



# OPERATOR'S MANUAL

## C2 Contour Air Drill

S50150-06



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# Safety

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## SAFETY-ALERT SYMBOL



Watch for this symbol. It identifies potential hazards to health or personal safety. It means:

**ATTENTION - BE ALERT.  
Your Safety is involved.**

Familiarize yourself with the location of all decals. Read them carefully to understand the safe operation of your machine.

---

## Signal Words

The words **DANGER**, **WARNING** or **CAUTION** are used with the safety alert symbol. Learn to recognize the safety alerts, and follow the recommended precautions and safe practices.

Three words are used in conjunction with the safety-alert symbol:



**DANGER**

Indicates an imminently hazardous situation that, if not avoided, will result in **DEATH OR SERIOUS INJURY**.



**WARNING**

Indicates a potentially hazardous situation that, if not avoided, could result in **DEATH OR SERIOUS INJURY**.



**CAUTION**

Indicates a potentially hazardous situation that, if not avoided, may result in **MINOR OR MODERATE INJURY**.

Replace any **DANGER**, **WARNING**, **CAUTION** or instructional decal that is not readable or is missing. The location and part number of these decals is identified later in this section of the manual.

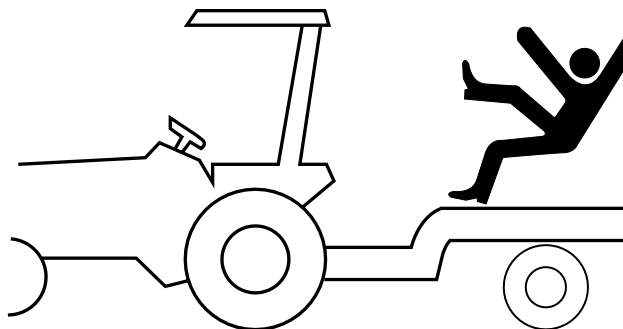
The words **Important** and **Note** are not related to personal safety but are used to give additional information and tips for operating or servicing this equipment.

**IMPORTANT:** Identifies special instructions or procedures which, if not strictly observed could result in damage to, or destruction of the machine, process or its surroundings.

**NOTE:** Indicates points of particular interest for more efficient and convenient repair or operation.

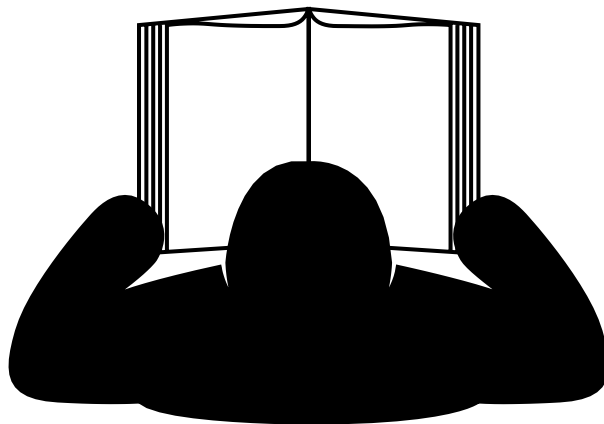
## General Operation

- **DO NOT RIDE!!** Do not allow riders on the implement when in motion.
- Do not allow extra riders in the tractor unless an instructor seat and seat belt are available.
- **Check behind** when backing up.
- **Reduce speed** when working in hilly terrain.
- Never allow anyone within the immediate area when operating machinery.
- **Stand clear** when raising or lowering wings.
- **Keep all shields in place**, replace them if removed for service work.



## Tractor Operation

- Be aware of the correct tractor operating procedures, when working with implements.
- Review tractor operator's manual.
- Secure hitch pin with a retainer and lock drawbar in centre position.



# Safety

## Chemicals

- **Use extreme care** when cleaning, filling or making adjustments.
- **Always read** granular chemical or treated seed manufacturer's warning labels carefully and remember them.
- Wear close fitting clothing and appropriate personal protective equipment for the job as specified by the chemical and/or seed manufacturer.
- **Always wear** safety goggles, breathing apparatus and gloves when handling with granular chemical or treated seed.
- **Do not feed** any treated seed to livestock. Treated seed is poisonous and may cause harm to persons or livestock.
- **Wash exposed skin immediately** - do not leave chemicals on your skin.
- **Properly store** chemicals in original containers with labels intact per the manufacturer's instructions.
- Always follow the manufacturer's operating instructions and warning labels when operating an ammonia tank with the equipment.
- **Do Not enter Air Cart tank unless another person is present and the tractor engine has been shut off.**



## Danger

**Failure to comply may result in death or serious injury.**

Read Operator's Manual and decals on **Ammonia** tank before operating Air Cart. Become familiar with all warnings, instructions, and controls.

**Always** wear gloves and goggles when transferring or handling ammonia.

**Always** stay clear of hose and valve openings.

**Always** be sure pressure is relieved before disconnecting hoses or parts.

**Always** secure connecting parts and safety chains before towing ammonia trailer.

**Always** have ample water available in case of exposure to ammonia liquid or gases.

## Transporting

- **Be aware** of the height, length and width of implement. Make turns carefully and be aware of obstacles and overhead electrical lines.
- Always travel at a safe speed. Do Not Exceed 20 mph (32 kph).
- Use an agricultural tractor that is large enough with sufficient braking capacity so that the weight of the loaded equipment towed **does not exceed 1.5 times** the weight of the tractor.
- Use flashing amber warning lights, turn signals and SMV emblems when on public roads.
- Do not transport in poor visibility.
- The slow moving vehicle (SMV) emblem and reflectors must be secured and be visible on the machine for transport.
- Avoid soft surfaces, the additional wing weight on the centre wheels could cause the machine to sink.
- Ensure safety chain is attached correctly to the towing vehicle and the hitch of the implement.
- Check that wings are firmly seated on transport wing stops, and wing lift valve and opener valve are in locked position.
- Be familiar with and adhere to local laws.

## Hydraulics

- **Do not** search for high pressure hydraulic leaks without hand and face protection. A tiny, almost invisible leak can penetrate skin, thereby requiring immediate medical attention.
- Use cardboard or wood to detect leaks - never your hands.
- Double check that all is clear before operating hydraulics.
- **Never** remove hydraulic hoses or ends with machine elevated. Relieve hydraulic pressure before disconnecting hydraulic hoses or ends.
- Maintain proper hydraulic fluid levels.
- Keep all connectors clean for positive connections.
- Ensure all fittings and hoses are in good condition.
- Do not stand under wings.

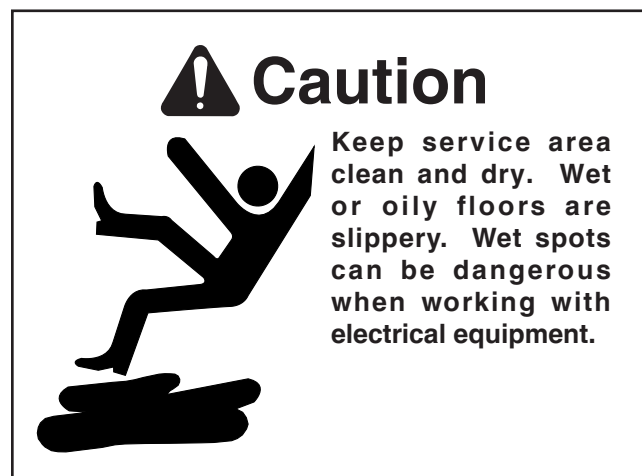
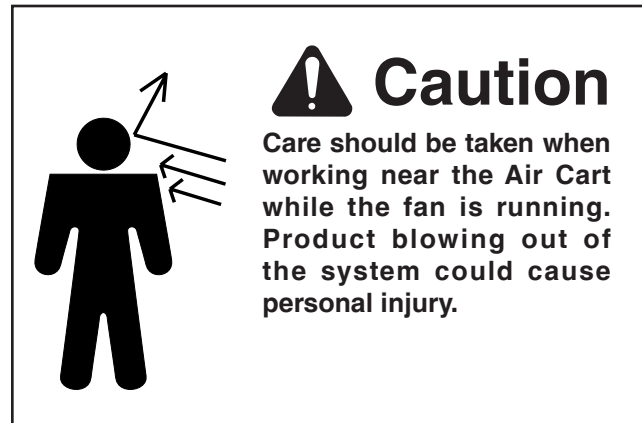


# Safety

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## Maintenance

- **Shut tractor engine off** before making any adjustments or lubricating the machine.
- **Block** machine securely to prevent any movement during servicing.
- Wear close fitting clothing and appropriate personal protective equipment for the job.
- **Always wear** safety goggles, breathing apparatus and gloves when working on seeder filled with granular chemical or treated seed per the manufacture's instructions.
- Do not modify the machine.


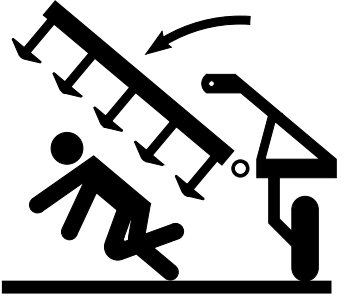



## Storage

- Store implement away from areas of main activity.
- Level implement and block up securely to relieve pressure on jack.
- Do not allow children to play on or around stored implement.



## Safety Signs

 <h1 style="margin: 0;">DANGER</h1>	
<ul style="list-style-type: none"> <li>• WINGS MAY FALL RAPIDLY CAUSING BODILY INJURY.</li> <li>• ALWAYS STAY CLEAR OF FOLDING WINGS WHEN BEING RAISED, LOWERED, OR IN ELEVATED STATE.</li> <li>• ALWAYS INSTALL ALL LOCKUP DEVICES PROVIDED WHEN WINGS ARE IN ELEVATED POSITION.</li> <li>• ENSURE CYLINDER IS COMPLETELY FILLED WITH HYDRAULIC FLUID TO AVOID UNEXPECTED MOVEMENT.</li> </ul>	C13704

 <h1 style="margin: 0;">WARNING</h1>
<p><b>Personal injury or property damage may result from loss of control.</b></p> <ul style="list-style-type: none"> <li>• Always use large enough tractor with sufficient braking capacity. <ul style="list-style-type: none"> <li>➢ Weight of fully loaded implement should not be more than 1.5 times weight of tractor.</li> </ul> </li> <li>• Maximum recommended towing speed is 20 mph (32 km/h).</li> <li>• Use flashing amber warning lights and SMV emblem when on public roads, except where prohibited by law.</li> <li>• Refer to tractor and implement Operator's Manuals for weights and further information.</li> </ul>
N24301

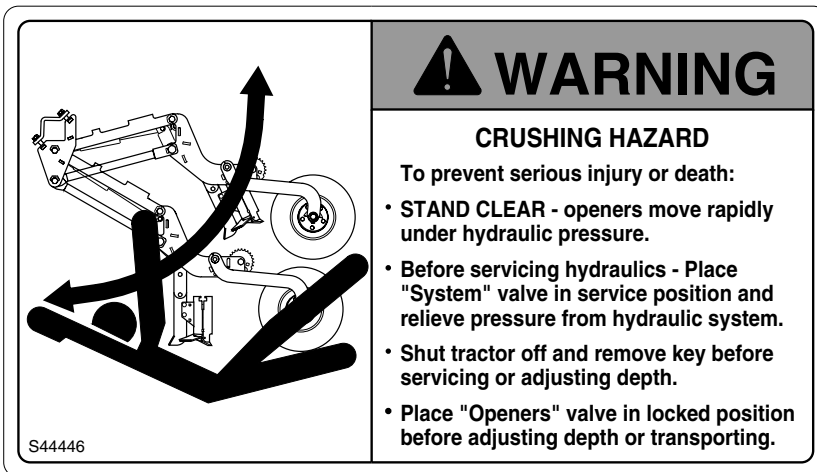
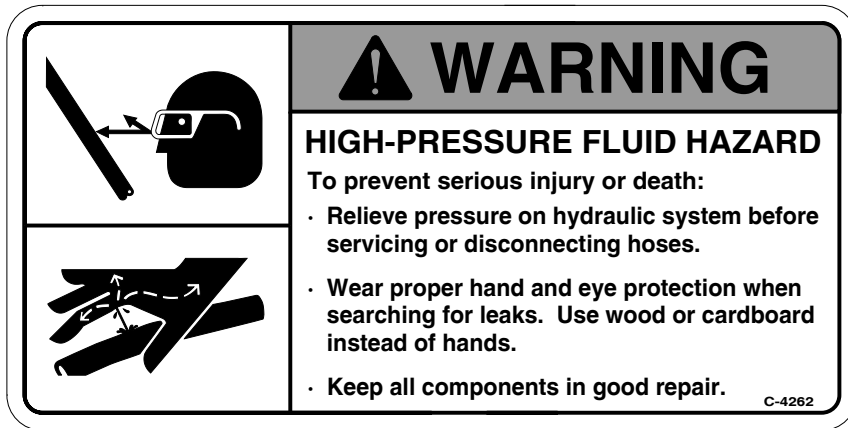
	 <h1 style="margin: 0;">WARNING</h1>
<p style="text-align: center;"><b>OVERHEAD HAZARD</b></p> <p><b>To prevent serious injury or death:</b></p> <ul style="list-style-type: none"> <li>• Front wheel castor may rotate rapidly causing bodily injury.</li> <li>• Stay away from beneath the wheels when in the raised position.</li> <li>• Keep others away.</li> </ul>	
S47332	



Familiarize yourself with the location of all decals. Read them carefully to understand the safe operation of your machine.

# Safety

## Safety Signs - Continued



Familiarize yourself with the location of all decals. Read them carefully to understand the safe operation of your machine.

## Safety Signs - Continued

### Locations

#### Front

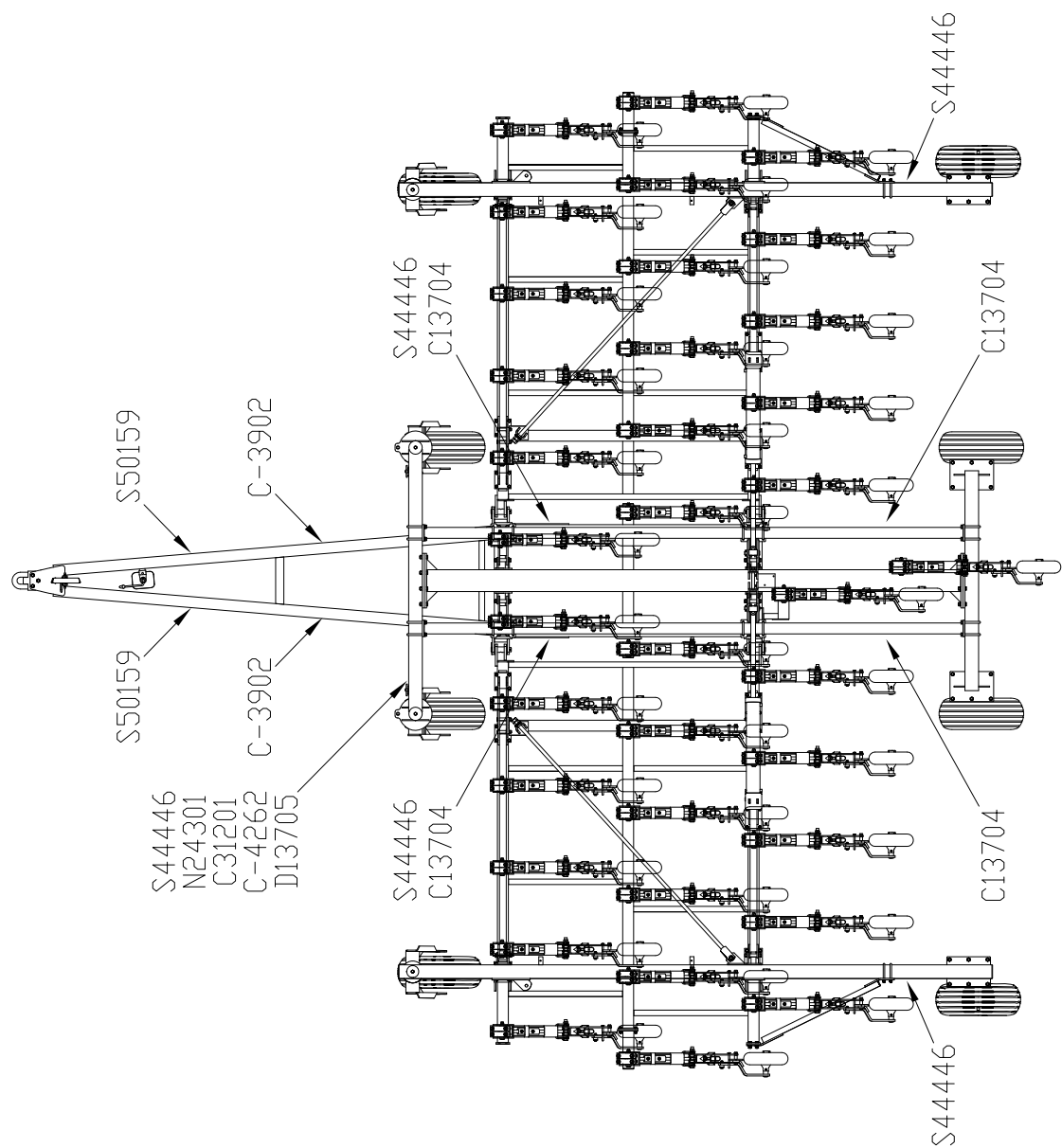


#### Rear



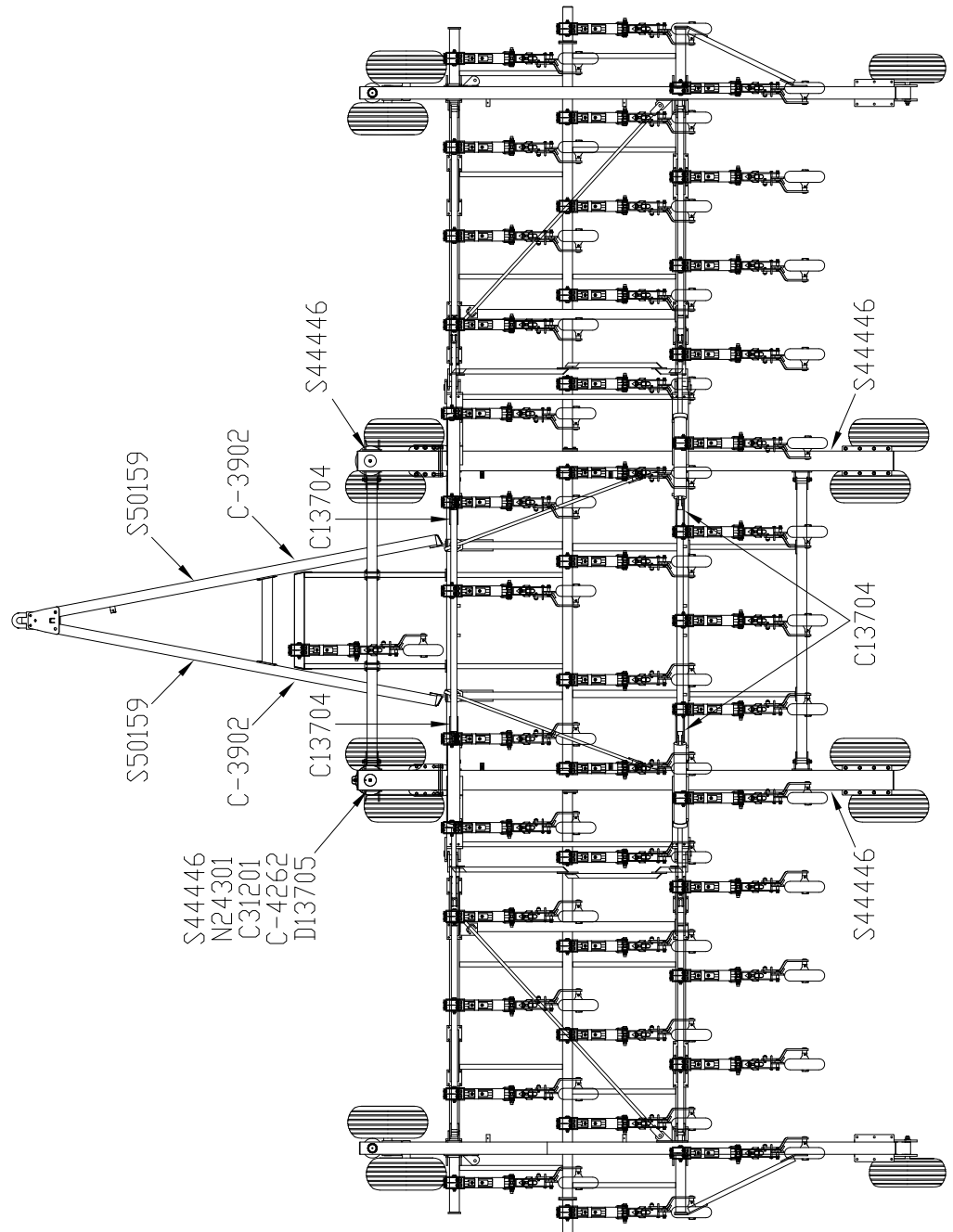
## Safety Signs - Continued

### Decal Locations - 25 and 31 Models



## Safety Signs - Continued

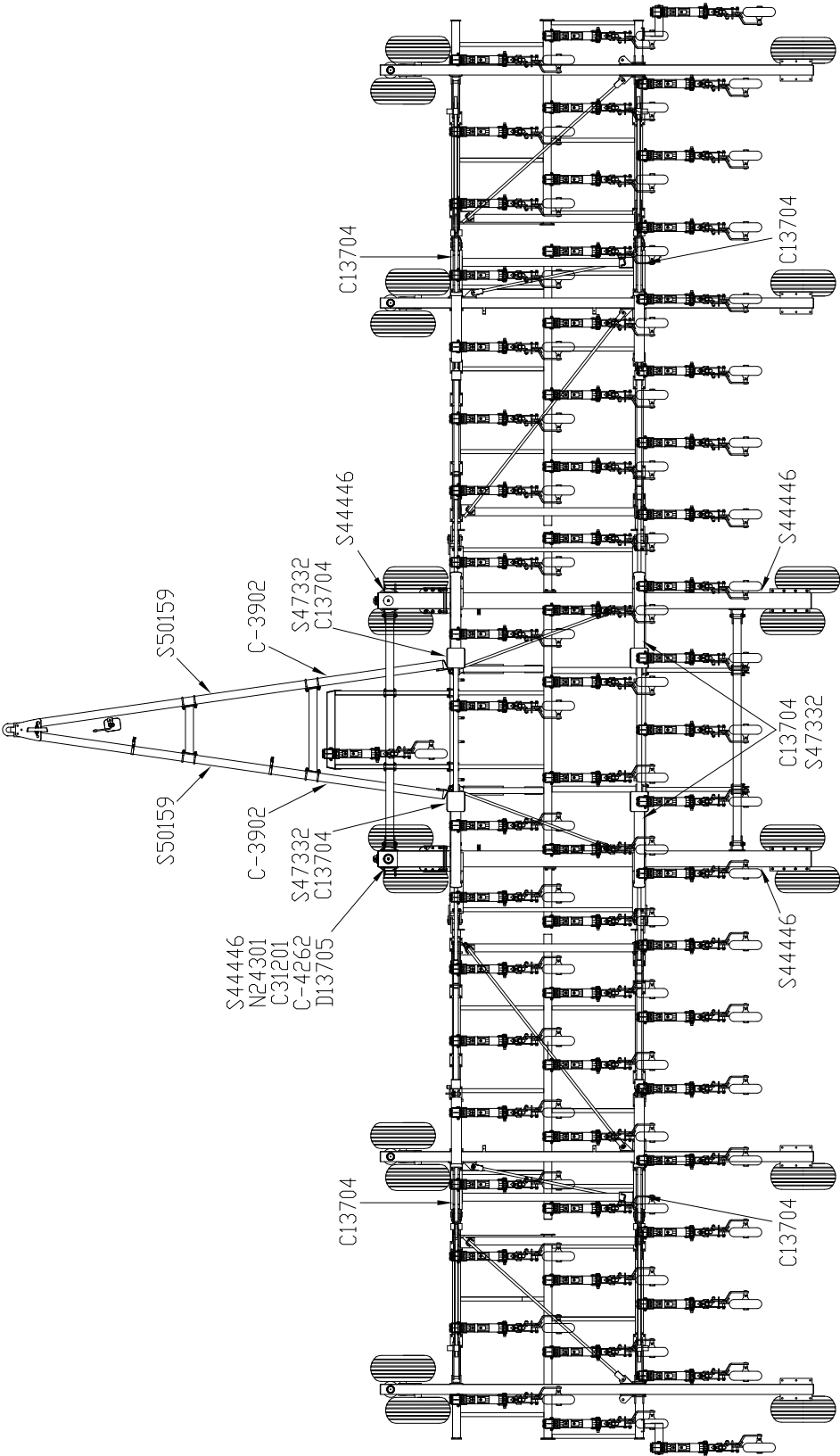
### Decal Locations - 41 and 51 Models





## Safety Signs - Continued

### Decal Locations - 61 and 71 Models





# Safety

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## Lighting and Marking

MORRIS recommends the use of correct lighting and marking to meet the ASAE standard for roadway travel. Be familiar with and adhere to local laws.

Amber warning and red tail lights secured on the machine promote correct transportation of this implement.

