the sprayer is parked overnight.	When use of the Transcal is complete, make sure the venturi probe tap is turned off and let the tank vent.

The sight tube on the Transcal is not giving a true indication of the tank level?	
Common causes	Common solutions
Probe or envirodrum couplers turned on	Ensure the tap on the Probe or Envirodrum coupler is turned off before evaluating the tank level.

TriTech Boom

Inner and outer wing are not inline with each other when the boom is unfolded?	
Common causes	Common solutions
Boom cables are not adjusted correctly	Adjust boom cables to realign booms

Booms will not fully fold to the boom rests?	
Common causes	Common solutions
Insufficient lubrication	Lubricate all boom pivots
Fold cylinder mounts have moved	Adjust fold cylinder mounts

Booms unfold unevenly?	
Common causes	Common solutions
Air trapped in the phasing cylinders	Unfold booms completely and hold hydraulic lever for approx 10 seconds. This will purge any air out of the phasing cylinder

Outer boom does not line up with the inner wing when unfolded?	
Common causes	Common solutions
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?	
Common causes	Common solutions
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.

Boom adjustment table			
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	Add

Smart Steer

The red warning light is permanently on?

Common causes	Common solutions
The centre calibration figure is not set correctly	Re-calibrate the centre position on the console

When the system is on, the sprayer wheels are reacting erratically?

Common causes	Common solutions
Wheel speed sensor may not be operating correctly	Jack up the sprayer and rotate the wheel. There is an LED light on the sensor that should pulse if working correctly

The wheels do not return the centre position exactly?

Common causes	Common solutions
The steering angle sensor may be loose	Tighten sensor and linkages
The minimum coil current may be set too low.	Consult your Goldacres dealer

The sprayer doesn't follow the tractor wheel tracks accurately?

Common causes	Common solutions
The yaw sensor connectors may have moisture in them	Disconnect yaw sensor. Clean and dry connector
The yaw sensor could be faulty	Replace yaw sensor

The smart steer system has a built in diagnostic tool that can tell the operator if a problem has occurred and what the problem is. Next to the steer axle calibration switch is a small red light. This light is what gives the operator feedback about the steering status. If an error occurs the light will flash several times and then pause, it will then flash again and pause. The number of flashes refers to the error. See the table below.

Number of flashes	Description of error
1	Sprayer steering angle sensors either open or short circuit.
2	Tractor mounted yaw sensor out of range. Check connections.
3	Can't drive steering solenoid A. Check hydraulic spool valve.
4	Can't drive steering solenoid B. Check hydraulic spool valve.
5	Sprayer steering angle sensor is out of range for centre position. Must be no more than +/- 4.5 degrees. Adjustment of steering sensor linkage is required.

Chapter 9

LUBRICATION & MAINTENANCE

Maintenance schedule

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

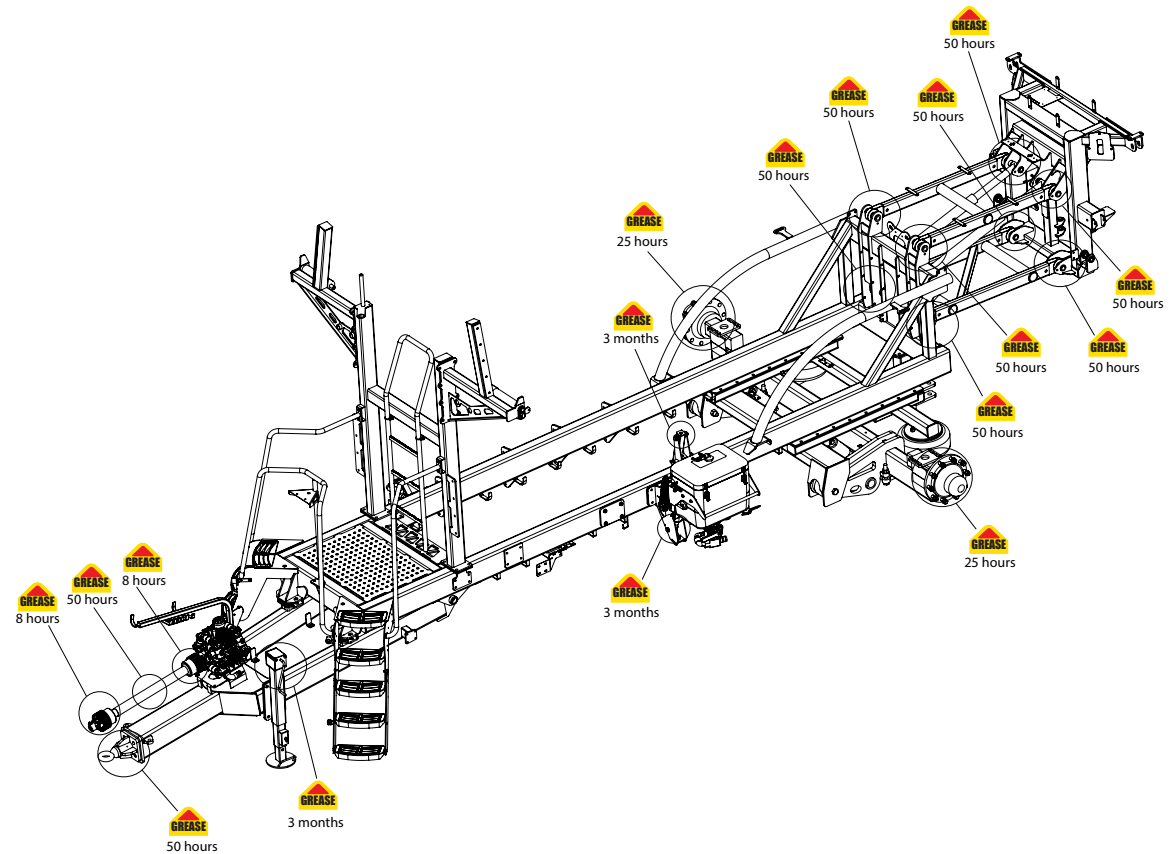
Lubrication

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

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

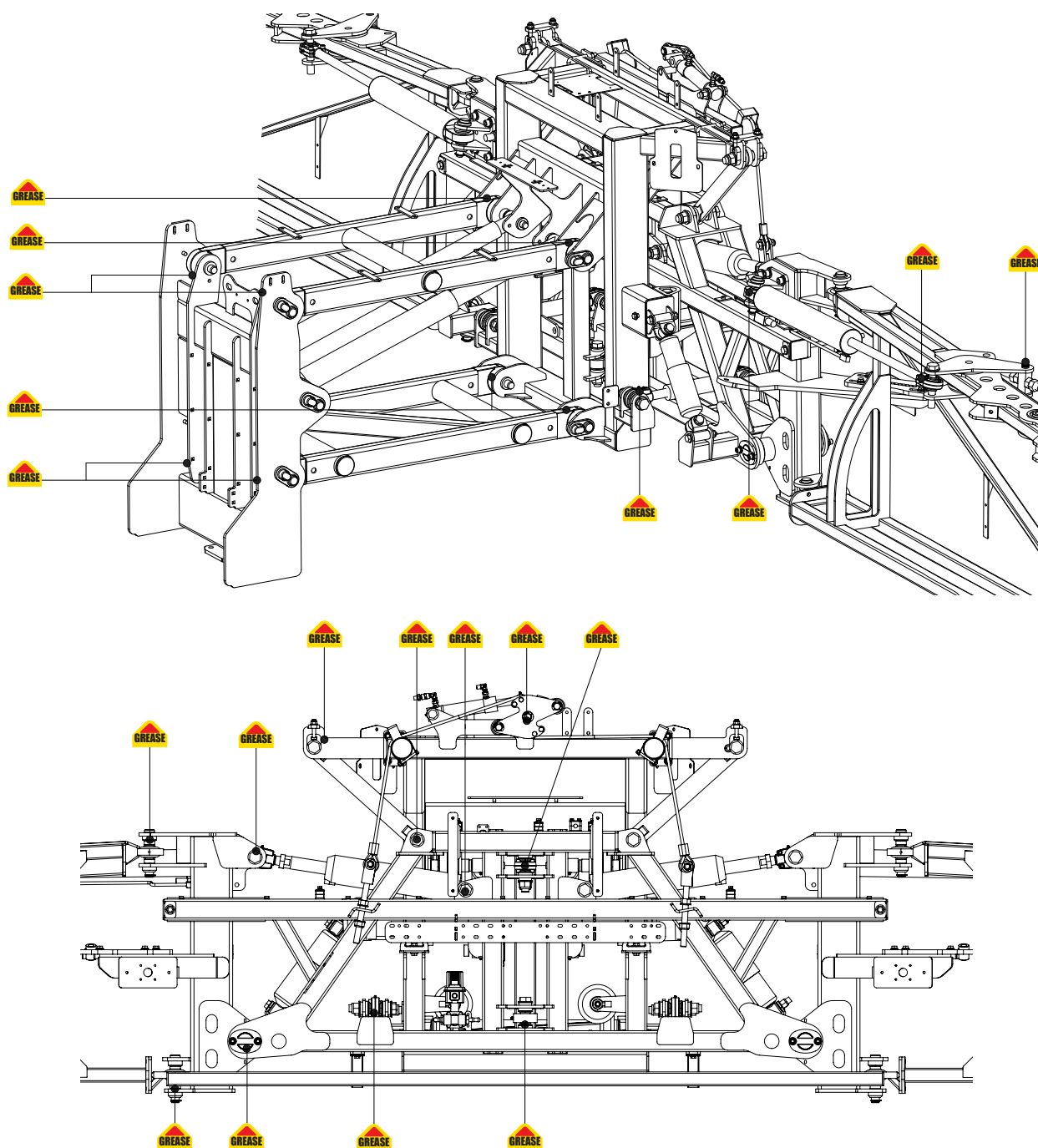
The pictures below outline key lubrication points. Please note the pictures do not show hydraulic cylinders, all hydraulic cylinders (excluding wing tilt cylinder) have grease points at the clevis'.

Chassis and PTO shaft grease points



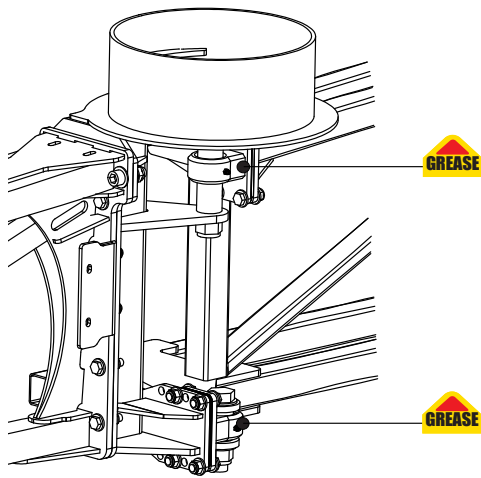
Location	Grease Interval
PTO Shaft universal joints	8 hourly
Wheel bearings	25 hourly
Hitch	50 hourly
PTO telescopic shaft	50 hourly
Paralift arm rose ends	50 hourly
Jack	3 monthly
Induction hopper pivots	3 monthly
NOTE: The drawing above does not show hydraulic cylinders. Each hydraulic cylinder has a grease nipple located at each end. These points should be greased on a 8 hourly basis.	

Boom centre section grease points



Location	Grease Interval
Boom rose ends	8 hourly
Hydraulic cylinder ends (wing tilt, lift, fold, hydraulic yaw)	8 hourly
Tilt pins	8 hourly
Diagonal delta link pins	8 hourly
Lineal delta link pins	8 hourly
Paralift pins	8 hourly
Centre Leveling hydraulic cylinder	8 hourly

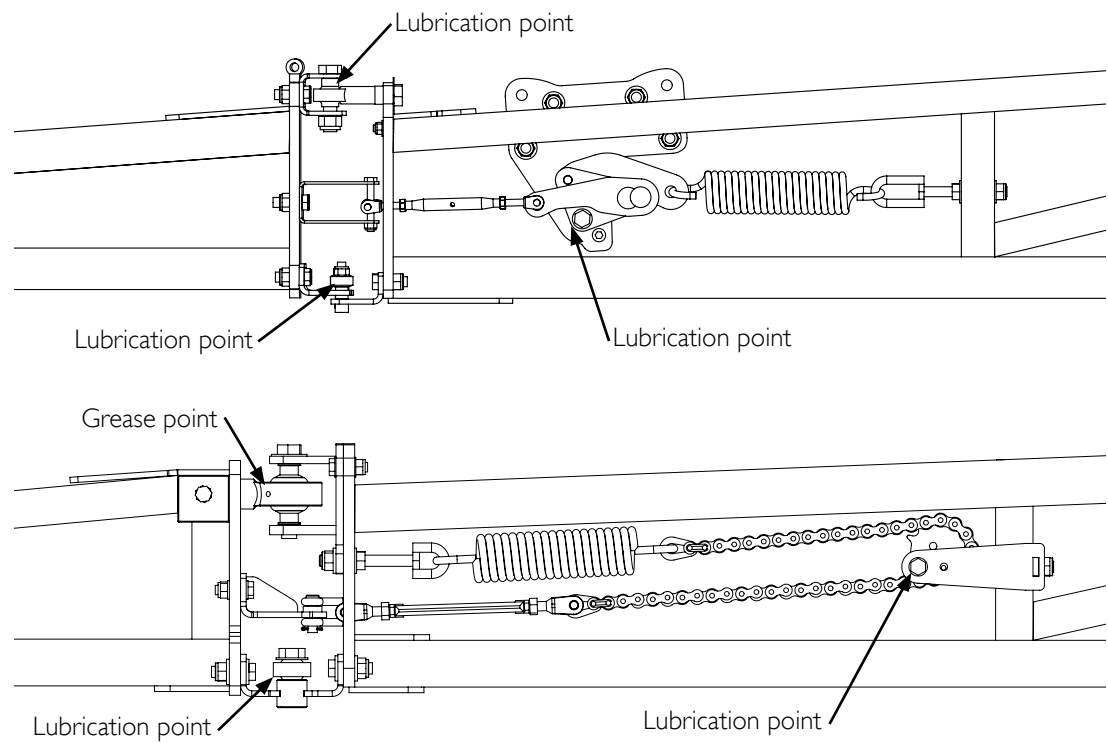
Cable drum grease points



Location	Grease Interval
Cable adjuster pivots	8 hourly
Cable drum bearing block pivots	8 hourly
Tilt arm pivot pins	8 hourly
Cable adjuster pivots	25 hourly
Boom mount rose ends	50 hourly
Delta links	50 hourly

NOTE: The drawing above does not show hydraulic cylinders. Each hydraulic cylinder has a grease nipple located at each end. These points should be greased on a 8 hourly basis.

3D Breakaway lubrication points



Location	Oil Interval
Pivot points on 3D breakaway	8 hourly

Maintenance

Pressure relief valve

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

Pump

8 Hours

Check pump oil level and condition:

50 Hrs

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

Pump oil level should be between the two level makers on the oil reservoir. If the oil level continually gets low or is turning milky, there is possibly a split in a diaphragm. The oil will need to be drained and all the diaphragms replaced. Use SAE 30W40 oil. Rotate the pump manually (by hand) to remove any air locks while filling. Do not over fill.

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

300-350 Hrs

Change Pump oil: Pump oil should be changed every 300-350 Hrs. Use SAE 30W40 oil. On an RO160 or RO320 pump the drain plug in between the two pump mounts underneath the pump. An RO250 has the drain plug on the drive shaft face below the shaft.

Seasonally

Check pump air accumulator (where fitted). The air

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

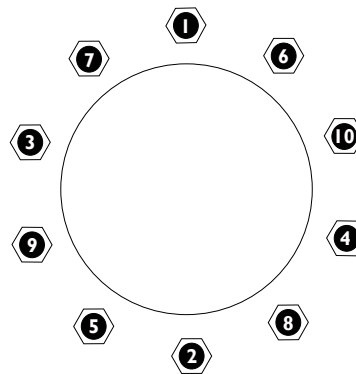
Chassis, wheels, tyres and axles

8 Hrs

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

Check wheel nuts are torqued correctly:

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



25 Hrs

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

150 Hrs

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

3 months

Grease jack: There are two grease nipples on the Prairie Evolution jack. One on the winding mechanism and one on the jack swing pivot. Both need to be greased every three months to ensure easy operation.

Check bolts on axle bearing caps:

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

Checking brakes & servicing of braked axles:

Brake maintenance and adjustments

The brakes should be tested before using for the first time and after the first laden journey.

Check the actuator and return spring mountings, check the actuator stroke and return travel and check they operate and release correctly.

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

Check for hydraulic fluid and air leaks.

Checking brake clearance and wear

Check and test the brakes before intensive use and every 3 months:

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

Check the thickness of the brake linings (minimum allowable 5mm)

The brake shoes should be replaced as soon as the minimum lining thickness is reached.

Check that the brakes are clean. Clean them if necessary. Do not clean with compressed air.

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

Adjusting brakes with fixed levers

Take up the slack when the actuator stroke reaches

about two thirds of the maximum travel.

To take up the slack, turn the lever by one or more splines, ensuring that the brakes are not touching when released (to prevent overheating the brakes).

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

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

Adjusting brakes with adjustable levers

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

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

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

Ensure that the brakes are not touching when released (to prevent overheating the brakes).

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

Seasonally

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

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

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

Remove the split pin and castle nut and washer.

Slide the outer bearing and hub off the axle. Bearing puller may be required. Remove the inner bearing.

If the seal is also to be replaced, remove it as well.

Clean all existing grease from the axle and the hub and wash in solvent.

Insert new rear seal.

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

Slide new inner bearing onto shaft.

Place hub back onto axle and fill cavity with grease.

Insert new outer bearing.

Fit washer and do nut up firm.

Perform the pre-load test on the hub to determine how tight to set the nut.

Grease the hub until grease emerges from the seal.

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

Removing a wheel from the sprayer:

- The sprayer must be hitched to the appropriate towing vehicle.
- The engine of the towing vehicle must be turned off and the park brake applied.
- Chock the wheel(s) that is/are not to be removed with an appropriate item to prevent the sprayer from moving.
- With a wheel nut wrench, loosen all the wheel nuts on the wheel that you wish to remove (Do not remove wheel nuts until the tyre is off the ground).
- Place a jack on level, firm and stable foundation under the sprayer axle and between the two axle

bolts near the wheel to be removed. The jack may need to have a large piece of timber or steel placed under it so that the jack will not sink.

- Use the jack to raise the sprayer axle such that the wheel is off the ground.
- Place an auxiliary jack block under the sprayer so that if the jack fails the sprayer will not fall.
- Remove all wheel nuts and remove wheel from sprayer. Be careful that the wheel does not fall on any person and cause bodily harm.
- Ensure that the sprayer is stable when being left for an extended period of time.

Replacing a wheel onto the sprayer:

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

front and rear of the opposite wheel (to prevent it from moving).

- Check tyre pressure before moving sprayer.
- Retighten wheel nuts to the required torque rating: One hour after fitting the tyre, before filling main spray tank, after the first tank load.

Booms

8 Hrs

Grease tilt arm pivot pins.

Grease cable drum bearing block pivots.

25 Hrs

Grease cable adjuster pivots:

50 Hrs

Grease boom mount rose ends.

Grease all delta links on centre section.

Grease paralift arm rose ends.

Adjusting boom ride height switch on paralift booms:

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

To adjust the switch:

1. Loosen the two adjustment knobs on ride height bracket
2. By lowering the switch the minimum boom height is increased.
3. Each notch gives approximately 100mm of boom height adjustment.
4. Once adjusted tighten knobs. The hydraulic cylinders must have 50mm of travel remaining.

Filters

WARNING: Always wear gloves if removing or cleaning filters.

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

It is essential to maintain all filters and filter screens in good condition. Filter screens that are not regularly cleaned can severely impede liquid flow and delivery pressure. If the screens are in anyway damaged, they can allow foreign material into the pumping system which can result in damage to the

pump, solenoids, valves and cause blockages in nozzle tips. Also, if the screens are not properly fitted, air can enter the pumping lines which will reduce pump performance.

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

WARNING: Read and heed the chemical label regarding protective clothing when cleaning any filter.

To clean the suction filter:

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

To clean pressure filter:

1. Wear gloves and other recommended protective clothing.
2. Ensure that the pump suction is turned 'OFF' and the pump 3-way ball valve is turned 'OFF' to prevent flow to the filter and pump.
3. Ensure that the supermix agitator ball valve is 'OPEN' (will release any residual pressure. Also remove small cap on bottom of pressure filter to relieve pressure)
4. Carefully unscrew filter nut and remove
5. Remove screen and clean.
6. Check for damage to screen, bowl, body and O-ring.
7. Place screen back in position.
8. Make sure O-ring is in position for proper seal.

Hydraulic fold cylinder re-phasing

9. Replace bowl and screw nut on.

10. Do not over-tighten nut.

If the booms do not fold together and they become out of line, the hydraulic cylinders will need to be re-phased.

To do this:

Open the boom right out and continue to hold the control lever in that position for 10-15 seconds until the cylinders are synchronised. When doing this, both cylinders must extend to 18". We recommend periodical re-phasing of the cylinders, it is good practice, as this ensures that the cylinders are working in tandem.

Hydraulic fold cylinder phasing relief pressure

To do this:

Before working on the machine, ensure the wheels are chocked and that the tractor handbrake is engaged.

Fit a 3500 psi pressure gauge (1) to the hose going to the base of the left hand cylinder: (the hose going into the external phasing block)

Fold the boom out into the working position.