**Note: Always replace missing or damaged lights and/or connectors.**

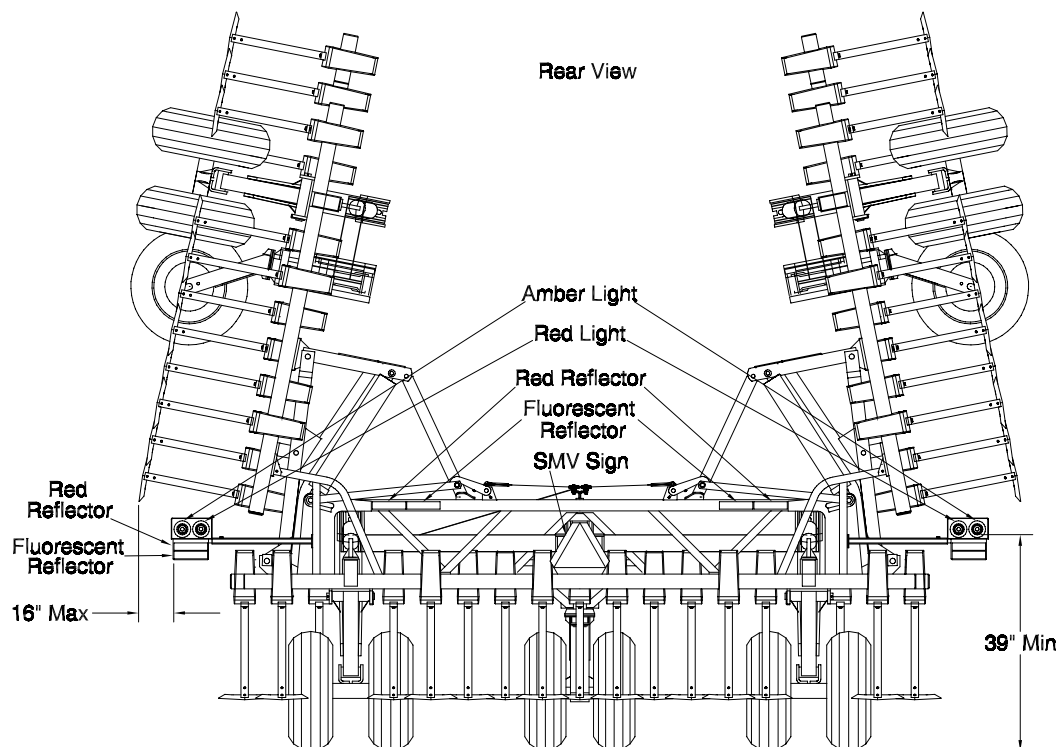
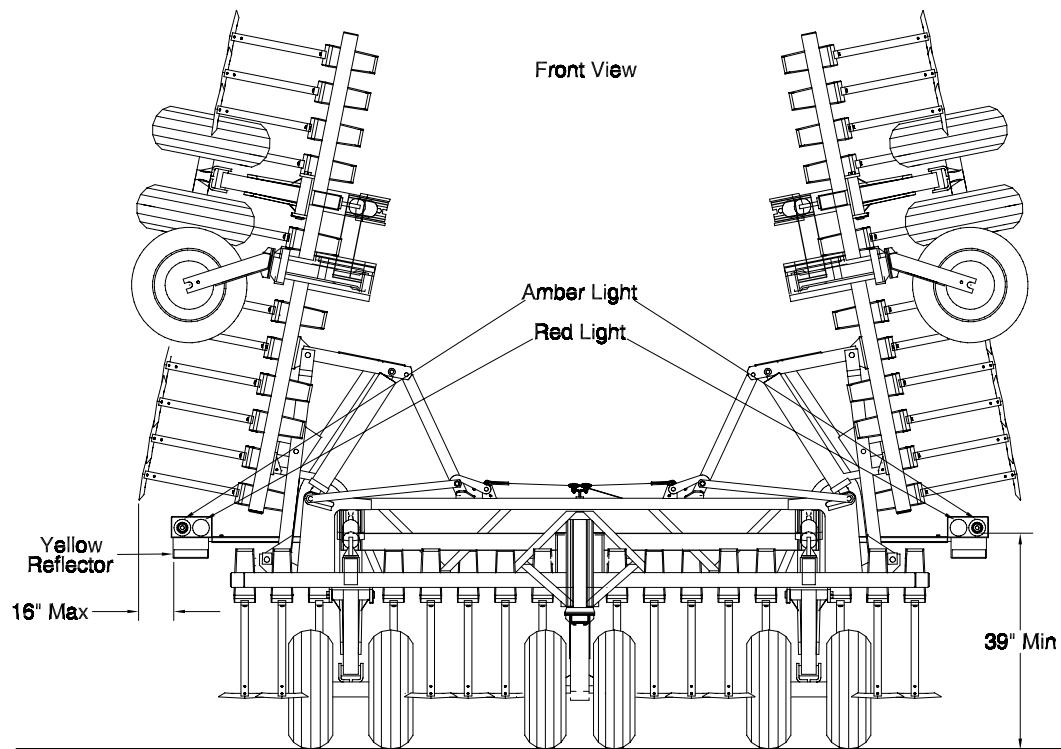
Amber warning and red tail lights must be mounted to the rear of the implement and be visible from front and rear. The lights must be within 16 inches (41 cm) of the extremities of the machine and at least 24 inches (60 cm) but not over 10 feet (3 m) above ground level.

**Note: Always replace missing or damage front, side, rear reflectors and SMV emblem.**

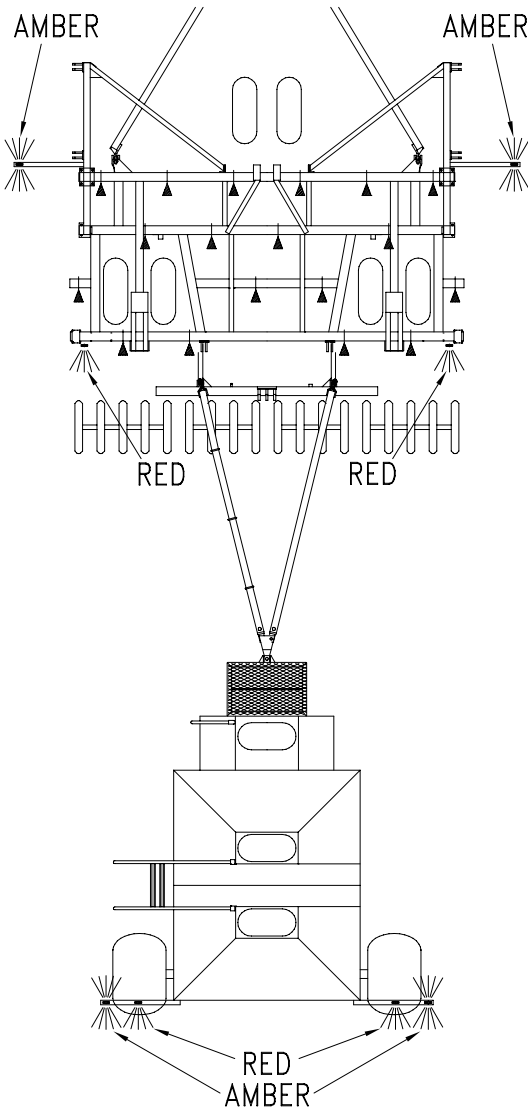
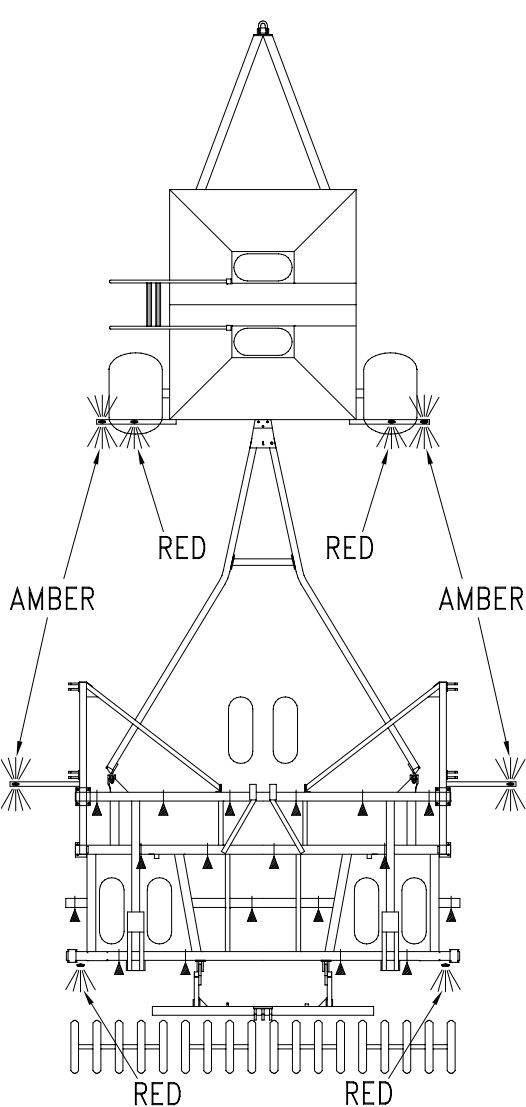




## Lighting and Marking - Continued



## Lighting and Marking - Continued



# Section 2: Specifications

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# Specifications

## C2 CONTOUR AIR DRILL Specifications and Options

Base Size	3 Frame Models			
	25' (7.62 m)	31' (9.45 m)	41' (12.5 m)	51' (15.54 m)
Weight - 10" Spacing 25.4 cm Spacing	14,738 lb 6,685 kg	16,025 lb 7,269 kg	20,928 lb 9,470 kg	24,622 lb 11,168 kg
	13,933 lb 6,320 kg	15,155 lb 6,874 kg	19,572 lb 8,856 kg	23,137 lb 10,495 kg
Working Width - 10" (25.4 cm) - 12" (30.5 cm)	25' (7.62m) 25' (7.62m)	30' (9.14m) 31' (9.45m)	41.67' (12.7m) 41' (12.5m)	50' (15.24m) 51' (15.54m)
Number of Shanks - 10" (25.4 cm) - 12" (30.5 cm)	30 25	36 31	50 41	60 51
Frame Width - Main - Wing Inner	5' (1.524m) 10' (3.048m)	5' (1.524m) 13' (3.962m)	16' (4.88m) 12' (3.66m)	16' (4.88m) 17.5' (5.334m)
Transport Position - Width - Height - Length	9' 10" (3m) 13' 9" (4.19m) 31' 6" (9.6m)	9' 10" (3m) 16' 2" (4.93m) 31' 6" (9.6m)	20' 6" (6.25m) 15' 5" (4.7m) 31' 6" (9.6m)	20' 6" (6.25m) 15' 5" (4.7m) 31' 6" (9.6m)
Tires - Main Frame Wheels	(4)12.5Lx15 FI Load Range F	(4)12.5Lx15 FI Load Range F	(8) 11Lx15 FI Load Range F	(8) 11Lx15 FI Load Range F
	- Wing Frame Front Castor Wheels	Single Castor (2) 12.5SLx15 12 Ply Rating	Dual Castor (4) 11SLx15 12 Ply Rating	Dual Castor (4) 11SLx15 12 Ply Rating
	- Wing Frame Rear Wheels	(1 per wing) (2) 12.5SLx15 12 Ply Rating	(1 per wing) (2) 11SLx15 12 Ply Rating	(1 per wing) (2) 11SLx15 12 Ply Rating
	- Optional Main Frame Wheels	NA	NA	NA
Opener - Trip Out Force - Packing Force - Packer Wheel	Maximum 700 lbs (317 kg) at 1200 psi (8274 kPa)			
	80 lbs to 200 lbs (36 kg - 91 kg)			
	4.50" x 16" Semi Pneumatic Otico tire 4.80" x 16" Semi Pneumatic or Pneumatic 5.50" x 16" Semi Pneumatic Otico tire 5.50" x 16" Semi-Pneumatic 4.00" x 16" "V" Crown			
Opener to Ground Clearance	12" (30.5 cm)			
Frame to Ground Clearance	32" (81 cm)			
Frame Depth	94" (238.8 cm) center to center			
Rank to Rank Spacing	47" (119.4 cm) center to center			
Number of Ranks	3 Rows			
Shank to Shank Spacing	30" (76.2 cm) on 10" (25.4 cm) Spacing 36" (91.4 cm) on 12" (30.5 cm) Spacing			
Weight Kit	Optional			
Safety Lights	Standard			
Hitch Clevis	Standard - Catagory 4 Optional - Catagory 5			
Safety Chain	Standard			

Specifications are estimates and subject to change.

# Specifications

C2 CONTOUR AIR DRILL Specifications and Options						
Base Size		5 Frame Models				
		61' (18.59 m)	71' (21.64 m)	80' (24.38 m)	86' (26.21 m)	90' (27.43 m)
Weight	- 10" Spacing 25.4 cm Spacing	31,392 lb 14,239 kg	35,441 lb 16,109kg	NA NA	NA NA	NA NA
	- 12" Spacing 30.5 cm Spacing	29,358 lb 13,317 kg	33,264 lb 15,120 kg	38,140 lb 17,300 kg	41,000 lb 18,600 kg	43,000 lb 19,505 kg
Working Width	- 10" (25.4 cm)	60' (18.29m)	70' (21.34m)	NA	NA	NA
	- 12" (30.5 cm)	61' (18.59m)	71' (21.64m)	80' (24.38m)	86' (26.21 m)	90' (27.43 m)
Number of Shanks	- 10" (25.4 cm)	72	84	NA	NA	NA
	- 12" (30.5 cm)	61	71	80	86	90
Frame Width	- Main	16' (4.88m)	16' (4.88m)	21' ( 6.40m)	21' ( 6.40m)	21' ( 6.40m)
	- Wing Inner	12' (3.66m)	15' (4.57m)	15' (4.57m)	15' (4.57m)	15' (4.57m)
	- Wing Outer	10' (3.05m)	12' (3.66m)	14.45 (4.4m)	17.75' (5.41m)	18.92' (5.77m)
Transport Position	- Width	20' 6" (6.25m)	20' 6" (6.25m)	25' (7.62m)	25' (7.62m)	25' (7.62m)
	- Height	15' 5" (4.7m)	18' 1" (5.51m)	18' 1" (5.51m)	18' 1" (5.51m)	18' 1" (5.51m)
	- Length	34' 10" (10.62m)	34' 10" (10.62m)	34' 10" (10.62m)	34' 10" (10.62m)	34' 10" (10.62m)
Tires	- Main Frame Wheels	(8) 12.5L x15 FI Load Range F	(8) 12.5Lx15 FI Load Range F	(8) 16.5x16.1 FI Load Range E	(8) 16.5x16.1 FI Load Range E	(8) 16.5x16.1 FI Load Range E
	- Wing Frame Front Castor Wheels	Dual Castor (8) 12.5SLx15 12 Ply Rating	Dual Castor (8) 12.5SLx15 12 Ply Rating	Dual Castor (8) 12.5SLx15 12 Ply Rating	Dual Castor (8) 12.5SLx15 12 Ply Rating	Dual Castor (8) 12.5SLx15 12 Ply Rating
	- Wing Frame Rear Wheels	(1 per wing) (4) 12.5SLx15 12 Ply Rating	(1 per wing) (4) 12.5SLx15 12 Ply Rating	(2 per wing) (8) 12.5SLx15 12 Ply Rating	(2 per wing) (8) 12.5SLx15 12 Ply Rating	(2 per wing) (8) 12.5SLx15 12 Ply Rating
	- Optional Main Frame Wheels	(8) 16.5x16.1 FI Load Range E	(8) 16.5x16.1 FI Load Range E	NA	NA	NA
Opener	- Trip Out Force	Maximum 700 lbs (317 kg) at 1200 psi (8274 kPa)				
	- Packing Force	80 lbs to 200 lbs (36 kg - 91 kg)				
	- Packer Wheel	4.50" x 16" Semi Pneumatic Otico tire 4.80" x 16" Semi Pneumatic or Pneumatic 5.50" x 16" Semi Pneumatic Otico tire 5.50" x 16" Semi-Pneumatic 4.00" x 16" "V" Crown				
Opener to Ground Clearance		12" (30.5 cm)				
Frame to Ground Clearance		32" (81 cm)				
Frame Depth		94" (238.8 cm) center to center				
Rank to Rank Spacing		47" (119.4 cm) center to center				
Number of Ranks		3 Rows				
Shank to Shank Spacing		30" (76.2 cm) on 10" (25.4 cm) Spacing 36" (91.4 cm) on 12" (30.5 cm) Spacing				
Weight Kit		Optional				
Safety Lights		Standard				
Hitch Clevis		Standard - Catagory 4 Optional - Catagory 5				
Safety Chain		Standard				

Specifications are estimates and subject to change.

# Specifications

## Transport Dimensions



# Section 3: Checklist

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# Checklist

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## SAFETY-ALERT SYMBOL



Watch for this symbol. It identifies potential hazards to health or personal safety. It points out safety precautions. It means:

**ATTENTION - BE ALERT.**  
**Your safety is involved.**

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### Manuals

**Note:** Pre-Delivery Inspection Form must be completed and submitted to Morris Equipment within 30 days of delivery date.

**Warranty Void if Not Registered**

**Parts Manual**

Order Part Number S50152

**Assembly Manual**

Order Part Number S50151 (For 41 ft to 90 ft)  
Order Part Number S50153 (For 25 ft and 31 ft)



## Checklist

Please read the Operator's Manual carefully and become a "SAFE" operator.

Adopt a good lubrication and maintenance program.

### General

- \_\_\_ Check if assembled correctly.
- \_\_\_ Check hose connections.

### Lubrication - Grease

- \_\_\_ Opener Wheel Hubs
- \_\_\_ Wheel Hubs
- \_\_\_ Castor Pivots

### Tire Pressure

- \_\_\_ See tire chart in Maintenance, Section 6.

### Transport

- \_\_\_ Tighten wheel bolts.
- \_\_\_ Check hose connections.
- \_\_\_ Accumulator pressure is at 0.
- \_\_\_ Ball valves are in locked position.

### OWNER REFERENCE

Model: \_\_\_\_\_  
Serial No: \_\_\_\_\_  
Dealer: \_\_\_\_\_  
Town: \_\_\_\_\_ State: \_\_\_\_\_  
Phone: \_\_\_\_\_  
OWNER/OPERATOR \_\_\_\_\_  
Date: \_\_\_\_\_



**TAKE SAFETY SERIOUSLY.**

**DO NOT TAKE  
NEEDLESS CHANCES!!**

# Checklist

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Notes

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# Section 4: Introduction

## Section Contents

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# Introduction

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## Introduction

This Operator's Manual has been carefully prepared to provide the necessary information regarding the operation and adjustments, so that you may obtain maximum service and satisfaction from your new MORRIS CONTOUR AIR DRILL.

To protect your investment, study your manual before starting or operating in the field. Learn how to operate and service your CONTOUR AIR DRILL correctly, failure to do so could result in personal injury or equipment damage.

If you should find that you require information not covered in this manual, contact your local MORRIS Dealer. The Dealer will be glad to answer any questions that may arise regarding the operation of your MORRIS CONTOUR AIR DRILL.

MORRIS Dealers are kept informed on the best methods of servicing and are equipped to provide prompt efficient service if needed.

Occasionally, your CONTOUR AIR DRILL may require replacement parts. Your Dealer will be able to supply you with the necessary replacement parts required. If the Dealer does not have the necessary part, the MORRIS Factory will supply the Dealer with it promptly.

Your MORRIS CONTOUR AIR DRILL is designed to give satisfaction even under difficult conditions. A small amount of time and effort spent in protecting it against rust, wear and replacing worn parts will increase the life and trade-in value.



**Keep this book handy for ready reference at all times.** It is the policy of Morris Equipment Ltd. to improve its products whenever it is possible to do so. The Company reserves the right to make changes or add improvements at any time without incurring any obligation to make such changes on machines sold previously.

# Section 5: Operation

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# Operation

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## CAUTION



**BE ALERT**

## SAFETY FIRST

**REFER TO SECTION 1 AND REVIEW ALL  
SAFETY RECOMMENDATIONS.**

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### Application

The Morris CONTOUR DRILL utilizes independent parallel link openers. Each opener moves independently of the frame and each other to follow every contour of the land closely. The unique design of the opener allows the Morris CONTOUR DRILL to be used in a variety of seeding applications from conventional to zero till applications.

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### Tractor

#### Tires

- Proper ballast and tire pressure are required when pulling heavy implements.
- Consult your tractor operator's manual and follow all recommended procedures.

#### Hydraulics

- Wipe all hydraulic fittings and couplers with a clean cloth to avoid contaminating the system.
- Check that hydraulic reservoir is filled to the proper level.

#### Drawbar

- Centre and pin in a fixed position for easier hitching and greater stability.



## Warning

**Do not permit smoking, sparks or an open flame where combustible fuels are being used. Keep the work area well ventilated.**



## Warning

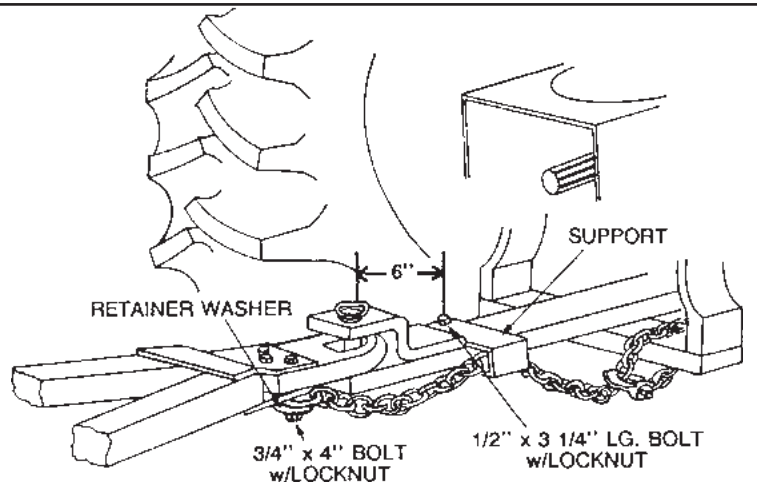
**Do not search for high pressure hydraulic leaks without hand and face protection. A tiny, almost invisible leak can penetrate skin, that requires immediate medical attention.**

## Hitching



### Caution

A safety chain will help control towed machines should it accidentally separate from the drawbar while transporting. A runaway machine could cause severe injury or death. Use a safety chain with a strength rating equal to or greater than the gross weight of the towed machines.

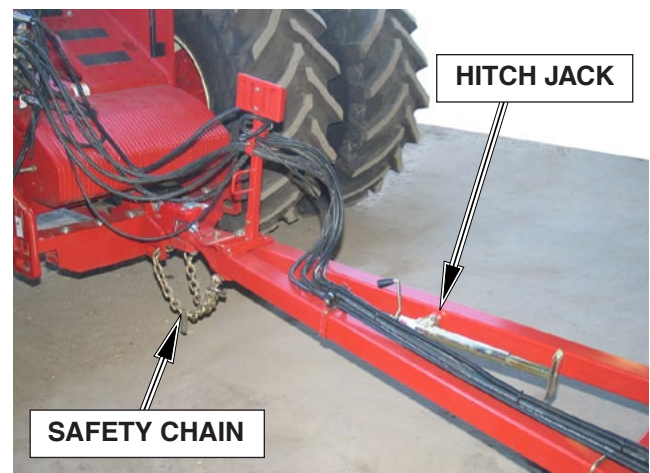


Attach safety chain to the tractor drawbar support or other specified anchor location with the appropriate parts.

## Hitching to Tractor

- Ensure swinging drawbar is locked in the centre position.
- Ensure hitch pin is in good condition.
- Level clevis with tractor drawbar using hitch jack.
- Back tractor into position and attach hitch clevis to drawbar, using an adequate hitch pin.
- Lock hitch pin in place with a hairpin or other proper locking device.
- After tractor to implement connection is made, relieve pressure off the hitch jack.
- Place hitch jack in raised position.
- Route Safety Chain through chain support and drawbar support.
- Lock safety hook onto chain.

**Note:** Provide only enough slack in chain to permit turning.



Hitch Jack Raised



### Caution

Dirt in the hydraulic system could damage O-rings, causing leakage, pressure loss and total system failure.



# Operation

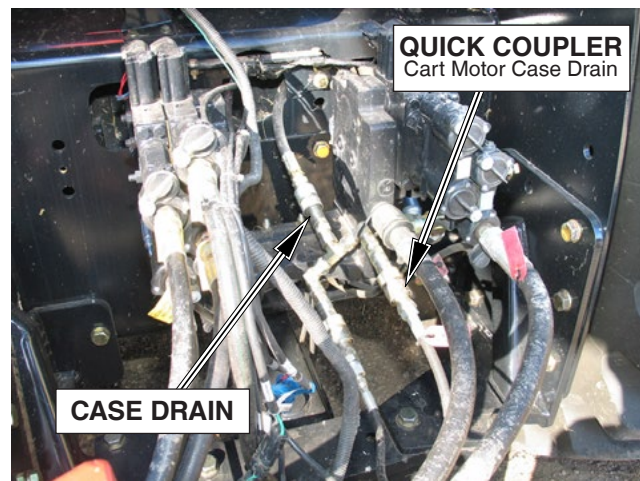
## Hitching to Tractor - Continued

- Ensure hydraulic hose quick couplers are dirt free.
- Inspect all fittings and hoses for leaks and kinks. Repair as necessary
- Connect the hydraulic hoses to the tractor quick couplers.

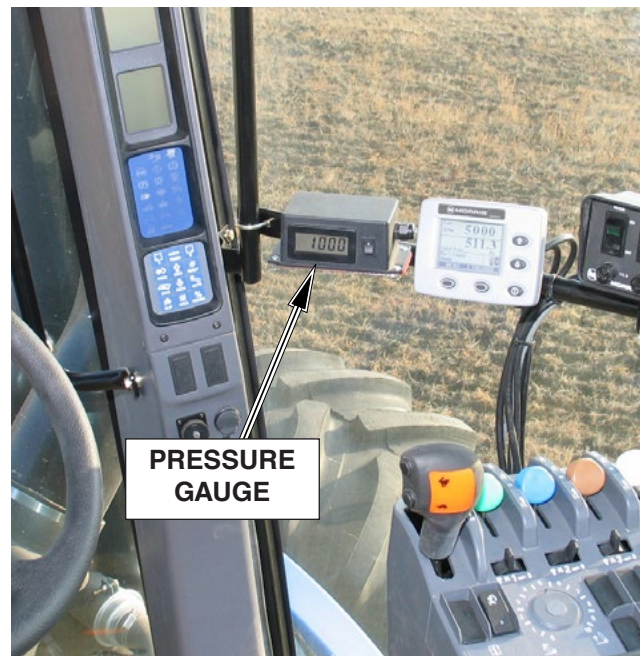
**Note:** For proper venting of the pressure reducing valve, the 1/4" diameter hose marked "Case Drain" must be run directly into the hydraulic tank. Also, the Air Cart motor "Case Drain" hose must be connected to this line at the quick coupler provided. If the hose is run through the filler cap then ensure the cap is **VENTED**. A quick coupler can still be used between the tractor and the seeding tool.

- Mount digital pressure gauge in tractor cab with the LCD visible and with in easy reach to operate.
- Route the digital pressure gauge harness away from moving parts and sharp protrusions. Connect the red wires to the positive (+) terminal of the battery. Connect the black wires to the negative (-) terminal of the battery.

**Note:** If C2 Contour is equipped with the optional Active Hydraulic System refer to Appendix A for operation details.



Hydraulic Coupling on Tractor





## Unhitching from Tractor

- Pin hitch jack in storage position.
- Lower hitch jack taking the weight off the hitch clevis.
- Ensure all transport locks are properly secured.
- Place “System” ball valve into service position and relieve accumulator pressure from the opener system before uncoupling hydraulic hoses.
- Relieve pressure in the wing lift hydraulic hoses by positioning tractor hydraulic lever in “float” position or turn tractor engine off and cycle lever back and forth several times.
- Disconnect the hydraulic hoses.
- Remove the safety chain.
- Remove the drawbar pin.
- Slowly move tractor away from cultivator.



Hitch Jack Lowered

## Transport

Observe all applicable safety precautions under transport heading in Safety, Section 1.

- Refer to Specifications, Section 2, for weight, transport height, and width.
- Transport with tractor only!
- Ensure safety chain is attached correctly to the towing vehicle and the hitch of the implement.
- Inspect tires for any serious cuts or abrasions. If such has occurred, tire should be replaced.
- Raise and lower wings on **level ground**.
- Never raise or lower wings when moving.

### Speed

- Always travel at a safe speed. Do Not Exceed 20 mph (32 kph).
- The weight of the implement being towed *must not exceed 1.5 times* the weight of towing vehicle.

### Lights

- Ensure proper reflectors are in place, refer to Safety, Section 1.
- Use flashing amber warning lights, turn signals and SMV emblems when on public roads.
- Be familiar with, and adhere to, local laws.

**MORRIS EQUIPMENT LTD. WILL NOT BE RESPONSIBLE FOR ANY DAMAGES OR OPERATOR INJURY RESULTING FROM NON-USE OR IMPROPER USE OF TRANSPORT LOCKS.**

## Caution

**Raise and lower wings on level ground. Never raise or lower wings when moving.**

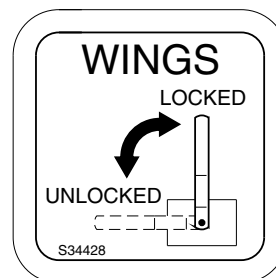
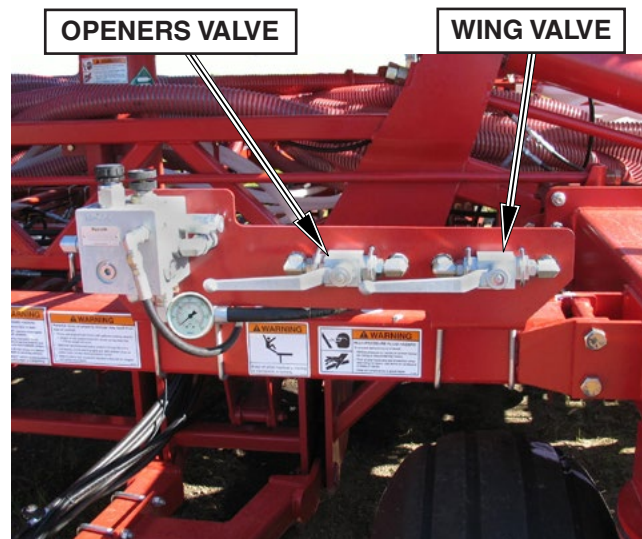
# Operation

## Transport - Continued

### Transport to Field Position

- Position machine on **level ground**.
- Stop tractor, and engage park brake.
- As a precaution, check surrounding area to be sure it is safe to lower wings.
- Remove castor lock pin from main frame gauge wheels.
- Unlock the wing valve and opener valve. Do not walk under raised wings.
- Operate opener hydraulics, to ensure all openers are retracted.
- Operate wing lift hydraulics until wings are lowered and the cylinder shafts are completely extended to allow wings to float when working in uneven land.  
**Never raise or lower wings when moving.**

**Note:** When raising or lowering wings, do so in one continuous motion until fully up or down. Do not stop flow part way allowing wings to fold on their own. This may disrupt the sequence of operation.



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## Danger

Always stay clear of wings being raised, lowered or in elevated position. Ensure cylinders are completely filled with hydraulic fluid - wings may fall rapidly causing injury or death.

**Note:** If C2 Contour is equipped with the optional Active Hydraulic System refer to Appendix A for operation details.



## Transport - Continued

### Field to Transport Position

- Position machine on **level ground**.
- Stop tractor, and engage park brake.
- Ensure wing lift cylinders are fully extended.

**Note:** The wing lift cylinders must be fully extended to ensure proper operation of the flow control valve (FCV) manifold.

- Operate the opener hydraulics, to raise the openers fully.
- Operate the wing lift hydraulics, to raise the wings fully into transport position. **Never raise or lower wings when moving.**

**Note:** When raising or lowering wings, do so in one continuous motion until fully up or down. Do not stop flow part way allowing wings to fold on their own. This may disrupt the sequence of operation.

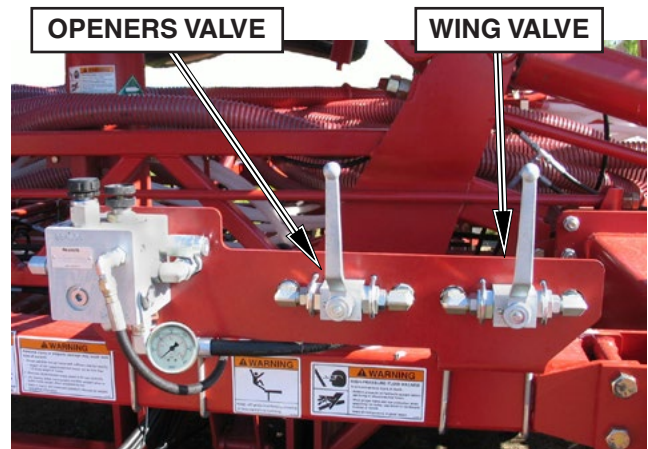
- Secure the main frame gauge wheel castors lock pins. **It is important to pin the castor wheels to prevent excessive shimmying of wheels at transport speeds.**
- Lock wing lift valve and opener valve. Do not walk under raised wings.
- Ensure safety chain is properly installed, see “Hitching to Tractor” of the Operation Section.

## Danger

Always stay clear of wings being raised, lowered or in elevated position. Ensure cylinders are completely filled with hydraulic fluid - wings may fall rapidly causing injury or death.

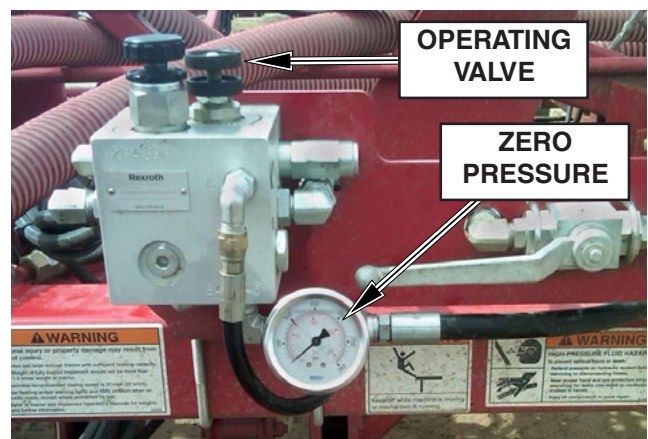
For long distance transport or storage bleed all pressure from Opener hydraulic system:

- Operate the opener hydraulics, to raise the openers fully.
- Screw “Operating” valve out to open position.
- Put tractor remote in “float” position.
- Let openers drop and pressure go to 0 psi (or near 0 psi) on gauge.
- Lift openers to transport position and lock “Openers” valve.



## Important

Castor wheel lock pins must be removed for 90 degree turns.



Pressure Gauge



# Operation

## Opener Operation

### Accumulator System Operation and Pre-Charge Information

- Always turn “Operating” valve out to bleed off/service position and relieve hydraulic pressure from the system before performing maintenance or repairs.

**Note:** Accumulator can store pressure even when disconnected from tractor.

- The gas bladder in the hydraulic accumulator should be pre-charged with dry nitrogen gas before being mounted on the unit.
- Different accumulator pre-charge pressures will allow for different ranges of trip out force, as shown in the chart.
- Pre-charge pressure should be set for the most common working conditions.
- Lower pre-charge pressures with higher operating pressures will give longer lifting and lowering times.

## Warning



### HIGH-PRESSURE FLUID HAZARD

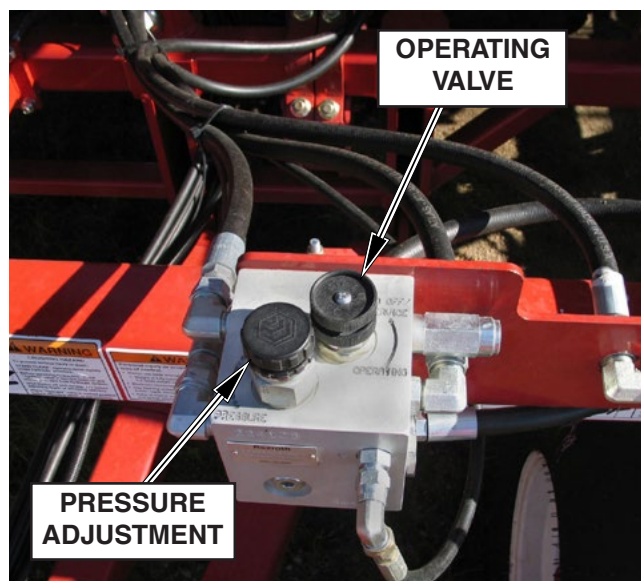
To prevent serious injury or death:

- Relieve pressure on hydraulic system before servicing or disconnecting hoses.
- Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.
- Keep all components in good repair.

### Accumulator Operating Range

Nitrogen Pre-charge Pressure	Display Pressure	
	Minimum	Maximum
350 psi (2413 kPa)	450 psi (3102 kPa)	1200 psi (8274 kPa)

\* Maximum system hydraulic pressure is 1200 psi or 4 times the pre-charge pressure, whichever is the lower number.



## Opener Operation - Continued

### Setting Maximum System Pressure (Trip Out Force)

- To determine the approximate trip out force in pounds on each shank, divide the system hydraulic pressure in the circuit by 1.5.

For example: A system hydraulic pressure of 750 psi (5171 kPa) would be approximately 500 lbs (227 Kg) trip force at each shank.

**Note:** Due to the variation of friction effects, this trip force is approximate.

- Maximum hydraulic operating pressure can be set by dialing the reducing valve in to increase allowable pressure, and dialing it out to decrease allowable pressure. This adjustment is done in order to set a maximum working pressure; pressure can be decreased below the set point and increased back up to the set point on the go from the tractor.

1. Ensure the “Operating” valve is set to operating position and the “Openers” ball valve is set to unlocked position to allow flow.
2. Begin by dialing the adjustment all the way out on the “Pressure” valve.
3. Dial the “Pressure” valve setting in 1 full turn.
4. Operate the tractor remote to pressurize the accumulator circuit. Once the pressure has stopped climbing check the system pressure on the gauge.

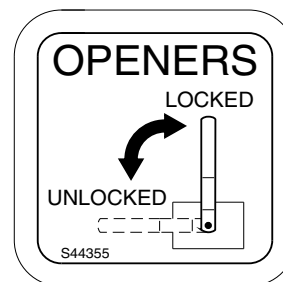
**Note:** Set “Pressure” valve pressure 100 - 150 psi above the desired working pressure in order to allow for pressure drop from accumulator cooling and valve hysteresis. System pressure will level off and hold after approximately 1 minute.

5. If the pressure in the system is high enough to achieve the desired trip out force, setting is complete. If the pressure is too low, relieve the circuit pressure using the tractor remote and repeat steps 3 and 4 until the desired pressure is achieved.
6. If the system pressure is too high, relieve the circuit pressure using the tractor remote, and then dial the “Pressure” valve adjustment out incrementally. Repeat step 4 until the desired system pressure has been reached.

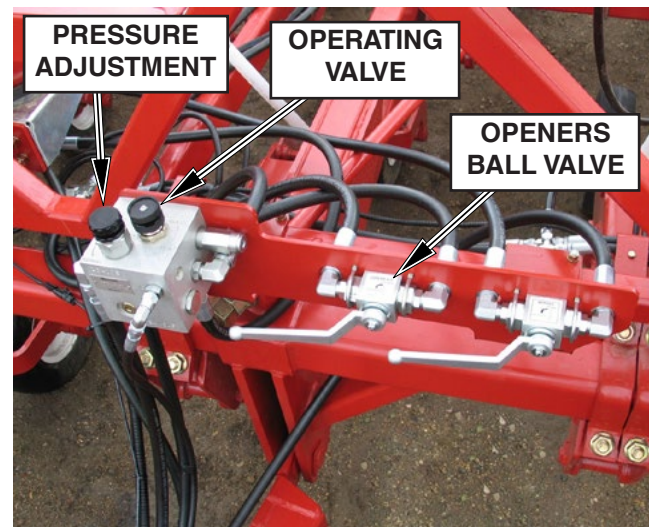
**Note:** Operate system at the lowest system pressure that will keep shanks locked vertical during seeding and provide adequate packing pressure. Excessive hydraulic pressure may disturb rocks and damage carbides.

## Important

Do not exceed 4 times the nitrogen pre-charge pressure or 1200 psi, whichever is the lower number.



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Valve Locations

**Note:** If C2 Contour is equipped with the optional Active Hydraulic System refer to Appendix A for operation details.

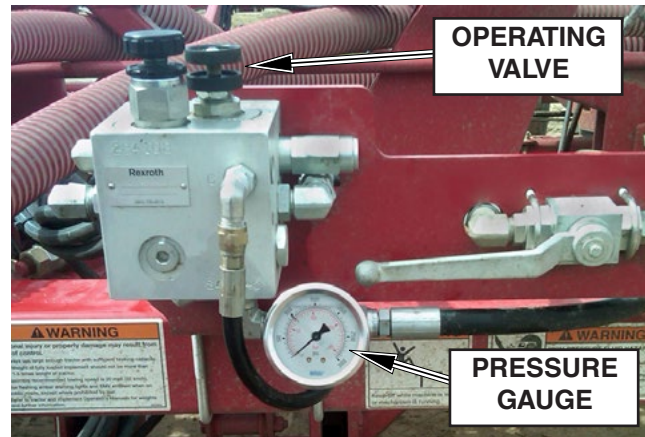
# Operation

## Opener Operation - Continued

### Relieve System Pressure

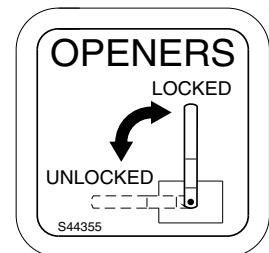
To bleed all pressure from Opener hydraulic system:

- Open “Operating” valve to service/bleed-off position.
- Lift openers to transport position.
- Put tractor remote in “float” position.
- Let openers drop and pressure go to 0 psi (or near 0 psi) on gauge.
- Lift openers to transport position and lock “Openers” valve.

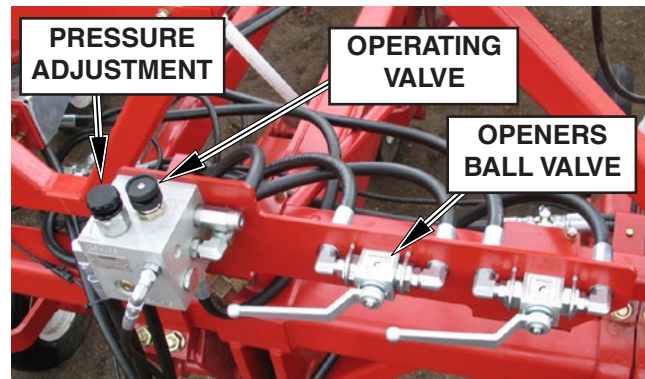


### Normal Operation

- Set operating pressure as described under “Setting Maximum System Pressure”.
- Ensure the “Operating” valve is turned in to operating position and the “Openers” ball valve is set to unlocked position to allow oil flow.
- With the Contour Air Drill moving forward, lower openers into the ground. Hold tractor hydraulic lever until the maximum preset operating pressure is reached (see “Setting Maximum System Pressure”). This ensures that all of the openers are fully charged and engaged.
- When turning at head land, the openers do not need to be completely cycled from working to fully lifted position. The openers can be lifted just to the point that they do not contact the ground. This will reduce the time required to fully recharge the hydraulic accumulator to the preset operating pressure.
- Avoid sharp turns with drill in ground. Turns sharp enough to cause the inside openers of the air drill to reverse direction may cause openers to plug.



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Valve Locations

**Note:** Under “Normal Operation” the valve block will maintain the set system pressure in the accumulator when openers are raised.





## Opener Operation - Continued

### Pressure Adjustment (On the go)

Pressure can be changed on the go to adjust for variable field conditions by using the tractor remote.

In order to lower the accumulator pressure on the go, the “Operating” valve must be turned out to the bleed-off/service position.

**Note:** Operating pressure may drop more than the 100 psi (689 kPa) described under “Setting Maximum System Pressure” when the “Operating” valve is set to the bleed-off/service position. This is dependant on tractor valve leakage.

- Screw “Operating” valve out to open position for “on the go” pressure adjustment.

Operate the openers as usual:

- With the Contour Air Drill moving forward, lower openers into the ground. Hold tractor hydraulic lever until the maximum preset operating pressure is reached (see “Setting Maximum System Pressure”). This ensures that all of the openers are fully charged and engaged.

To reduce operating pressure on the go:

- Place tractor hydraulic lever into “Float Position” until pressure drops to desired operating point.
- Release hydraulic lever once desired pressure is reached.

**Note:** If pressure drops too rapidly when tractor remote is put into float, the “Operating” valve can be turned in a few turns to reduce bleed-off speed.

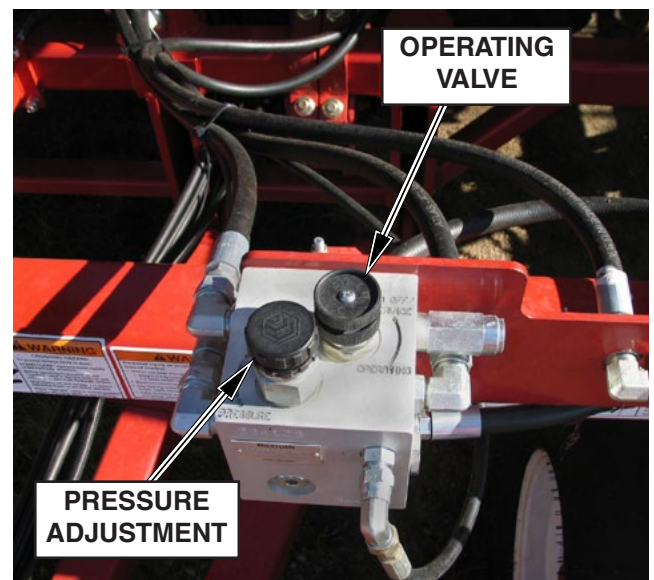
To increase operating pressure:

- Operate tractor hydraulic lever to increase pressure to desired operating point.

**Note:** If C2 Contour is equipped with the optional Active Hydraulic System refer to Appendix A for operation details.

## Important

The “Operating” valve must be set to the “Bleed Off / Service” Position in order to lower accumulator pressure with openers in operating position.

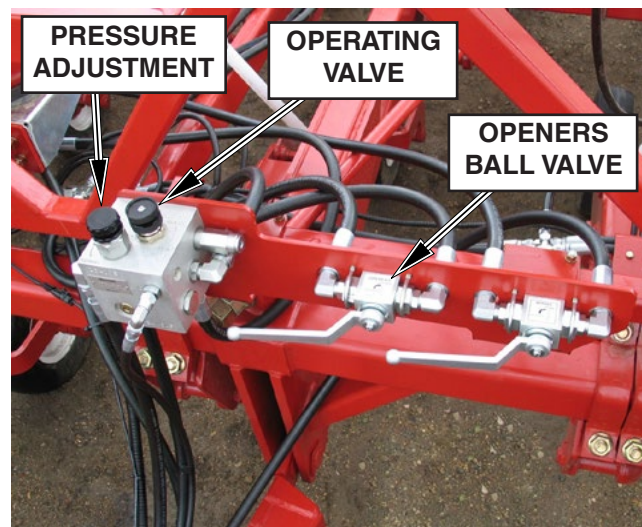
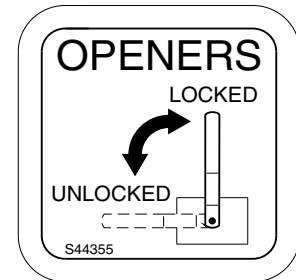


# Operation

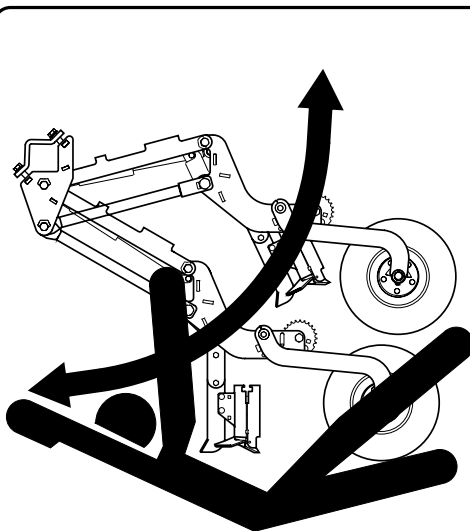
## Depth Adjustment

To adjust seed depth:

- Lift openers to raised position (allow pressure gauge to reach zero).
- Shut tractor off and remove key.
- Ensure tractor park brake is engaged before proceeding.
- Place "Openers" ball valve into locked position to prevent accidental oil flow to openers.



Valve Locations



S44446



## WARNING

### CRUSHING HAZARD

To prevent serious injury or death:

- **STAND CLEAR** - openers move rapidly under hydraulic pressure.
- **Before servicing hydraulics** - Place "System" valve in service position and relieve pressure from hydraulic system.
- **Shut tractor off and remove key** before servicing or adjusting depth.
- **Place "Openers" valve in locked position** before adjusting depth or transporting.



## Depth Adjustment - Continued

### Prior to 2020

- Remove lynch pin from 1/2" diameter depth pin.
- Remove depth pin.
- Rotate depth cam to desired lettered setting ("A" is the shallowest position). Each increment changes the depth a 1/4" (6.4 mm).
- Reinstall 1/2" pin and lynch pin noting letter position before adjusting other openers.

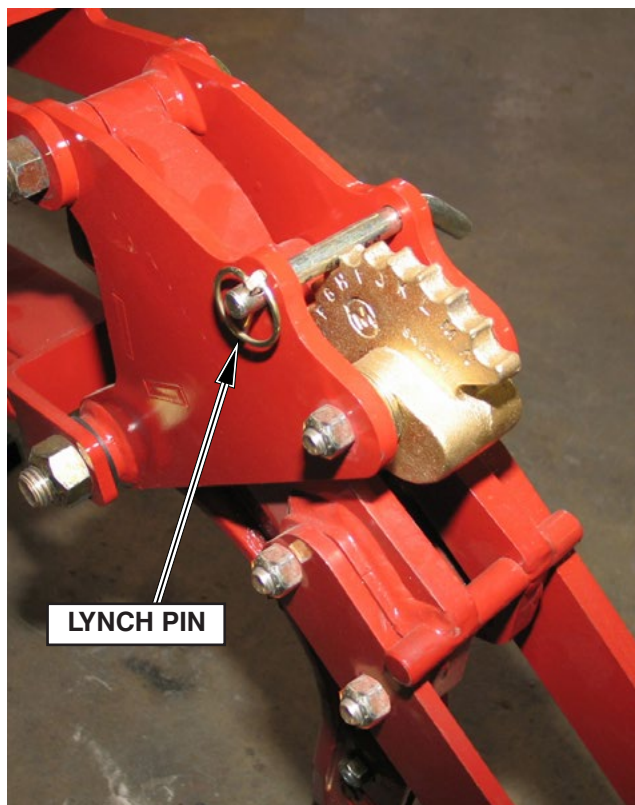
**Note:** For ease of adjustment, adjust a few openers across the drill to confirm desired seeding depth before adjusting the remaining openers.

- Move the "Openers" ball valve to the unlocked position before using drill.

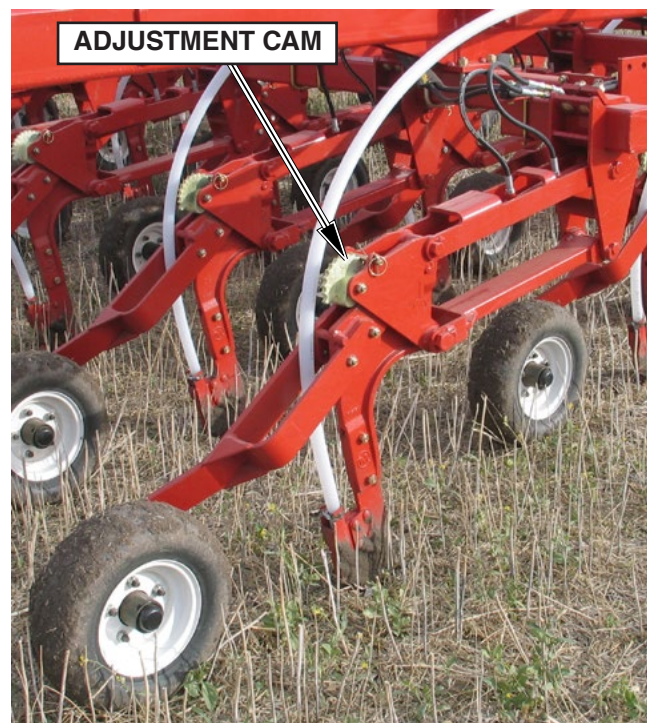
## Important

**Pneumatic Tires Only.**

**Keep opener tires air pressure at the listed specifications to achieve and maintain proper seed depth.**



Adjustment Cam



# Operation

## Depth Adjustment - Continued

### 2020 to Present

- Remove lynch pin from 1/2" diameter depth pin.
- Remove depth pin.
- Rotate depth cam to desired lettered setting ("A" is the shallowest position). Each increment changes the depth a 1/4" (6.4 mm). A good starting point for depth settings would be setting "D".
- Reinstall 1/2" pin and lynch pin noting letter position before adjusting other openers.

**Note:** For ease of adjustment, adjust a few openers across the drill to confirm desired seeding depth before adjusting the remaining openers.

- Move the "Openers" ball valve to the unlocked position before using drill.

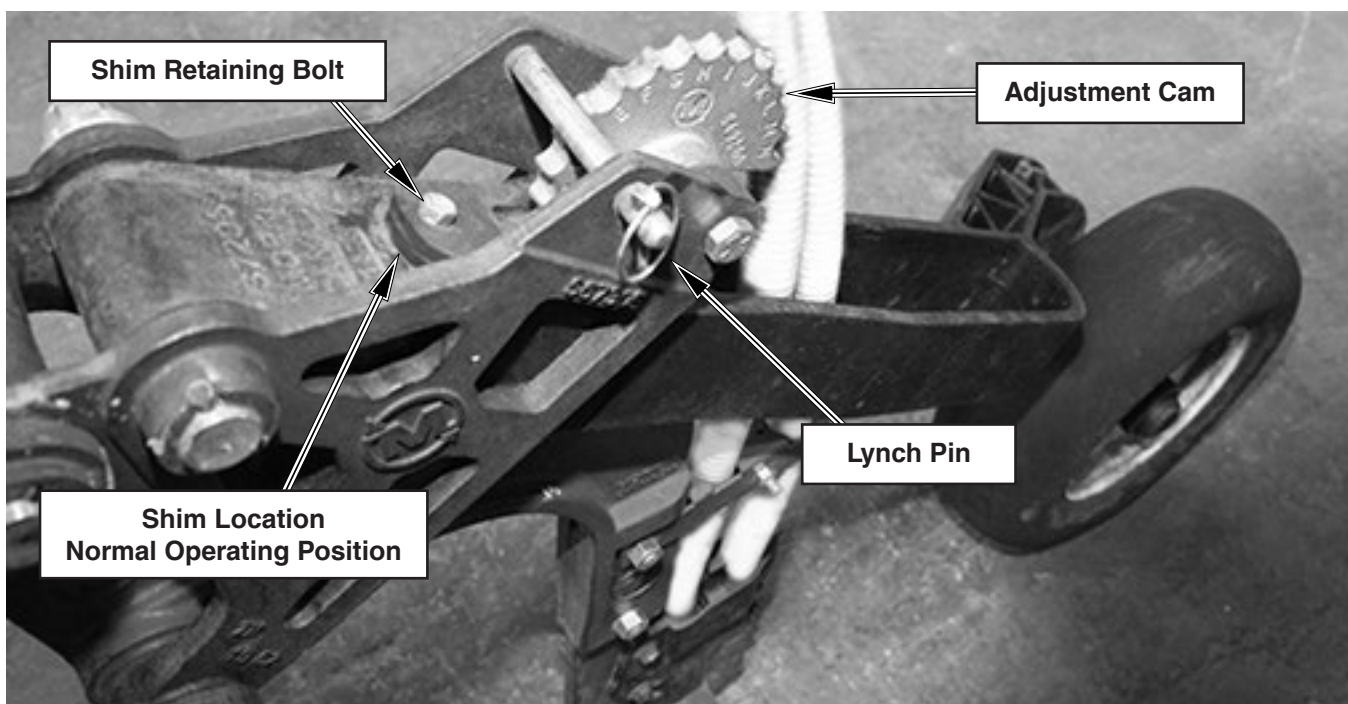
### Depth Range Interval Change

- A shim in the normal operating position (produces depth range results similar to the prior to 2020 C2 opener).
- Removing the shim will make each position on the depth cam 1" (25.4 mm) deeper.  
i.e. if the seeding depth is at 1" (25.4 mm) and the shim is removed the seeding depth would now be at 2" (50.8 mm) roughly.
- The depth cam remains the same i.e. going from A to B will change the depth by 1/4" (6.4 mm).