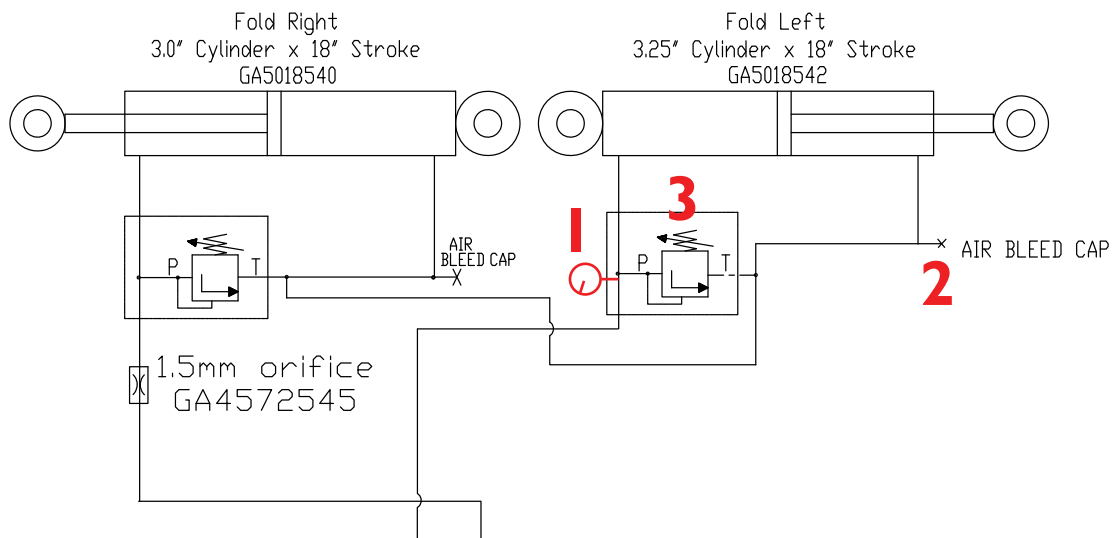
Loosen the bleed cap on the rod end of the left hand cylinder (2). Remove the cap if there is no pressure and drain the port into a bucket or tank. Use of a hose is advised.

Press fold out until the boom cylinders are fully extended. The rods should be extended at least 457mm (18") on both cylinders and even in length.

While holding the fold out button, have someone read the pressure on the gauge.

WARNING: DO NOT open or close the boom with any people or objects in the boom wing fold radius. Stay behind the machine out of the reach of the boom wings.

The relief valve (3) on the phasing block must be adjusted so that the pressure gauge reads 2250 psi.



Connect hose here once bleed cap is removed.

Hydraulic fold cylinder phasing relief pressure

Press fold out until the boom cylinders are fully extended. The rods should be extended at least 457mm (18") on both cylinders and even in length.

While holding the fold out button, have someone read the pressure on the gauge.

WARNING: DO NOT open or close the boom with any people or objects in the boom wing fold radius. Stay behind the machine out of the reach of the boom wings.

The relief valve (3) on the phasing block must be adjusted so that the pressure gauge reads 2250 psi. By turning the relief adjuster counter clockwise the pressure will reduce. By turning the relief adjuster clockwise the pressure will increase.

This measure from factory is set to, 7mm of thread exposed. This is the default setting to obtain 2250PSI in the phasing circuit.

When adjusting the relief, make only small adjustments, a 1/4 to a 1/2 turn at a time. Then hold the boom fold out switch and re check the pressure.

NOTE: 2250 psi relief pressure is a factory default setting. If the maximum pressure output of the tractor is less than 2250 psi, set the relief pressure to 50 psi less than the maximum pressure output from the tractor. Or if possible, increase the output pressure from the tractor.

eg. Maximum tractor output pressure = 1900 psi

$1900 - 50 = 1850$ psi relief pressure

However, a 36m boom requires a minimum of 1800psi to fold correctly.

When the pressure reading is correct, refit the bleed cap and remove the pressure gauge.



Bleeding the hydraulic fold cylinders

The cylinders should now be bled to remove any air from the system.

To bleed the phasing cylinders, fold the boom out into the working position.

Crack the bleed cap fitted to the rod end of the left hand cylinder. This will only need to be rotated 1/2 to 1 full turn.



Hold the fold out function while the system is bled. Oil will drain out of the bleed cap and carry any air out of the system with it.

If there is air in the oil it may appear milky. Use a container to catch the oil as it comes out.

Once the oil runs clear and continuous, tighten the bleed cap.

Ensure both fold cylinders have extended fully and are the same length, must be at least 457mm (18").

Cycle the boom through the full fold function a minimum of 5 times.

Re bleed the circuit to ensure all air is removed.

Tighten the bleed cap and ensure the booms fold correctly.

Airbag suspension

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

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

Adjusting the system pressure

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

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

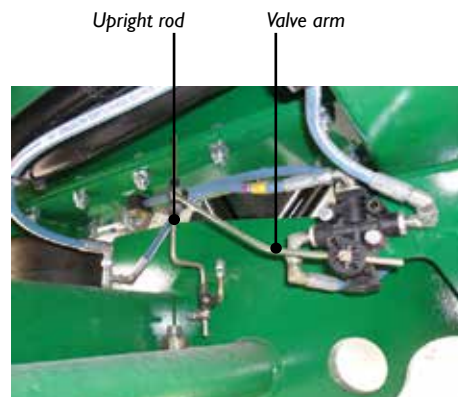


Adjusting the ride height

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

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

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

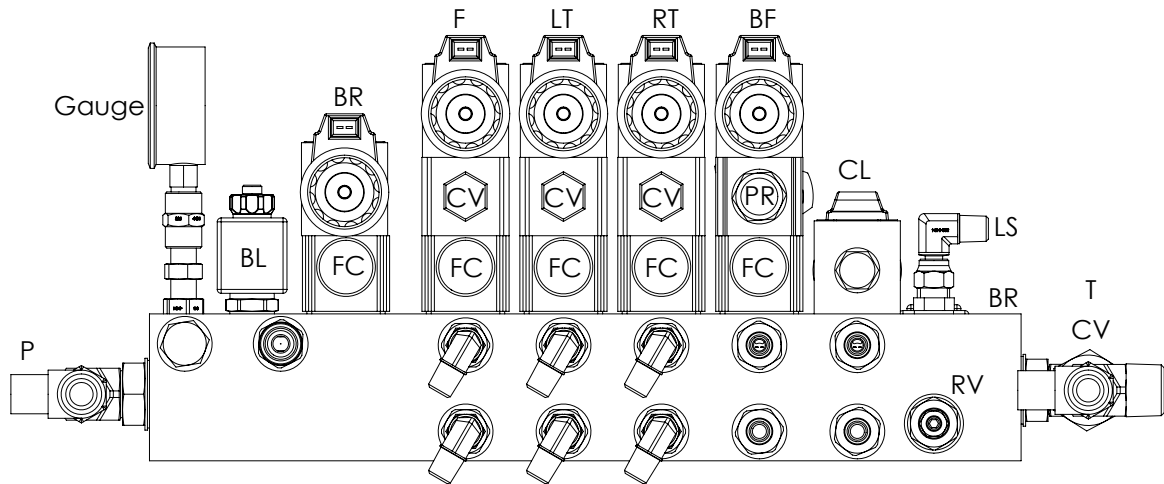


The ride height valve has a dead band position where the valve will does not let air in or out of the airbags. Over time the seals in the ride height valve may wear causing this dead band to decrease. If this is the cause the ride height will require readjustment or possibly replacement.



Electric over hydraulic spool valves

CV	- Check Valve	LC	- Load Sense	LT	- Left Tilt
FC	- Flow Control	RV	- Relief valve	RT	- Right Tilt
PR	- Pressure Reducing Valve	BL	- Boom Lower	BF	- Bi-fold
P	- Pressure	BR	- Boom Raise	CL	- Centre Lock
T	- Return to Tank	F	- Boom Fold		



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

To adjust the boom function speed remove the orange cap from the flow control valve. Using a 10mm spanner and a 5mm Allen key, adjust the hydraulic flow until the required speed is achieved. Screw in to slow down, out to speed up. Only small adjustments of a 1/4 or half turn should be made before checking the speed of the function being adjusted.

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

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



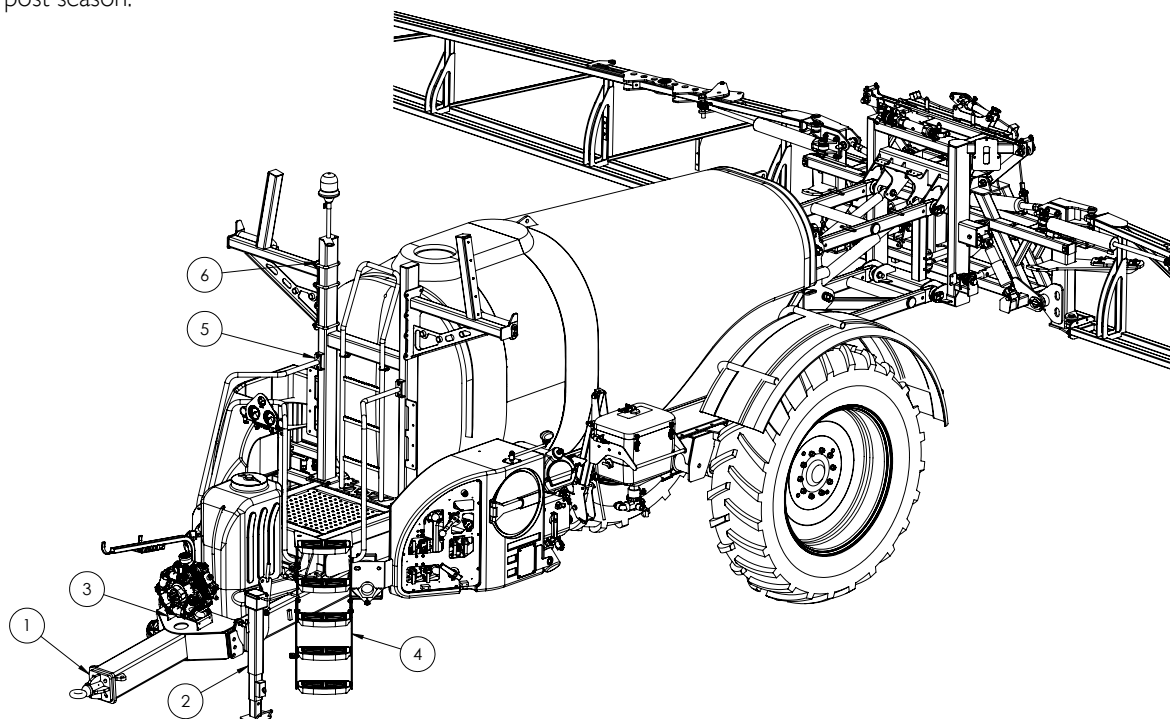
Spool block shown with cap removed from flow control valve.

Corrosion Prevention

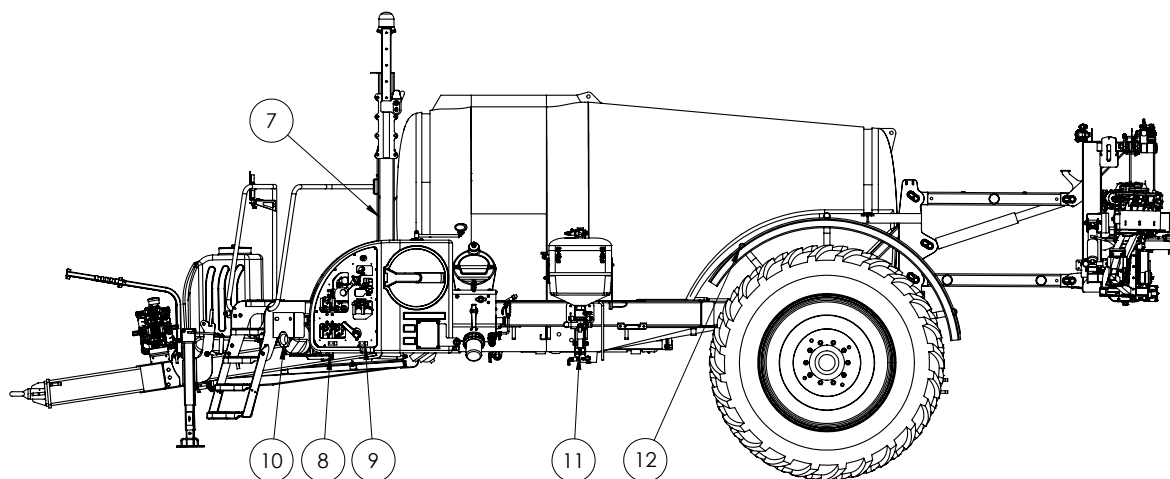
Goldacres are applying G15 anti corrosion spray to all fasteners (bolts, washers and nuts) and zinc plated components at the time of manufacture.

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

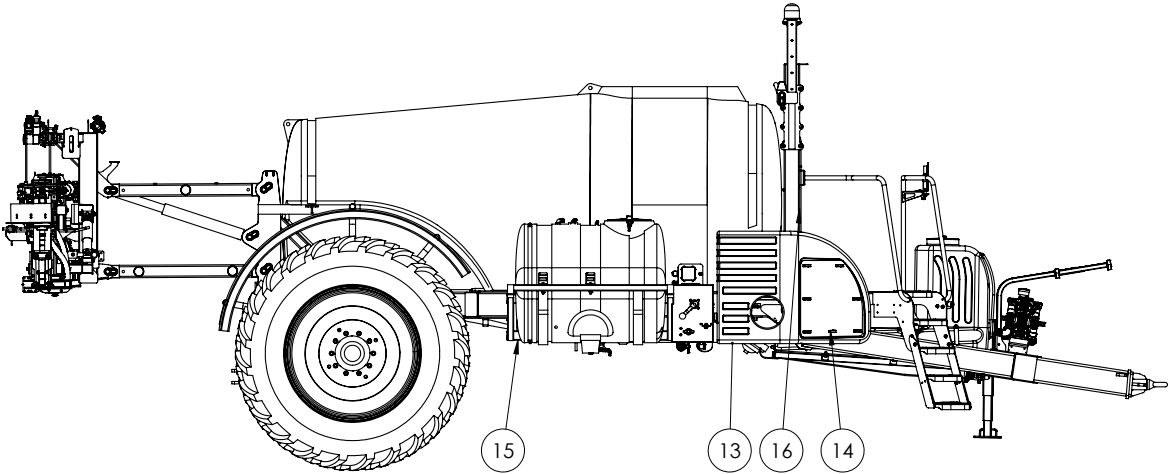
The following is a guide, application to these areas is recommended but not limited to.



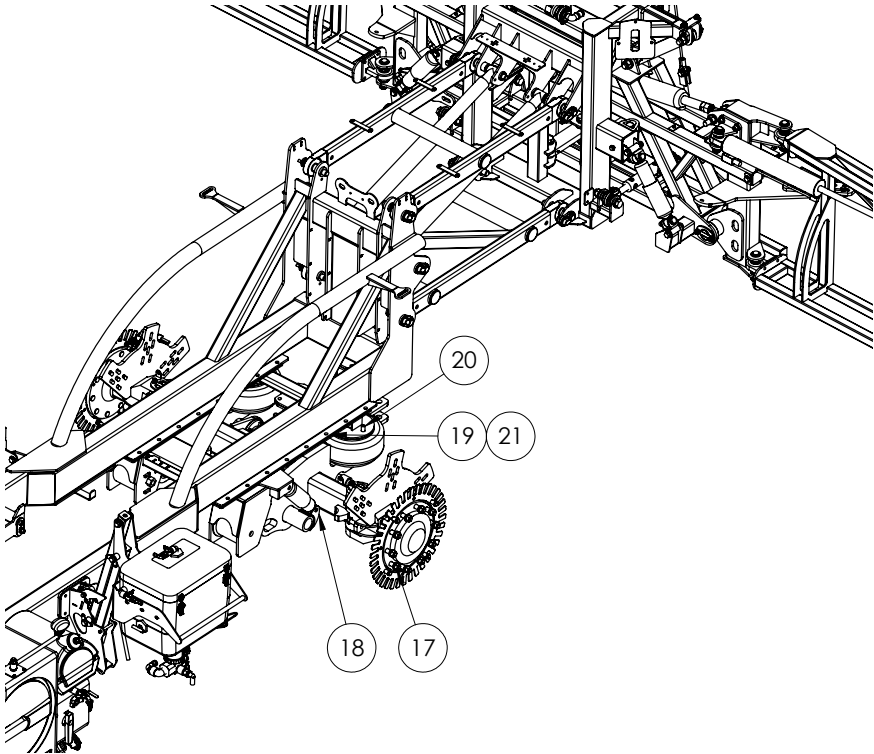
Item	Component
1	Towing eye bolts
2	Jack mounting bolts and locking pins
3	Pump mounting and manifold bolts
4	Steps and hand rails
5	H-Frame and handrails
6	Boom rests



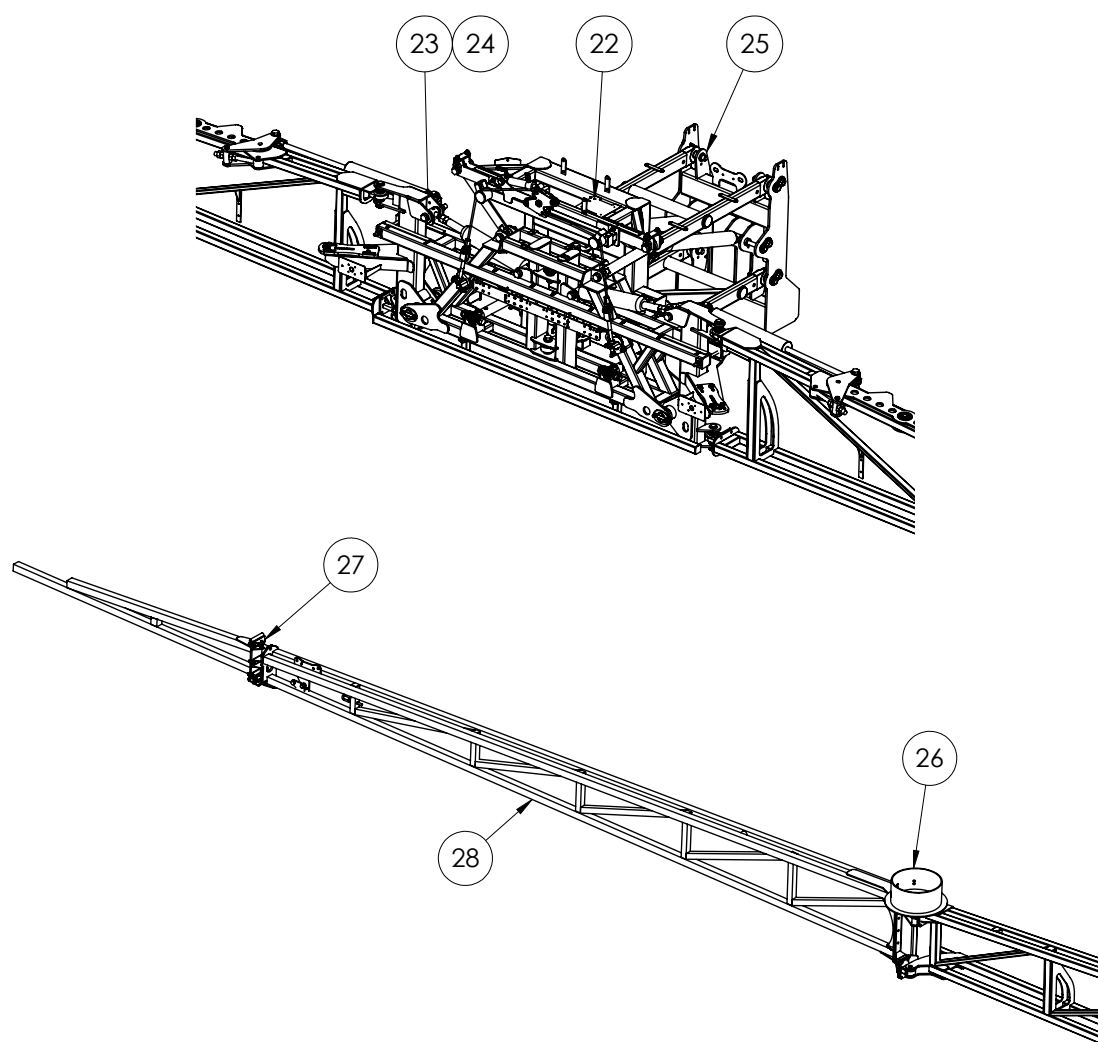
Corrosion Prevention



Item	Component
7	Transcal frame (if fitted)
8	LH pod frame mounting bolts
9	LH pod covers
10	Banjo fill pump
11	Induction hopper bolts and latches
12	Mudguard mounting bolts
13	RH pod frame mounting bolts
14	RH pod covers
15	Drum storage or DCI module
16	Foam marker brackets (if fitted)