## Important

**Pneumatic Tires Only.**

**Keep opener tires air pressure at the listed specifications to achieve and maintain proper seed depth.**



## Work Switch

(Optional equipment)

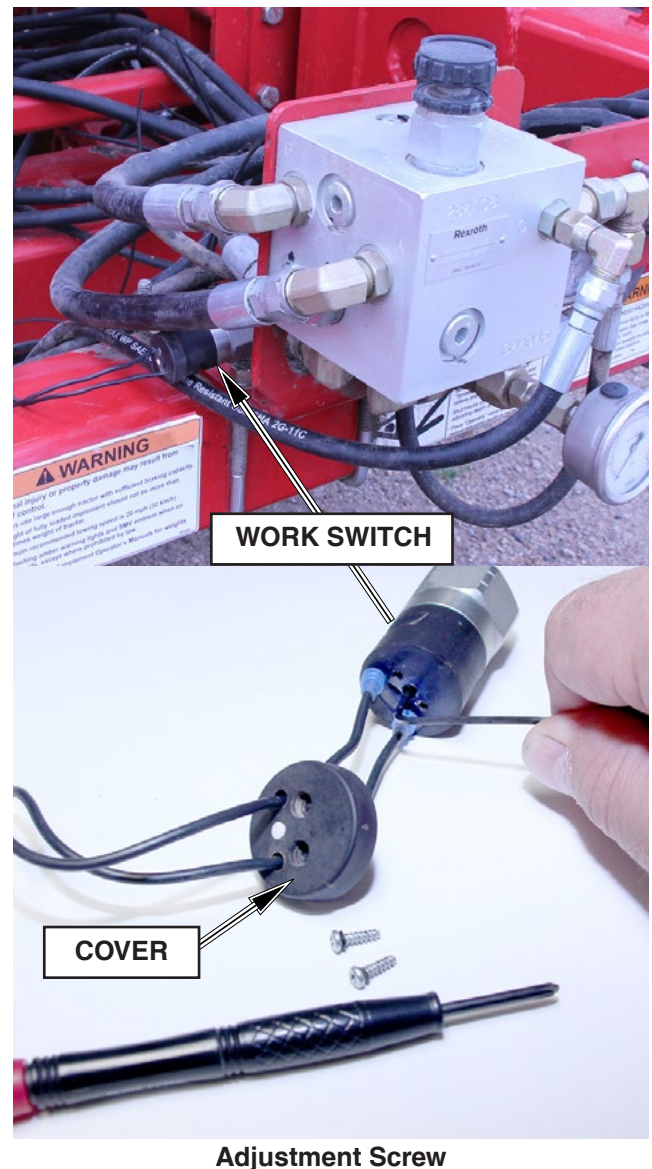
The pressure work switch activates the Air Cart Metering system by the hydraulic pressure on the opener lift side. When the openers are raised the switch opens at a pre-set pressure turning off the Air Cart metering and when lowered the switch closes at the pre-set pressure to turn on the metering.

The pre-set Factory set point meets most operators' preference. If the turn ON and OFF time needs to be adjusted follow the procedure below:

- Remove cover from back of switch.
- Insert a 3/32" allen wrench into the adjustment screw opening. Turn the screw clockwise to increase the set point or counter clockwise to decrease.
  - Increasing set point will cause the metering system to **turn ON quicker**. This will also cause the metering system to turn OFF later.
  - Decreasing set point will cause the metering system to **turn ON later**. This will also cause the metering system to turn OFF quicker.

## Important

Ensure metering clutch is turned OFF when moving unit to prevent damage to metering wheels in the event pressure switch is in ON position.





# Operation

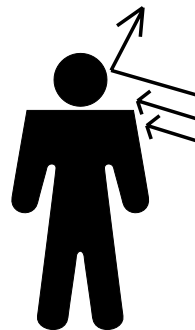
## General Guidelines

The results obtained from the Morris Contour Drill are directly related to the depth uniformity of the unit. Worn points, uneven tire pressures, and bent shanks must be avoided to obtain optimum field results.

- Operating depth should be uniform at all opener locations, when spot checking the implement in the field.
- Check openers running in tractor or air cart tracks and adjust depth accordingly.
- Repair or replace bent shanks. Bent shanks cause openers to work at uneven depths and can cause unnecessary ridging. See Maintenance Section.
- Keep tire pressure at the listed specifications to maintain proper level. See Maintenance Section.
- Have Air Drill moving forward before lowering into ground to avoid plugging openers.
- Avoid sharp turns. Turns sharp enough to cause the inside openers of the air drill to reverse direction are not recommended. This may cause the seed openers to plug.



**TAKE SAFETY SERIOUSLY.**  
**Do Not Take Needless Chances!**



## Caution

Care should be taken when working near the air cart while the fan is running. Product blowing out of the system could cause personal injury.



## Quick Tips

**Note:** Read the Operator's Manual for detailed operating and adjustment instructions.

## Shank Trip Force

Shank trip force (lbs) is calculated by dividing the display pressure by 1.5 (ex. 750 psi display pressure = 500 lbs shank trip force). Shank trip out pressure is generally set at the minimum pressure that keeps the shanks solid in the vertical position and prevents them from repeatedly “tripping out”, while still providing adequate packing. Maximum recommended shank trip out pressure is 1200 psi.

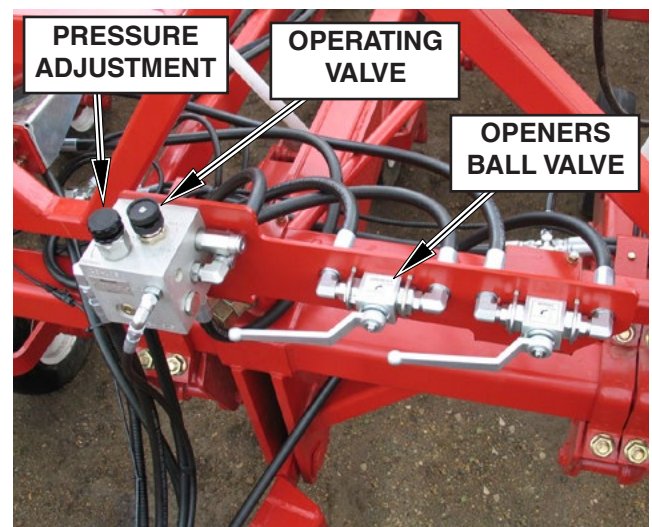
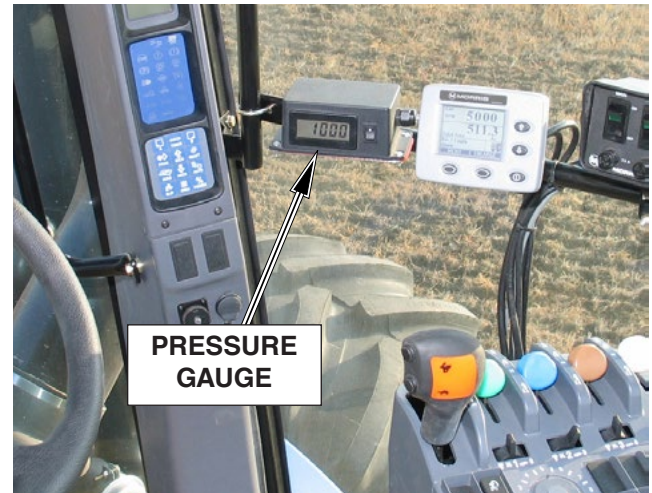
## Packing Force

Packing force is proportional to shank trip out force and is roughly 1/3 of the shank trip force (ex. 500 lbs shank trip force would give approximately 167 lbs of packing force).

## Hydraulic System

The Contour Air Drill uses a passive hydraulic system (no constant flow is needed from the tractor during seeding). Maximum operating pressure is set using the reducing valve on the frame (see “Setting Maximum System Pressure”). Pressure can be changed on the go to adjust for variable field conditions by using the tractor remote (see “Pressure Adjustment”). If full range adjustment of pressure is desired, the reducing valve can be set at its maximum pressure and the operator can then adjust pressure manually by watching the pressure display and opener shanks.

**Note:** It is normal for the pressure to drop 100 to 150 psi from the initial set point while the accumulator cools (the reducing valve can be set higher to account for this initial pressure drop). If the pressure continues to drop quickly, check the machine for a cylinder, fitting, or hydraulic line leak.



Valve Locations

## Lifting and Lowering the Openers

The openers do not need to be completely cycled from working to fully lifted position while turning. Openers can be lifted just to the point that they do not contact the ground while turning, in order to save time by not having to fully recharge the hydraulic accumulator with fluid each cycle (the display pressure won't drop all the way to zero). When transporting the drill, lift the openers and ensure that the display pressure goes down to zero.



# Operation

## Quick Tips - Continued

### Setting the Seed Depth

Seed depth is measured from the packed soil surface to the seed. Set the seed depth on the drill by setting a few openers across the drill to different depths and seeding a test patch. Always seed the test patch at the same ground speed and opener pressure that you intend to maintain during regular seeding conditions. Then check the seed depth of these openers, pick the depth setting that you prefer, and set all openers to the desired letter setting on the depth adjustment cam. The openers perform best while seeding from 1/2" (13mm) to 1-1/2" (38 mm) seed depth, but each customer is responsible for choosing their own depth setting according to their preferences and experience. Each adjustment notch on the adjustment cam is 1/4" (6.4 mm) adjustment. Shallow depth settings can be consistently maintained with the Contour Air Drill system.

**Note:** Be sure to check tractor and/or air cart tracks to see if the added soil compaction has affected the seed depth; the independent openers can be adjusted separately to compensate for wheel tracks.

### Seeding Conditions

The Contour Air Drill is meant to be used as a minimum to no-till seeding system and care should be taken when attempting to seed into loose or pre-worked soil conditions. Shallow seeding depth, reducing operating speed and operating pressure may help reduce soil throw and ridging in soft conditions.

**Note:** Soil throw onto adjacent seed rows also occurs on conventional air drills with gang style packers, but is less visible because the gang packers pack all rows simultaneously at the back of the drill.

### Straw Management

Successful seeding starts at harvest. The height of the straw should not exceed the row spacing of the seeding unit. The combine should chop the straw and spread the straw and chaff evenly across the entire swath width. A heavy harrow may also be required to spread and break down the straw after the field has been harvested. If the straw height does exceed the row spacing a mower should be used to shorten the straw length.



## IMPORTANT

The Paired Row Opener with the NH3 adapter is intended to allow the operator the flexibility to switch between granular fertilizer and NH3 without having to change openers. The opener is not intended to apply granular fertilizer and NH3 in the same operation. Excessive gassing off of the NH3 will occur in such an operation. Producers are still able to place starter fertilizer with the seed.

**Morris Equipment shall have no obligation or liability of any kind on account of the end-user incorrectly using this opener.**

## Quick Tips - Continued

### Air Drill Frame

The Contour Air Drill frame is a simple slab frame system, designed to let the parallel link openers do the work of depth control and leveling during seeding. No leveling of the frame is required. During normal operation of the drill there will be very little weight on the rear tires of the frame. The rear tires may even leave the ground while traveling through sharp gullies; this is normal, and it will not affect the seed depth control of the openers. If the tires are lifted in the air consistently, optional weight kits can be applied to the depth beams near the rear axles.



Weight Kit



Normal Frame Angle

### Trouble Shooting Guide

**\*Note:** The “Operating” valve must be turned out to the bleed-off/service position and remove all pressure from hydraulic systems before attempting any service work on hydraulic components.

Hydraulic system must be bled after it has been serviced (if any portion of the system has been opened to atmosphere). See “Bleeding Hydraulic System” in Maintenance Section.





# Operation

## Wing Lift Hydraulics

The wing lift hydraulic system is controlled by a parallel hydraulic system. A pressure compensated Flow Control Valve is used to control the flow of oil to the cylinders allowing both wings to fold and unfold simultaneously. A hydraulic circuit Shut Off valve is used to lock the hydraulic circuit and prevent any leak back, this ensures the wings remain in transport.

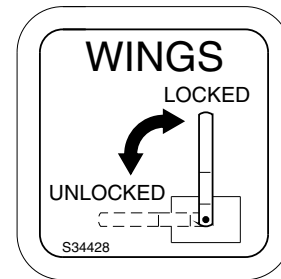
The Flow Control Valve is located on the main frame and there are no adjustments associated with the valve.

The Shut Off valve is located on the front wing lift truss for easy access.

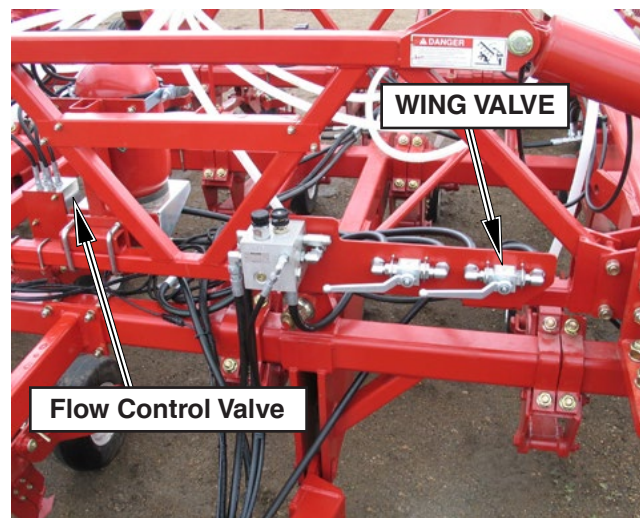
To unfold the Air Drill, the oil flows to the Flow Control Valve, from there to the butt end of all the wing lift cylinders extending the shafts and lowering the wings. All cylinders must be fully extended to ensure correct operation of the machine.

Placing the unit into transport is the reverse of unfolding the unit. Oil is fed to the shaft end of the cylinders retracting the cylinders and lifting the wings into transport position.

**Note:** When raising or lowering wings, do so in one continuous motion until fully up or down. Do not stop flow part way allowing wings to fold on their own. This may disrupt the sequence of operation.



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# Operation

## Opener Hydraulics

The Contour openers can be operated using two methods as described in the operators manual as Normal Operation and Pressure Adjustment (On the go).

The following is the oil flow for both operating types and can be used for problem diagnosis.

### Normal Operation

The opener ball valve is in the unlocked position. This ball valve is open. The operation valve is screwed in fully to the operating position. This needle valve is closed.

**To lower** the openers, oil flows through the hose to port “A” of valve block. The oil is allowed to flow simultaneously through ports “D” and “F”. Port “F” charges up the accumulator to operating pressure set by the pressure valve. Port “D” charges the butt end of the opener cylinders causing the openers to lower.

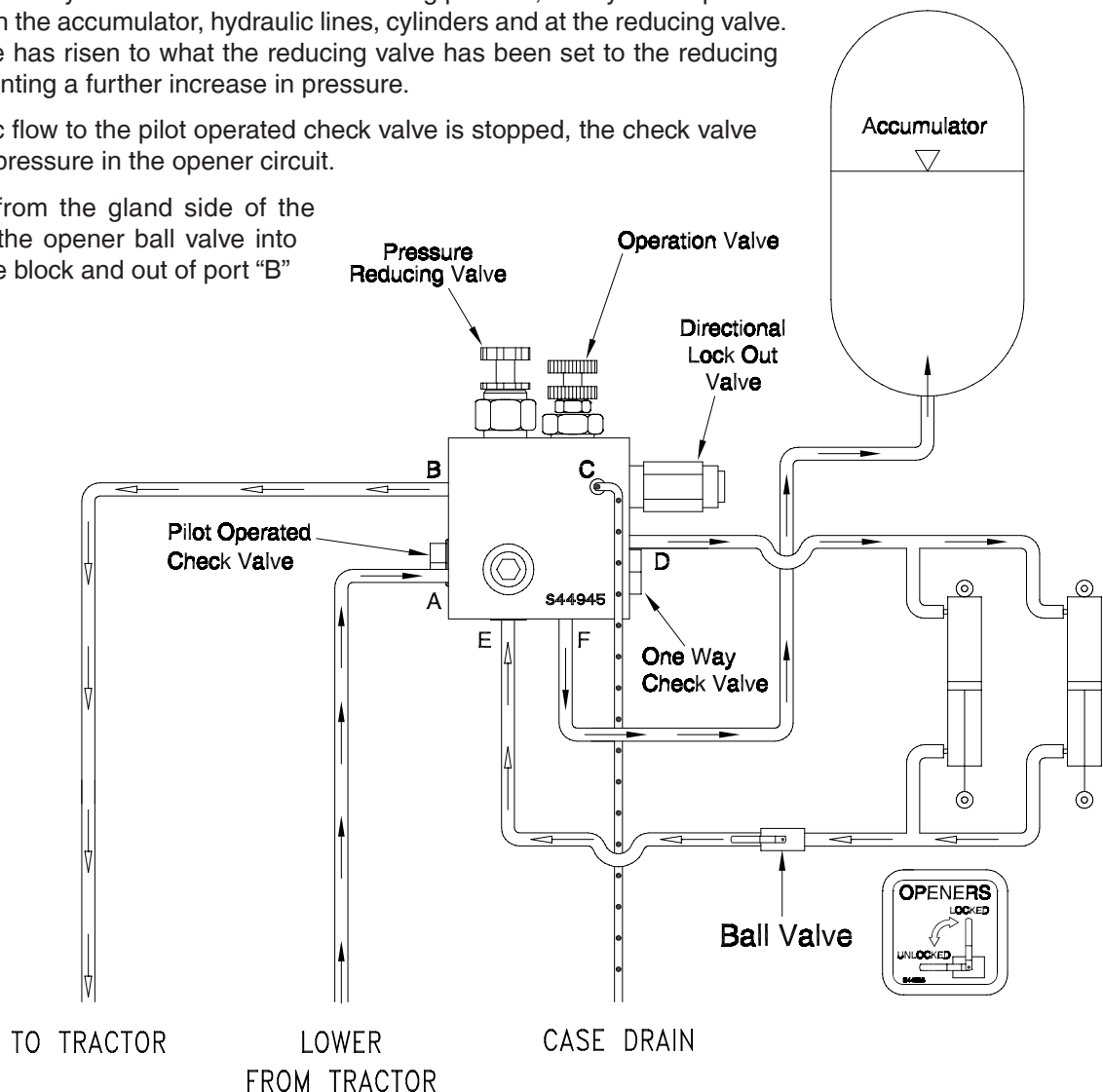
Once the operating pressure is reached the oil will stop flowing.

From port “A” of valve block, oil flows through the pressure reducing valve, to the pilot operated check valve unseating the check valve and out of Port “D” to the butt end of the opener cylinders causing the openers to lower. Simultaneously, oil flows from the check valve through the directional lock out valve and out of Port “F” to the accumulator.

When all of the opener cylinders are extended to working position, the hydraulic pressure continues to build in the accumulator, hydraulic lines, cylinders and at the reducing valve. When the pressure has risen to what the reducing valve has been set to the reducing valve closes, preventing a further increase in pressure.

When the hydraulic flow to the pilot operated check valve is stopped, the check valve seats, holding the pressure in the opener circuit.

The oil returning from the gland side of the cylinders flows to the opener ball valve into port “E” of the valve block and out of port “B” back to the tractor.



## Opener Hydraulics - Continued

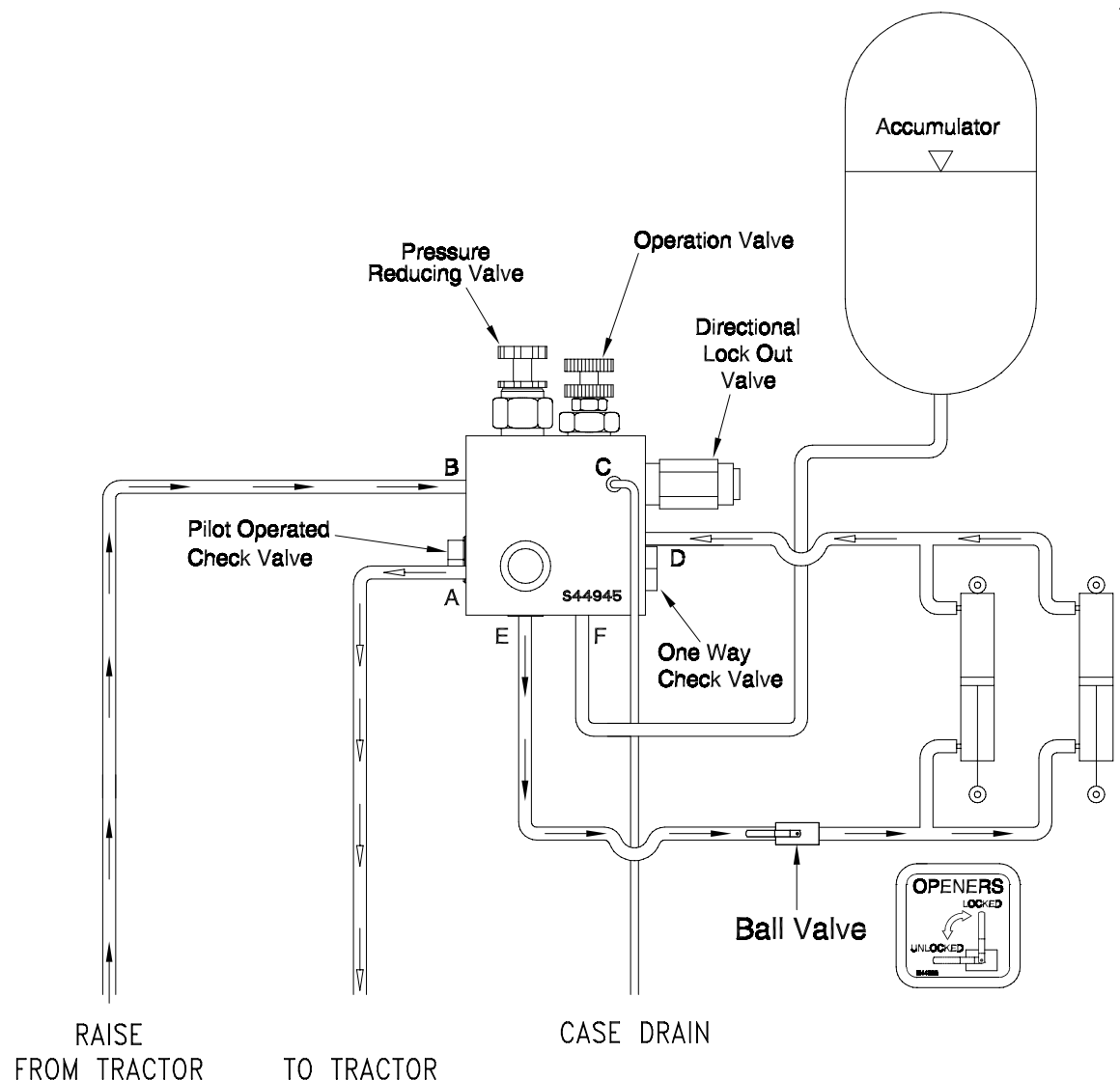
### Normal Operation - Continued

**To raise** the openers, oil flows from the tractor hose to port “B” of the valve block and out of port “E” to the opener valve and on to the gland side of the cylinders. Oil is also felt on the line that operates the pilot operated check valve. This causes the check valve to open and allow return oil back to the tractor.

Oil from the butt side of the cylinders travels to port “D” and through the opened pilot operated check valve to the pressure relief valve. Oil can not go through the relief valve in this direction and is directed to the one way check valve. The oil then travels through the one way check valve to port “A” of the valve block.

The oil flows through the port “A” of the valve block and back to the tractor.

Oil is also felt on the line that operates the directional lock out valve. This causes the directional lock out valve to close preventing the oil in the accumulator from returning back to the tractor. The directional lock out valve maintains the pressure in the accumulator in this position.



# Operation

## Opener Hydraulics - Continued

### Pressure Adjustment (On the Go)

The opener ball valve is in the unlocked position. This ball valve is open. The operation valve is screwed out fully to the service/bleed-off position. This needle valve is open.

**To lower** the openers, oil flows through the hose to port “A” of valve block. The oil is allowed to flow simultaneously through ports “D” and “F”. Port “F” charges up the accumulator to operating pressure set by the pressure valve. Port “D” charges the butt end of the opener cylinders causing the openers to lower.

Once the operating pressure is reached the oil will stop flowing.

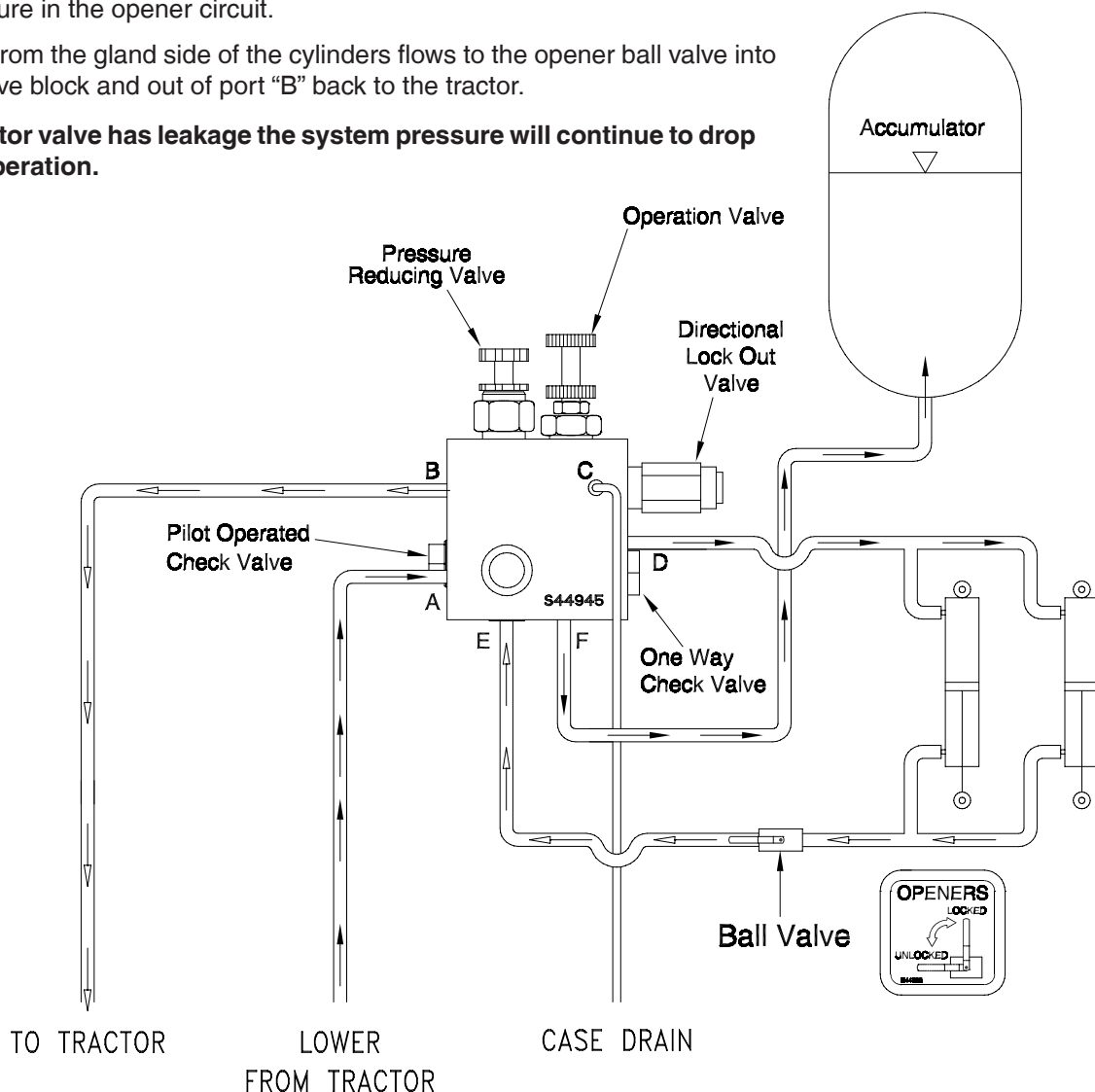
From port “A” of valve block, oil flows through the pressure reducing valve, to the pilot operated check valve unseating the check valve and out of Port “D” to the butt end of the opener cylinders causing the openers to lower. Simultaneously, oil flows from the check valve through the directional lock out valve and out of Port “F” to the accumulator.

When all of the opener cylinders are extended to working position, the hydraulic pressure continues to build in the accumulator, hydraulic lines, cylinders and at the reducing valve. When the pressure has risen to what the reducing valve has been set to the reducing valve closes, preventing a further increase in pressure.

When the hydraulic flow to the pilot operated check valve is stopped, the check valve seats, holding the pressure in the opener circuit.

The oil returning from the gland side of the cylinders flows to the opener ball valve into port “E” of the valve block and out of port “B” back to the tractor.

**Note:** If the tractor valve has leakage the system pressure will continue to drop during operation.



## Opener Hydraulics - Continued

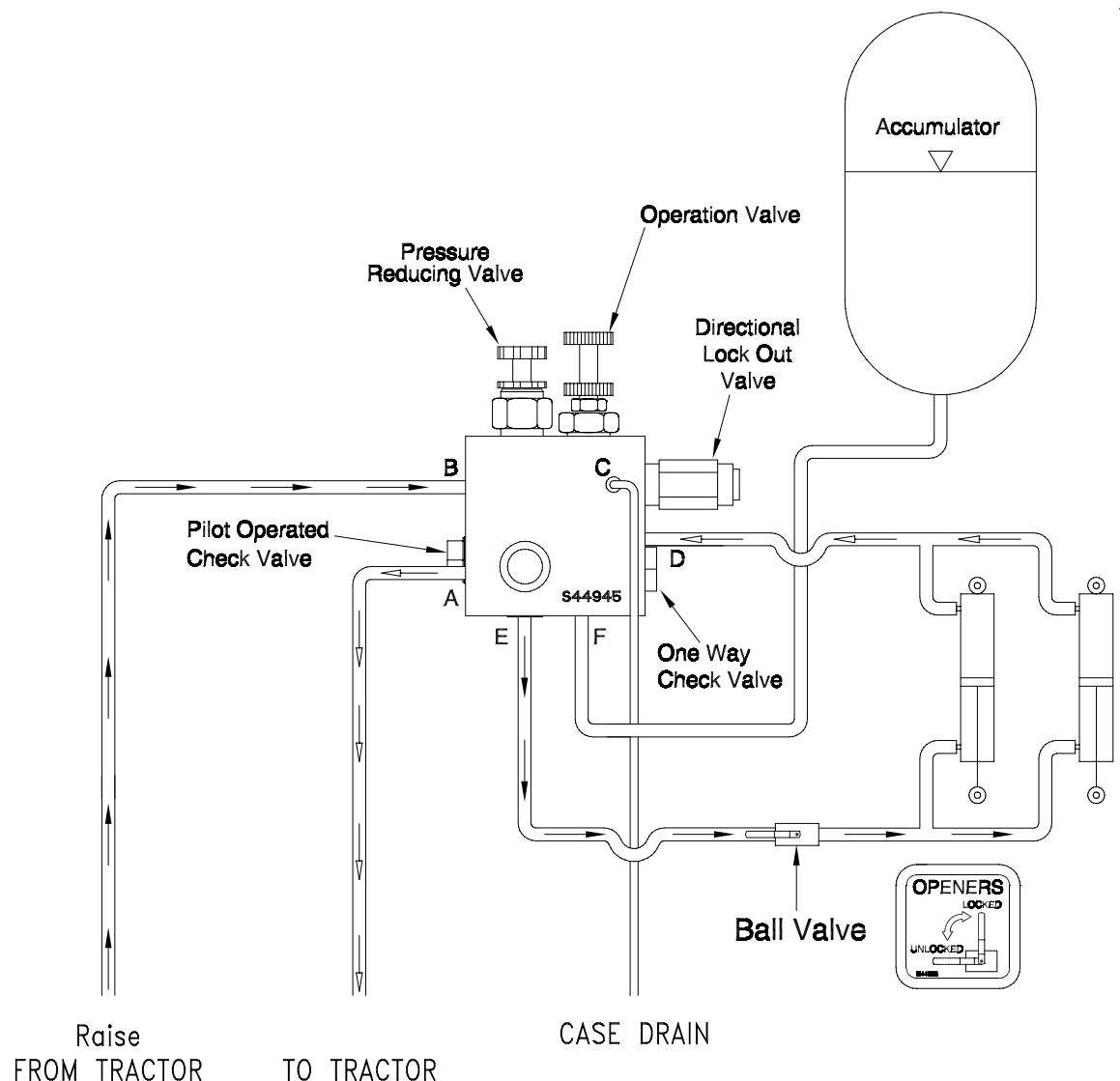
### Pressure Adjustment (On the Go) - Continued

**To raise** the openers, oil flows from the tractor hose to port “B” of the valve block and out of port “E” to the opener valve and on to the gland side of the cylinders. Oil is also felt on the line that operates the pilot operated check valve. This causes the check valve to open and allow return oil back to the tractor.

Oil from the butt side of the cylinders travels to port “D” and through the opened pilot operated check valve to the pressure reducing valve. Oil can not go through the reducing valve in this direction and is directed to the one way check valve. The oil then travels through the one way check valve to port “A” of the valve block.

The oil flows through the port “A” of the valve block and back to the tractor.

Oil is also felt on the line that operates the directional lock out valve. This causes the directional lock out valve to close preventing the oil in the accumulator from returning back to the tractor. The directional lock out valve maintains the pressure in the accumulator in this position.



# Operation

## Opener Hydraulics - Continued

### Pressure Adjustment (On the Go) - Continued

**Pressure adjustment on the go**, requires input from the operator to function.

The operator will have selected the operation valve to be in the bleed off/service position.

The adjustable reducing valve (Pressure Valve) will be set to provide correct trip and packing pressure.

With the Contour Air Drill moving forward, lower openers into the ground. Hold tractor hydraulic lever until the maximum preset operating pressure is reached. This ensures that all of the openers are fully charged and engaged. To reduce operating pressure on the go:

- Place tractor hydraulic lever into “Float Position” until pressure drops to desired operating point.
- Release hydraulic lever once desired pressure is reached.

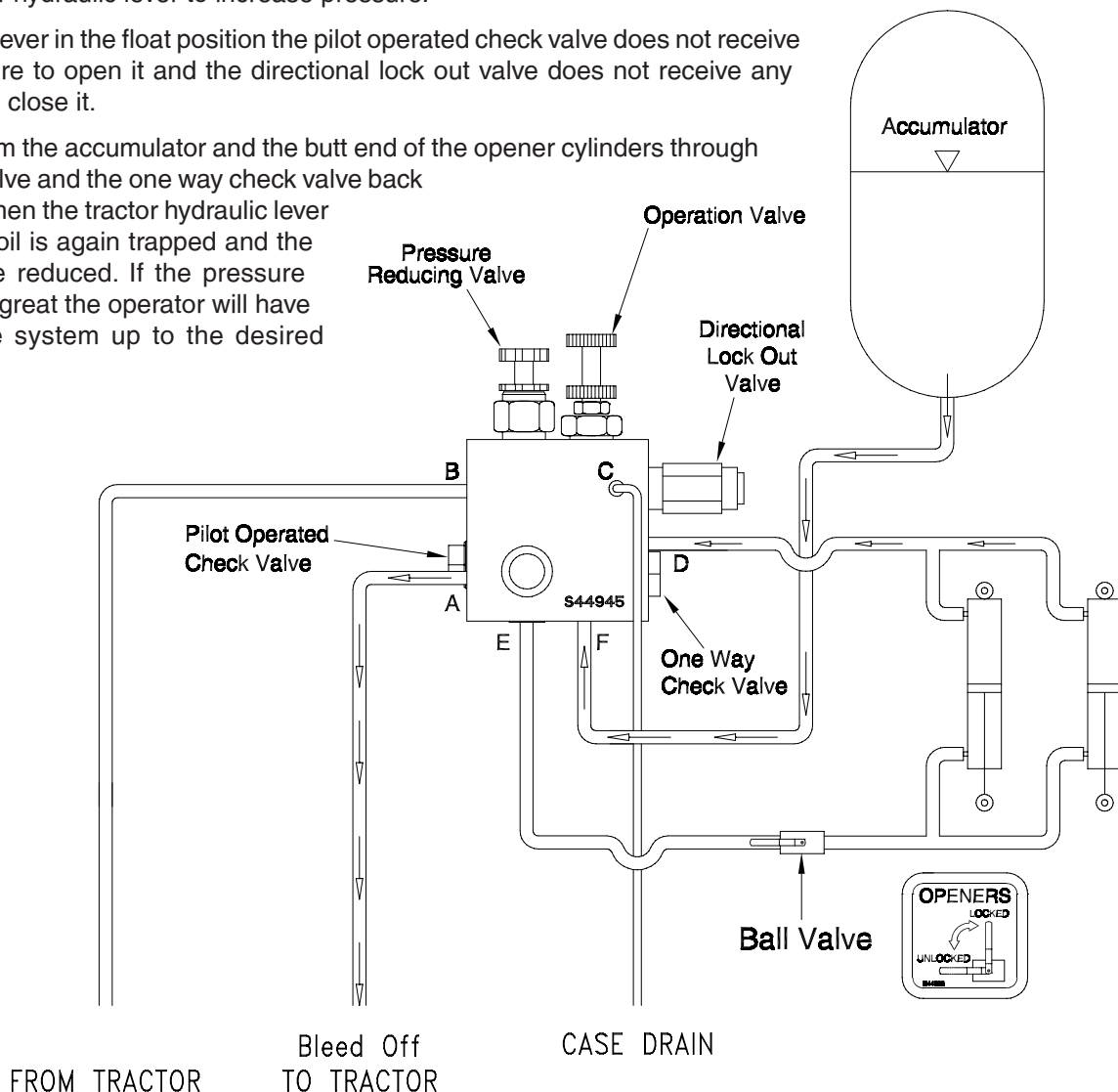
**Note:** If pressure drops too rapidly when tractor remote is put into float, the “Operating” valve can be turned in a few turns to reduce bleed-off speed.

To increase operating pressure:

- Operate tractor hydraulic lever to increase pressure.

With the tractor lever in the float position the pilot operated check valve does not receive any pilot pressure to open it and the directional lock out valve does not receive any pilot pressure to close it.

The oil flows from the accumulator and the butt end of the opener cylinders through the operation valve and the one way check valve back to the tractor. When the tractor hydraulic lever is released the oil is again trapped and the pressure will be reduced. If the pressure reduction is too great the operator will have to pressure the system up to the desired pressure.



# Section 6: Maintenance

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# Maintenance

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## CAUTION



## BE ALERT

## SAFETY FIRST

REFER TO SECTION 1 AND REVIEW ALL  
SAFETY RECOMMENDATIONS.

## General

This section deals with two goals, maximum life and dependable operation. Adopt a regular maintenance and lubrication program. Care and sufficient lubrication is the best insurance against delays.

## Safety

- Always shut off the tractor and remove key before dismounting.
- Guard against hydraulic high pressure leaks with hand and face protection.
- Never work under the implement unless it is in the down position or transport lock pins are in place and secured with hair pins. Do not depend on the hydraulic system to support the frame.
- Always wear safety goggles, breathing apparatus and gloves when working on seeder filled with chemical. Follow manufactures recommended safety procedures when working with chemicals or treated seeds.
- Do not feed left over treated seed to livestock, treated seed is poisonous and may cause harm to persons or livestock.



## Warning

Securely support any machine elements that  
must be raised for service work.



## Caution



Keep service area clean  
and dry. Wet or oily  
floors are slippery.





## Tighten Bolts

- Before operating the machine.
- After the first two hours of operation.
- Check tightness periodically thereafter.
- Use Bolt Torque Chart for correct values on various bolts.
- Note dashes on hex heads to determine correct grade.

**Note: DO NOT use the values in the Bolt Torque Chart if a different torque value or tightening procedure is given for a specific application.**

- Fasteners should be replaced with the same or higher grade. If higher grade is used, only tighten to the strength of the original.

Bolt Torque Chart				
Grade 5 Bolt Marking 		Bolt Size	Grade 8 Bolt Marking 	
Nm	lb. ft.		lb. ft.	Nm
11	8	1/4	12	16
23	17	5/16	24	33
41	30	3/8	45	61
68	50	7/16	70	95
102	75	1/2	105	142
149	110	9/16	155	210
203	150	5/8	210	285
366	270	3/4	375	508
536	395	7/8	610	827
800	590	1	910	1234
1150	850	1-1/8	1350	1850
1650	1200	1-1/4	1950	2600
2150	1550	1-3/8	2550	3400
2850	2100	1-1/2	3350	4550

## Tires

- Inspect tires and wheels daily for tread wear, side wall abrasions, damaged rims or missing lug bolts and nuts. Replace if necessary.
- Tighten wheel bolts - refer to Bolt Torque Chart.
- Check tire pressure daily, when tires are cold.
- Correct tire pressure is important.
- Do not inflate tire above the recommended pressure.

Tire Specifications		
SIZE	LOAD RANGE	PRESSURE
4.80-8 NHS	4 ply rating	12 P.S.I.
11L x 15SL	12 ply rating	52 P.S.I.
11L x 15FI	F	90 P.S.I.
12.5L x 15SL	12 ply rating	52 P.S.I.
12.5L x 15FI	F	90 P.S.I.
16.5L x 16.1FI	E	60 P.S.I.



## Caution

Tire replacement should be done by trained personnel using the proper equipment.

Wheel Bolt Torque	
SIZE	Torque
1/2	75 lb. ft. (102 Nm)
9/16	110 lb. ft. (149 Nm)
5/8	150 lb. ft. (203 Nm)

# Maintenance

## Lubrication

Greasing pivot points prevents wear and helps restrict dirt from entering. However, once dirt does enter a bearing, it combines with the lubricant and becomes an abrasive grinding paste, more destructive than grit alone.

- Apply new lubricant frequently during operation to flush out old contaminated lubricant.
- Use a good grade of **lithium based grease**.
- Use a good grade of machine oil.
- Clean grease fittings and lubricator gun before applying lubricant.

Refer to the photos for grease fitting locations.

### 1. Wheel Hubs

- Grease every 500 hours or seasonally, whichever occurs first.

### 2. Gauge Wheel Castor Pivot

- Grease every 50 hours.

### 3. Offset Axle Pivot Pin

- Grease every 50 hours.

### 4. Packer Wheel Hubs

- Grease every 5,000 acres (2,000 hectares) or seasonally, whichever occurs first.



## Opener Maintenance

### Bushing Replacement

In the event the pivot pin bushings need replacing, use the following procedure.

- Turn “Operating” valve out to bleed off/service position and **relieve all pressure** from the accumulator circuit using the tractor remote.
- Shut tractor engine off and ensure park brake is engaged before proceeding.
- Place “Openers” ball valve into locked position to prevent accidental oil flow to openers.
- Once the pressure is off of the accumulator circuit, opener can be disassembled as illustrated in diagram on the following page.

Reverse the above procedure to reassemble trip.

**Note:** Bleed air from hydraulic circuit before using unit. Refer to “Bleeding Hydraulic System” for details.

### Cylinder Replacement

In the event the opener cylinder needs repair or replacing, use the following procedure.

- Turn “Operating” valve out to bleed off/service position and **relieve all pressure** from the accumulator circuit by placing the tractor remote in “float” position.
- Shut tractor engine off and ensure park brake is engaged before proceeding.
- Place “Openers” ball valve into locked position to prevent accidental oil flow to openers.
- Once the pressure is off of the accumulator circuit, disconnect hydraulic hoses from opener cylinder.
- Refer to diagram on following page to remove the pins from the opener cylinder.
- Remove the cylinder. Repair or replace cylinder as necessary.

Reverse the above procedure to reassemble trip.

**Note:** Bleed air from hydraulic circuit before using unit. Refer to “Bleeding Hydraulic System” for details.

## Warning



### HIGH-PRESSURE FLUID HAZARD

To prevent serious injury or death:

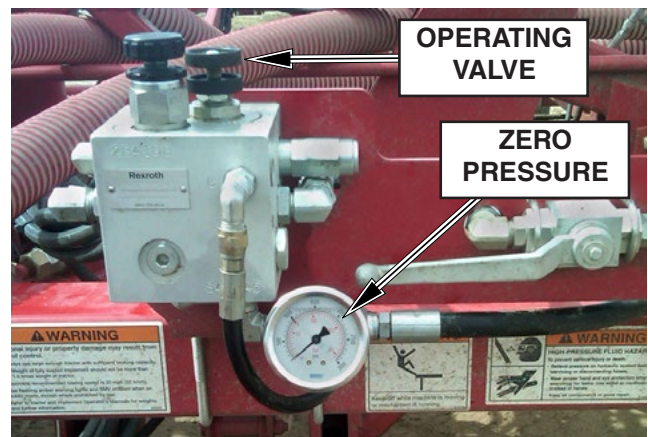
- Relieve pressure on hydraulic system before servicing or disconnecting hoses.
- Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.
- Keep all components in good repair.

## Warning

### CRUSHING HAZARD

To prevent serious injury or death:

- Stand clear - openers move rapidly under hydraulic pressure.
- Place valve in service position.
- Relieve pressure on hydraulic system before servicing.
- Lower openers to ground before adjusting depth.
- Shut tractor off and remove key.

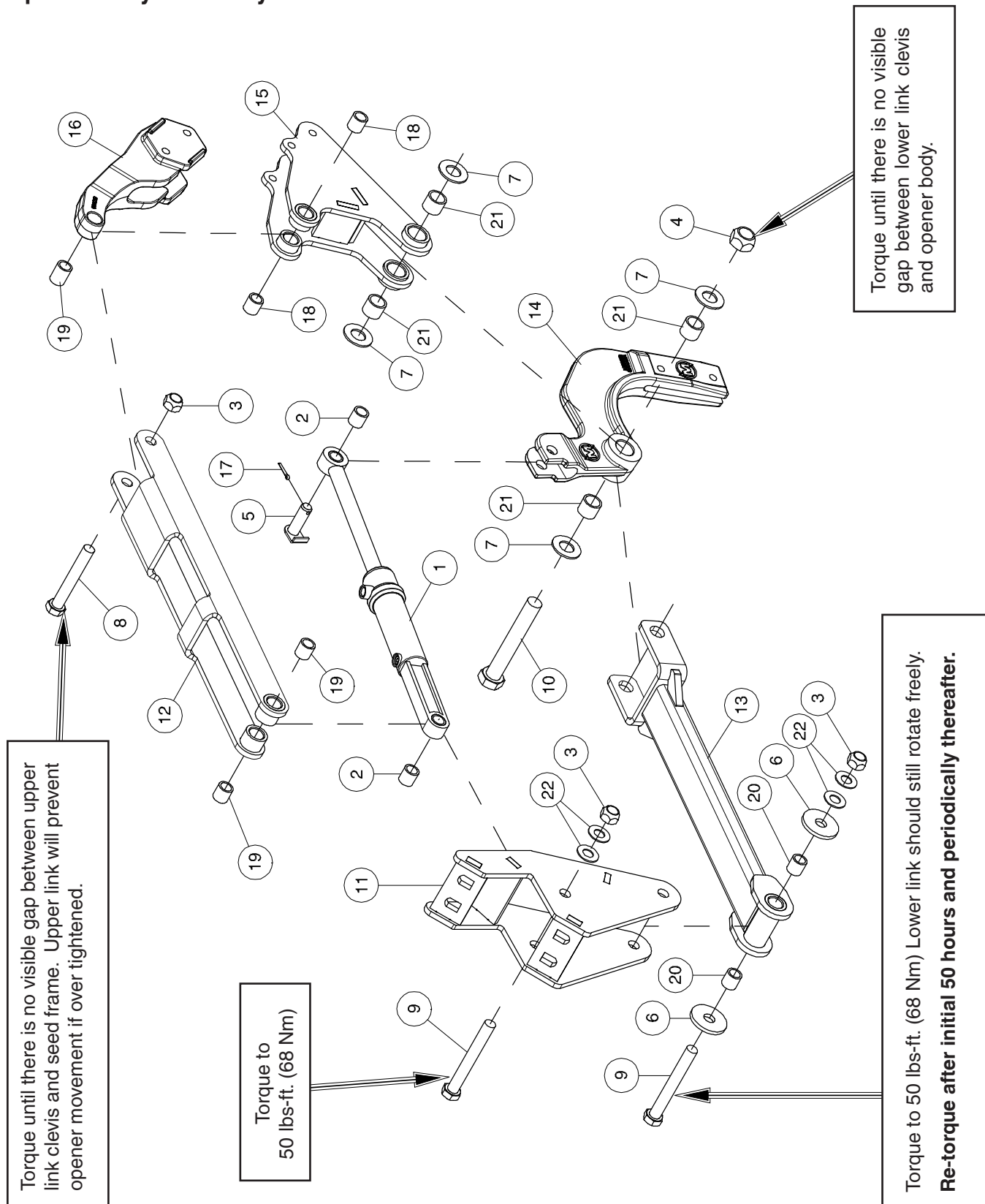


Pressure Gauge

# Maintenance

## Opener Maintenance - Continued

### Opener Body Assembly - Prior to 2020



## Opener Maintenance - Continued

### Opener Body Assembly - Prior to 2020

Item	Part No.	Description	Qty
1	C51033	Hydraulic Cylinder - 1 3/4 Bore x 4 Stroke .....	1
2	S51494	Bushing - 0.756/0.759 ID x 1.003/1.005 OD x 1.000 Lg.....	2
3	D-5273	Locknut - 3/4 Unitorque.....	3
4	D-5274	Locknut - 1 Unitorque.....	1
5	S58730	Pin Chrome - 3/4 x 1 29/32 UL .....	1
6	S42674	Washer - 2 1/2 OD x 25/32 ID x 1/4 .....	2
7	S42675	Washer - 1 1/32 ID x 2 OD x 1/8.....	4
8	S51004	Hex Bolt - 3/4 x 5 1/8 Lg GR-8.....	1
9	S51006	Hex Bolt - 3/4 x 6 1/4 Lg GR-8.....	2
10	S42952	Hex Bolt - 1 x 6 5/8 Lg.....	1
11	S58748	Mounting Bracket .....	1
12	S59801	Top Link (Includes item 19) .....	1
13	S59802	Lower Link (Includes item 20) .....	1
14	S59804	Shankholder - Cast (Includes item 21).....	1
15	S59803	Opener Body (Includes item 18 & 21) .....	1
16	S59807	Packer Arm Pivot Bracket - Cast (Includes item 19).....	1
17	W-530	Cotter Pin - 5/32 x 1 Lg .....	1
18	S58744	Q2 Bushing - 3/4 ID x 1 OD x 1 Lg Nominal size.....	2
19	S58746	Q2 Bushing - 3/4 ID x 1 OD x 1.313 Lg Nominal size.....	3
20	S58747	Q2 Bushing - 3/4 ID x 1 OD x 1.875 Lg Nominal size .....	2
21	S59806	Q2 Bushing - 1 ID x 1 1/4 OD x 1 Lg Nominal size.....	4
22	W-476	Flatwasher - 13/16 ID x 1 1/2 OD x 11 Ga .....	4
	S59800	Base Assembly (Includes all items above).....	1

**Note:** Openers should drop to the ground under their own weight, when the tractor remote is placed into float position relieving oil pressure.

If it requires pressure to push an opener down to the ground during this procedure, one or more of the pivot bolts are over tightened.

Check and adjust pivot bolts as required.

## Important

Turn "Operating" valve out to "Bleed Off/Service" position and remove all pressure from hydraulic systems before attempting any service work on hydraulic components.