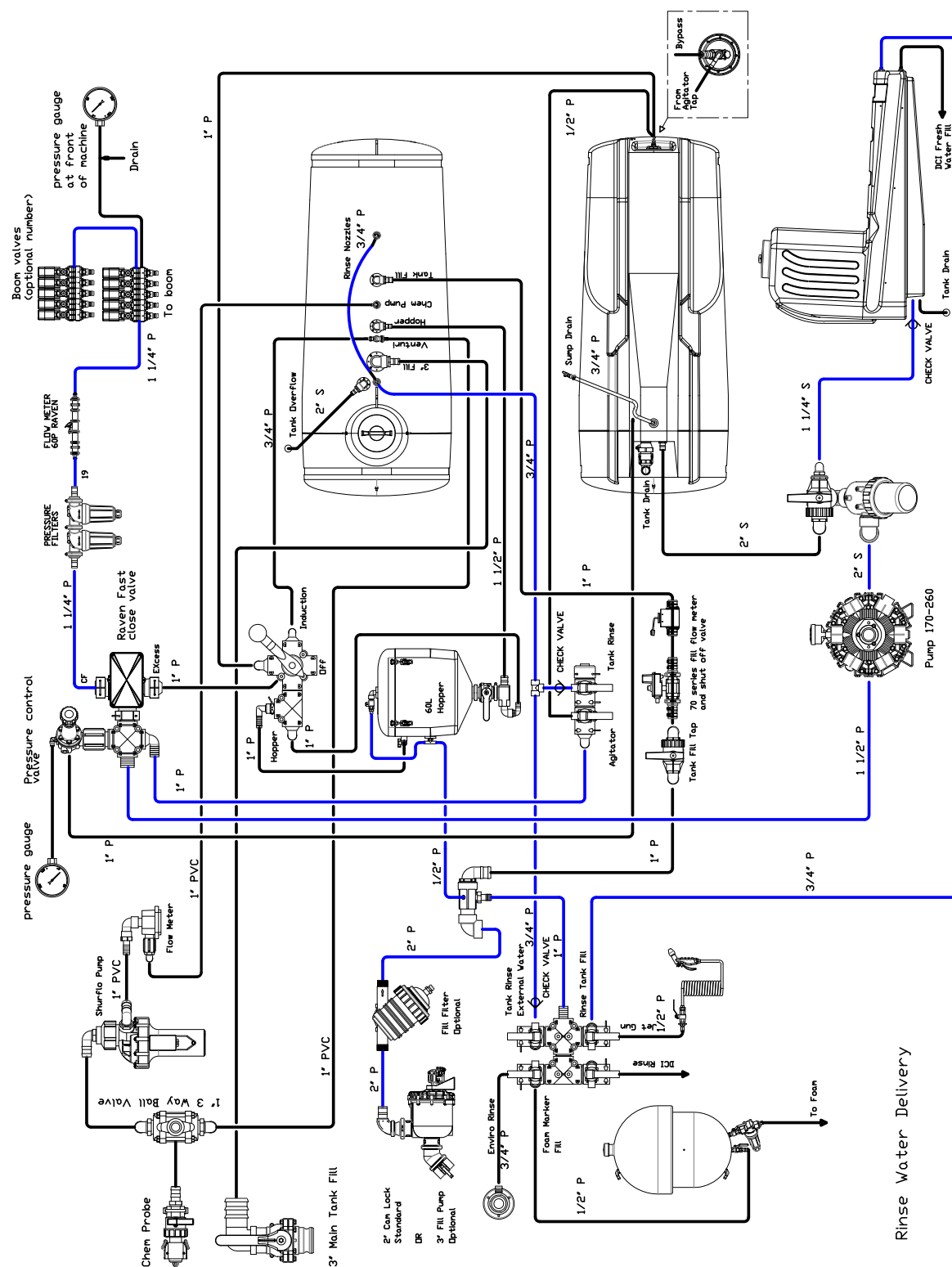


Corrosion Prevention

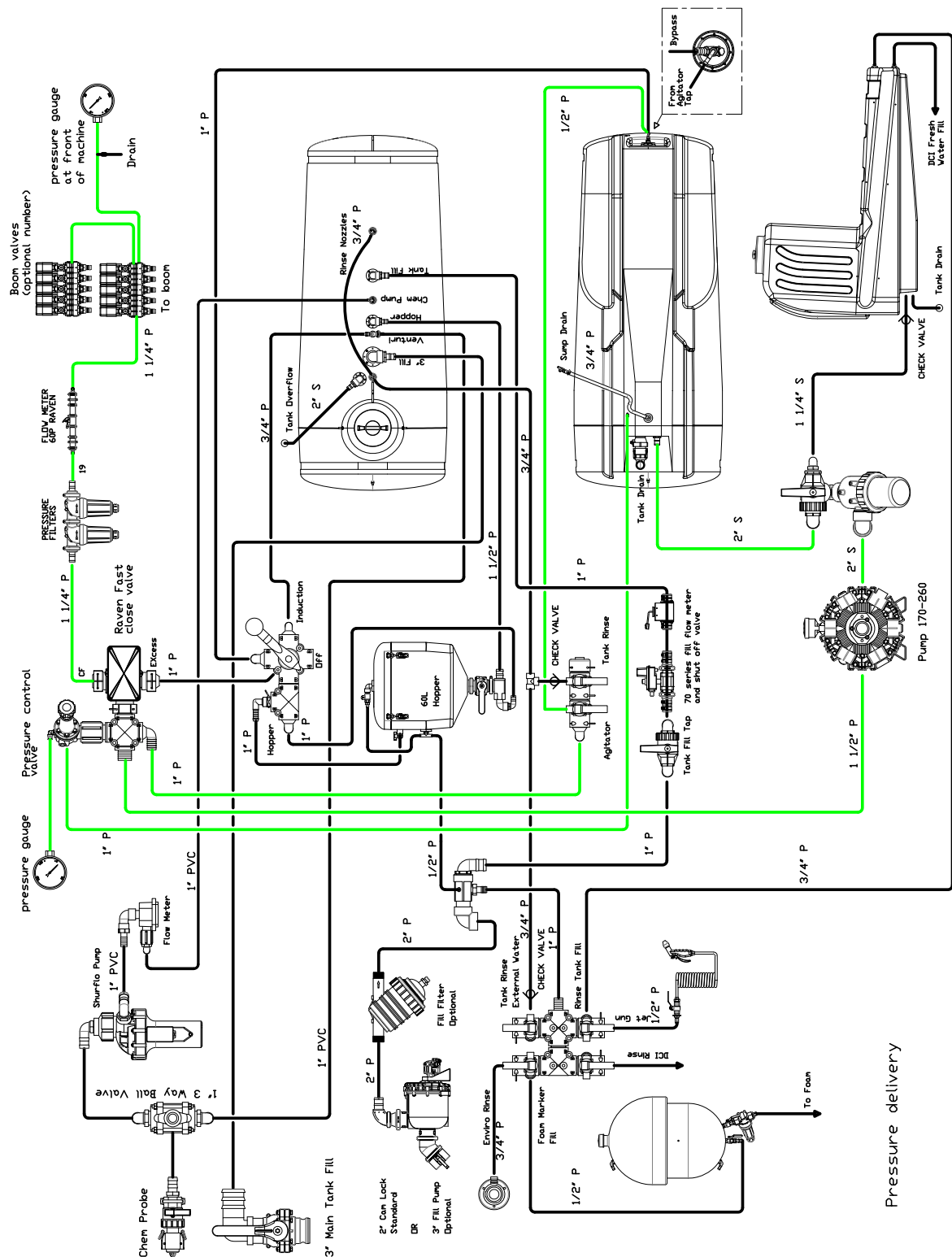


Item	Component
17	Wheel nuts
18	Axle retainer bolts
19	Axle airbag frame mounting bolts
20	Airbag hose fittings
21	Fixed axle frame mounting bolts
22	Hydraulic manifold
23	Hydraulic cylinder fittings
24	Hydraulic hose crimp fittings on all hoses
25	Centre section paralift rear pins and bolts
26	Cable drum bolts
27	Breakaway hinges & Boom end protectors
28	Nozzle bracket bolts

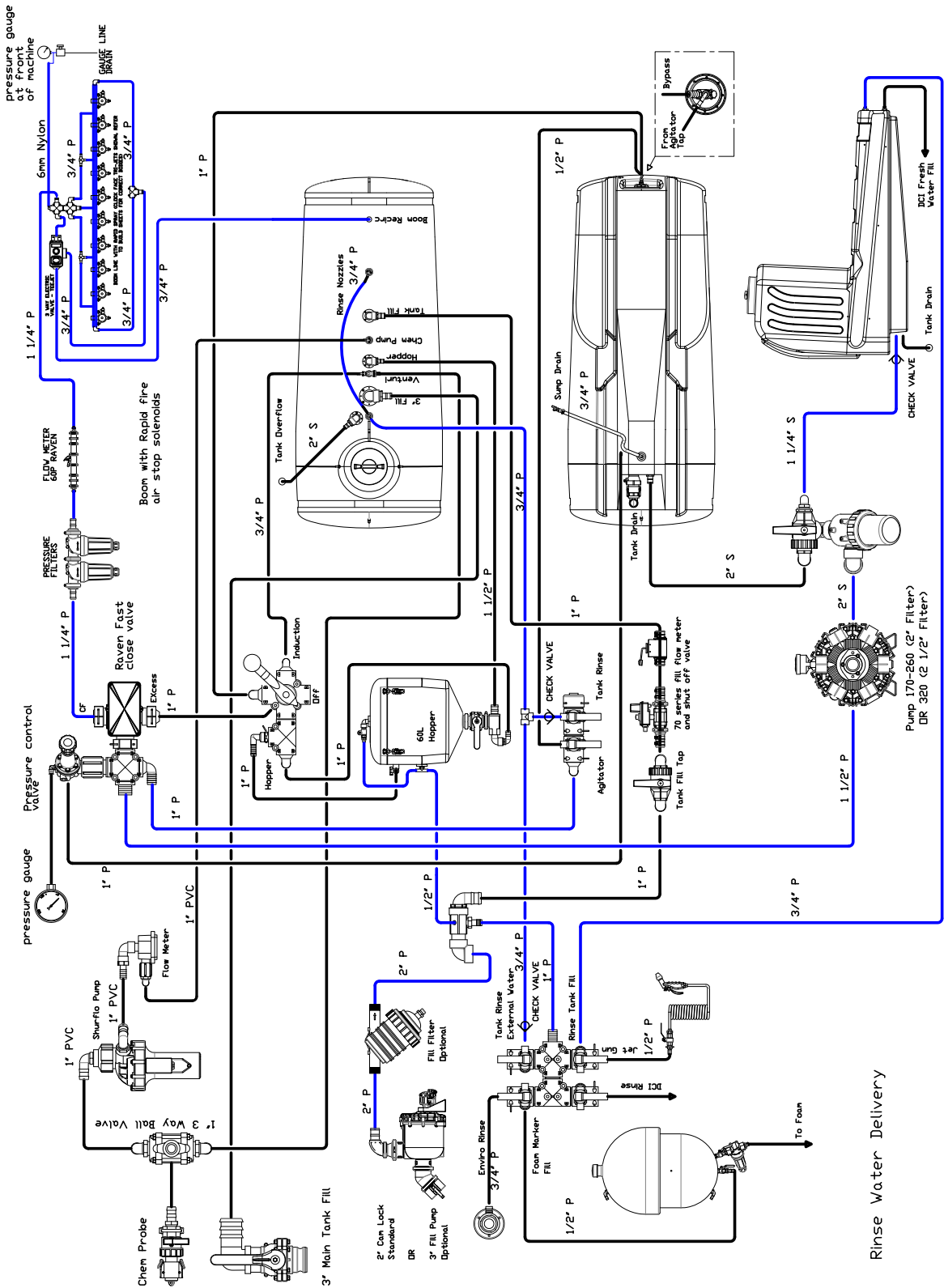
Rinse water delivery - Boom Valves



Pressure delivery - Boom Valves

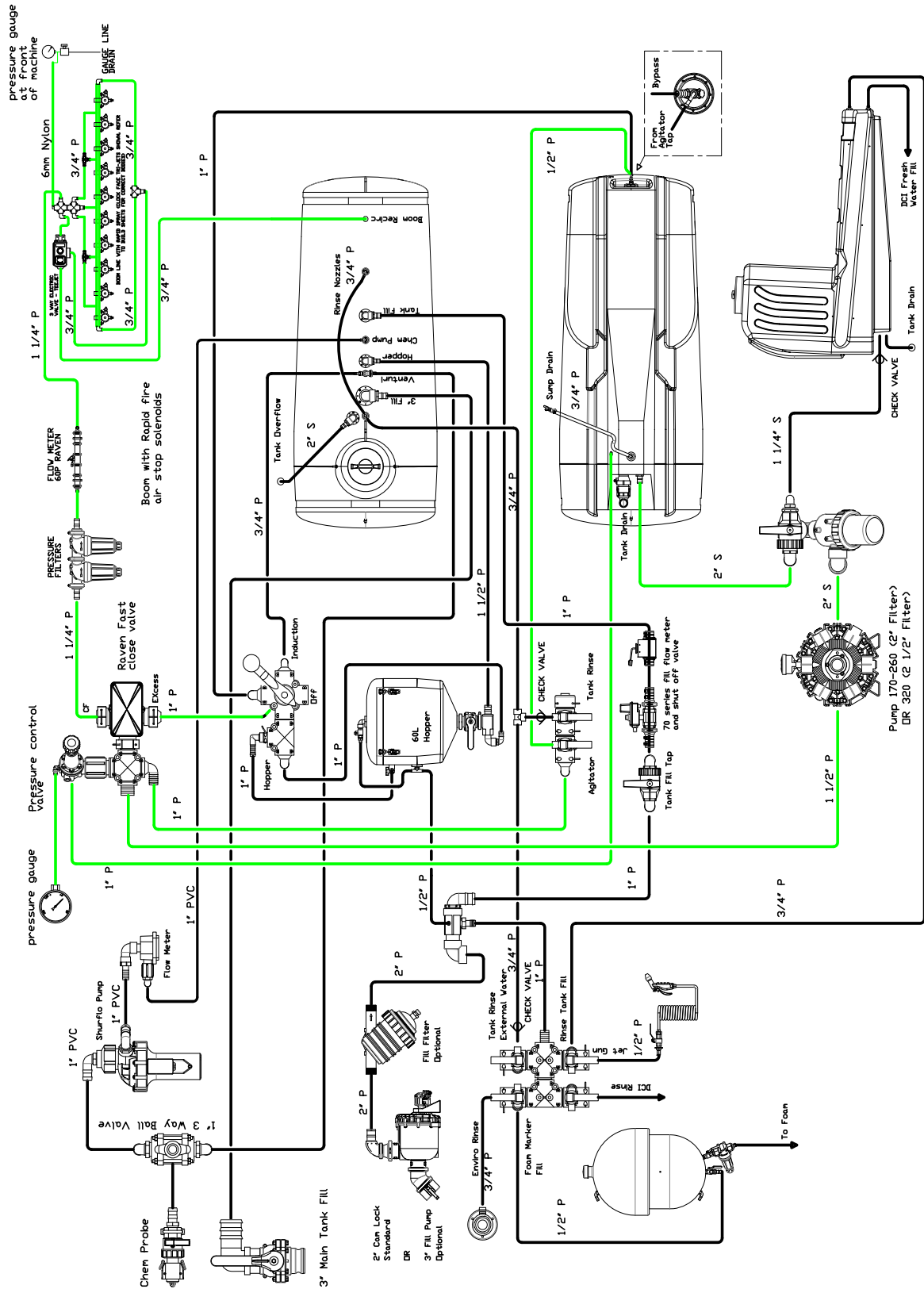


Rinse water delivery - with RapidFlow

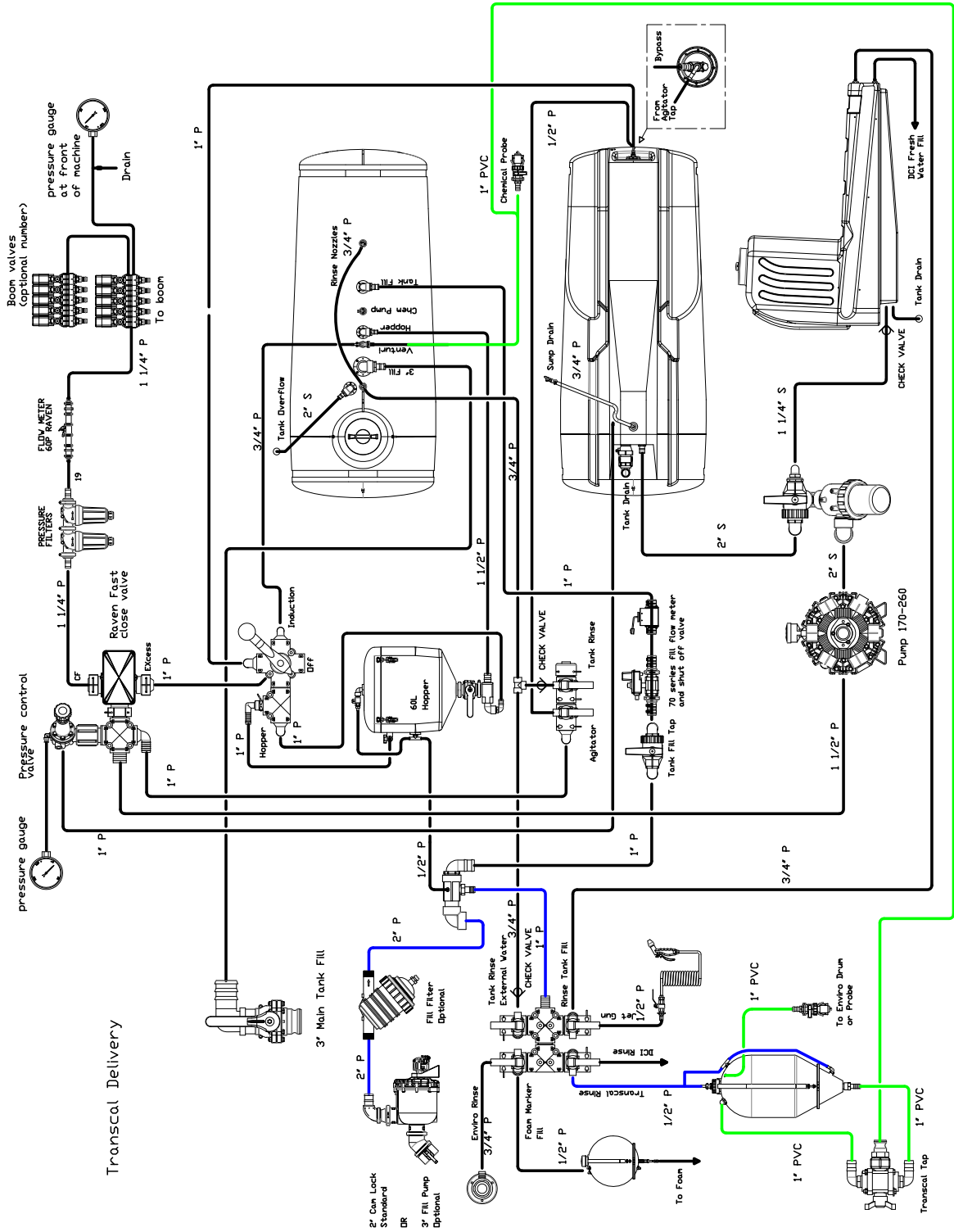


Rinse Water Delivery

Pressure delivery - with RapidFlow



Pressure delivery - Transcal



Chapter 10

OPTIONAL ACCESSORIES

General Information

The following pages provide information on Goldacres optional accessories available on this equipment.

Please note: These options may not be fitted to your equipment unless ordered.

Chemical induction probe

Overview

A simple method of transferring chemical into the sprayer tank is via the chemical probe. The chemical probe enables the chemicals to be transferred with minimal exposure to the operator. The probe is used in conjunction with the Venturi filler (located on the top of the tank) which creates the required suction on the pressure side of the pump.

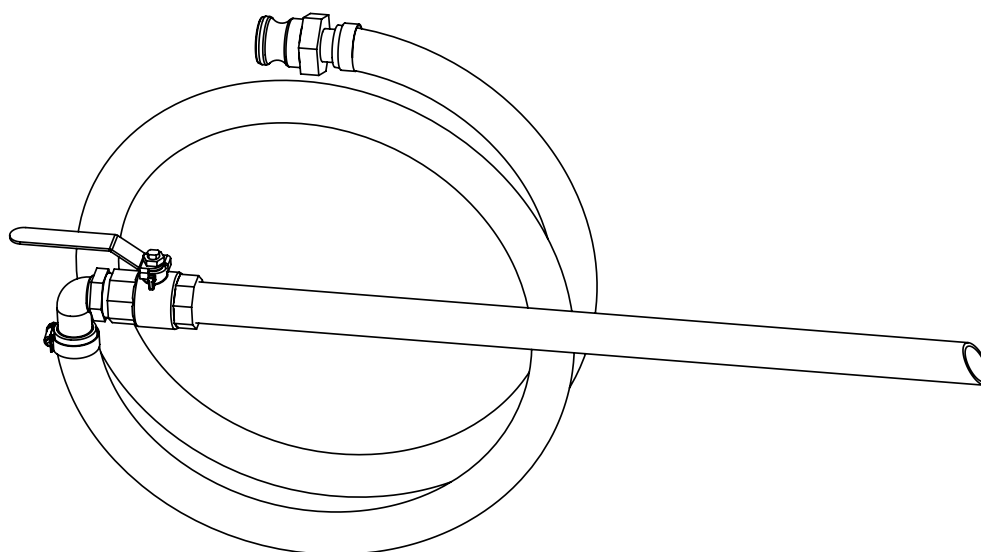
The viscosity of the chemical being transferred will affect the rate of suction flow and hence the amount of time required to transfer the chemical. Water and air have low viscosities whereas molasses is an example of a highly viscous liquid. The higher the viscosity of the liquid, the longer it takes to transfer

via the chemical probe. If the viscosity of a chemical is such that it takes too long to transfer, dilute the chemical with water, which will reduce the viscosity, and then transfer the solution.

The chemical should be transferred after about 20% to 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 a container, will not restrict the flow of chemical.

Key Features



Operation

WARNING: It is critical that the chemical probe venturi continues to operate for a minimum of 30 seconds following use. This will ensure that no chemical is left in the line prior to the probe being disconnected.

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

To operate the chemical probe:

1. Add 20 percent of the tank's volume of clean water to the main spray tank. Initially there needs to be a sufficient amount of water in the tank in order for the pump delivery to create the venturi effect via the venturi filler.
2. Ensure that the red handle on the pump 3-way valve is pointing towards the suction hose coming from the main tank sump.
3. Connect probe via cam lever fitting. Close all ball valves and set pressure to 110psi.
4. 'OPEN' the venturi and agitator valves.
5. Close the bypass and induction hopper valves.
6. Operate the pump at the speed necessary to generate at least 85 psi delivery pressure (as displayed on the pressure gauge mounted on the side pod). Do not run faster than 500 RPM. The higher the pump delivery pressure, the greater the venturi suction and the quicker the probe will transfer the chemical. The delivery pressure should not exceed 100 psi as determined by the pressure relief valve setting.
7. Place probe in chemical.
8. 'OPEN' the valve on the probe.
9. The chemical should be now transferring to the sprayer tank via the venturi filler.
10. When all of the chemical has been transferred, rinse the chemical container with water and transfer the rinsate to the sprayer tank via the probe. This should ensure that the entire chemical is transferred and that the probe, venturi filler and connecting suction hose are cleaned. Induct clean water to rinse probe vacuum hose.