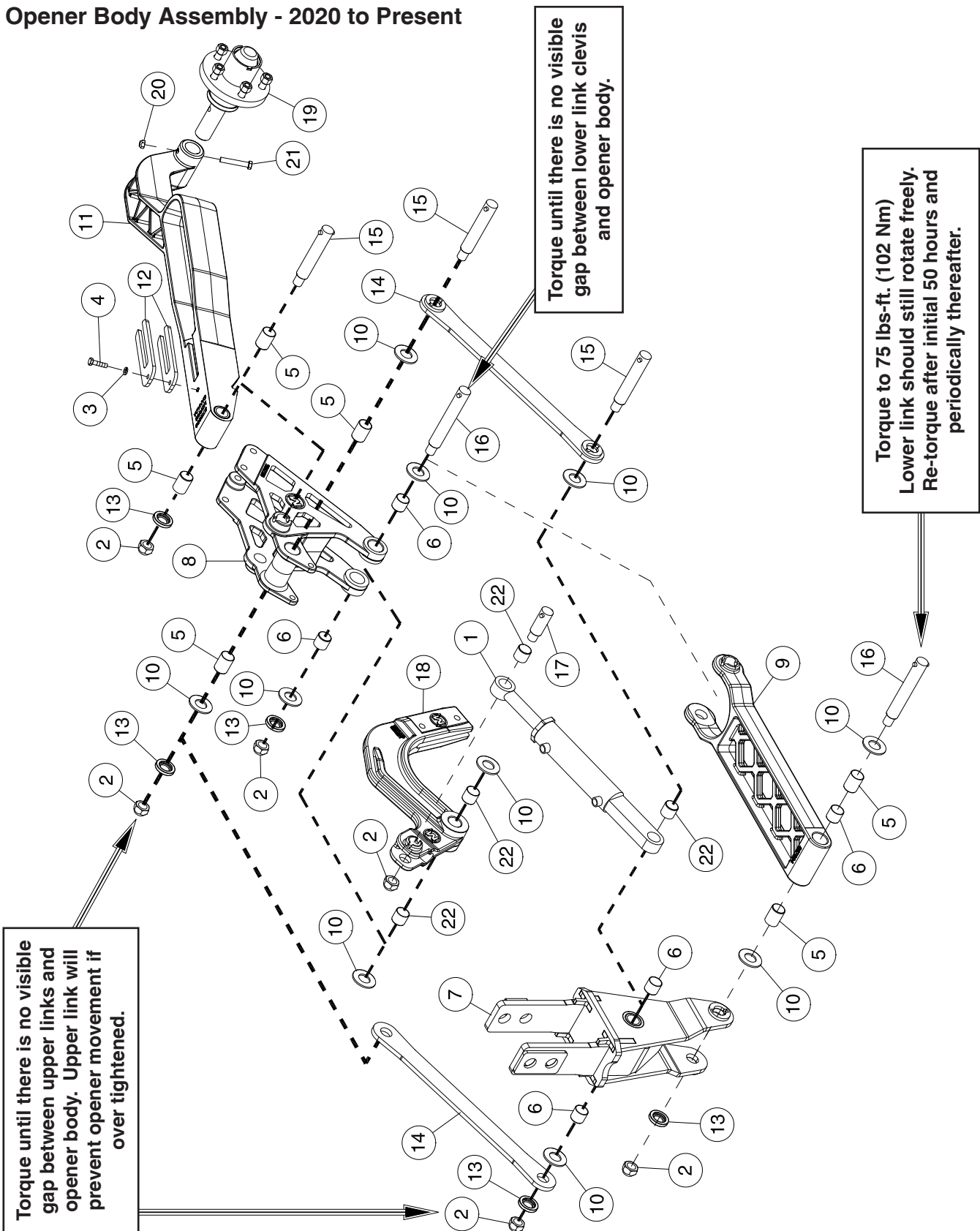
Hydraulic system must be bled after it has been serviced (if any portion of the system has been opened to atmosphere)



# Maintenance

## Opener Maintenance - Continued

### Opener Body Assembly - 2020 to Present



## Opener Maintenance - Continued

### Opener Body Assembly - 2020 to Present

Item	Part No.	Description	Qty
1	C68272	Cylinder - 1 3/4 Bore x 4 Stroke - (Includes Item 6 Qty of 2).....	1
2	D-5275	Locknut - 3/4 nylon insert.....	6
3	W-522	Lock Washer - 5/16 .....	1
4	W-472	Hex Bolt - 5/16 x 1 1/4 Lg - Torque 10 lbs-ft (14 Nm).....	1
5	S67549	Q2 Bushing - 1 ID x 1 1/4 OD x 1 1/2 Lg Nominal size.....	6
6	S59806	Q2 Bushing - 1 ID x 1 1/4 OD x 1 Lg Nominal size.....	5
7	S69360	Mounting Bracket - (Includes Item 6 Qty of 2).....	1
8	S67305	Opener Body - (Includes Item 5 Qty of 2 and Item 6 Qty 2).....	1
9	S67304	Bottom Link - (Includes Item 5 Qty of 2 and Item 6 Qty 1) .....	1
10	S69398	Washer - 1 1/32 ID x 2 OD x 1/8.....	10
11	S72060	Packer Arm - Right - (Includes Item 5 Qty of 2) - Shown .....	1
	S72065	Packer Arm - Left - (Includes Item 5 Qty of 2) .....	1
12	S66251	Shim - Depth Adjustment - 1/4 Thick.....	2
13	S72061	Washer - Step - Machined - 0.800 ID x 1.063 ID x 1 9/16 OD x 0.266 Thick.....	5
14	S65009	Top Link.....	2
15	S69573	Pin - Chrome - 1 Dia x 5 1/16 UL (Includes W21776 Roll Pin) - Torque 75 lbs-ft (102 Nm) ...	3
16	S69574	Pin - Chrome - 1 Dia x 5 23/32 UL (Includes W21776 Roll Pin) - Torque 75 lbs-ft (102 Nm) .	2
17	S69598	Pin - Chrome - 1 Dia x 1 29/32 UL (Includes W21776 Roll Pin) - Torque 75 lbs-ft (102 Nm) .	1
18	S67613	Cast Shankholder - (Includes Item 6 Qty of 2).....	1
19	S48850	Spindle Hub Assembly .....	1
20	M-3388	Locknut - 3/8 Unitorque.....	1
21	W-480	Hex Bolt - 3/8 x 2 1/2 Lg - Torque 20 lbs-ft (27 Nm) .....	1
22	S72046	EWS Bushing - 1 ID x 1 1/4 OD x 1 Lg Nominal size .....	4

**Note:** Openers should drop to the ground under their own weight, when the tractor remote is placed into float position relieving oil pressure.

If it requires pressure to push an opener down to the ground during this procedure, one or more of the pivot bolts are over tightened.

Check and adjust pivot bolts as required.

### Important

Remove all pressure from hydraulic systems before attempting any service work on hydraulic components.

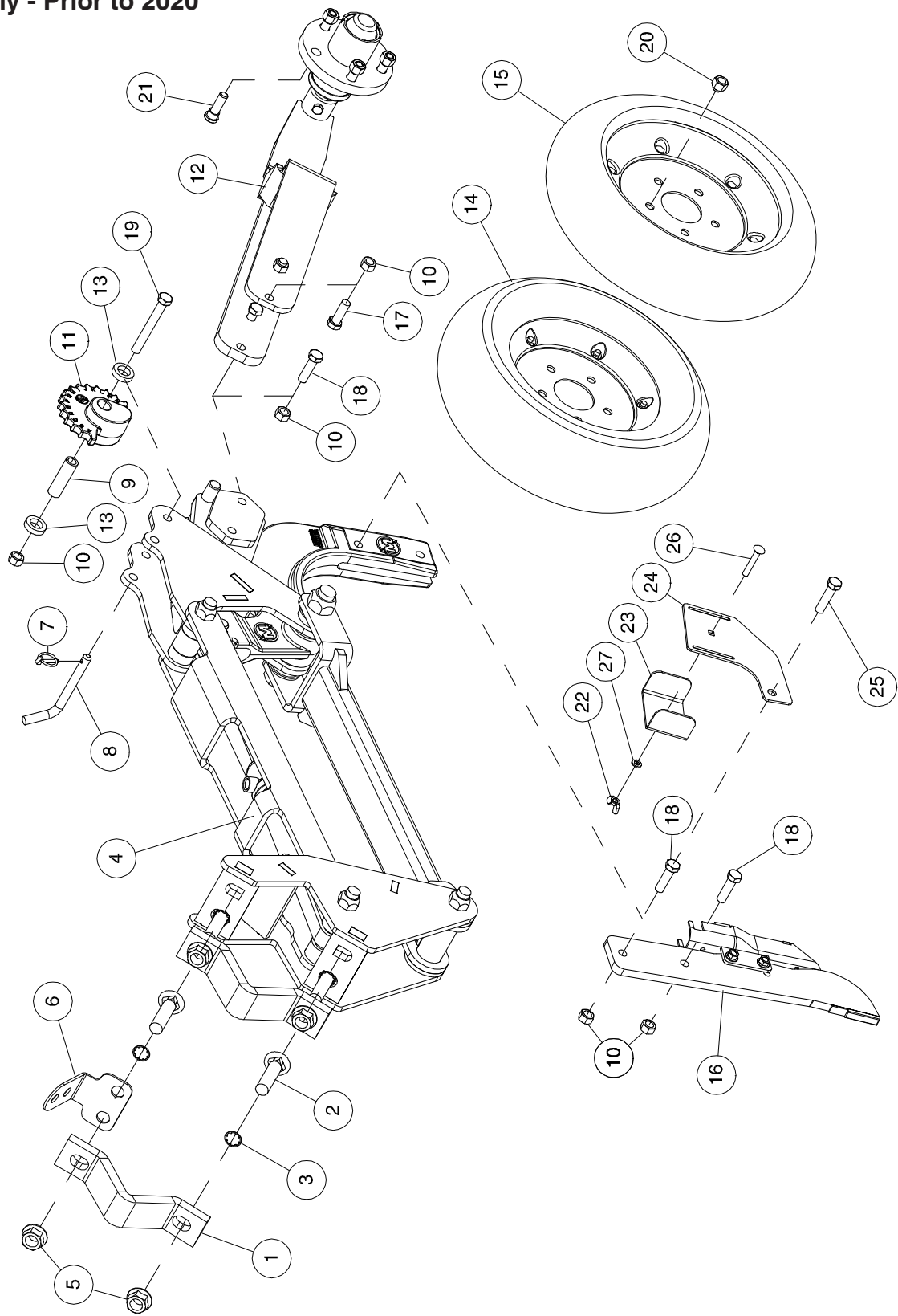
Hydraulic system must be bled after it has been serviced (if any portion of the system has been opened to atmosphere) and also on initial start-up or if spongy or irregular trip operation is occurring.

# Maintenance

## Opener Maintenance - Continued

### Opener Assembly - Prior to 2020

**Important**  
Torque Locknuts (5) to 220 ft. lbs. (298 Nm)  
Re-torque locknuts (5) after  
initial 50 hours and periodically thereafter.





## Opener Maintenance - Continued

### Opener Assembly - Prior to 2020

Item	Part No.	Description	Qty
1	C26506	Clamp Strap .....	2
2	C33957	Carriage Bolt - 3/4 x 3 Lg .....	4
3	C33958	Retaining Ring .....	4
4	S59800	Base Assembly - See Page 6-6 .....	1
5	D12942	Serrated Flange Lock Nut - 3/4 .....	4
6	S47976	Hose Holder .....	1
7	S42294	Lynch Pin - 3/16 Dia x 1/14 Lg .....	1
8	S42659	Depth Pin - 1/2 Dia x 3 1/2 UL .....	1
9	S44402	Bushing - 0.510 ID x 0.750 OD x 2 9/16 Lg.....	1
10	S47110	Center Lock Hex Nut - 1/2 .....	7
11	S49260	Depth Adjustment Cam .....	1
12	S49500	Packer Arm Assembly .....	1
13	S49516	Spacer Washer - 25/32 ID x 1 1/4 OD x 5/16 thick.....	2
14	S49520	Otico Tire - 5 1/2 .....	1
15	S49521	Otico Tire - 4 1/2.....	1
16	S49538	Single Shoot Knife .....	1
17	W-486	Hex Bolt - 1/2 x 1 1/2 Lg.....	2
18	W-487	Hex Bolt - 1/2 x 1 3/4 Lg.....	4
19	W-495	Hex Bolt - 1/2 x 4 Lg.....	1
20	S50246	Tapered Wheel Nut - 1/2-20 UNF .....	5
21	S50247	Press-In Wheel Stud - 1/2-20 UNF x 1 3/4 Lg.....	5
22	N31016	Wing Nut - 5/16 .....	1
23	S51330	Hose Holder Clamp.....	1
24	S51463	Hose Holder .....	1
25	S51464	Hex Bolt - 1/2 x 2 Lg Gr. 8.....	1
26	S51466	Carriage Bolt - 5/16 x 2 Lg .....	1
27	W-522	Lockwasher - 5/16.....	1
	S46595	Optional Secondary Hose Holder Kit - (Includes Items 22 - 27)	

## Important

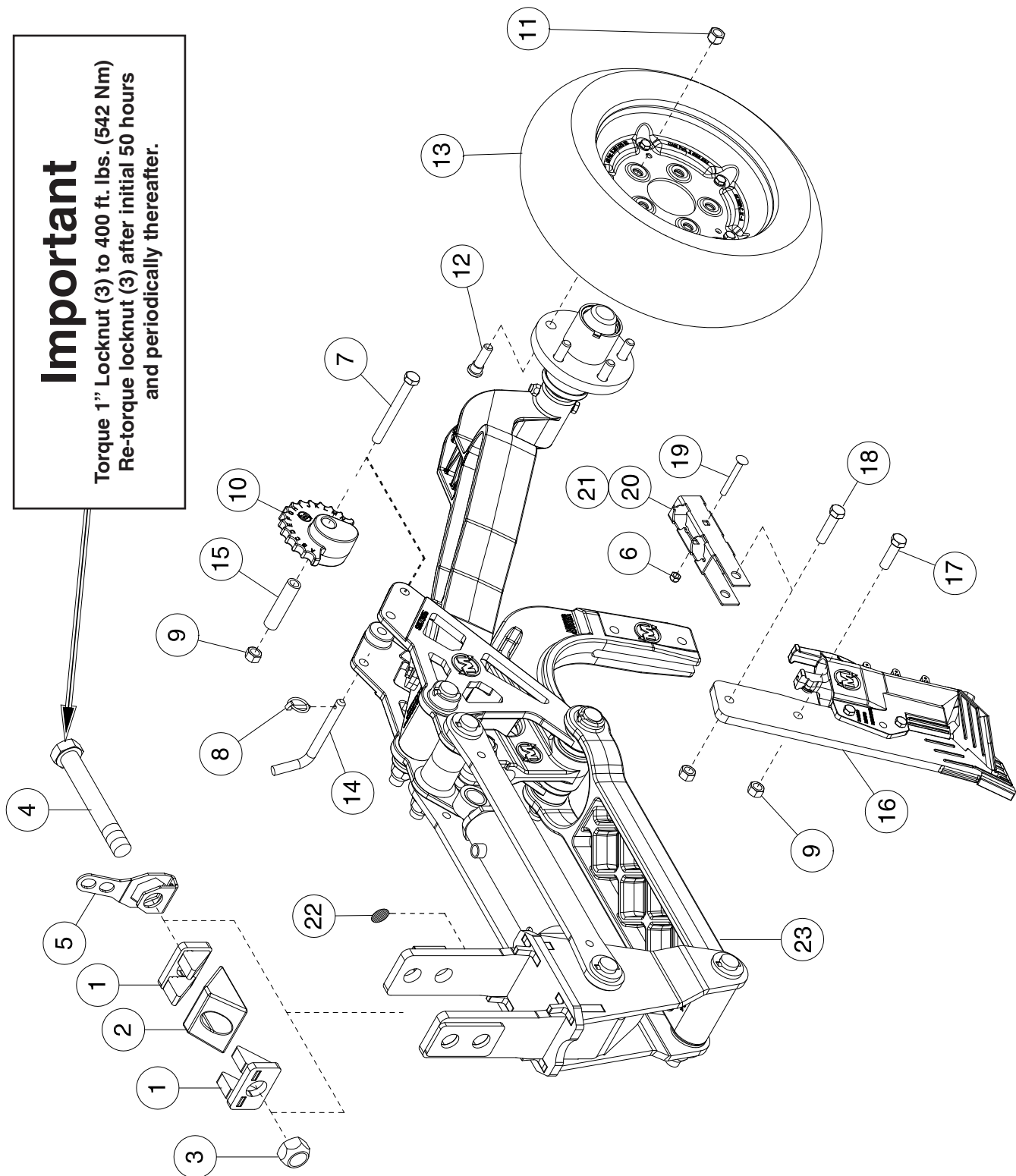
Turn “Operating” valve out to “Bleed Off/Service” position and remove all pressure from hydraulic systems before attempting any service work on hydraulic components.

Hydraulic system must be bled after it has been serviced (if any portion of the system has been opened to atmosphere)

# Maintenance

## Opener Maintenance - Continued

### Opener Assembly - 2020 to Present



## Opener Maintenance - Continued

### Opener Assembly - 2020 to Present

Item	Part No.	Description	Qty
1	S69115	Outer Wedge - Steel.....	2
2	S66337	Centre Wedge - Cast.....	1
3	D-5274	Lock Nut - 1 Unitorque .....	1
4	S42952	Hex Bolt - 1 x 6 5/8 Lg.....	1
5	S72070	Hose Holder - Opener.....	1
6	D-5272	Lock Nut - 5/16 Unitorque .....	1
7	S66403	Hex Bolt - 1/2 x 4 1/2 Lg - GR.8 .....	1
8	S42294	Lynch Pin - 3/16 Dia x 1-3/8 Lg .....	1
9	S47110	Hex Nut - 1/2 Center Lock.....	3
10	S49260	Depth Cam - Cast .....	1
11	S50246	Tapered Wheel Nut - 1/2-20UNF.....	5
12	S50247	Press-In Wheel Stud - 1/2 - 20UNF.....	5
13	*****	See "Packer Wheel Assemblies".....	1
14	S65061	Depth Pin - 1/2 Dia.....	1
15	S67944	Bushing - 0.510 ID x 0.750 OD x 1 31/32 Lg .....	1
16	*****	Shank Assembly - Refer to following pages.....	1
17	W-487	Hex Bolt - 1/2 x 1 3/4 Lg.....	1
18	S51464	Hex Bolt - 1/2 x 2 Lg - GR 8 (Hose Holder Replacement Bolt) .....	1
19	S51466	Carriage Bolt - 5/16 x 2 Lg .....	1
20	S69305	Hose Holder .....	1
21	S72297	Hose Holder Kit - Contains Items 6, 9, 18, 19 & 20.....	1
22	S66171	Openers Number Decal - 1 per machine	
		<div> <div>1</div><div>4</div><div>7</div><div>10</div><div>13</div><div>16</div><div>19</div><div>22</div><div>25</div><div>28</div><div>31</div><div>34</div><div>37</div><div>40</div><div>43</div><div>46</div><div>49</div><div>52</div><div>55</div><div>58</div><div>61</div><div>64</div><div>67</div><div>70</div><div>73</div><div>76</div><div>79</div><div>82</div><div>85</div><div>88</div> </div> <div> <div>2</div><div>5</div><div>8</div><div>11</div><div>14</div><div>17</div><div>20</div><div>23</div><div>26</div><div>29</div><div>32</div><div>35</div><div>38</div><div>41</div><div>44</div><div>47</div><div>50</div><div>53</div><div>56</div><div>59</div><div>62</div><div>65</div><div>68</div><div>71</div><div>74</div><div>77</div><div>80</div><div>83</div><div>86</div><div>89</div> </div> <div> <div>3</div><div>6</div><div>9</div><div>12</div><div>15</div><div>18</div><div>21</div><div>24</div><div>27</div><div>30</div><div>33</div><div>36</div><div>39</div><div>42</div><div>45</div><div>48</div><div>51</div><div>54</div><div>57</div><div>60</div><div>63</div><div>66</div><div>69</div><div>72</div><div>75</div><div>78</div><div>81</div><div>84</div><div>87</div><div>90</div> </div>	
23	S69368	Row Unit - Right (Includes items 7, 8, 9,10,11,12,14,15) - Shown .....	1
	S69369	Row Unit - Left (Includes items 7, 8, 9,10,11,12,14,15)	

## Important

**Remove all pressure from hydraulic systems before attempting any service work on hydraulic components.**

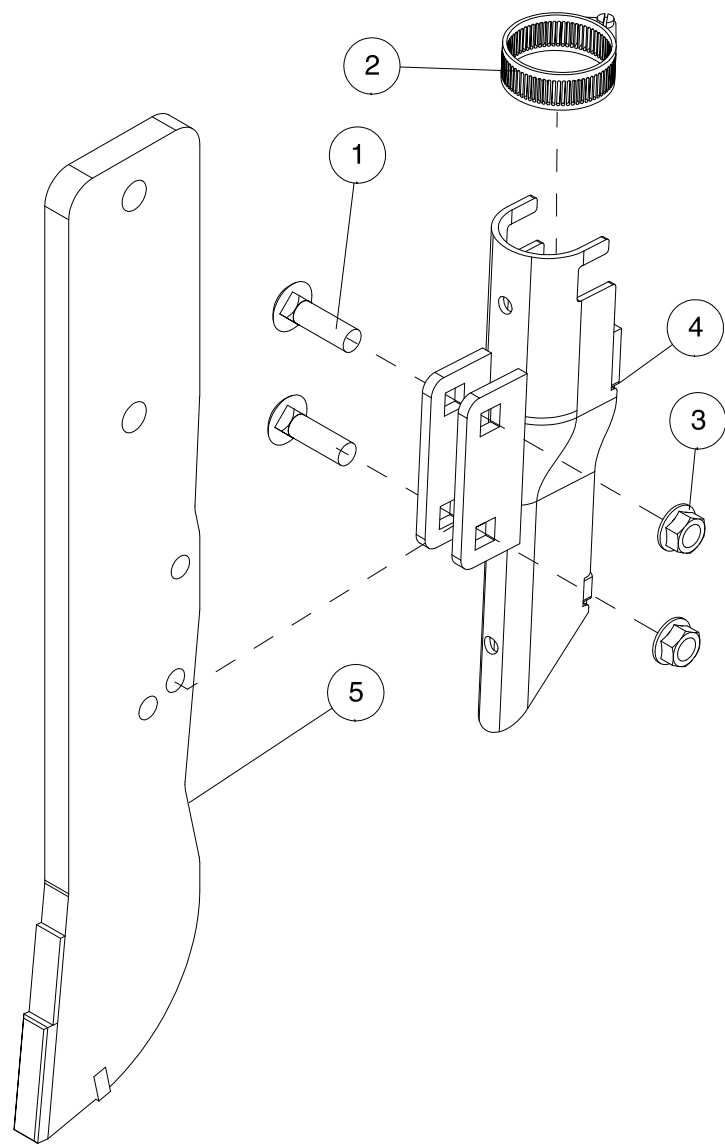
**Hydraulic system must be bled after it has been serviced (if any portion of the system has been opened to atmosphere) and also on initial start-up or if spongy or irregular trip operation is occurring.**

# Maintenance

## Opener Maintenance - Continued

### Opener Assembly - Continued

#### Single Shoot Boot

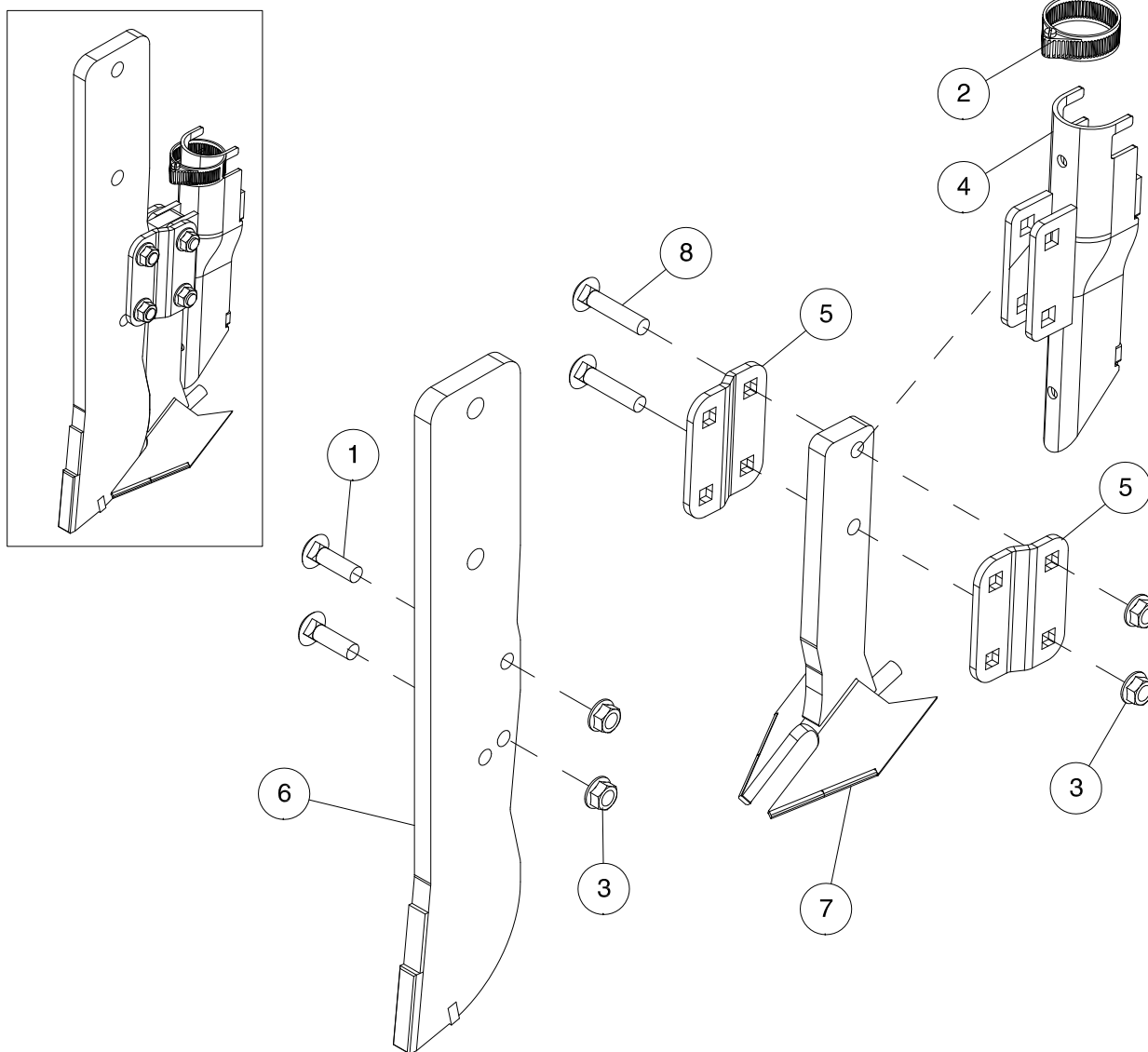


Item	Part No.	Description	Qty
1	D-5260	Carriage Bolt - 3/8 x 1-1/4 Lg .....	2
2	N11470	Hose Clamp .....	1
3	S27987	Center Lock Flange Lock Nut - 3/8 .....	2
4	S42865	Single Shoot Boot .....	1
5	S72310	CP Shank.....	1

## Opener Maintenance - Continued

### Opener Assembly - Continued

#### Single Shoot Boot - 3" Spread



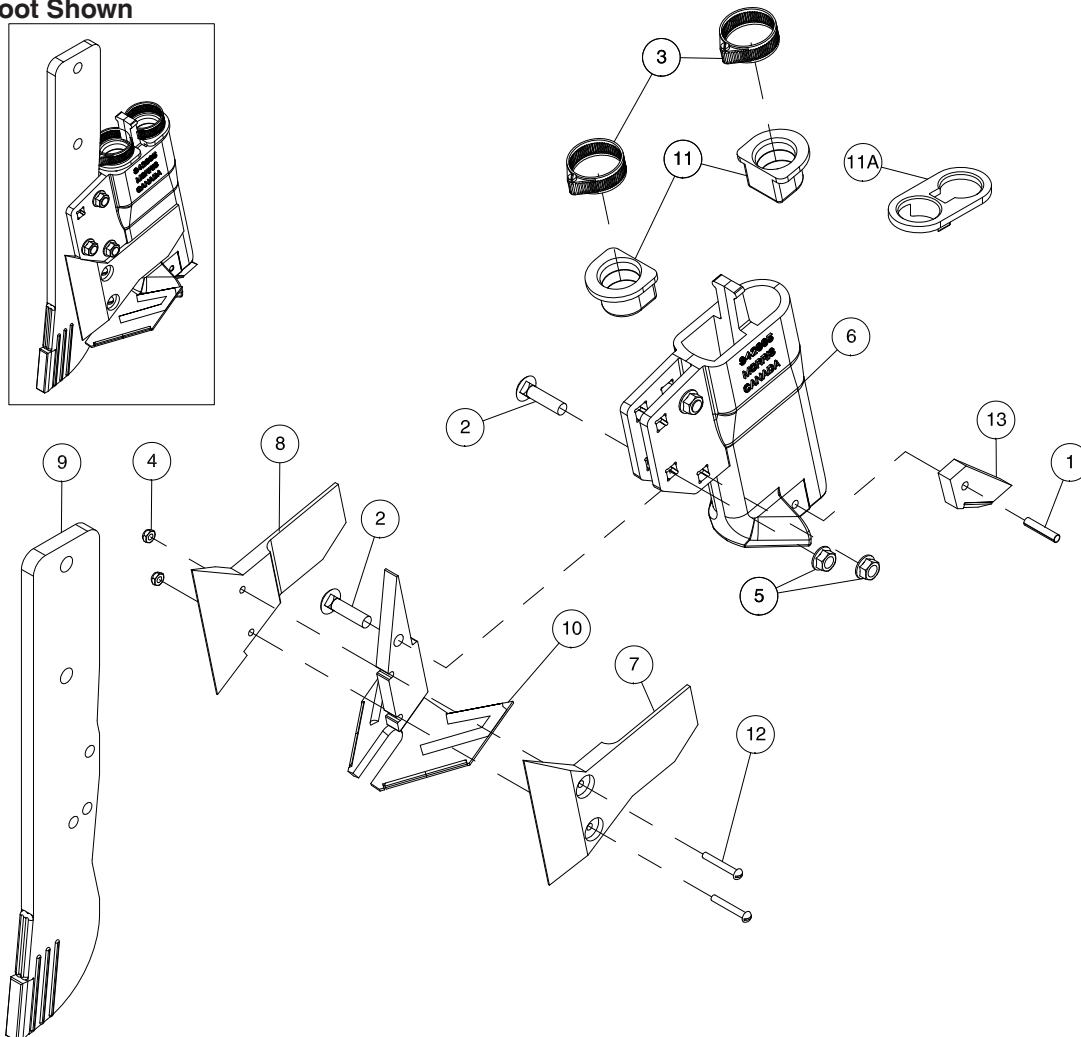
Item	Part No.	Description	Qty
1	D-5260	Carriage Bolt - 3/8 x 1-1/4 Lg .....	2
2	N11470	Hose Clamp .....	1
3	S27987	Center Lock Flange Lock Nut - 3/8 .....	4
4	S42865	Single Shoot Boot .....	1
5	S45269	Mounting Plate .....	2
6	S72310	CP Shank.....	1
7	S47337	3" Wear Shovel .....	1
8	S31980	Carriage Bolt - 3/8 x 1-3/4 Lg .....	2