11. When finished, 'CLOSE' the valve on the probe and the venturi valve, 'OPEN' the bypass valve, keep the agitator valve 'OPEN' and disconnect the probe. Once chemical has been transferred into the main spray tank the sprayer should always be agitating until spraying begins.

SuperFlow chemical induction hopper

Overview

The 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.

Key Features



Reference Number	Function
1	Rinse tap
2	Tank rinse nozzle
3	Level indicator 60L
4	Drain tap



Reference Number	Function
5	Hopper tank ball valve
6	Drum rinse nozzle
7	Fresh water mixing valve

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 pump three-way ball valve is pointing towards the main tank sump.
4. Open the induction hopper ball valve and (if required) the supermix agitator ball valve located on the EZ control.
5. Ensure the bypass line ball valve and the chemical probe ball valves are closed.
6. Operate the pump at the speed necessary to generate at least 70-80 psi delivery pressure (as displayed on the sprayer pressure gauge). Do not run faster than 500 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.

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

When finished using the hopper:

- Close the hopper tank ball valve at the bottom of the hopper by turning the yellow handle so that it

is horizontal.

- Turn the bypass valve 'ON'.
- Turn 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 and "R" clip in the mechanism.

Rinsing

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

1. Lower the hopper. (Check that the delivery hose to the hopper is not restricted or kinked).
2. Make sure that all valves on the EZ control external water delivery station are 'OFF'.
3. Make sure that the Hopper Rinse valve on the top of the hopper is 'OFF'.
4. Connect the fresh water fill hose to the quick-fill coupling.
5. Operate the fresh water pumping system between 70 and 100 psi.
6. Turn the Induction Hopper valve on the Pressure delivery station 'ON'.
7. Open the hopper tank valve at the bottom of the hopper by turning the yellow handle 'UP'.
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.

Induction Hopper - Continued

- Turn the Induction hopper valve on the EZ control Pressure Delivery station 'OFF'.

Drain the hopper of any remaining liquid using the hopper drain tap at the bottom of the hopper.

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

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.



CAUTION: Do not have the sprayer pump operating.

NOTE:

- Take proper safety precautions to avoid any contact with rinsate when draining, as it may contain chemical residue.
- Be careful as to where the rinsate is being 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 looking up from underneath the hopper

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-I 100 flow meter, its an accurate way of measuring chemical being transferred into the main tank.

Pump Specifications:

- Flow rate - Up to 29 Lt/min
- Head - To 3.6Mt
- Pressure - To 1.0 bar

Note: The polypropylene pump housing is designed to pump chemicals with a low PH. 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).



Maintenance

CAUTION: Exposure to chemicals can cause bodily harm. Thoroughly flush pump with water before disassembling. Gloves and proper eye protection should be worn.

Pump Disassembly:

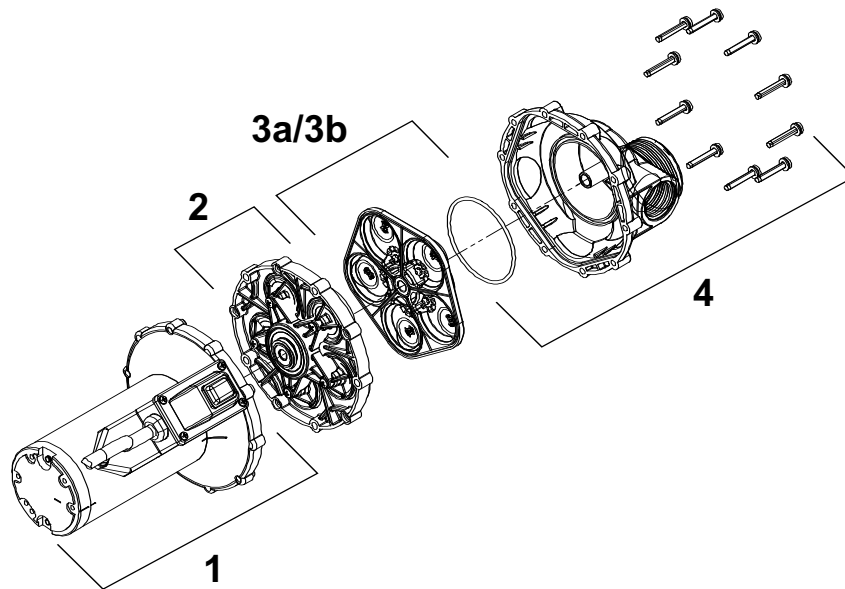
1. Purge pump with clean water.
2. Disconnect 12-volt power source.
3. Remove motor by removing the 10 screws from the pump assembly.
4. Remove the Diaphragm Lower Housing Assembly from the Upper housing. **DO NOT** pry the Diaphragm Housing from the Upper housing, damage to the o-ring or Valve Housing Assembly can occur.
4. Remove the Valve Housing Assembly from the Diaphragm Lower Housing.

Pump Assembly

1. Reverse the disassembly procedure and ensure that the o-ring seats in the correct groove..
5. Secure the 6 screws connecting the motor and pump housing to 2.5 ft/lb

CAUTION: do not over tighten plastic connections, breakage can occur resulting in fluid exposure.

Note: On all pipe connections, teflon tape is the recommended pipe thread sealant.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	94-718-00	Motor Assembly Kit	1
2	94-719-00	Diaphragm / Lower Housing / Drive Assembly Kit	1
3a	94-720-00	Valve Housing Assembly Kit (EPDM)	1
3b	GA2000034	Valve Housing Assembly Kit (Viton)	1
4	94-721-00	Upper Housing Assembly Kit	4

FM-1100 Flow meter



The SEM-10 Flow Meter is a positive displacement fluid metering unit.

- Accuracy: $\pm 0.5\%$
- Flow Range: 9-136 L/min
- Maximum Pressure: 410 kPa (60 PSI)
- Maximum Total: 9999
- Auto Shut Off: 3 minute
- Auto Wake Up: With Flow

Operation

CAUTION: Exposure to chemical can cause serious injuries, always wear proper protective clothing and devices when transferring chemical. Refer to and follow chemical manufacturers instructions.

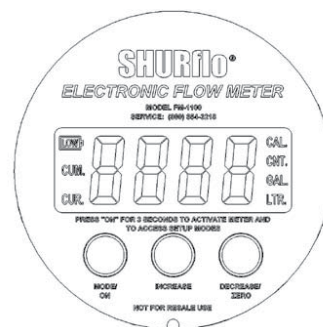
The FM-1100 flow meter will start working automatically when flow is detected.

The LCD display will show the following:

- LOW - Low battery indicator
- CUR - Current Total indicator
- CUM - Cumulative total indicator
- GAL - Gallons indicator
- LTR - Litre indicator
- CNT - counts indicator
- CAL - Calibration indicator

The meter displays and stores:

- A resettable CURRENT TOTAL (CUR)
- A non-resettable CUMULATIVE TOTAL (CUM)
- A COUNTS calibration value (CNT)



The FM-1100 Series Flow Meter has three push buttons:

- 1 MODE or "ON" button
- 2 INCREASE (up arrow) button
- 3 DECREASE (down arrow) or "ZERO" button



MODE/
ON



INCREASE



DECREASE/
ZERO

FM-1100 Flow meter

The MODE button performs the following functions:

1. If the display is off, press MODE button to display current total (CUR).
2. Use MODE button to cycle between CURRENT TOTAL (CUR) and CUMULATIVE TOTAL (CUM).
NOTE: After approximately 30 seconds, display will automatically switch from CUMULATIVE TOTAL (CUM) back to CURRENT TOTAL (CUR).
3. Press and hold MODE button for 3–5 seconds to show Volume Unit Selection. Press INCREASE or DECREASE buttons to cycle through volume units. When desired units are flashing, press MODE button to save selection and return to CURRENT TOTAL (CUR).

Volume Unit Selection choices are: GALLONS (GAL), LITERS (LTR), or COUNTS (CNT).

NOTE: To reset CURRENT TOTAL (CUR) to Zero, press and hold DECREASE button for 2 seconds or more while CURRENT TOTAL (CUR) is displayed.

NOTE: Meter will not enter Volume Unit Selection mode if pump is running.

CUMULATIVE TOTAL CANNOT BE RESET - EVEN BY REMOVING THE BATTERY.

- The flow meter display will turn on whenever flow is detected.
- The flow meter will turn off and blank the display after a 3-minute period of button or flow inactivity. Any unsaved changes will not be saved.

Calibration Procedures

- Calibration procedures are the same for both the 90° and inline 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), please 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).
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

FM-I 100 Flow meter

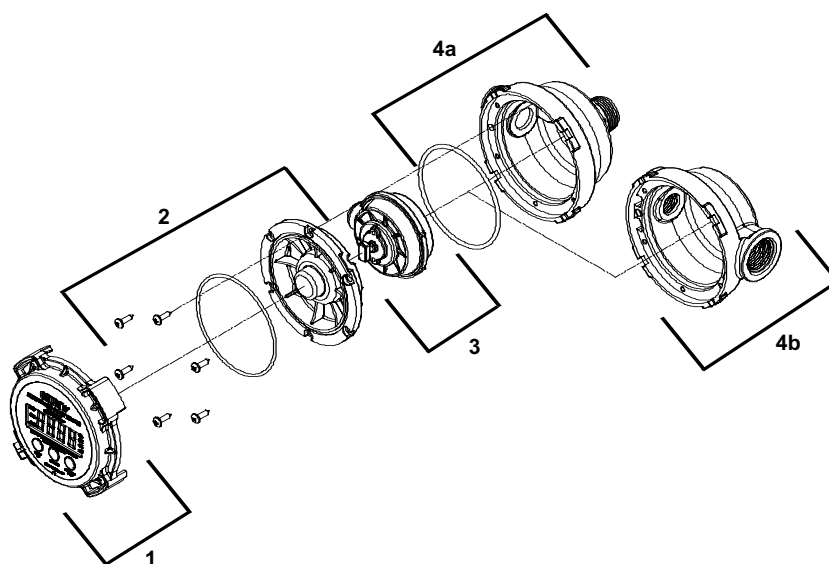
desired value.

- 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).
CUMULATIVE TOTAL CANNOT BE RESET - EVEN BY REMOVING THE BATTERIES.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	94-732-00	Electronic Assembly Kit	1
2	94-733-00	Meter Housing Seal Cover Kit	1
3	94-734-00	Nutating Chamber Assembly Kit	1
4a	94-735-00	90 Degree Meter Housing Kit	1
4b	94-736-00	Inline Meter Housing Kit	1

Troubleshooting Flowmeter and Pump

Pump is noisy?	
Common causes	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.

Transcal

Overview

The Transcal volumetric measuring system is designed to provide a measuring facility without the need for an auxiliary pump and flowmeter. When used in conjunction with the venturi chemical probe, or micromatic fitting, the required volume of chemical can be transferred out of the chemical container into the Transcal tank.

The chemical can then be transferred into the main spray tank via venturi suction by simply turning a valve and there is no undiluted chemical coming into contact with any pump or complex components. The system can be used with most types of chemical containers (including the envirodrum closed transfer system).

Key Features

NOTE: The calibration markings on the Transcal tank should be used as a guide only.

The Transcal system requires a vacuum to operate. Any air leaks in the tank lid, hoses or cam lever seals will affect the performance or cause total failure to operate.

WARNING: Do not fill Transcal tank past the 45 litre mark.

WARNING: Do not use the Transcal tank to store chemicals when spraying.

WARNING: Do not level tank under vacuum.



Transcal Operation

NOTE: The Transcal is intended for the induction of liquid chemicals only.

1. Remove the cam lever plug and connect the chemical probe line or the Micromatic coupler to the cam lever fitting.
2. Ensure that the yellow T-handle on the Transcal station is aligned to 'FILL'.
3. Add approximately 10% of the total volume of clean water to the main spray tank.
4. Ensure that the red handle on the pump 3-way valve is pointing towards the suction hose coming from the main tank sump. Close all ball valves and set pressure to 110psi.
5. 'OPEN' the agitator and venturi valves on the pressure delivery station.
6. 'CLOSE' the bypass and induction hopper valves on the pressure delivery station.
7. 'OPEN' the chemical probe valve at the Transcal station.
8. Operate the pump at the speed necessary to generate 85 psi delivery pressure (as displayed on the manifold pressure gauge). Do not run faster than 500 RPM. The higher the pump delivery pressure, the greater the venturi suction and the quicker the probe will transfer the chemical. The delivery pressure should not exceed 110 psi as determined by the pressure relief valve setting.
9. Place the probe in the chemical drum and open the valve on the chemical probe or connect the Micromatic fitting to the outlet on the envirodrum and push the handle down so that it locks into position and opens the valve on the envirodrum.
10. The chemical should now be transferring into the Transcal tank.
11. When the required amount of chemical has been transferred, 'CLOSE' the valve on the chemical probe. Remove it from the chemical drum and then 'OPEN' the valve on the chemical probe again. This will drain residual chemical from hose.

If chemical has been transferred from an envirodrum, push the handle on the Micromatic coupling down slightly and then up. This will make the handle lift up

and close the valve on the envirodrum. This should be done when doing successive fills into the Transcal tank. When finished transferring chemical, turn the fitting in order to release it from the envirodrum.

What to do if the Transcal tank is overfilled

CAUTION: Ensure that the appropriate protective clothing is worn, as per the chemical label.

In the event of over-filling the Transcal tank, a small piece of supplied black 25mm hose can be fitted to the ball valve on the bottom of the Transcal to drain away any excess chemical. To perform this you:

1. Turn the Transcal 'T' handle on the Transcal station to 'OFF'.
2. Close the venturi valve on the EZ control pressure delivery station.
3. With the Transcal 'T' handle on the Transcal station to 'OFF', and wearing the appropriate safety clothing, undo the cam lever fittings on the ball valve on the bottom of the Transcal station and remove the black 25mm hose. This is behind the Transcal station cover and can be accessed from underneath.
4. Attach the short length of black drain hose via the cam lever connection.
5. Place an appropriate container under the drain hose.
6. Turn the 'T' handle on the Transcal station to 'EMPTY'.
7. After draining the required amount of chemical, remove the drain hose, replace the vacuum supply hose and resume operating the Transcal. The raw chemical should be returned to the original container.

Transferring chemical from the Transcal tank to the main tank

Once the required amount of chemical is in the Transcal tank, transfer it into the sprayer tank:

1. Ensure that the venturi valve on the pressure delivery station is 'ON'.
2. The Transcal tank needs to be vented when emptying. Remove the chemical probe from the

Transcal Operation

container and open the valve on the chemical probe, or open the Micromatic fitting.

3. Turn the 'T' handle on the Transcal station to 'EMPTY'.
4. The chemical should now transfer into the main spray tank.

When finished:

1. The Transcal tank and probe or Micromatic coupler should be thoroughly rinsed (see rinsing instructions on the pages following).
2. Turn the 'T' handle on the Transcal station 'OFF'.
3. Turn the valve on the probe 'OFF'.
4. Turn the venturi valve 'OFF'.
5. Turn the bypass valve 'ON'.
6. Ensure that the agitator valve is 'ON'.
7. Keep the agitator valve 'ON' until spraying begins.
8. Disconnect the probe or envirodrum line and replace the cam plug in the cam lever fitting.

Transferring chemical without measuring

The chemical can be transferred from the chemical container into the main spray tank (bypassing the Transcal tank) without the chemical being measured (i.e. by emptying full containers). This will reduce the time taken to transfer the chemical.

To do this you:

1. Release the cam lever fitting from the rear of the Transcal station and connect either the probe or the envirodrum line.
2. Place the probe in the chemical drum and open the ball valve on the chemical probe, or connect to the envirodrum and engage the Micromatic handle.
3. Turn the venturi valve on the pressure delivery station 'ON' 85 psi (see previous instructions).
4. The chemical will now transfer from the chemical drum into the main sprayer, bypassing the Transcal.
5. When the required amount of chemical has been

transferred, close the ball valve on the chemical probe and remove it from the chemical drum or release the Micromatic fitting.

6. When finished, the probe or Micromatic coupler should be thoroughly rinsed (see following instructions).
7. Turn the venturi valve 'OFF'.
8. Turn the bypass valve 'ON'.
9. Ensure that the agitator valve is 'ON'. The sprayer agitator should be maintained until spraying begins.
10. Disconnect the probe or envirodrum line from the sprayer and re-attach black suction hose to the rear of Transcal station.

Transcal Rinsing

Rinse the chemical probe line:

If you're wanting to rinse the Transcal lines after using the chemical probe.

1. Fill a suitable container with fresh water (and any applicable decontaminating agent), at least 50 litres of fresh water should be sucked through for sufficient cleaning.
2. Remove the cam lever plug and connect the chemical probe line to the cam lever socket at the Transcal station.
3. Turn Chemical Probe valve to 'ON'.
4. Place the probe into the container with fresh water and open the valve on the chemical probe.
5. Turn the yellow 'T' handle on the Transcal station to 'EMPTY'.
6. Operate the Transcal venturi around 85psi.
7. The fresh water should now transfer to the Transcal tank and then into the main spray tank cleaning the lines from the chemical probe to the Transcal tank and to the main spray tank.

When finished:

- Turn the valve on the chemical probe line 'OFF'.
- Turn the chemical probe valve 'OFF'.
- Turn the yellow 'T' handle 'OFF'.
- Turn the venturi valve 'OFF'.
- Ensure that the agitator valve is 'ON'.

Disconnect the line from the Transcal tank to the probe from the cam lever fitting and replace the cam plug.

Rinsing the envirodrum line

To rinse the Transcal lines after using the Micromatic coupler.

1. Connect the Micromatic coupler to the Micromatic rinsing socket.
2. Connect the envirodrum suction line to the cam lever socket on the sprayer.
3. Turn Chemical Probe valve to 'ON'.

4. Open the 'Envirodrum Coupling Rinse' valve on the external water delivery station so that the fresh water cleans both the Micromatic coupler and the line to the Transcal tank.
5. Turn the venturi 'ON' at 85psi.
6. The fresh water will now rinse through the Micromatic fittings to the Transcal tank and then into the main spray tank.
7. When there has been sufficient cleaning with fresh water (at least 5 minutes of cleaning), close the Envirodrum Coupling Rinse valve.

When finished:

- Turn the chemical probe valve 'OFF'.
- Turn the yellow 'T' handle 'OFF'.
- Turn the venturi valve 'OFF'.
- Ensure that the agitator valve is 'ON'.

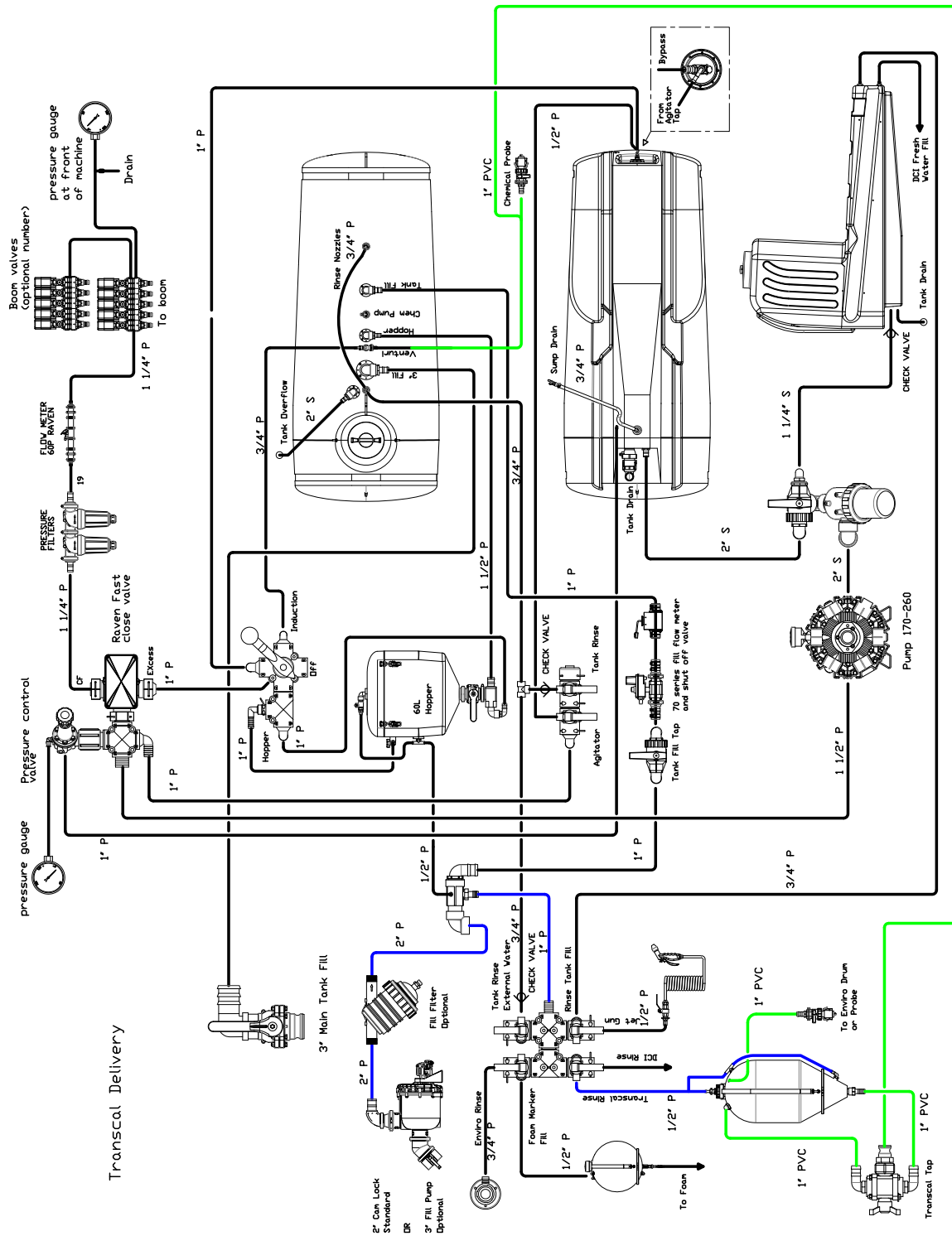
Rinse the Transcal:

1. Continue to have the sprayer pump operating and the Transcal venturi system operating at 85psi.
2. Ensure that the tank is vented by turning the yellow 'T' handle on the Transcal station to 'EMPTY'.
3. Turn the 'Transcal Flush' valve on the external water delivery station 'ON'.
4. The tank and sight tube should be rinsed and the rinsate transferred to the main spray tank.
5. Rinse the Transcal tank for as long as recommended on the chemical label, or at least two minutes.
6. Close the 'Transcal Flush' valve when tank is sufficiently rinsed and the rinsate should all have been transferred to the main spray tank.

To vent tank:

1. Turn off venturi
2. Open probe ball valve
3. Open Transcal ball valve to empty Transcal
4. Vent for 30 seconds then close

Transcal Schematic



Hydraulic fill pump

Key Features



Suction and delivery lines

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

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

Setting pump RPM

WARNING: Do not run the pump with the water delivery line closed (deadheaded) for prolonged periods, as pump overheating and seal damage will result. Pump should never be run empty. Always turn off the delivery ball valve slowly as pump damage can occur if its turned off too quickly.

The hydraulic fill pump requires approximately 40 litre per minute of oil @ 2000 psi.

With open centre tractor hydraulic systems:

- Before starting the tractor open the oil bypass adjustment screw (as circled in picture above)
- Start the tractor and engage the pump.

- Turn the adjustment screw in to increase the pump RPM'S until it is running just fast enough to prime.
- When properly primed close the water delivery line to dead head the pump Continue adjusting the bypass screw until the water pressure reaches a maximum 3.4 bar.
- Once this is achieved, lock down the bypass screw and reopen the pump water delivery line.

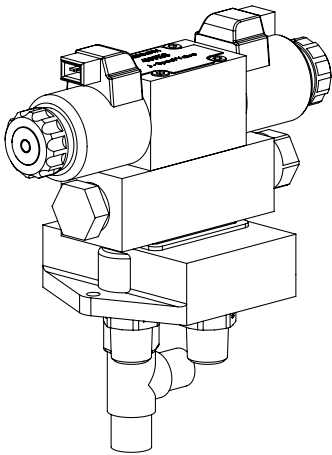
Tractors with closed centre hydraulic systems:

- The oil bypass adjustment screw should be screwed all the way in and locked down (Oil bypass screw circled above).
- The flow control valve on the tractor (hare and tortoise) used to set the hydraulic oil flow.
- Before starting the pump on a closed centre hydraulic system, ensure this screw is fully closed and locked down.
- Set the flow control valve on the tractor to its lowest setting (tortoise).
- Start the tractor and engage the pump.
- Adjust the flow control valve on the tractor until the pump is running just fast enough to prime.
- When properly primed, close the water delivery

line to deadhead the pump, Continue to adjust the oil flow until the water pressure reaches a maximum 3,4 bar.

- Once this is achieved re-open the pump water delivery line.

WARNING: If the pump bypass screw is not closed when operated on a closed centre hydraulic system the tractor will pump excessive volumes of oil to compensate. This will cause the hydraulic oil to overheat, which may result in damage to the pump and tractor transmission.



Operation

WARNING: Do not pump flammable or hazardous liquids with hydraulic fill pumps.

IMPORTANT: Before starting the pump for the first time, fill the pump chamber and suction hose with water and ensure the delivery line is open. This will aid in initial pump priming and reduce the likelihood of seal damage. The pump chamber can be filled through either the 1/2" or delivery port on the top of the pump.

NOTES:

- Do not run the pump dry or un-primed for extended periods, otherwise seal damage will result.
- The amount of oil fed to a hydraulic centrifugal pump directly determines its RPM'S and thus the liquid pressure at which the pump operates.
- Excessive oil flow will cause the hydraulic motor to over-rev, resulting in damage to the pump and hydraulic motor. It is imperative to set the correct oil flow to the hydraulic motor every time the pump is connected to the tractor.

Instructions for machines fitted with electric over hydraulic operated fill pumps:

Attach fill hose to quick fill point.

Ensure that the fill pump bypass ball valve is in the "fill pump OFF" position.

Ensure that pump is primed prior to starting.

Activate fill pump with toggle switch located on the EZ control panel.

Slowly turn fill pump bypass ball valve to the "fill pump ON" position. (This valve allows you to regulate the rate of fill with more or less hydraulic flow as required).

Once the required amount of water has been transferred, rotate the ball valve to "fill pump OFF" position and then switch off toggle switch.

Instructions for machines not fitted with electric over hydraulic spool valves

Attach fill hose to quick fill point.

Ensure that the fill pump bypass ball valve is in the "fill pump OFF" position.

Ensure that pump is primed prior to starting.

Activate fill pump by engaging tractor hydraulic remote lever.

Slowly turn fill pump bypass ball valve to the "fill pump ON" position. (This valve allows you to regulate the rate of fill with more or less hydraulic flow as required).

Once the required amount of water has been transferred, rotate the ball valve to "fill pump OFF" position and then disengage tractor remote.

Exacta foam marker

Using the foam marker

STANDARD NEEDLE VALVE SETTINGS

WATER:

Booms 24 metres and larger:
Open the water valve 12 turns.

CONCENTRATE:

Booms 24 metres and larger:
Open the concentrate valve up to 4 turns.

Start with half this amount and open the concentrate in only quarter turn intervals until the correct foam consistency is reached. Allow up to 5 minutes for each needle adjustment to take effect.

To successfully use the Exacta foam marking system, it is essential to observe the following points:

1. Make sure that initially all ball valves on the external water delivery station are turned 'OFF'.
2. If filling of the main spray tank is not required at the same time, turn the red handle on the fill ball valve 'OFF'.
3. Connect the fresh water fill hose to the quick-fill coupling.
4. Operate the fresh water pumping system (make sure pressure does not exceed 200 kPa).
5. Take the lid off the foam marker water tank.
6. 'OPEN' the 'foam marker fill' valve. Fill the Exacta foam water tank with only clean soft water.
7. Continue to bottom-fill the foam tank until the desired amount has been transferred.
8. When the desired amount of water has been transferred to the foam tank, turn the 'foam marker fill' valve 'OFF'.
9. Re-fit the lid to the foam marker water tank.
10. Turn the fresh water pumping system off.
11. Fill the concentrate tank with only Goldacres foam concentrate.
12. All adjustments of the control valve should be within plus or minus ½ a turn or similar.
13. Always allow sufficient time for the altered foam

to come out of the accumulator:

14. If the foam is too runny, close the water valve slightly, if the foam is stiff and has air holes, open the water valve slightly. Loose foam is desirable when spraying in crops where the foam needs to sit on top of the crop in order to be visible. Tight foam is desirable when the foam needs to be visible for an extended period of time and when the spraying conditions are relatively hot and windy.
15. Regularly inspect the foam marker lines, to ensure they are free of foreign matter.
16. Periodically remove and clean the water filter:
The foam marker filter is located underneath the foam marker tank. To remove the filter, ensure the appropriate protective clothing is being worn. Close the foam tank ball valve, loosen the brass screen, remove the filter and clean.
17. Periodically check the condition of the one-way valve in the compressor/diverter unit.

WARNING: Ensure that the foam marker water tank lid is screwed on loosely to prevent pressure build up in the tank.

NOTE: If either the water tank or the foam concentrate tank empties, it's possible that flow from the other tank (foam water or foam concentrate) can siphon into the empty tank. To prevent this, as soon as either the foam water tank or foam concentrate tank empties, shut the ball valve at the bottom of both tanks. Re-fill the tanks prior to the next spraying operation. Regularly check valves.

Bleeding the concentrate line when the foam concentrate tank empties:

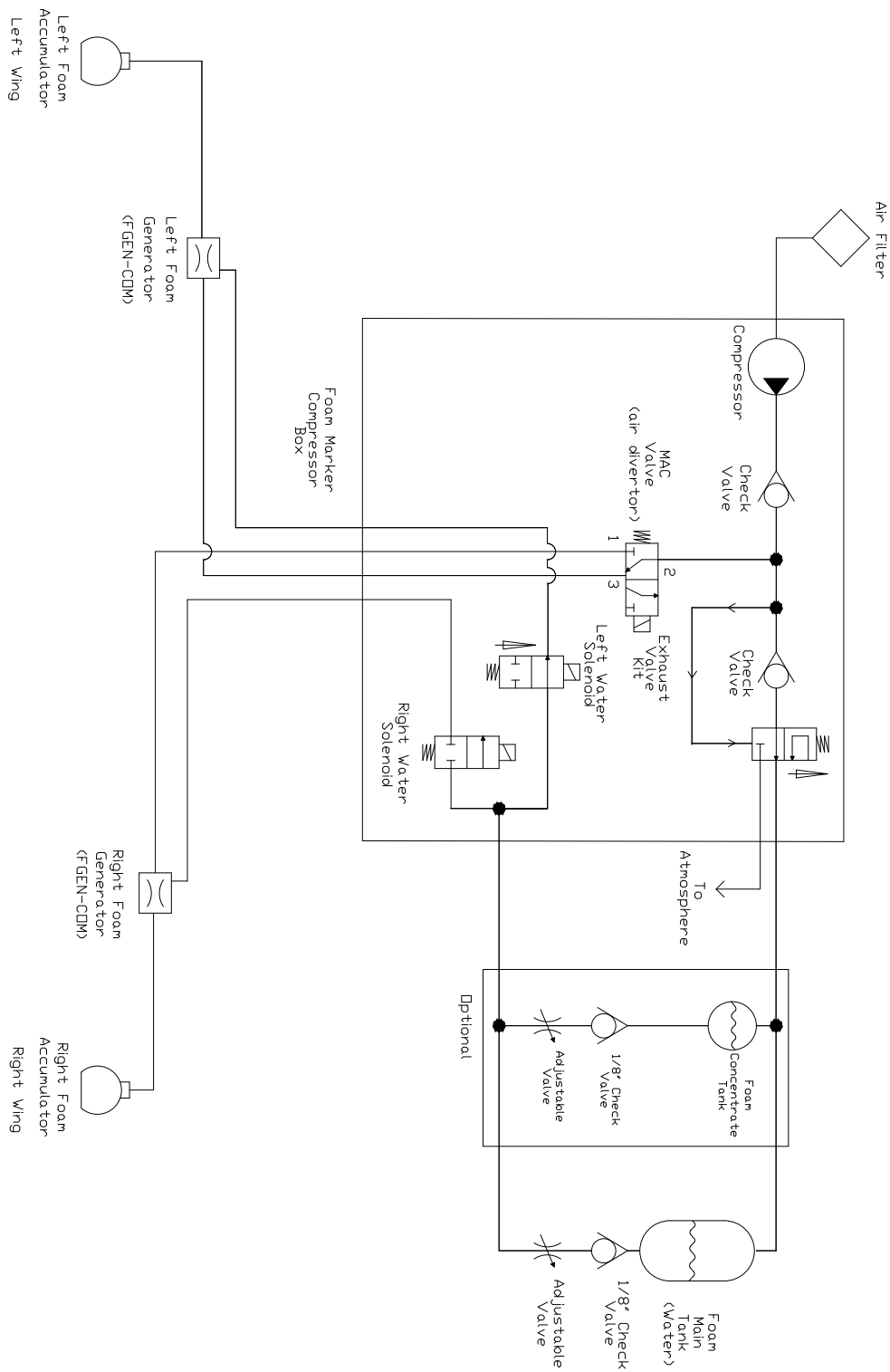
If the foam concentrate tank empties, it will take a few minutes for the concentrate to feed through the lines to the compressor/diverter unit. To reduce this time, the concentrate can be bled to minimize water wastage.

To bleed the foam concentrate:

1. Close the concentrate needle valve ½ turn at a time and record the number of turns until the needle valve is closed.

2. Open the needle valve several turns more than the previous setting.
3. When the concentrate comes through, fully close the concentrate needle valve, and then re-open the valve to the setting recorded from step 1).

Foam marker schematic



Direct Chemical Injection

Operation

Filling the chemical tank/s

The tank filling operation is very similar to the proven TRANSCAL system. By utilising the main diaphragm pump to create water pressure in a venturi, vacuum is applied to the chemical tank. This vacuum in turn draws the chemical out of an enviro drum or container into the chemical tank on the injection module.

Caution: If the chemical injection tank is overfilled, chemical will be drawn into the main tank.

Please ensure that when the chemical injection tank is almost full that the suction is turned off.

Note: Chemical to be inducted into the injection module (s) is carried out on the right hand side of the sprayer. However, before this can be done some set up work is required on the left hand side. All steps shown below refer to tank number 1 - Repeat these steps for tank number 2.

Step 1. If the sprayer is fitted with a Transcal ensure that the three way ball valve (on the LHS) is turned to the "off" position

Step 2. The main spray tank must contain a minimum of 500L of water. This will ensure that the spray pump has sufficient water to operate the venturi.

Step 3. Set the spray pump running between 400 & 500 rpm. On the left hand side of the sprayer turn the valve labelled "chem probe / Transcal" to the "on" position. This will start the venturi in the top of the tank.

Step 4. Back on the right hand side of the sprayer. Ensure that the chemical tank vent valve is "OFF". Now set the three way ball valve to "Vacuum to tank 1".

Step 5. Connect the probe / enviro drum coupling hose to the 1" cam lock fitting (photo) as shown, in the DCI Quickstart guide. Connect to the container with the chemical to be transferred. Open the ball valve (shown) and the chemical should now be drawn into the tank on the sprayer. Once the desired level has been reached turn off the ball valve.

Step 6. Open the "chemical tank vent" valve. This must be carried out to allow the injection pump to draw

Step 7. Turn off the chem probe / Transcal tap on the LHS and switch off the spray pump.

Priming the pump

Before spraying commences it is important to prime the pump. This will eliminate any air in the system. It can also aid with agitation, however the pump is designed for very low volumes and is not designed as an agitation pump.

Step 1. Set the 4 way rotary valve to the "recirculate" position.

Step 2. Set the pump suction to "pump suction from chemical tank".

Step 3. Refer to the console programming section relating to self testing. Run the pump for several minutes to remove any air from the lines. The system should now be ready to use.

Let's go spraying

Now that the chemical tank is full and the pump is primed the sprayer is now ready to use.

Step 1. Turn the 4 way rotary valve to "to boom".

Step 2. Open the "chemical tank vent" valve.

Step 3. Set the application rate as per the programming section.

You now have confidence that the DCI system will be delivering precise amounts of chemical to the boom.

Rinsing the DCI system after use

It is very important that the system is rinsed out correctly after use. Failure to do so may result in damage to the direct chemical injection pump or chemical residue being left in the tank or hoses. There are two methods of rinsing. 1 – Pumping circuit rinse. This would be done if the same chemical is to be used the next day for example. 2 – Complete system rinse. This would be done if the sprayer is not going to be used for a long period or if a chemical change was going to be made.

Pumping circuit rinse

Step 1. Ensure the 4 way rotary valve is set to "to boom".

Step 2. Set the pump suction to "Pump suction from rinse tank"

Note: Ensure there is a sufficient amount of water in the main sprayer rinse water tank.

Step 3. Set the sprayer up as though you were doing a normal boom line rinse. Activate the DCI module and turn on the boom valves. Rinse water will now be pumped through the DCI pump and out to the boom. This should be done for at least 10 minutes.

Complete system rinse

Step 1. If there is any chemical left in the chemical tank this can be either drained out using the drain tap (see photo), or pumped out by setting the 4 way rotary valve to "calibrate" and ensuring the "pump suction from chemical tank" is on. Connect a hose using the calibrate cam lock to the external drum. Set the monitor so the pump is running.

Step 2. Now that the DCI tank is empty the tank can be flushed out. Set the main spray pump suction valve so that water is drawn from the rinse

water tank. Set the spray pump running, 400 rpm is sufficient. Now turn on the "chemical tank rinse". This will force rinse water into the top of the DCI tank through the rinsing nozzle. Once the tank is $\frac{3}{4}$ full turn the tap off. The main spray pump can be switched off now.

Step 3. The pump suction valve should be set to "pump suction from chemical tank", set the 4 way rotary valve to "recirculate" and set the DCI pump running. Let the pump recirculate for several minutes.

Step 4. The rinsate from the DCI tank can now be either drained out or using the controller, pumped out through the boom.

Step 5. Repeat steps 1 to 4 until you are satisfied that the system is decontaminated.

Rinsing the vacuum line can be achieved by sucking clean water into the tank. Refer to section 1. Filling the DCI tank.

Raven SCS4400 DCI programming

If the console detects the presence of a chemical injection pump during initial console programming it will automatically interrupt the programming procedure after the [RATE CAL] value has been entered for the initial product. At this point it will then request values be entered for the injection module: Product type, valve type, meter cal, value cal, rate cal before reverting back to [SPEED SENSOR TYPE] in the initial console programming.

If the console senses it is connected to two injection pumps it will subsequently request the information for the second unit be entered before reverting back to the initial console programming.

If a chemical injection module is connected to the console it will automatically highlight product 2 and display a prompt for "PRODUCT TYPE" to be selected after the [RATE CAL] value has been entered for the initial product (product 1)

CHEMICAL INJECTION PRODUCT TYPE

Momentarily depressing the [CE] key repeatedly at this stage toggles the console between "LIQUID and "GRANULAR" control selections.

- Chemical injection pumps require selection of "LIQUID CONTROL" to function correctly

- Ensure "LIQUID CONTROL" is displayed then depress the [ENTER] key to lock it in.
- The console will now prompt for a "VALVE TYPE" value to be selected

CHEMICAL INJECTION VALVE TYPE

Momentarily depressing the [CE] key repeatedly at this stage toggles the console through the various valve types

- Injection pumps require selection of "STANDARD VALVE" to function correctly.
- Ensure "STANDARD VALVE" is displayed then depress the [ENTER] key to lock it in
- The console will now prompt for a "METER CAL" value to be entered

CHEMICAL INJECTION METER CAL

Raven chemical injection pumps are pre-calibrated. The pump may have a calibration tag attached quoting a value of 110. This is an imperial calibration value and must be ignored. The correct metric value is [372]

To enter this meter calibration figure

- Depress the [ENTER] key to display the "E" enter

symbol.

- Key in the correct calibration figure [372]
- Depress the [ENTER] key again to lock it in.
- The console will now prompt for a "VALVE CAL" value to be entered.

NOTE: Once initial console programming is completed it is recommended that this value be checked using the following procedure.

NOTE: 10 decilitres = 1 litre.

- Fill the injection tank with water
- Place the 3-way tap on the outlet side of the pump to the recirculate (top of tank) position.
- Turn the console [POWER] switch "on"
- Momentarily depress the [PRODUCT SELECT] key repeatedly until the product corresponding to the relevant injection pump unit is highlighted
- Momentarily depress the [PRODUCT ON/OFF] key repeatedly to turn the product on
- Momentarily depress the [AUTO/MANUAL] key repeatedly until AUTO/NOBM is displayed
- Enter a [SELF TEST] value equivalent to the normal operating speed i.e. 16 kph (see "Self-Test" section in SCS 4400 programming and operation section for further details)
- Depress the [RATE CAL] key to display the "E" enter symbol
- Key in a value of 10 decilitres (1 Lt)
- Depress [ENTER] again to lock it in
- Disconnect the recirculating hose at the top of the injection tank
- Turn the boom master and all the boom section switches "on"

NOTE: Main sprayer pump does not need to be engaged to perform this test function but all boom sectional switches need to be on to simulate the total width of the boom. With the main pump disengaged and the injection pump on by-pass no liquid should exit the nozzles even though the boom valves are on.

- Ensure liquid is flowing from the re-circulation hose to indicate the pump is primed
- Turn off the boom master switch
- Depress the [TOTAL VOLUME] key
- Depress the [ENTER] key to display the "E" enter symbol
- Key in a value of [0] to reset this function
- Depress the [ENTER] key to lock it in
- Place a measuring flask under the end of the re-circulation hose
- Return the boom master switch "on" position
- Run the injection pump until 10 decilitres (1 Lt) [TOTAL VOLUME] is displayed then turn the master switch "off"
- Inspect the measuring flask and note the volume of water collected
- If the [METER CAL] value is correct a litre of water should be collected in the measuring flask
- If not use the formula below to correct the [METER CAL] value

$$\text{NEW [METER CAL] VALUE} = \frac{\text{OLD [METER CAL] VALUE} \times 10 \text{ VOLUME MEASURED IN FLASK}}{\text{VOLUME MEASURED IN FLASK}}$$

Repeat the above test procedure to confirm the new [METER CAL]

CHEMICAL INJECTION VALVE CAL

Chemical injection pumps use a standard valve cal of [123]

To enter the value calibration figure:

- Depress the [ENTER] key to display the "E" enter symbol
- Key in the appropriate [VALVE CAL] calibration number [123]
- After keying in the appropriate valve calibration figure depress [ENTER] again to lock it in.
- The console will now prompt for a [RATE CAL] value to be entered.

CHEMICAL INJECTION APPLICATION RATE

Raven Chemical Injection Modules operate in decilitres/hectare. 1 decilitre = 100 millilitres thus there are 10 decilitres to a litre

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

To enter a [RATE CAL]

- Depress the [ENTER] key to display the “E” enter symbol
- Key in the desired application rate (i.e. 10 decilitres/ha)
- Depress [ENTER] again to lock it in

NOTE: At this point if the console detects a second injection pump it will revert back to [PRODUCT TYPE] for the second unit so begin the DCI programming procedure again.