# Maintenance

## Opener Maintenance - Continued

### Opener Assembly - Continued

Double Shoot Boot Shown

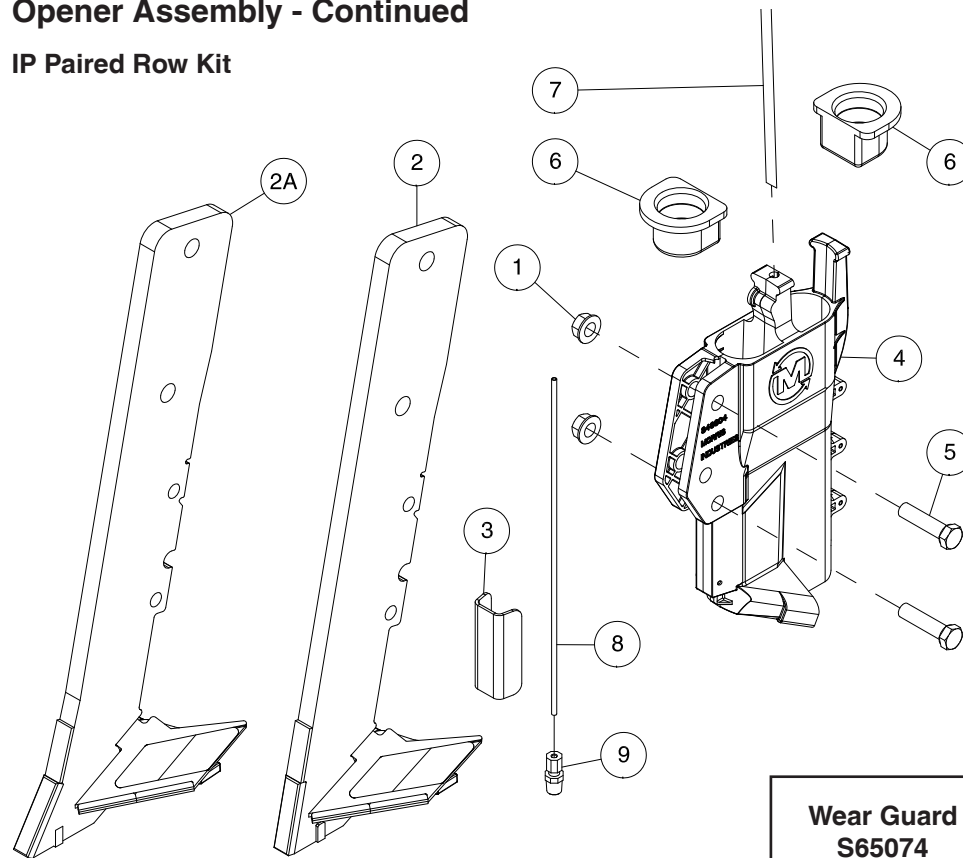


Item	Part No.	Description	Qty
1	D-5243	Roll Pin.....	1
2	D-5261	Carriage Bolt - 3/8 x 1-1/2 Lg .....	3
3	N11470	Hose Clamp .....	2
4	N37787	Nylon Insert Locknut - #10-24 .....	2
5	S27987	Center Lock Flange Lock Nut - 3/8 .....	3
6	S42965	Cast Double Shoot Boot .....	1
7	S45312	Mud Guard Option Left.....	1
8	S45313	Mud Guard Option Right .....	1
9	S72310	CP Shank.....	1
10	S45470	Paired Row Shovel .....	1
11	S47076	Secondary Hose Grommet Option - 15/16 ID Hose .....	2
11A	S50245	Secondary Hose Grommet Option - 1.125 ID Hose .....	
12	S47128	Machine Screw - #10-24 x 1 3/8.....	2
13	S47980	Carbide Wear Tail.....	1
	S46181	Kit - Mud Guards (Includes Items 4, 7, 8, and 12)	

## Opener Maintenance - Continued

### Opener Assembly - Continued

#### IP Paired Row Kit

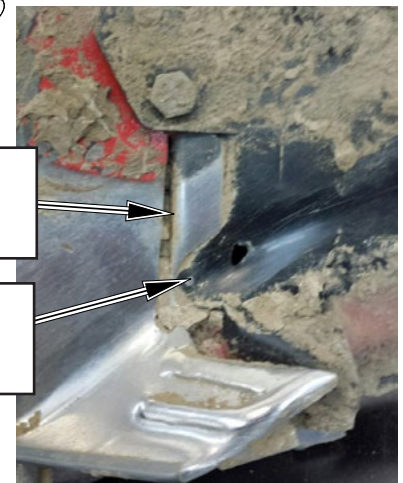


### Important

Check Wear Guards regularly and replaced before the IP Boot is damaged.

Wear Guard  
S65074

Damage to  
IP Boot



#### Abbreviations:

IP - Injected Polymer  
LD - Low Disturbance  
HP - High Penetration  
SC - Shield Core

Item	Part No.	Description	Qty
1	S27987	Lock Nut - 3/8 Flange W/Center Lock .....	2
2	S72185	CP Shank - Paired Row LD .....	1
2A	S72306	CP Shank - Paired Row HP .....	1
3	S72328	Wear Guard - 316L.....	1
4	S56485	IP Paired Row Seed Boot.....	1
5	W-477	Hex Bolt - 3/8 x 1 1/2 Lg.....	2
6	S47076	Secondary Hose Grommet .....	2
7	*****	Liquid Tube - 1/4 OD - See Liquid Kit Supplier for Tube.....	1
8	*****	Injector Tube - 1/8 OD - See NH3 Kit Supplier for Tube .....	1
9	S48814	Compression Fitting - 1/8 x 1/8 .....	1
	S72321	Kit: CP Paired Row IP - LD (Contains Items 1, 2, 3, 4 & 5)	
	S72322	Kit: CP Paired Row IP - HP (Contains Items 1, 2A, 3, 4 & 5)	

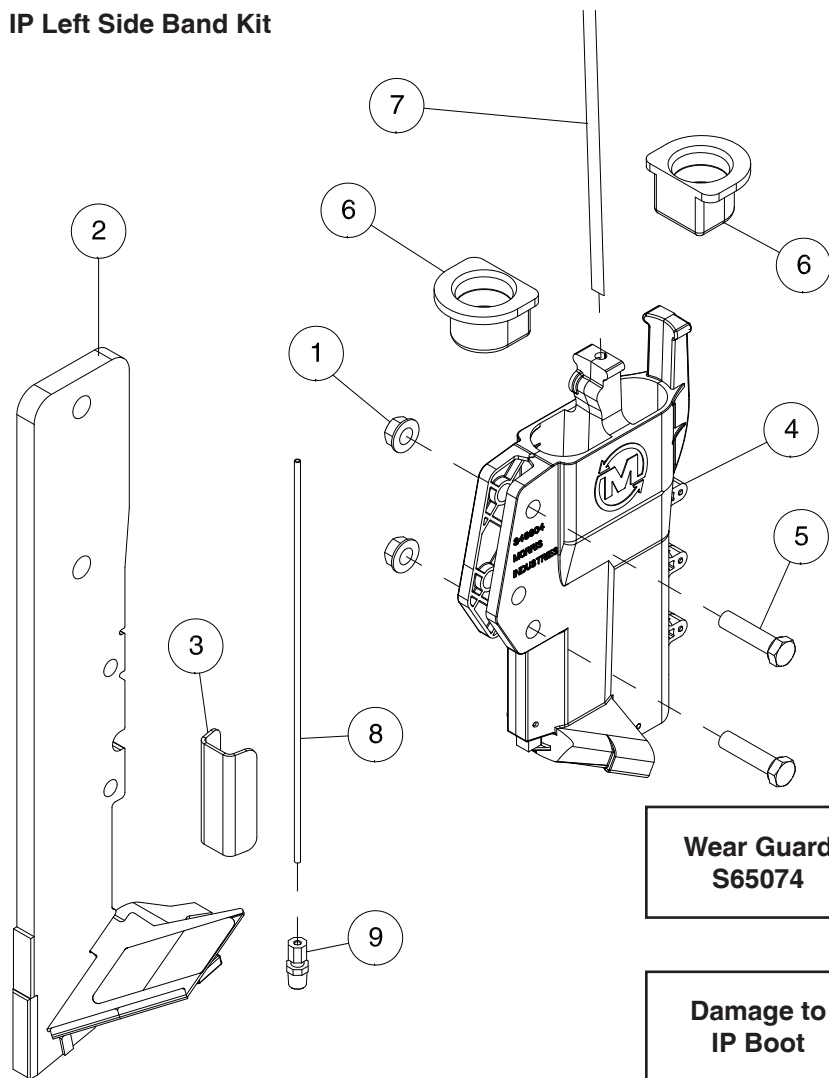


# Maintenance

## Opener Maintenance - Continued

### Opener Assembly - Continued

#### IP Left Side Band Kit



### Important

Check Wear Guards regularly and replaced before the IP Boot is damaged.



Mount the side band openers with the deflector and seed tube facing the center of the Air Drill.

Item	Part No.	Description	Qty
1	S27987	Lock Nut - 3/8 Flange W/Center Lock .....	2
2	S72309	CP Shank - Sideband Left LD .....	1
3	S72328	Wear Guard - 316L .....	1
4	S56482	IP (Injected Polymer) Left Sideband Seed Boot .....	1
5	W-477	Hex Bolt - 3/8 x 1 1/2 Lg. ....	2
6	S47076	Secondary Hose Grommet .....	2
7	*****	Liquid Tube - 1/4 OD - See Liquid Kit Supplier for Tube .....	1
8	*****	Injector Tube - 1/8 OD - See NH3 Kit Supplier for Tube .....	1
9	S48814	Compression Fitting - 1/8 x 1/8 .....	1
	S72324	CP Sideband Boot Kit - Left IP - LD (Contains Items 1, 2, 3, 4 & 5) .....	1

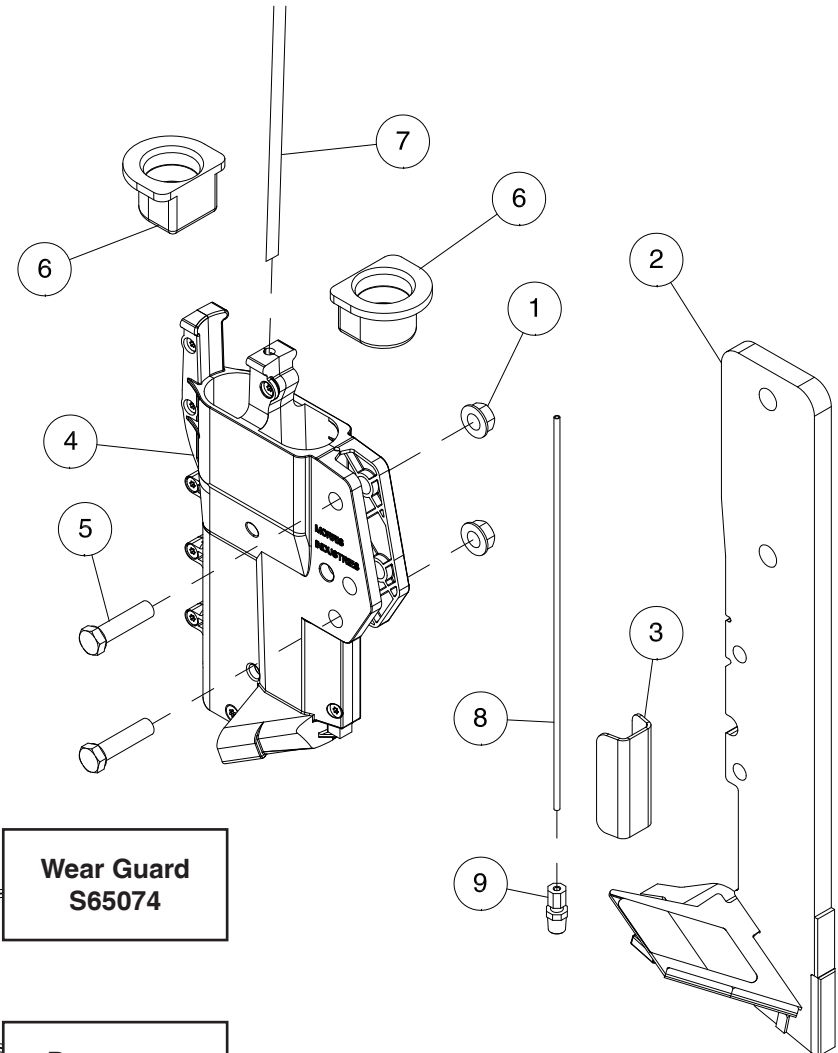
## Opener Maintenance - Continued

### Opener Assembly - Continued

#### IP Right Side Band Kit

### Important

Check Wear Guards regularly and replaced before the IP Boot is damaged.



Wear Guard  
S65074

Damage to  
IP Boot

Mount the side band openers with the deflector and seed tube facing the center of the Air Drill.

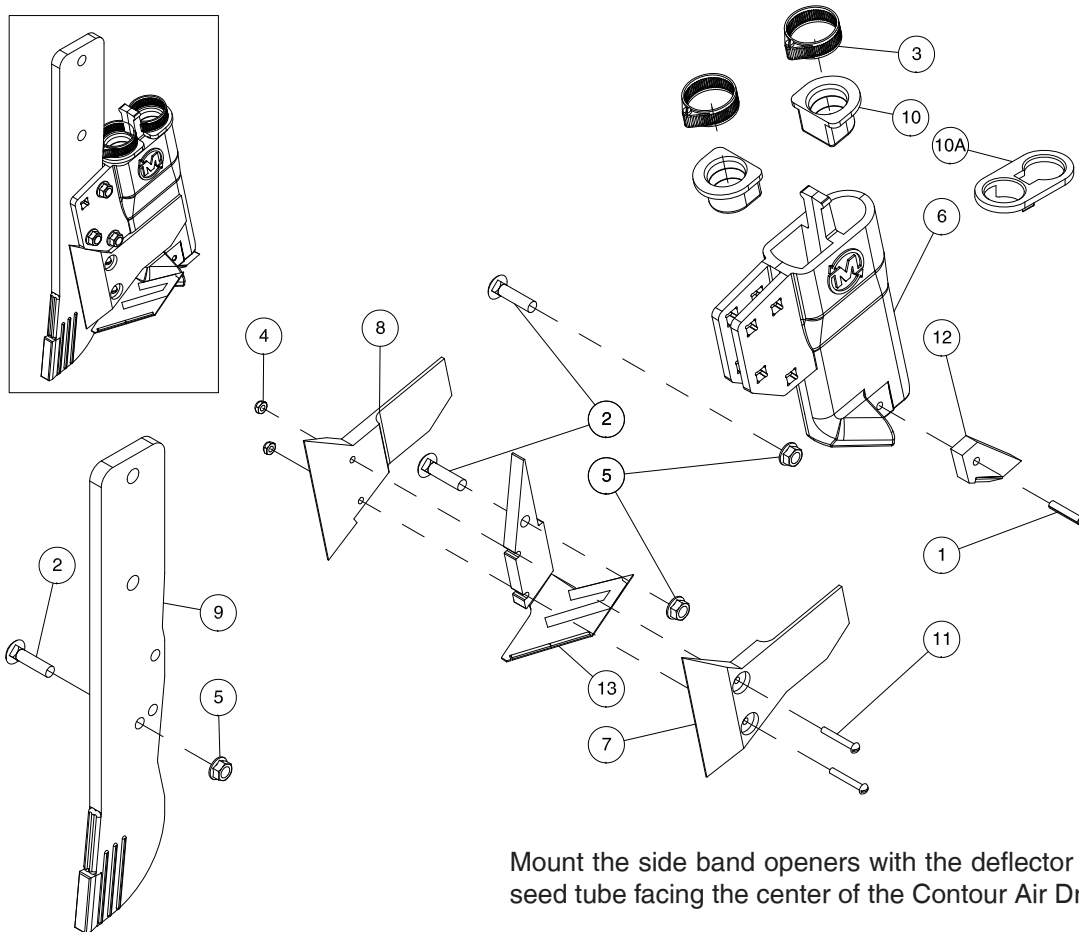
Item	Part No.	Description	Qty
1	S27987	Lock Nut - 3/8 Flange W/Center Lock .....	2
2	S72308	CP Shank - Sideband Right LD .....	1
3	S72328	Wear Guard - 316L.....	1
4	S56483	IP (Injected Polymer) Right Sideband Seed Boot .....	1
5	W-477	Hex Bolt - 3/8 x 1 1/2 Lg.....	2
6	S47076	Secondary Hose Grommet .....	2
7	*****	Liquid Tube - 1/4 OD - See Liquid Kit Supplier for Tube.....	1
8	*****	Injector Tube - 1/8 OD - See NH3 Kit Supplier for Tube .....	1
9	S48814	Compression Fitting - 1/8 x 1/8 .....	1
	S72323	CP Sideband Boot Kit - Right IP - LD- (Contains Items 1, 2, 3, 4 & 5).....	1

# Maintenance

## Opener Maintenance - Continued

### Opener Assembly - Continued

#### Side Band Boot - Left Shown



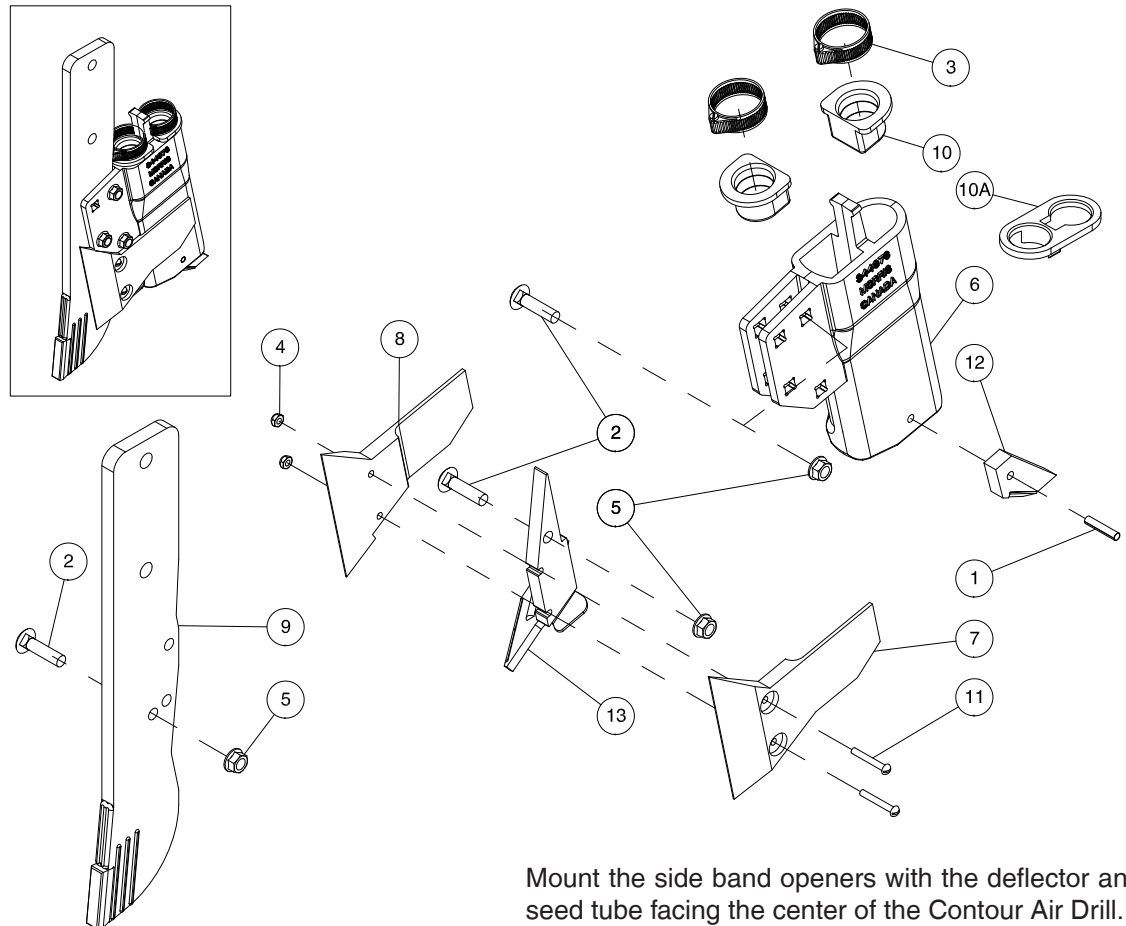
Mount the side band openers with the deflector and seed tube facing the center of the Contour Air Drill.

Item	Part No.	Description	Qty
1	D-5243	Roll Pin.....	1
2	D-5261	Carriage Bolt - 3/8 x 1-1/2 Lg .....	3
3	N11470	Hose Clamp .....	2
4	N37787	Nylon Insert Locknut - #10-24 .....	2
5	S27987	Center Lock Flange Lock Nut - 3/8 .....	3
6	S44977	Cast Double Shoot Boot - Side Band - Left.....	1
6A	S51469	Cast Double Shoot Boot - Side Band - Left - Carbide	
7	S45312	Mud Guard Option Left.....	1
8	S45313	Mud Guard Option Right .....	1
9	S72310	CP Shank.....	1
10	S47076	Secondary Hose Grommet - Option - 15/16 ID Hose .....	2
10A	S50245	Secondary Hose Grommet - Option - 1.125 ID Hose	
11	S47128	Machine Screw - #10-24 x 1-3/8.....	2
12	S47980	Carbide Wear Tail.....	1
13	S49536	Side Band Shovel.....	1
	S46181	Kit - Mud Guards (Includes Items 4, 7, 8, and 11)	

## Opener Maintenance - Continued

### Opener Assembly - Continued

#### Side Band Boot - Right Shown



Mount the side band openers with the deflector and seed tube facing the center of the Contour Air Drill.

Item	Part No.	Description	Qty
1	D-5243	Roll Pin - 1/4 x 1 1/4 Lg.....	1
2	D-5261	Carriage Bolt - 3/8 x 1-1/2 Lg .....	3
3	N11470	Hose Clamp .....	2
4	N37787	Nylon Insert Locknut - #10-24 .....	2
5	S27987	Center Lock Flange Lock Nut - 3/8 .....	3
6	S44976	Cast Double Shoot Boot - Side Band - Right .....	1
6A	S51470	Cast Double Shoot Boot - Side Band - Right - <b>Carbide</b>	
7	S45312	Mud Guard Option Left.....	1
8	S45313	Mud Guard Option Right .....	1
9	S72310	CP Shank.....	1
10	S47076	Secondary Hose Grommet - Option - 15/16 ID Hose .....	2
10A	S50245	Secondary Hose Grommet - Option- 1.125 ID Hose	
11	S47128	Machine Screw - #10-24 x 1-3/8.....	2
12	S47980	Carbide Wear Tail.....	1
13	S49537	Side Band Shovel - Right.....	1
	S46181	Kit - Mud Guards (Includes Items 4, 7, 8, and 11)	

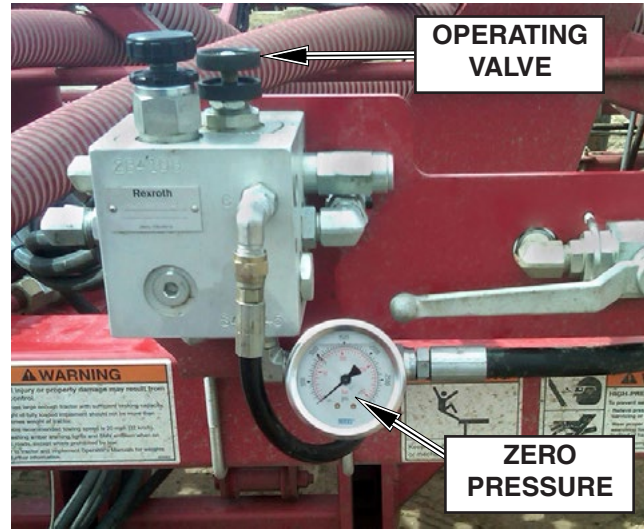
# Maintenance

## Opener Maintenance - Continued

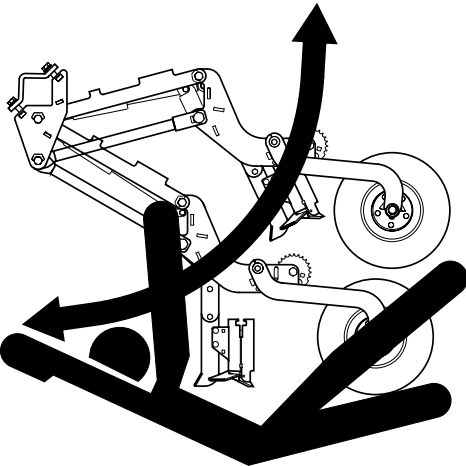
### Shank Replacement

In the event a shank needs replacing, use the following procedure.

- Turn "Operating" valve out to bleed off/service position and **relieve all pressure** from the accumulator circuit by placing the tractor remote in "float" position.
- Shut tractor engine off and ensure park brake is engaged before proceeding.
- Place "Openers" ball valve into locked position to prevent accidental oil flow to openers.
- Once the pressure is off of the accumulator circuit, remove retaining bolts from shank holder. See diagram on previous page.
- Remove shank from shank holder.
- Remove opener from shank.
- Reverse above procedure to reassemble.



Pressure Gauge



S44446

## ! WARNING

### CRUSHING HAZARD

To prevent serious injury or death:

- **STAND CLEAR** - openers move rapidly under hydraulic pressure.
- **Before servicing hydraulics** - Place "System" valve in service position and relieve pressure from hydraulic system.
- **Shut tractor off** and remove key before servicing or adjusting depth.
- **Place "Openers" valve in locked position** before adjusting depth or transporting.