If a second injection pump is not detected the console will revert back to the initial programming phase and prompt for a “SPEED SENSOR TYPE” to be entered. If this is the case revert back to step 8 in the initial console programming instructions

LOW FLOW LIMIT

A Low Flow Limit can be entered for the chemical injection pump independent of the main product (see initial console programming section for details).

To enter a Low Flow Limit value for the chemical injection pump:

- Ensure the correct product is highlighted on the screen. If not depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word “SERIAL” will be highlighted.
- Depress the [DATA MENU] key again to highlight “PRODUCT”
- Depress the key repeatedly to move the cursor adjacent to “LOW LIMIT”
- Depress [ENTER] key to display the “E” (enter symbol)
- Enter the “LOW FLOW LIMIT” value calculated. Remember this figure needs to be entered in

decilitres

- Depress the [ENTER] key again to lock it in
- Depress a volume or area key to exit the data sub menu and return to the operational screen.

When a low limit value is entered it is important that the zero speed shut off setting is turned off. The zero speed shut off setting will turn the regulating valve off when low or no speed is registered. With this setting turned on it is not possible to spray from a stationary position. To set the zero speed shut off to “OFF” the following steps must be followed.

To set “Zero Speed Shut-Off” to OFF.

- Ensure the correct product is highlighted on the screen. If not depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word “SERIAL” will be highlighted.
- Depress the [DATA MENU] key until “CONSOLE” is highlighted.
- Depress the key repeatedly to move the cursor adjacent to “ZERO SPEED”
- Depress [CE] key to change the display from “ON” to “OFF”.

Depress a volume or area key to exit the data sub menu and return to the operational screen

TO RESET AREA AND VOLUME INFORMATION FOR THE CHEMICAL INJECTION UNITS WHEN STARTING A NEW APPLICATION

The SCS 4400 has the ability to simultaneously store Area and Volume data for a chemical injection unit independently to that being recorded for the main tank

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

The Area and Volume functions for the chemical injection units can be reset using the following procedure;

"TANK VOLUME" gives the operator a reference as to the number of decilitres left in the tank as the injected chemical is applied to the field. For this feature to function correctly the estimated volume in the chemical tank must be entered before application period is commenced.

To reset the chemical injection pump tank volume

- Ensure the correct product is highlighted on the screen. If not momentarily depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Depress the [VOLUME TANK] key
- Depress the [ENTER] key to display the "E" enter symbol
- Enter the volume of chemical actually in the tank at the start of the application period. Remember this needs to be entered in decilitres
- Depress [ENTER] again to lock it in

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

TO ZERO OUT DATA IN AREA AND VOLUME:

To reset an Area or Volume values for a chemical injection pump:

- Ensure the correct product is highlighted on the screen. If not momentarily depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Depress the relevant key relating to the value to be reset. For example [TOTAL AREA], [TOTAL VOLUME], [FIELD AREA] or [FIELD VOLUME]
- Depress the [ENTER] key to display the "E" enter symbol
- Enter a value of "0" to reset the particular function
- Depress [ENTER] key to lock it in

The Area and Volume will now count up from zero as the application is commenced.

[FIELD AREA] and [FIELD VOLUME] are generally used 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 used to record data for the current tank load while the [TOTAL AREA] and [TOTAL VOLUME] can be used to record accumulative data for the whole area. If [TOTAL AREA] and [TOTAL VOLUME] are used to accumulate data do not reset them until starting a new area.

SELF-TEST SIMULATION

The [SELF TEST] feature provides speed simulation for testing an injection unit in the "AUTO" mode whilst stationary.

CAUTION: The boom valves must be open when the injection pumps are switched on otherwise a deadhead situation will occur which may result in a burst delivery line.

Before using the [SELF TEST] feature ensure the individual products are in the "AUTO" mode.

The console automatically defaults all products to the "OFF" mode when the console power switch is turned "on"

To change a product to the "AUTO" mode;

- Ensure the correct product is highlighted on the screen. If not momentarily depress the [PRODUCT SELECT] key repeatedly until the relevant product is highlighted
- Momentarily depress the [PRODUCT ON/OFF] key to turn the product "on". At this point the console should read "AUTO NOBM" (auto no boom).
- If it reads "MAN NOBM" (manual no boom) momentarily depress the [AUTO/MANUAL] key to switch to the product to the auto mode.

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

The [SELF TEST] function should be used

- To help familiarize the operator with the Raven chemical injection system before spraying in the field is commenced.
- To test the sprayer after a period of non-use to

ensure the system is operating correctly before filling the tanks with chemical

- To help familiarize any new operators with the Raven chemical injection system

THE [SELF TEST] FEATURE SHOULD NEVER BE USED WITH CHEMICAL IN THE TANK

DO NOT USE THIS FEATURE WITH THE BOOMS IN THE TRANSPORT POSITION

To simulate a speed

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

A desired test speed should now be displayed in the speed window at the lower left corner of the display, spraying can now be simulated by simply turning on the boom switches

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

NOTE: Some radar and GPS units may sense motion when the sprayer is stationary thus continually clear this function. To counteract this simply unplug the speed sensor at the back of the console whilst using this function

Changing the order in which additional product appear on the console screen

If more than one injection unit is connected to the console the order in which they appear as the 2nd and 3rd product on the console screen can be change to suit the operator using the following procedure;

NOTE: The console will automatically allocate the carrier product to the 1st position on the screen

- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word "SERIAL" will be highlighted.
- Momentarily depress the [DATA MENU] key

repeatedly until "CAN" is highlighted

- Momentarily depress the key repeatedly to move the curser adjacent to the line "PRESS ENTER TO READRESS PROD NODES"
- Depress the [ENTER] key to begin the reboot process
- The console will now display "REBOOT NODES IN SEQNC, PRESS ENTER WHEN DONE"
- Disconnect the logic power to both injection pumps (the logic power is the smaller of the two sets of red and white wires leading to each pump. Disconnect by either uncoupling the plug or pulling out the 5 amp fuse)
- Wait a few seconds then reconnect the injection units in the order you wish them to assume the 2nd and 3rd position on the screen (note: position 1 will always be taken up by the carrier product)
- Depress the [ENTER] key again to resume normal operation

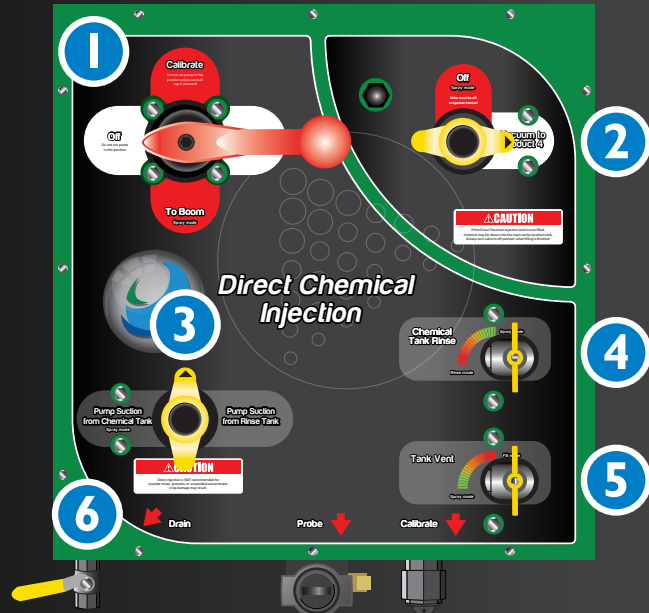
NOTE: If the console displays "check control node 2 or 3" when reconnecting an injection module at any stage;

- Momentarily depress the [DATA MENU] key to bring up the data submenu at the bottom of the screen. The word "SERIAL" will be highlighted.
- Momentarily depress the [DATA MENU] key repeatedly until "CAN" is highlighted.
- Momentarily depress the key repeatedly to move the curser adjacent to the particular product be it either 2 or 3.
- If the communication link is turned "off" the console will display "PROD CONTROL NODE 2 OR 3 NOT INSTALLED".
- At this point momentarily depressing the [CE] key will turn the communication link between the console and the injection pump unit either "on".
- If properly connected and turned "on" a PGM and VER number should be displayed.
- Depress and volume or area key to resume normal operation.

DCI Quickstart Guide

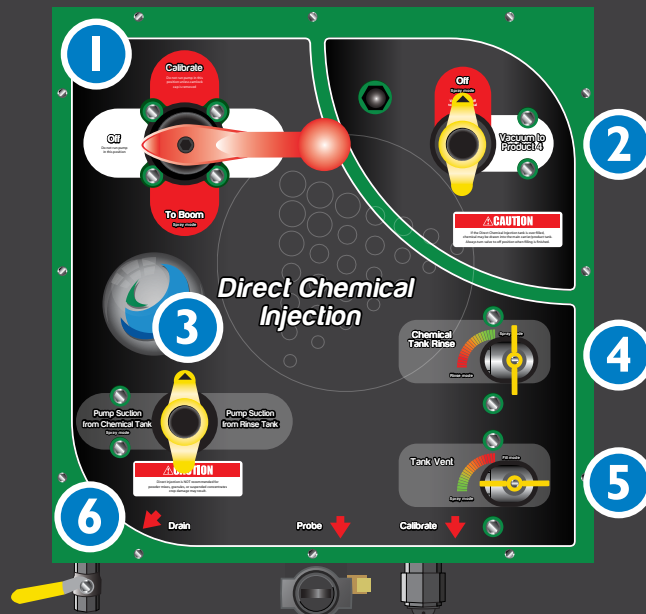
Fill

1. Move handle to Off
2. Move handle to Vacuum to Product 1
3. Move handle to Middle
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (FILL MODE)
6. Connect hose to Probe



Empty

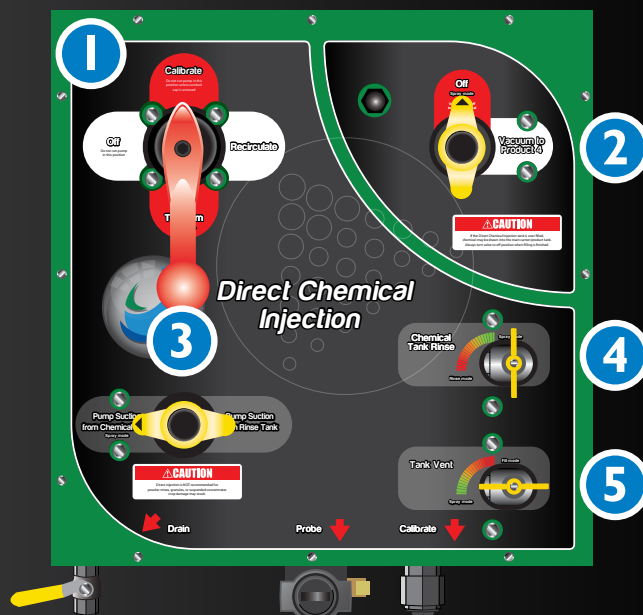
1. Move handle to Off
2. Move handle to Off (SPRAY MODE)
3. Move handle to Middle
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (SPRAY MODE)
6. Move Drain handle to "On" position



DCI Quickstart Guide - continued

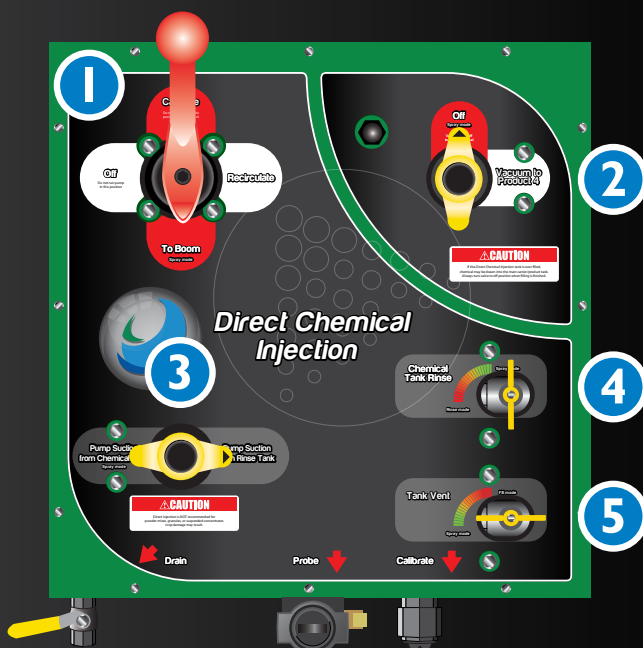
Calibrate

1. Move handle to To Calibrate
2. Move handle to Off (SPRAY MODE)
3. Move handle to Pump Suction from Rinse Tank (SPRAY MODE)
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (SPRAY MODE)



Flush

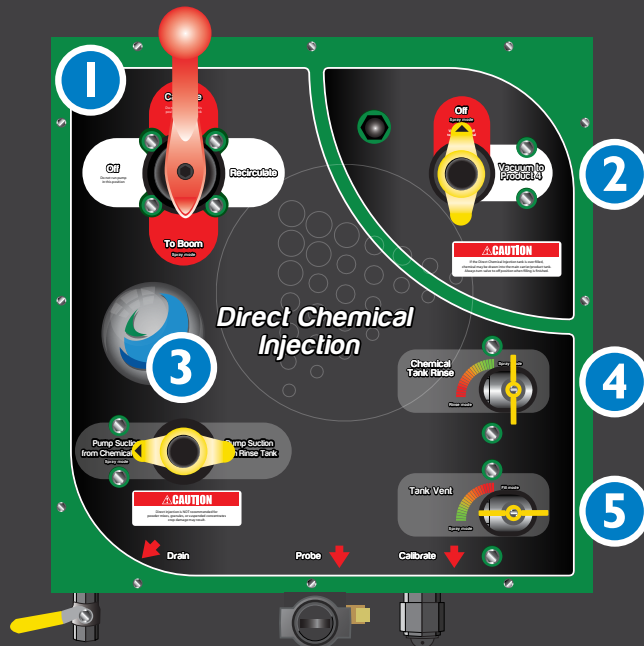
1. Move handle to To Boom (SPRAY MODE)
2. Move handle to Off (SPRAY MODE)
3. Move handle to Pump Suction from Rinse Tank
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (SPRAY MODE)



DCI Quickstart Guide - continued

Spray

1. Move handle to To Boom (SPRAY MODE)
2. Move handle to Off (SPRAY MODE)
3. Move handle to Pump Suction from Rinse Tank (SPRAY MODE)
4. Move handle to Chemical Tank Rinse (SPRAY MODE)
5. Move handle to Tank Vent (SPRAY MODE)



UltraGlide

Overview

UltraGlide uses boom mounted ultrasonic sensors to measure the height of the boom above the ground and maintain the boom at a pre-set level.

The UltraGlide system comes in 3 configurations:

- 3 sensor (standard), one centre sensor and two outer sensors on the boom wing
- 5 sensor; one centre sensor, two inner boom sensors and two outer boom wing sensors.
- 5 sensor severe terrain, five sensors and touch down wheels fitted to each outer wing.

Touch down wheels are fitted for severe terrain because they provide instant feed back to the UltraGlide hydraulics and provide a quicker reaction time than the sensors alone.

Terrain conditions and the machines hydraulic system dictate the actual speeds that can be achieved during application with an engaged UltraGlide system. Typically rougher and more varied terrain require slower speeds when UltraGlide is activated.

Key Features



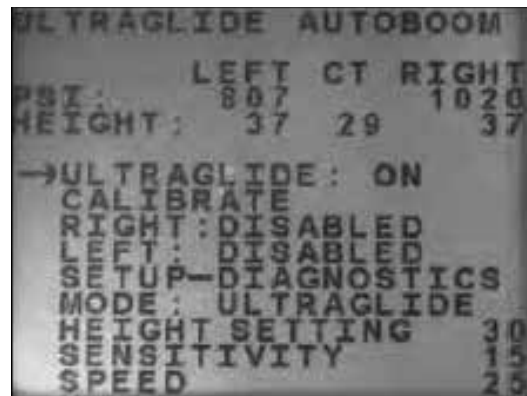
Operation - Calibration

AutoBoom calibration requires pressure in the machine's cylinders and enough boom travel to allow the boom to travel 10" up or down without reaching the top or bottom of the cylinder stop.

During calibration and operation, it is important to keep the machine running at a sufficient engine RPM so that the hydraulic pump is able to supply a full flow of oil to the hydraulic system.

NOTE: Calibration procedures should be performed with the machine operating at the normal operating engine RPM with oil at normal operating temperatures.

1. Move the machine to a flat area.
2. Verify that the booms are unfolded, and lower the center rack.
3. Press the DATA MENU button on the SCS console keypad until the AutoBoom Main Menu is displayed.
4. Press the CE button to toggle UltraGlide to ON.



5. Verify that the booms are unfolded, and lower the center rack so that the wheels are approximately six inches from the ground.

Note: If the booms do not go over center or are travel-limited, raise the booms so that the boom tips are approximately ten inches above the horizontal position and lower the center section slightly below the normal spraying height.

6. Using a tape measure the distance from the bottom of the sensor to the spray nozzle tip.
7. In the setup screen adjust the vertical sensor height offset settings in the SCS console to sensor

position as measured in step 4.

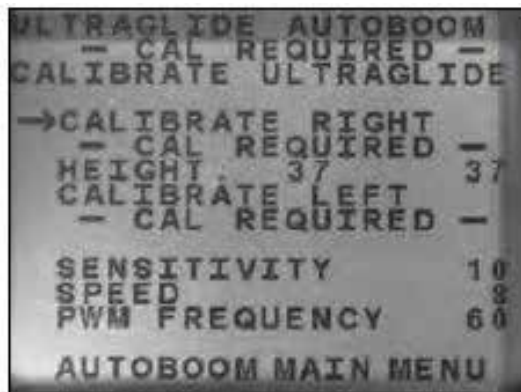
- Positive offsets indicate the sensor surface is located above the nearest spray tips.
- Negative offsets indicate the sensor surface is located below the nearest spray tips.
- Inner, outer, and center offsets are not required to be the same across the width of the machine, but they must be correctly measured relative to the spray tips.

Note: If the machine is equipped with a center sensor, the center rack height can be verified through the main menu or diagnostics screen in AutoBoom section of the SCS console.

8. Raise the boom tips to approximately the target height.

Note: The default target height is 30 inches. Verify that the booms are not fully raised to the boom stops. If gauge wheels are installed, the setting must be adjusted to 40 - 45 inches to prevent the wheels from touching the ground during system calibration.

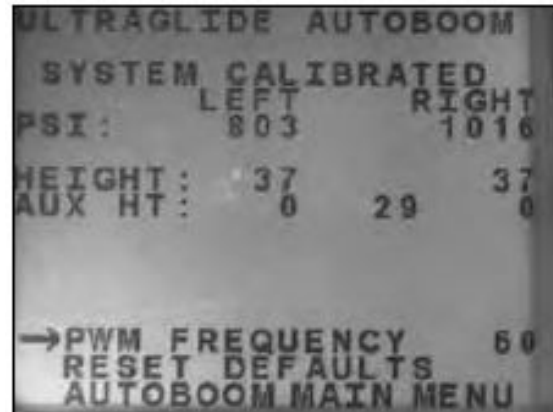
9. Press the arrow down button to move the cursor to CALIBRATE RH and select ENTER.



10. Press the ENTER button on the SCS console to begin calibration.

11. Repeat steps 9 and 10 to calibrate the left hand boom as well.

The calibration process may take up to a minute to complete. "Calibration" will flash, indicating that calibration is in progress. If the boom fails to calibrate, press enter to stop the calibration process. Once the calibration is complete the following screen will appear:



Note: The PWM Frequency will display 250 for all machines from 2009 onwards.

12. Press the arrow down button twice to return to the AutoBoom Main Menu.

Centre Rack Control Calibration

There are many different valve configurations used to control the machine's center rack functions. The AutoBoom system must "learn" which of the machine's solenoids are used to raise and lower the booms.

Complete the following steps to calibrate the center rack control feature after the individual booms have been calibrated.

1. Press and hold the center rack raise button on the machine's control panel or joystick for six seconds so that the center rack raises.

Note: The center rack may reach the upper limit of travel during this time, but continue holding the button until the full six seconds has passed.

2. Press and hold the center rack lower button on the machine's control panel or joystick for six seconds so that the center rack lowers.

Note: The center rack may reach the lower limit of travel during this time, but continue holding the button until the full six seconds has passed.

Routine Operation

Joystick Functions

- When AutoBoom control is on, control of each boom can be enabled or disabled via the SCS console or by tapping the sprayer's switch functions (if equipped).

Note: Pressing the down function for longer than 1/2 a second will switch the function to manual control.

The operator must tap the down function to enable AutoBoom.

A single up-tap on the sprayer's switch functions disables AutoBoom on that boom.

A single down-tap on the sprayer's switch functions enables AutoBoom on that boom.

Enabling AutoBoom via the SCS Console

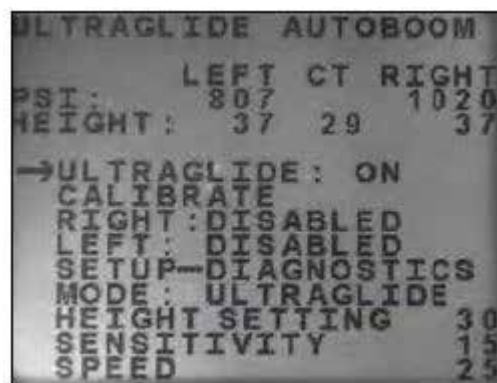
The status of the AutoBoom system is displayed in the lower-right corner of the SCS console display. The status details displayed are:

- The type of AutoBoom system installed and whether it is powered on or off.
- The status of the AutoBoom system (enabled or disabled).
- Center rack height (if equipped with center rack control).



1. Press the DATA MENU button to navigate to the AutoBoom Main Menu.
2. Select ULTRAGLIDE and use the CE button to toggle the setting to ON.

Note: The AutoBoom system is now powered on, but the booms are disabled.



3. Press the down arrow to navigate to the RIGHT boom setting.
4. Press the ENTER button to select the RIGHT boom setting.
5. Press the down arrow to enable the RIGHT boom setting.
6. Repeat the steps above to enable the LEFT boom setting.

Note: AutoBoom can be disabled by selecting the boom settings and pressing the up arrow.

Boom Adjustments When Approaching Headlands (If Equipped with Gauge Wheels)

When approaching the headlands to make a turn, the gauge wheel must be raised approximately six inches from the ground to prevent it from sliding sideways or backward, causing damage to the gauge wheel assembly.

Center Rack Control (AutoBoom Enabled and Center Rack Control On)

Note: The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

Note: Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

Note: Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- Center Down Switch - A single down-tap will lower the center rack to the desired spray height, enable the center rack, and enable both booms.
- Center Up Switch - A single up-tap will disable the center rack and both booms. Two consecutive up-taps will raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height, turn AutoBoom off, and preserve the new transport height as the maximum height.

Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.

Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

Center Rack Control (AutoBoom Enabled and Center Rack Control Off)

Note: The machine may require the activation of a boom valve and/or master spray switch for the center rack control feature to engage.

Note: Consecutive up-taps or down-taps must be performed within 1.5 seconds of each other.

Note: Return to height and return to transport heights are measurements relative to the crop canopy, not necessarily ground level.

- Center Down Switch - Two consecutive down-taps will lower the center rack to the desired spray height and enable both booms.

Note: Center rack control will not be enabled since center rack control is off.

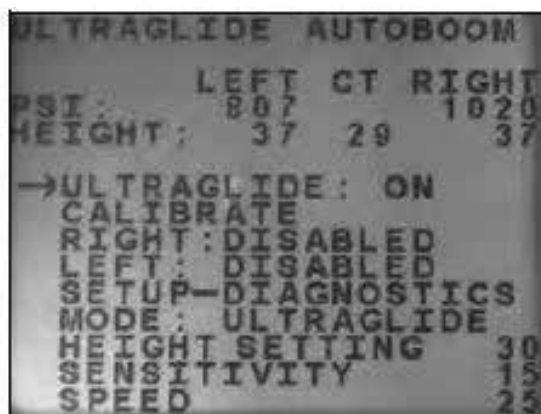
- Center Up Switch - Two consecutive up-taps will disable both booms and raise the center rack to the desired transport height. Four consecutive up-taps will raise the center rack to the maximum height and turn AutoBoom off, preserving the new transport position as the maximum height.

Set a lower transport height - While the center rack is returning to transport, down-tap once on the center switch when the new transport height is reached.

Set the transport height to the maximum height - With the center rack positioned higher than the current transport height and with the AutoBoom not currently returning to the transport height, up-tap twice on the center switch to move the center rack to the maximum height.

System Adjustments

Note: AutoBoom must be enabled after both booms have been calibrated in order to make system adjustments.



Sensitivity

1. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface.

Note: The boom should react immediately and raise at approximately the same speed as your hand.

2. Adjust the Sensitivity setting as needed to make the boom more or less reactive to hand motions.

Note: The default setting is 15. If the Sensitivity is too high, the boom will appear unstable and jittery, reacting to slight changes in target height or crop movement. The typical Sensitivity setting that works best for most machines is 13 - 17. During routine operation, AutoBoom should be unresponsive to changes in height of 2" - 3", but should react quickly to changes of 5" or more. For row-crop situations, or when crop conditions are sparse and not fully covering the ground, it may be beneficial to decrease the sensitivity so the boom is less reactive to sudden changes in crop height, and less likely to cause sudden movements that diminish performance.

Speed

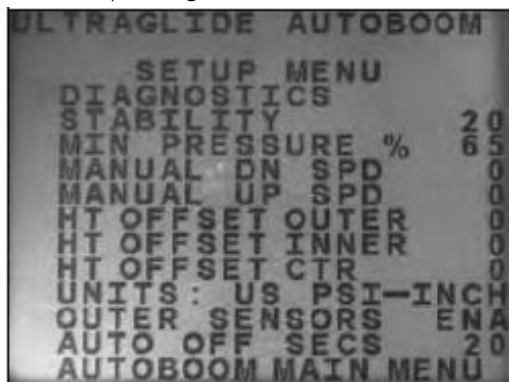
The Speed setting controls how fast the boom will move away from an obstacle, and how much the boom overshoots the target height. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. Adjust the Speed setting as needed so that boom raise rates match hand movement rates, but so that the booms don't overreact and become unstable.

1. Place one hand at ground level below one boom sensor and raise it quickly (about 2 feet per second) to within 12 inches of the sensor surface.

Note: The boom should react immediately and adjust at a raise speed matching the hand movement, overshooting the new target height by one foot or less.

2. Adjust the Speed setting as needed.

Note: The default setting is 25. The Speed setting should be set so that the boom motion is smooth and the machine does not oscillate. The typical Speed setting that works best for most machines is 22 - 27, but can be much higher depending on the static pressures of the boom, boom geometry, and the Sensitivity settings.



Stability

1. Place one hand at ground level below one boom sensor and raise it quickly (about two feet per second) to within 12 inches of the sensor surface, while observing the movement of the opposite boom.

Note: The opposite boom should raise slightly (usually no more than six inches) simultaneously.

2. Adjust the Stability setting to minimize movement of the opposite boom.

Note: Lower the Stability value to make the opposite boom more rigid, but keep the number high enough to allow for natural movement of the boom without affecting the chassis roll.

Min Press %

Note: On machines with travel-limited booms, operate the AutoBoom system with center rack control enabled, or with the center sensor at or slightly below the target height to prevent the booms from continuously entering the Min Press % mode. This mode is for boom emergency protection only, and AutoBoom system should not be run in this mode during routine operation.

1. Raise the center rack section to the target height, so that the booms and center rack are horizontal.
2. Enable the AutoBoom system.
3. Locate the Min Press % setting in the AutoBoom control menus.

Note: The default setting is 65.

4. Increase the Min Press % value to approximately 80.
5. Place one hand at ground level below one boom sensor and raise it slowly (about one foot per second) to within 12 inches of the sensor surface, or until the boom travels up approximately three feet higher than the original target.
6. Pull hand away, and verify that the booms lower slowly after a slight delay.

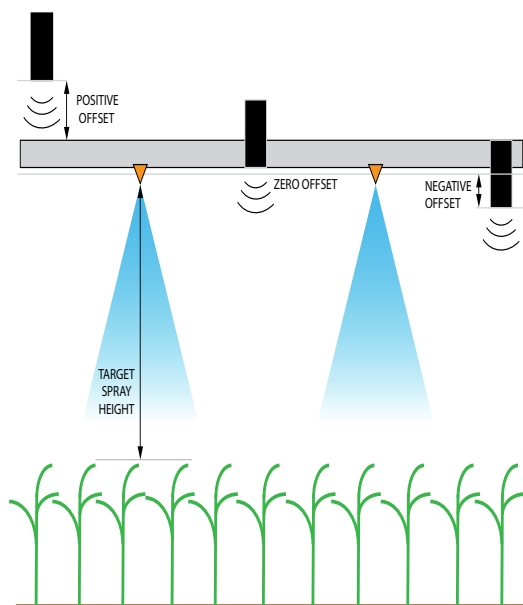
Note: If the booms do not lower, decrease the Min Press % setting value by one and repeat the steps above. Continue performing the Min Press % test until the booms begin to lower.

Ultrasonic Sensor Height Offsets

Ultrasonic sensor height offset adjustments are used to compensate for the difference between the height of the sensor surface and the height of the spray tip. The offset height is calculated by measuring the distance from the bottom of the sensor to the height of the crop, measuring the distance between the spray tip to the height of the crop, and then subtracting the spray tip distance from the sensor distance. Refer to the diagram below to determine whether the offset value should be positive or negative.

Note: The maximum offset height value is 20 inches.

Note: Ultrasonic sensors will react to the first object that reflects an echo, whether it is the ground or the crop. For row-crop situations, it may be beneficial to adjust the sensor positions to directly over a row, or add additional boom sensors.

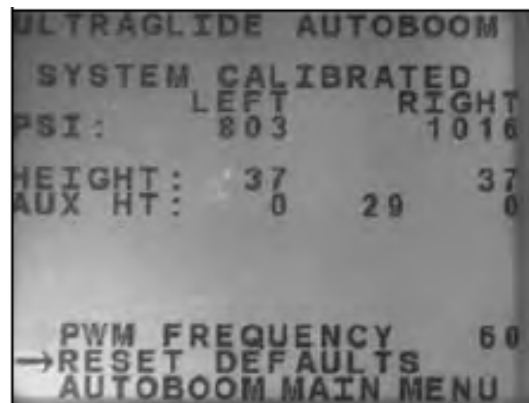


- Touch the up arrow in the Sensor Height section to increase the value representing the distance between the sensor and the ground.
- Touch the down arrow in the Sensor Height section to decrease the value representing the distance between the sensor and the ground.

Note: On machines with travel-limited booms, center sensor height offsets may need to be entered as less than the measured value from the sensor to the ground to ensure the boom cylinders have sufficient pressure during operation.

Resetting Defaults

Although it is not normally necessary, there may be circumstances under which it may be necessary to reset the system defaults. Resetting the defaults erases all AutoBoom system settings and adjustments that have been performed. System calibration will be required after the defaults have been reset.



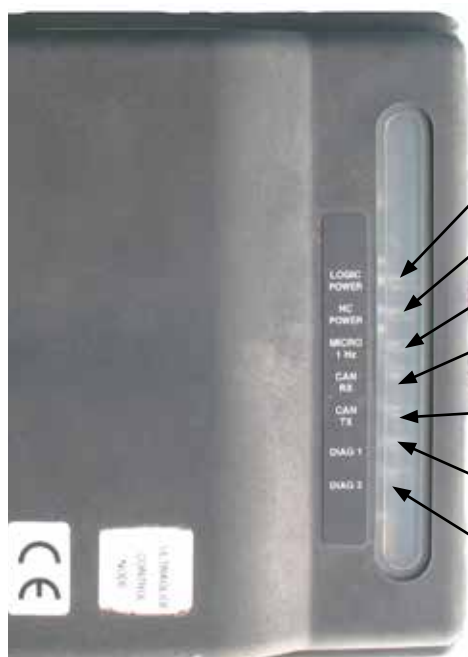
1. From the Calibration menu, use the arrow buttons to navigate to RESET DEFAULTS.
2. Press the ENTER button on the SCS console to reset the AutoBoom settings.

Troubleshooting

Node

The AutoBoom CAN control node features several green light-emitting diodes (LEDs) which may be used to diagnose issues within the AutoBoom system.

Note: If the LEDs are not displayed as outlined in the picture below or are all on continuously, check the CAN connections and the control cable connections on the node. If the issue persists, contact your local Raven dealer for additional technical support.



- Logic power - Lit when +12V current is supplied to the node
- HC (High current) Power - Lit when High current power is supplied to the node
- Micro 1 Hz - Flashes every 1 second during processor activity
- CAN Rx - Flashes to indicate CAN messages are being received by the node. This light typically flashes rapidly.
- CAN Tx - Flashes to indicate CAN messages are being transmitted from the node. The flash speed of this light varies.
- Diag 1 - Lit when the left inner sensor is detected on a dual sensor UltraGlide system
- Diag 2 - Lit when the right inner sensor is detected on a dual sensor UltraGlide system

Pre Calibration Troubleshooting

Problem	Possible Cause	Corrective Action
Booms and centre section will not raise/lower properly through the Raven controller	The proportional blocker coil connections from the AutoBoom harness cable are incorrect on the AutoBoom valve	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The hydraulic connections are reversed.	Reverse the left and right hydraulic connections.
	The electrical connections are reversed.	Reverse the left and right electrical connections (proportional, blocker, and possibly pressure transducers).
	Improper high current voltage electrical connection or blown fuse.	Check the electrical connections and fuses.
	The center sense/control cables are improperly connected.	Check the center rack section control cabling (connections to center control valve(s), directional valve, load sense valve, and open center valve - if applicable).

Problem	Possible Cause	Corrective Action
Pressures/heights are not being displayed in the correct units of measure.	The units of measure are set incorrectly in the AutoBoom system.	Change the units of measure in the controller being used in the AutoBoom system.
Pressures for the left and right boom are not displayed on the correct side.	The left and right pressure transducer connections are reversed.	Reverse the left and right transducer connections.
	The left and right hose connections are reversed.	Reverse the left and right cylinder connections on the AutoBoom valve.
Ultrasonic sensor heights are displaying incorrect locations.	The left and right sensor connections are reversed.	Reverse the left and right outer sensor connections on the AutoBoom harness cable.
	The outer sensors are connected to the inner sensor connectors.	Disconnect the sensors from the AutoBoom harness cable and connect the outer sensor connectors to the sensors.
Left, right, and center raise/lower functions are not sensed correctly when the machine's functions are used.	The boom sense cables/connections are connected to the incorrect machine coils.	Check the connections to the machine's coils and trace the wiring to ensure the connections are made to the correct cylinders.
Center section will not raise/lower manually with the machine's functions.	The center rack boom sense cables are not connected to the correct center sense/control function.	Check the connections to the machine's coils and trace the wiring to ensure the connections are made to the correct coils.
	The AutoBoom node hardware does not support the center rack control function.	The node must be revision B or higher to support the center rack control function. Contact your Raven dealer.
Fold/unfold status does not change when booms are folded/unfolded (if equipped).	The fold/unfold sensors are not connected.	Check the electrical connections to the fold/unfold sensors.

Calibration Troubleshooting

Problem	Possible Cause	Corrective Action
Left and right booms do not move during calibration.	The proportional/blocker connections are reversed or improperly connected.	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The hydraulic connections are improperly connected.	Check the hydraulic connections.
	Booms are resting on their stops or the cylinders are fully extended.	Raise the booms and lower the center rack to ensure the pressure is sufficient in the booms for calibration.
	The pressure transducer or connection is faulty.	Check the transducer connections to the AutoBoom harness cable.
	There is insufficient high current power.	Check the power and ground connections at the battery and the connections to the node.
The booms over react or oscillate during calibration	There are objects beneath the sensors causing faulty readings.	Attempt to calibrate the system over open ground or consistent crop canopy.
	The inner and outer sensor connections are reversed.	Check the inner and outer sensor connections and reverse if necessary.
	Faulty ultrasonic sensor readings.	Check the sensors and cabling and replace if necessary.
	The Speed setting is too high.	Decrease the Speed setting.
	The Sensitivity setting is too high.	Decrease the Sensitivity setting.
	The hydraulic flow is too high (pull type sprayers only).	Decrease the hydraulic flow the AutoBoom circuit remote.
	The orifices are missing from the AutoBoom valve.	Reinstall orifices into the AutoBoom valve.

Problem	Possible Cause	Corrective Action
The booms fully raise during calibration and do not lower	The inner and outer sensor connections are reversed.	Check the inner and outer sensor connections and reverse them if necessary.
	The ultrasonic sensors are giving poor readings.	<ul style="list-style-type: none"> • Check the cabling to the sensors. • Verify the sensor surface is clean. • Verify no obstructions or boom components are interfering with sensor readings.
	The hydraulic connections are improperly connected.	<ul style="list-style-type: none"> • Check the hydraulic connections. • Reverse the direction of the hydraulic lever on pull-type sprayers.
	The electrical connections to the AutoBoom valve are reversed.	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The Speed setting is too high.	Decrease the Speed setting.
	The Sensitivity setting is too high.	Decrease the Sensitivity setting.
	The hydraulic flow is too high (pull type sprayers only).	Decrease the hydraulic flow the AutoBoom circuit remote.
The booms fall to the ground during calibration	The proportional valve connections are reversed on the AutoBoom valve.	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The hydraulic connections are improperly connected.	<ul style="list-style-type: none"> • Check the hydraulic connections. • Reverse the direction of the hydraulic lever on pull-type sprayers.
	Malfunctioning proportional valve.	<p>Turn the set screws in on the proportional valve to verify the booms raise during calibration.</p> <ul style="list-style-type: none"> • If the booms raise, troubleshoot the electrical system and/or AutoBoom node. • If the booms do not raise, troubleshoot the hydraulic system and/or AutoBoom valve.
	The hydraulics are not activated (pull type sprayers only).	<ul style="list-style-type: none"> • Verify the hydraulics are activated. • Ensure hydraulic flow going to the AutoBoom valve.

Operation Trouble Shooting

Problem	Possible Cause	Corrective Action
Booms raise but will not lower when starting the machine or engaging the hydraulics (pull-type sprayers) with AutoBoom engaged.	The PWM base is too high.	Engage the AutoBoom hydraulics and allow the PWM base to decrease and the booms to lower automatically.
	The system is out of calibration.	Re-calibrate the AutoBoom system.
	(Pull-Type only) The flow is turned up too high on the remote.	Reduce flow on the sprayer to 3 - 5 gallons per minute.
	(Pull-Type only) There is a restriction in the tank line hose.	<ul style="list-style-type: none"> • Check the quick couplers on the sprayer. • If the sprayer is equipped with a case drain line (non-restricted), connect the tank line to this hose.
The booms will not enable with the down-tap of the machine's functions.	The boom sense adapter cables are damaged or not connected.	<ul style="list-style-type: none"> • Check the cabling. • Use the Diagnostics menu to determine the proper wiring setup.
	There is inadequate voltage to the system.	Use a multi-meter to verify +12V is provided to the machine's coils when the function is activated.
	The AutoBoom system is not calibrated.	Calibrate the AutoBoom system.
	The AutoBoom harness cable is damaged.	Inspect the cable for damage and repair or replace as needed.
	The AutoBoom node is faulty.	Replace the AutoBoom node.
The pressure alarm is always on.	The pressure alarm setting in the PowerGlide Plus mode is set too low.	Increase the pressure alarm setting.
	The pressure and tank hoses are reversed.	Check the hoses and reverse if necessary.
	The pressure transducer is faulty	<ul style="list-style-type: none"> • Inspect the transducer and verify the pressure reading on the Diagnostic screen. • Replace the pressure transducer if necessary.
	The AutoBoom harness cable is damaged.	Inspect the cable for damage and repair or replace as needed.
	Booms are resting on their stops or the cylinders are fully extended.	Raise the booms, lower the center section, and re-engage AutoBoom.

Problem	Possible Cause	Corrective Action
Objects under one boom makes the opposite side react.	The inner and outer sensor connections are reversed.	Check the inner and outer sensor connections and reverse them if necessary.
	The proportional valve connections are reversed or one side is not connected.	Check the connections on the AutoBoom valve to ensure the harness cable connections are connected to the correct ports.
	The Stability setting is too low.	Increase the Stability setting incrementally until the opposite side barely raises.
	The proportional valve is faulty.	<ul style="list-style-type: none"> • Inspect the proportional valve. • Clean and/or replace if necessary.
The booms oscillate or overreact when the machine is stationary.	The Sensitivity setting is too high.	Decrease the Sensitivity setting by one increments until the boom oscillation stops.
	The wind is affecting the sensor readings.	Decrease the Sensitivity setting by one increments until the boom oscillation stops.
	The Speed setting is too high.	Decrease the Speed setting by one until the boom oscillation stops.
	The center section is unstable.	Decrease the Stability setting to balance the movement of the booms on both sides of the center section.
	Sporadic ultrasonic sensor readings.	Inspect the sensor cabling for damage and repair or replace as needed.
The booms raise but will not lower or lower too slowly during operation.	The incorrect PWM frequency was entered.	Verify the PWM frequency setting in the Raven console/field computer. (60 Hz for square coil valves, 250 Hz for round coil valves)
	The Speed setting is too low	Increase the Speed setting.
	The Minimum Pressure % setting is too high.	Decrease the minimum pressure % setting by one until the booms lower at the desired rate.
	The inner and outer sensor connections are reversed.	Check the inner and outer sensor connections and reverse them if necessary.
	Faulty ultrasonic sensor readings	Check the sensors and cabling and replace if necessary.
	The orifices or circuit restrictions are restricting the return flow from the tilt cylinders.	Inspect the AutoBoom hydraulics and remove orifices or restrictions in the circuit if necessary.

Problem	Possible Cause	Corrective Action
The booms are slow to raise or are unresponsive to height changes.	The Speed setting is too low.	Increase the Speed setting.
	The Sensitivity setting is too low.	Increase the Sensitivity setting.
	Excessive ground speed.	Decrease the ground speed.
	The incorrect sensor height offsets were entered.	Verify the proper height offset and adjust the settings as needed. Refer to the appropriate chapter in this manual for the Raven controller/field computer being used to determine the height offset settings calculation.
	The orifices or circuit restrictions are restricting the return flow from the tilt cylinders.	Inspect the AutoBoom hydraulics and remove orifices or restrictions in the circuit if necessary.

Smart steer

General

The Goladacres Smart Steer is a state of the art trailing sprayer tracking system. It is designed to make the sprayer track directly behind the towing vehicle. By effectively creating only one set of wheel tracks, crop damage is greatly reduced.

It is a simple system consisting of a computer, speed sensors, angle sensor and a yaw sensor. The yaw sensor, speed signal and angle sensor simply send signals to the computer which turns this information into output signals that activate the hydraulics accordingly.

The yaw sensor is mounted remotely on the tractor and all the other components are mounted on the sprayer. Using the yaw sensor and the speed sensors, the computer can calculate the radius of the turn and direct the sprayer onto the same tracks, confirming this by using the angle sensor fitted directly to the steering king pin on the axle.

Modes

Crab:

This is where you can offset the sprayer wheels to run offset from the tractor. You can run the sprayer in a different set of gutters or just simply in the middle of the tractor wheels. It is useful in extremely muddy or dusty conditions.

Manual:

Manual gives you the ability to steer the sprayer where you would like it to go. Useful for getting into and out of hard to access water fill points, also a very handy diagnostic tool.

Automatic:

Once in automatic there is no manual control over the steering of the sprayer. The sprayer will track in line with the rear axle of the tractor. It will only stop steering if the wheels stop rotating or the ground speed is detected at zero.

Centred:

Centered position is the same as driving a sprayer without steering. To center, simply turn the switch to auto then back to manual and the wheels will return to their calibrated center.

Transport:

Transport mode is the same as driving a sprayer without steering. It is used for high speed transport. Centre the wheels (as above) and have the switch in either the manual or off position. The ball valves on the steering cylinder must be closed.

Reversing:

Centre the wheels as above and have the switch in either the manual or off position.

WARNING: DO NOT reverse the sprayer unless the Smart Steer switch is in the manual or off position. Otherwise damage to the sprayer can occur.

Operation

1. When you are ready to start using the smart steer system, ensure there is no one or no obstacles around the wheels or between the chassis and the wheels. Once you are sure all these areas are clear, you may proceed.
2. With the tractor turned off, turn the hydraulic tap located on the steering cylinder to the on position.
3. Start your tractor and power up the smart steer system. With the steering in manual mode, repeatedly press the crab left switch, until the trailer wheels have reached full lock left. Once this process has completed, again with the steering in manual mode, repeatedly press the crab right switch, until the trailer wheels have reached full lock right. This is an indication that the system is working (when you engage the crab functions the computer understands it as a simulation of yaw).
4. Engage the Smart Steer to automatic mode and the system will straighten the wheels ready to begin. This will indicate the system is ready for operation.
5. When the unit stationary there will be no automatic steering function. Ground speed must be detected to start the auto-steer process. Even if the yaw sensor is moved the steering will not react.

Smart Steer - Operation Calibration

To recalibrate the machine, straighten the wheels in manual crab mode, turn the tractor off. Within ten seconds of turning the tractor back on, press the calibration button. To prove this has worked, while stationary, operate the steering switch from manual to automatic then back to manual again. The wheels SHOULD NOT move. If they do move, the calibration has not worked. Repeat procedure.

Troubleshooting

I HAVE NO AUTO STEERING?

In manual mode check the crab function.

IF THE CRAB FUNCTION IS WORKING...

Without a speed signal the Smart Steer will not work in automatic, you need to check your speed sensors. One way to do this is:

With machine in manual mode, jack the sprayer up using an appropriate jack on a firm solid base. With the wheel just high enough to spin it freely, rotate the wheel (complete rotation to check the whole disc) and inspect the speed sensor (always being careful to keep as far away from the wheels as possible). The speed sensor has a little orange light on the under side of it. This should blink constantly with the rotation of the wheel.

When a gap on the speed sensor disc passes the sensor the light should be off. When a solid piece passes the sensor; the light it should be on. If this is not the case there could be a problem with your speed sensor alignment, it should be 3-10mm off the disc. This would most certainly be a problem if you have an intermittent signal. If the sensor is too close to the disc, the light will be constantly on, and too far away from the disc the light will not come on at all.

Another way to check the speed sensor unit itself is to remove the speed sensor and make sure the light is off - then place a piece of metal in front of the sensor (at the target end) and make sure the light turns on.

IF THE CRAB FUNCTION IS NOT WORKING...

Making sure the ball valve on the cylinder is on. And your pin (if fitted) is removed from then machine as thought the machine was ready for work.

Check you have a power supply to the transistor box. A quick way of testing this is to see if the light on the speed sensors is illuminating. If you have power, use a multi meter to check whether there is power at the plug, on the top of the solenoid. While operating the crab (left or right) function there should be 12v between terminal 1 and terminal 2. If there is power the electrical system is ok. If the electrical system is ok, check whether you have hydraulic pressure supplied to the sprayer by simply checking the gauge on your spool block while operating a function such as holding down the raise button. There should be at least 2500psi in the system.

If you have hydraulic pressure trying to steer the wheels, check that there is no mechanical malfunction such as something seized, something jamming the system, a bent or broken cylinder or the high speed travel locks are not engaged (pin or ball valve).

Technical Fault Finding

NO STEERING, NO MANUAL CRAB

No power

- Visually inspect loom: Look at the loom and ensure there is no broken wires, stretched harnesses or any other visual damage to the loom or connectors.
- Check fuses: inspect the fuses in the fuse box and make sure they are all working.
- Check Circuit breaker (Joystick loom): Inspect the circuit breaker near the battery on the tractor and make sure it has not tripped.
- Check connection to plc: Inspect the small loom between the plc, trident (pc) and main loom connector. Making sure to check large plug that connects to the microprocessor and the plug that connects to the loom. At the microprocessor there should be 12v+ at pins 1, 27, 41 and 42. There should be 12v- (Ground) at pins 2 and the 28.
- Check drawbar connections: Ensure all the plugs are connected correctly at the drawbar.
- Check the battery and all connections at the battery: Ensure the battery is not flat or partially flat. A minimum of 10 volts.

Technical Fault Finding

No hydraulic function

- Check hydraulic connections: Check all hydraulic connections to the tractor are still securely attached and into the correct ports.
- Check other hydraulic function (Lift, fold etc.):
 - Check hydraulic Pressure: While operating a function inspect the pressure on the gauge on the spool valve. Or alternatively operate the bi-fold function and watch the gauge from inside the cabin.
 - Check hydraulic flow
 - Check load sense
 - Check hydraulic oil level of tractor
- Check the ball valves on steering cylinder are on: Check the ball valve(s) located above the steering cylinder are turned on and are parallel with the hose.

POWER BUT NO OUTPUT POWER

- Check connection to plc: Inspect the small loom between the plc, trident (pc) and main loom connector: Making sure to check large plug that connects to the microprocessor and the plug that connects to the loom.
- Check connection din plugs: Inspect the din plugs on top of the hydraulic solenoids and ensure they are all securely fixed together: With the controller in manual mode, remove the din plugs and test the voltage across pin one and two, with someone operating the function. There should be approximately 12 volts between the two terminals.

NO STEERING, MANUAL CRAB WORKS

Left speed sensor not flashing or not on

- Adjust speed sensor: Ensure the speed sensor and lead are still aligned, have not been bumped and are not damaged; also check the gap between the disc and the sensor (3mm-10mm).
- Simulate speed at sensor plug signal: You can simulate a speed signal on Bodem by rapidly shorting the A and B pin with a paper clip on the sensor lead together. This should appear on

Bodem, it will not be steady but there should be a reading. If there is not a reading inspect the loom.

- Replace Speed sensor: If there is a speed reading appearing on Bodem, (when shorting the pins) there is a fault with the speed sensor. Replace the speed sensor.

Both speed sensors not working

- Check power at 307 pin D: Above the axle there will be a plug labelled 307 (leading to the speed sensors and the angle sensor). A six pin Packard plug off the main loom. Between pin "d" and "f" there should be 12Vdc+.

No yaw power

- Check 12v+: There should be a twelve volt positive supply between the pins "A" and "C" of the yaw sensor connector.

ERRATIC STEERING

Right speed sensor not flashing or not on

- Adjust Speed Sensor: Check the right hand speed sensor gap is between 3mm and 10mm. Ensure the light is flashing on every vein of the disc. If the light is not on check there is a 12V+ supply between pin "d" and "f" on plug 307 above the axle.

Calibration error

- When travelling in a straight line and the machine seems to be tracking either too far to the left or too far to the right and this is consistent during turning it is a calibration issue.

Recalibrate the machine by straightening the wheels in manual crab mode, turn the tractor off. Within ten seconds of turning the tractor back on press the calibration button. To prove this has worked, while stationary, operate the steering switch from manual to automatic then back to manual again and the wheels should not move. If they do move, the calibration has not worked. Repeat procedure.

70 Series Fill Flow Meter

Key Features

The Tee Jet monitor and flow meter system can be set up to measure the amount of flow entering the main spray system or it can be set up with a supplementary electronic ball valve that will shut off when a pre determined volume is reached preventing over filling of the sprayer.

When the flow meter system is connected without the ball valve the flow meter is not required to be turned on to fill the tank. However when the electronic ball valve is part of the system the console must be powered on and the target volume must be set to open the ball valve and allow liquid to flow through and fill the tank. If this is not done the ball valve will remain closed, blocking flow to the main tank and dead heading the fill pump.

The console can be programmed to reset to the maximum tank volume every time the filling process is activated. If a lesser amount is required then the maximum volume can be reduced to the required amount. When this amount is reached an alarm will sound. If the system has a ball valve, the valve will shut off stopping flow to the main tank. If the valve is not fitted the [CLR] button can be pressed to silence the alarm.

Operation

Button Functions



Start Up Screen

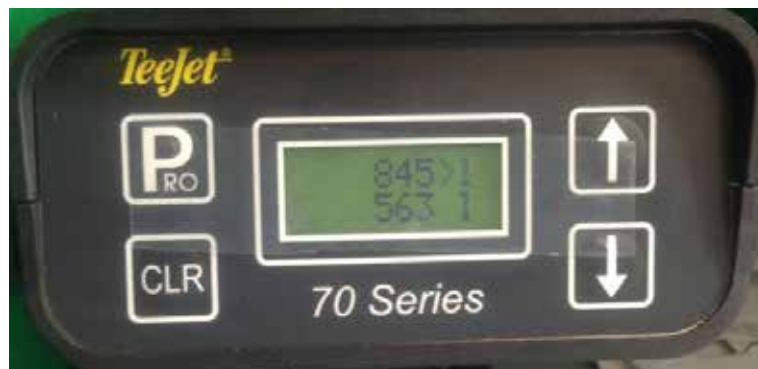


Operating Screen

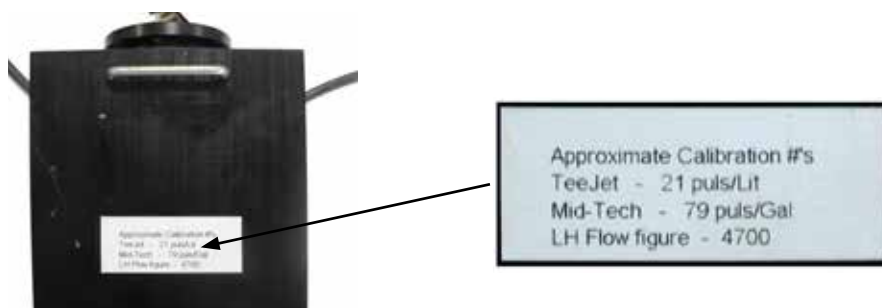


Console Programming

1. Press 'PRO' to turn display screen on. (once turned on, numbers shown on screen may vary to those shown below)



2. The flow meter calibration number must be entered. This number is located on the flow meter ID label.



3. To do this, press 'PRO' and hold down for 3 seconds. Using the up and down arrows adjust the number so that it matches the flow meter calibration figure (pulses/liter).



4. Press the 'PRO' button once the correct calibration number has been entered. This will take you to the next screen but will also set the calibration figure that was just entered. (To save the flow meter cal figure, the 'Pro' button must be pressed once. Don't press and hold the 'PRO' button to exit from this screen or changes won't be saved. See step 6 for exiting calibration.)

5. When in this screen, the maximum target volume is set. This is used as a quick reset to the tank's maximum volume. Use the up and down arrows to set the required maximum tank volume.



6. Once all calibrations have been entered, press and hold 'PRO' for 3 seconds to go back to the fill screen. (shown below, numbers shown here may vary to what is displayed on your screen)

7. To set the target volume, press 'PRO' once so the target value flashes. Use the arrows to adjust the value. Press 'PRO' when value is reached.



8. Press up and down arrows simultaneously to turn off.

Flow Meter Operation

1. Press 'PRO' to switch display screen on
2. To begin measuring flow into the sprayer tank, ensure '>L' next to the target volume is flashing. You can now apply flow through the fill system. The actual volume on the bottom line should begin increasing.



Note: If '>L' is not flashing when the TeeJet electric ball valve is fitted, the 'Actual' volume will not count

3. Once the target volume has been reached, an alarm will activate. Stop water flow and press 'CLR' to silence the alarm.
4. To reset the actual volume, press and hold 'CLR'
5. If at any stage the target volume becomes incorrect, press 'CLR' once. This will reset the target volume to the maximum value you programmed in when setting up the console.
6. When the operation is complete, press the up and down arrows simultaneously to turn the console off.

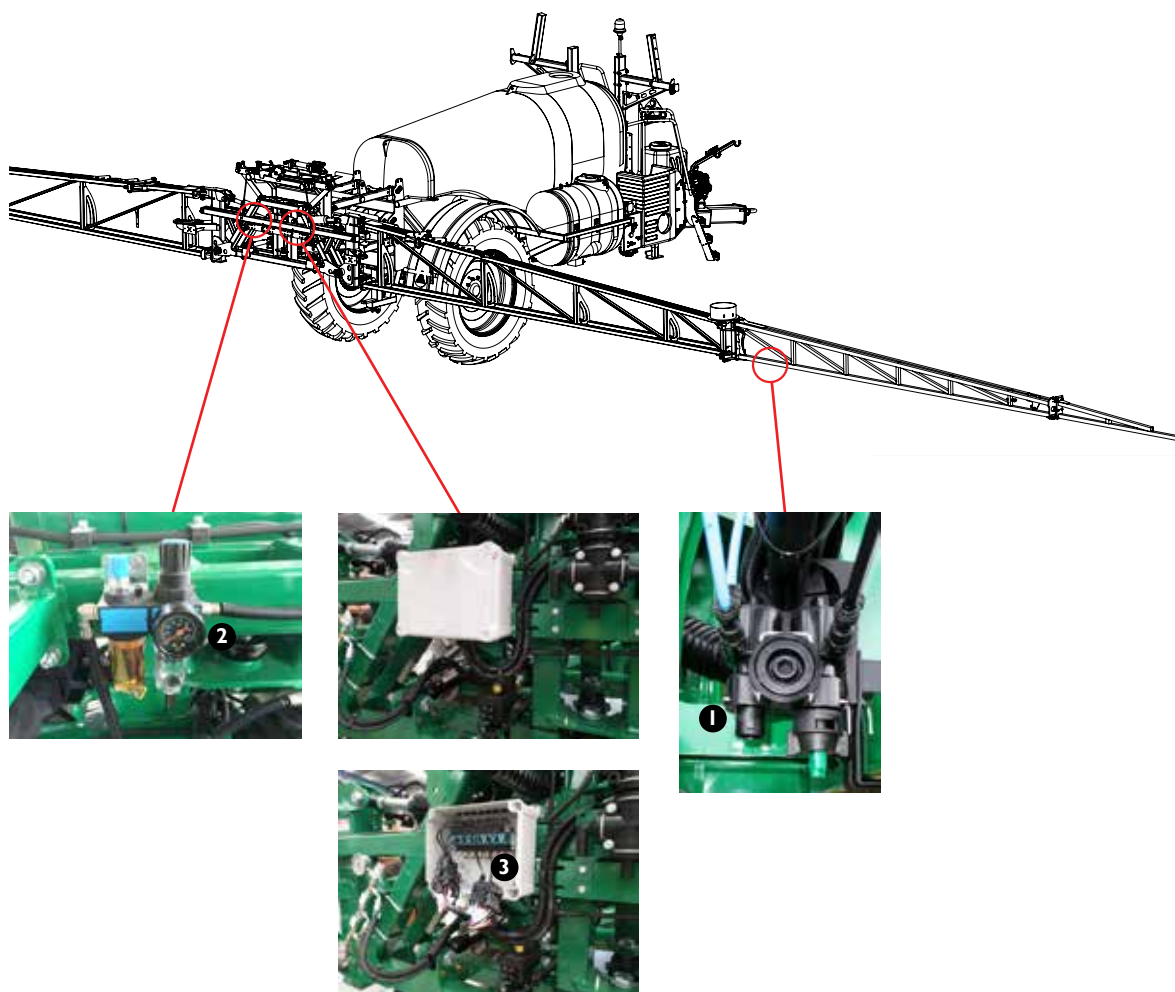
RapidFire

Overview

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

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

Key Features



Number	Feature
1.	Air Check Nozzle Body
2.	Air Dryer/Oiler
3.	Air Solenoids

Key Features

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 10 bar pressure. 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 10 bar 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.



Outer O-ring

Inner O-ring

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.

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



Release ring

Check Valve

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 RapidFire 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 RapidFire system. This should be set to 100-110 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.

(see pictures on next page)



AIR DRYER & OILER continued.

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, 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.

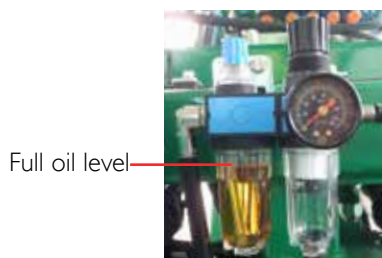
Fill the oil up to the flutes on the outside of the oil bowl. Use an air tool oil, Trax or equivalent.

To ensure the correct flow of oil into the air: The oil flow adjustment screw should protrude 3mm from the top of the bowl.

This can be adjusted by turning the regulator with a small flat screwdriver. Turning the screw in, clockwise will reduce the amount of oil being supplied to the RapidFire. Turning the screw out, counter clockwise will increase amount of oil. The oiler requires regular inspection and topping up every 250 hours or when required.



Moisture trap drain.



Oil flow adjustment screw.

SOLENOID VALVES

The solenoid valves are, electronically, 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.



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

SOLENOID VALVES continued

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.



RapidFlow (Boom Recirculation)

Key Features

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.

This option is not available unless RapidFire is also fitted.

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)

Note: Raven console must be turned on for RapidFlow to operate.

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

Note: The lines will require at least 30L of fluid to fill them. Keep RapidFlow on for at least 2 minutes to fully charge the lines.

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

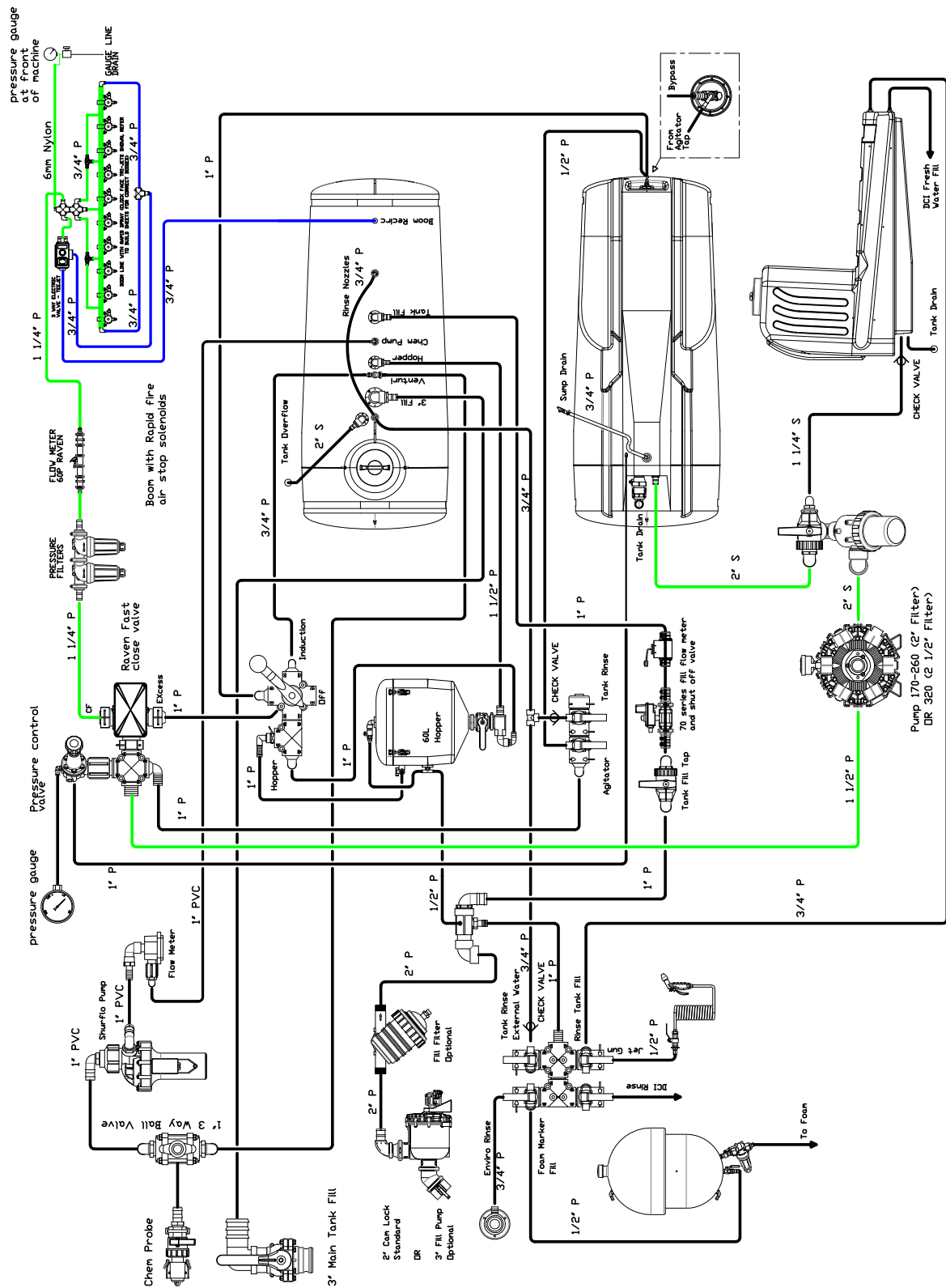
After Spraying (Rinsing)

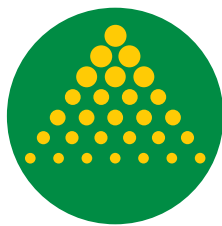
1. Turn off all boom sections on the console.
2. Turn the pump suction to "Draw From Flush Tank"
3. Turn pump on.
4. Turn on boom recirculation.

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

5. Turn off boom recirculation.
6. Return pump suction to "Draw From Main Tank".

Charging Lines





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