## Opener Maintenance - Continued

### Bleeding Hydraulic System

If hydraulic system has been serviced air will need to be bleed out of system as follows:

To bleed hydraulic system of air:

- Lift openers up and lock tractor remote in lift position.
- With tractor hydraulics operating, open bleed-off ball valves on end of drill wings.
- Allow oil to cycle for a few minutes then change direction of tractor remote to lower openers and cycle for a few more minutes.
- Close bleed-off ball valves and lift openers up.
- Repeat above procedure for a second time.
- Close bleed-off ball valves and lift openers up.
- Lock “Openers” valve and check to see that openers stay firmly in position.
- If openers are spongy repeat procedure until air is gone.

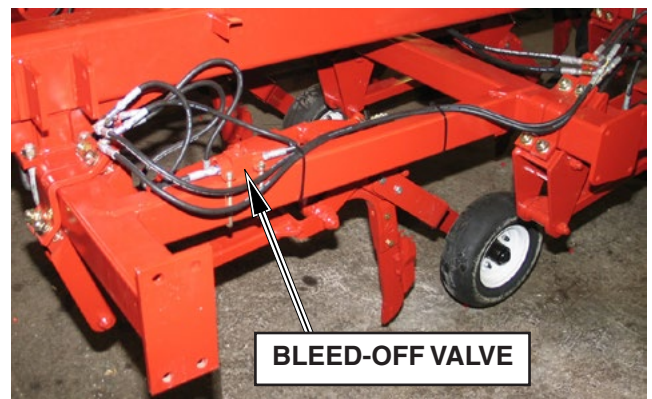
### Warning



#### HIGH-PRESSURE FLUID HAZARD

To prevent serious injury or death:

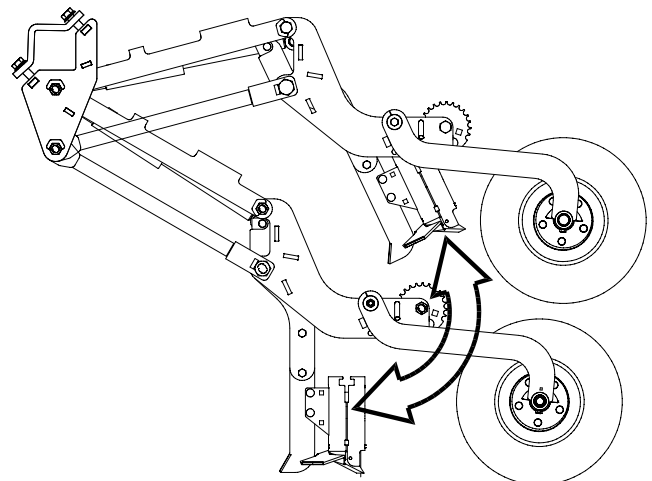
- Relieve pressure on hydraulic system before servicing or disconnecting hoses.
- Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.
- Keep all components in good repair.



### Important

Turn “Operating” valve out to “Bleed Off/Service” position and remove all pressure from hydraulic systems before attempting any service work on hydraulic components.

Hydraulic system must be bled after it has been serviced (if any portion of the system has been opened to atmosphere)





# Maintenance

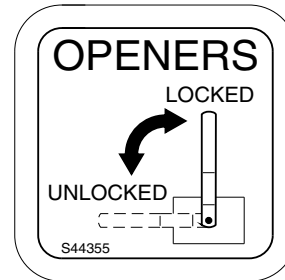
## Opener Maintenance - Continued

### Hydraulic System Trouble Shooting

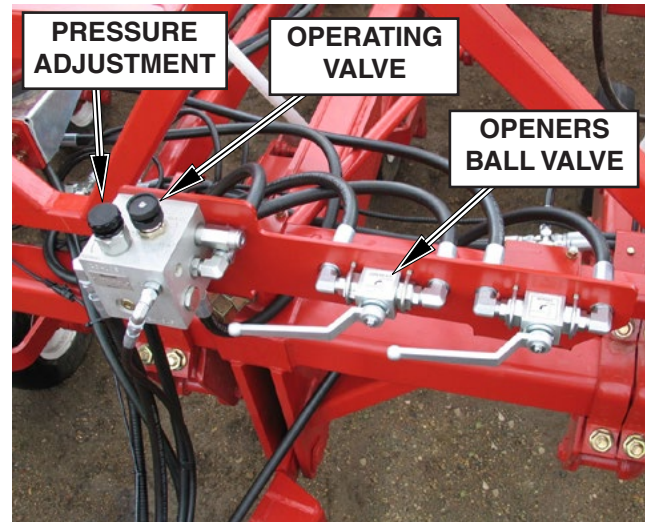
If pressure can not be maintained in the hydraulic system, or openers drop rapidly from transport position, a leaky hydraulic cylinder (bypassing oil across the piston seal) may be present. To locate a hydraulic leak in the Contour Air Drill hydraulic system, the following procedure can be used:

1. Remove pressure from the hydraulic system.
2. Check the drill frame and hoses to make sure that the leak is not external (leaking oil out of the circuit).
3. Lift the contour openers into their raised position.
4. Lock the hydraulic ball valve marked "OPENERS".
5. Watch the openers carefully across the drill and locate the first opener(s) to visibly drop down from the raised position (NOTE: This is the general area of the leaking cylinder, but the first opener to drop is not always the leaking cylinder.).
6. Unlock the "OPENERS" hydraulic ball valve and lift the openers to the raised position and lock the hydraulic remote in the raised position to apply flow to the circuit for about five minutes.
7. Let the hydraulic remote go back to neutral, shut off the tractor, and then go and check the temperature of the opener cylinders by feeling the cylinder barrels. Start at the group of cylinders that were located in step 5) and then work from the outer openers in to center until a "hot" cylinder is located.
8. Under normal conditions the cylinders should remain cool (ambient temperature or slightly above); the opener with a "hot" cylinder barrel has the leaky seal and should be serviced or replaced.

**NOTE: All hydraulic cylinders have a natural leakage rate. The openers on the contour drill will drop over a long period of time during storage; this is normal. Only check for leaky cylinders if accumulator system pressure drops rapidly during operation or openers drop rapidly from transport in a short period of time.**



DECAL - S44355



Valve Locations



## Hydraulics

Refer to Section 1 regarding hydraulic safety. In addition:

- Inspect hydraulic system for leaks, damaged hoses and loose fittings.
- Damaged hoses and hydraulic tubing can only be repaired by replacement. **DO NOT ATTEMPT REPAIRS WITH TAPE OR CEMENTS.** High pressure will burst such repairs and cause system failure and possible injury.
- Always place “Operating” valve into service position and relieve hydraulic pressure from the system before performing maintenance or repairs.

**Note: Accumulator can store pressure even when disconnected from tractor.**

- Leaking cylinders - install a new seal kit.
- Fittings - use liquid Teflon on all NPT hydraulic joints. **Do not use liquid Teflon or Teflon tape on JIC or ORB ends.**
- Hydraulic Hose Connections - when connecting the hoses to the cylinders, tubing, etc. always use one wrench to keep the hose from twisting and another wrench to tighten the union. Excessive twisting will shorten hose life.
- Keep fittings and couplers clean.
- Check the Tractor Manual for proper filter replacement schedule.

Refer to the Trouble Shooting Section.



Contact your nearest Dealer for genuine repair parts. Dealers carry ample stocks and are backed by the manufacture and regional associations.

### **Caution**

**Dirt in the hydraulic system could damage O-rings, causing leakage, pressure loss and total system failure.**

**Note: Extreme care must be taken to maintain a clean hydraulic system. Use only new hydraulic fluid when filling reservoir.**



### **Warning**

#### **HIGH-PRESSURE FLUID HAZARD**

**To prevent serious injury or death:**

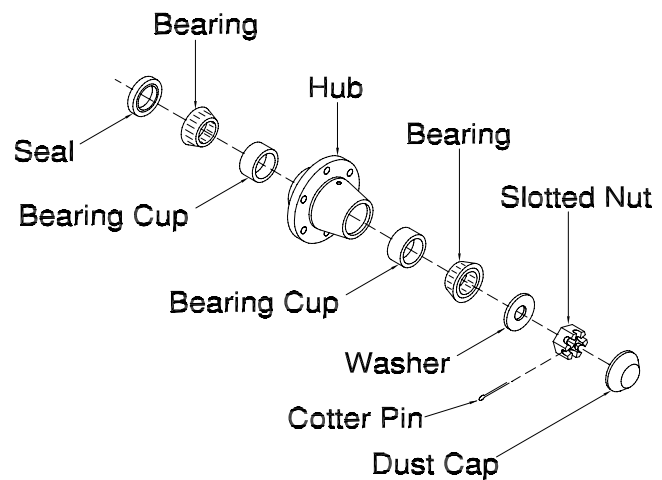
- Relieve pressure on hydraulic system before servicing or disconnecting hoses.
- Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.
- Keep all components in good repair.

# Maintenance

## Wheel Bearings

### Implement Hub

- Position implement in field position.
- Shut tractor off, remove key, and engage park brake.
- Block wheel on tractor.
- Raise the implement wheel enough to clear the surface.
- Securely block implement frame.
- Remove wheel from hub.
- Remove the dust cap, cotter pin, and the slotted nut and washer.
- Be careful when pulling the hub off as not to drop the outer bearing.
- Clean spindle and bearing components with solvent.
- Inspect for wear on bearings, spindle and cups, replace parts as required.
- Do not reuse old seals. Use only new seals when assembling.
- Pack inner hub with bearing grease.
- Be sure bearing and cup are dry and clean.
- Work grease into the bearing rollers, until each part of the bearing is completely full of grease.
- Install inner bearing and cup first, then press new seals in place.
- Place hub on spindle.
- Install outer bearing, washer and slotted nut.
- Tighten nut while turning the wheel until a slight drag is felt.
- Back nut off one slot and install a cotter pin. Bend cotter pin up around nut.
- Pack grease inside the dust cap and tap into position.



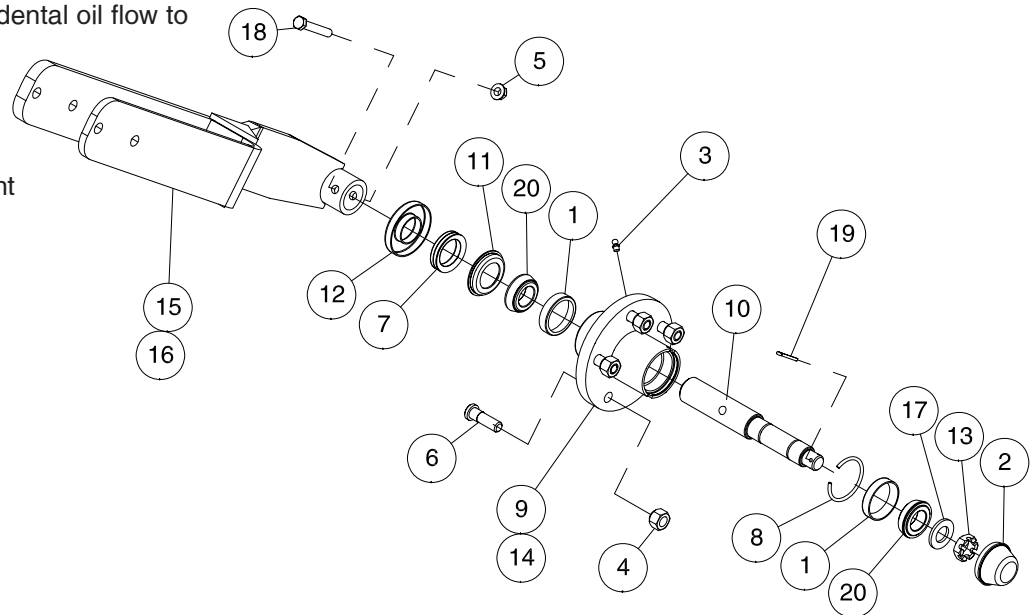
## Important

Check wheel bearings for play every  
5,000 acres (2,000 hectares)  
or yearly, which ever occurs first.  
Tighten as required.

## Wheel Bearings - Continued

### Opener Hub - Prior to 2020

- Position implement in field position.
- Move “System” ball valve to service position and **relieve all pressure** from the accumulator circuit using the tractor remote.
- Shut tractor engine off and remove key. Engage park brake before proceeding.
- Place “Openers” ball valve into locked position to prevent accidental oil flow to openers.
- Follow procedure for hub removal and bearing replacement outlined under “Implement Hub”.



## Important

Check wheel bearings for play every  
5,000 acres (2,000 hectares)  
or yearly, which ever occurs first.  
Tighten as required.

Item	Part No.	Description	Qty
1	N14009	Bearing Cup .....	2
2	N14011	Dust Cap .....	1
3	S-752	Grease Zerk - 1/4 .....	1
4	S50246	Tapered Wheel Nut - 1/2-20 UNF .....	5
5	S27987	Center Lock Flange Lock Nut - 3/8.....	1
6	S50247	Press-In Wheel Stud - 1/2-20 UNF .....	5
7	S48842	V-Seal - 1-1/4 Shaft .....	1
8	S48843	Dust Cap Retaining Wire .....	1
9	S48844	Hub Casting - 1000 Lb - 5 Bolt .....	1
10	S48846	Spindle - 1-1/4 Dia.....	1
11	S48847	Seal Counterface.....	1
12	S48848	Seal Retainer.....	1
13	S48849	Slotted Jam Nut - 3/4.....	1
14	S48850	Packer Hub Assy .....	1
15	*****	Packer Arm - Prior to 2020 shown .....	1
16	*****	Packer Arm Sub-Assy.....	1
17	W-476	Flat Washer - 3/4 .....	1
18	W-479	Hex Bolt - 3/8 x 2 1/4 Lg.....	1
19	W-529	Cotter Pin - 1/8 x 1 Lg.....	1
20	W-4187	Bearing Cone .....	2

# Maintenance

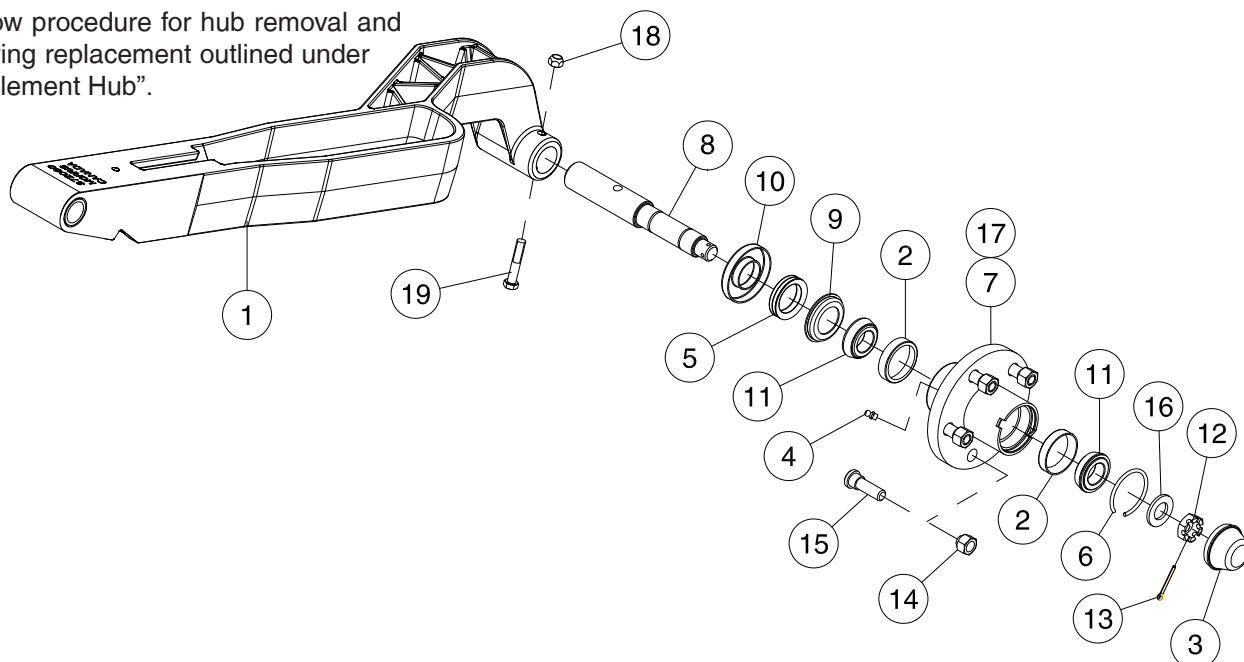
## Wheel Bearings - Continued

### Opener Hub - 2020 to Present

- Position implement in field position.
- **Relieve all pressure** from the opener circuit using the tractor remote.
- Shut tractor engine off and remove key. Engage park brake before proceeding.
- Place “Openers” ball valve into locked position to prevent accidental oil flow to openers.
- Follow procedure for hub removal and bearing replacement outlined under “Implement Hub”.

### Important

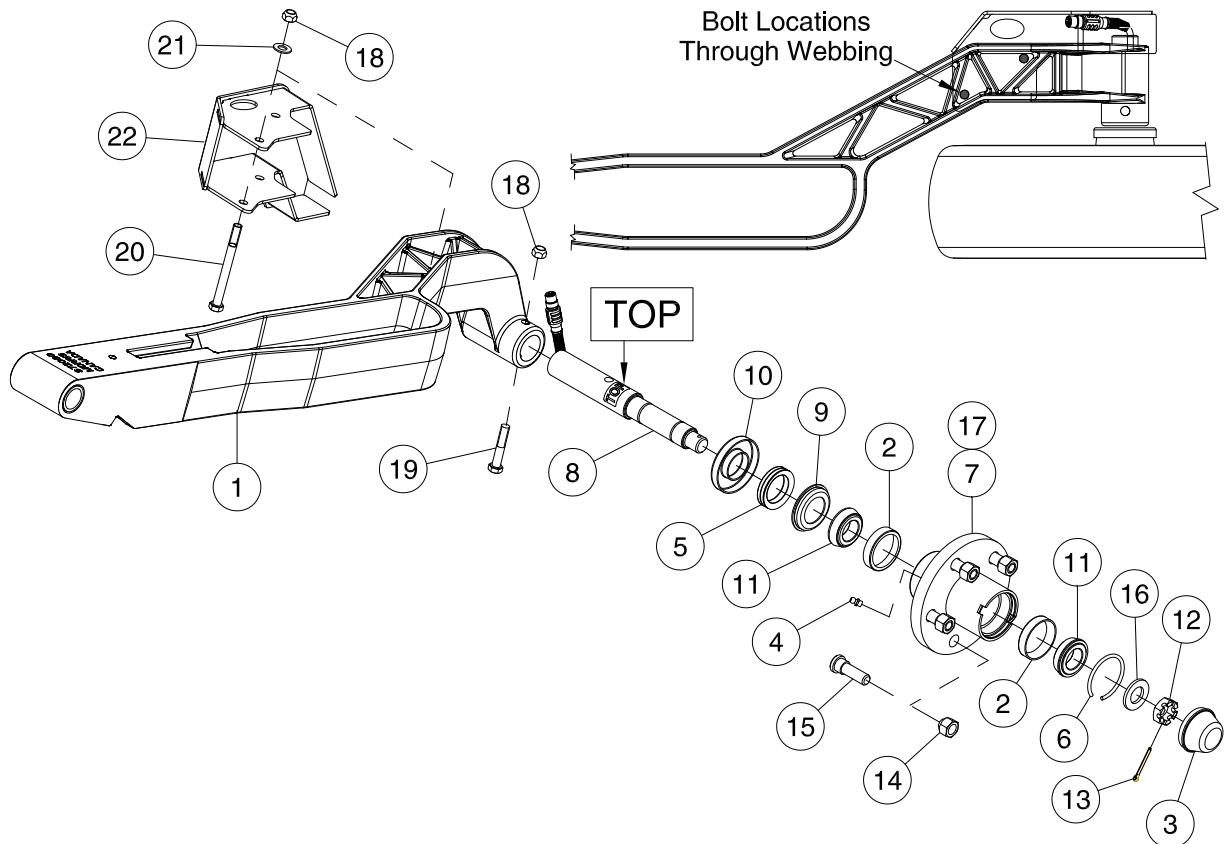
**Check wheel bearings for play every  
5,000 acres (2,000 hectares)  
or yearly, which ever occurs first.  
Tighten as required.**



Item	Part No.	Description	Qty
1	S72060	Packer Arm - Right - Shown .....	1
	S72065	Packer Arm - Left .....	1
2	N14009	Bearing Cup .....	2
3	N14011	Dust Cap .....	1
4	S-752	Grease Zerk - 1/4 .....	1
5	S48842	V-Seal - 1 1/4 Shaft .....	1
6	S48843	Dust Cap Retaining Wire .....	1
7	S48844	Hub Casting - 1000 Lb - 5 Bolt .....	1
8	S48846	Spindle - 1-1/4 Dia .....	1
9	S48847	Seal Counterface .....	1
10	S48848	Seal Retainer .....	1
11	W-4187	Bearing Cone .....	2
12	S48849	Slotted Jam Nut - 3/4 .....	1
13	W-529	Cotter Pin - 1/8 x 1 Lg .....	1
14	S50246	Tapered Wheel Nut - 1/2 .....	5
15	S50247	Press-In Wheel Stud - 1/2 .....	5
16	W-476	Washer - 3/4 .....	1
17	S48850	Packer Hub Assembly (Includes Items# 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 & 16) .	1
18	M-3388	Lock Nut - 3/8 Unitorque .....	1
19	W-480	Hex Bolt - 3/8 x 2 1/2 Lg .....	1

## Wheel Bearings - Continued

### Pack Control Hub - 2020 to Present



Item	Part No.	Description	Qty
1	S72060	Packer Arm - Right .....	1
	<b>S72292</b>	<b>Pack Force Spindle and Guard Kit. (Includes ALL Items below)</b>	
2	N14009	Bearing Cup .....	2
3	N14011	Dust Cap .....	1
4	S-752	Grease Zerk - 1/4 .....	1
5	S48842	V-Seal - 1 1/4 Shaft .....	1
6	S48843	Dust Cap Retaining Wire .....	1
7	S48844	Hub Casting - 1000 Lb - 5 Bolt .....	1
8	S72200	Spindle - 1-1/4 Dia - Digi-Star .....	1
9	S48847	Seal Counterface .....	1
10	S48848	Seal Retainer .....	1
11	W-4187	Bearing Cone .....	2
12	S48849	Slotted Jam Nut - 3/4 .....	1
13	W-529	Cotter Pin - 1/8 x 1 Lg .....	1
14	S50246	Tapered Wheel Nut - 1/2 .....	5
15	S50247	Press-In Wheel Stud - 1/2 .....	5
16	W-476	Washer - 3/4 .....	1
17	S72190	Packer Hub Assembly (Includes Items# 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 & 16) .	1
18	M-3388	Lock Nut - 3/8 Unitorque .....	5
19	W-480	Hex Bolt - 3/8 x 2 1/2 Lg. ....	1
20	C-1550	Hex Bolt - 3/8 x 4 Lg. ....	2
21	D-5489	Washer - 13/32 ID x 13/16 OD x 16 GA. ....	2
22	S72094	Guard -Pack Control - Cast Arm - Right .....	1

# Maintenance

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## Wing Section Tie Rods

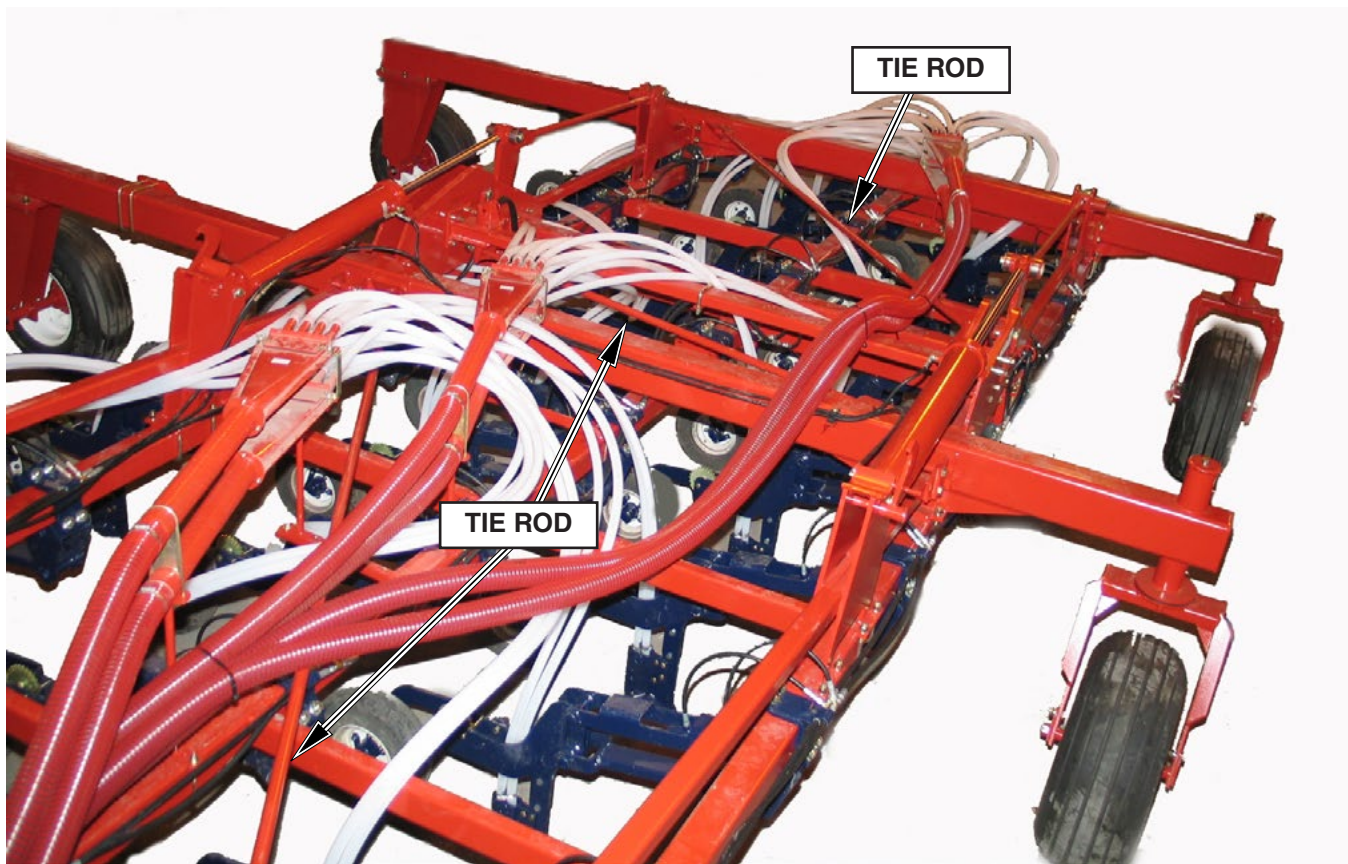
The tie rods are an integral part of the frame structure.

The wing tie rods must be torqued to 175 ft lbs. (237 Nm).

Check periodically as indicated below:

1. On delivery before field operation.
2. After first 1 hour of use.
3. After first 50 hours of use.
4. Check seasonally to ensure the tie rods on the wings are tight.

**Note:** Damage to frame components could result if tie rod tension is not maintained.



71 Foot Unit Shown



## Outer Wing Lift Rod

Check seasonally to ensure the wing lift rods on the outer wings are adjusted correctly.

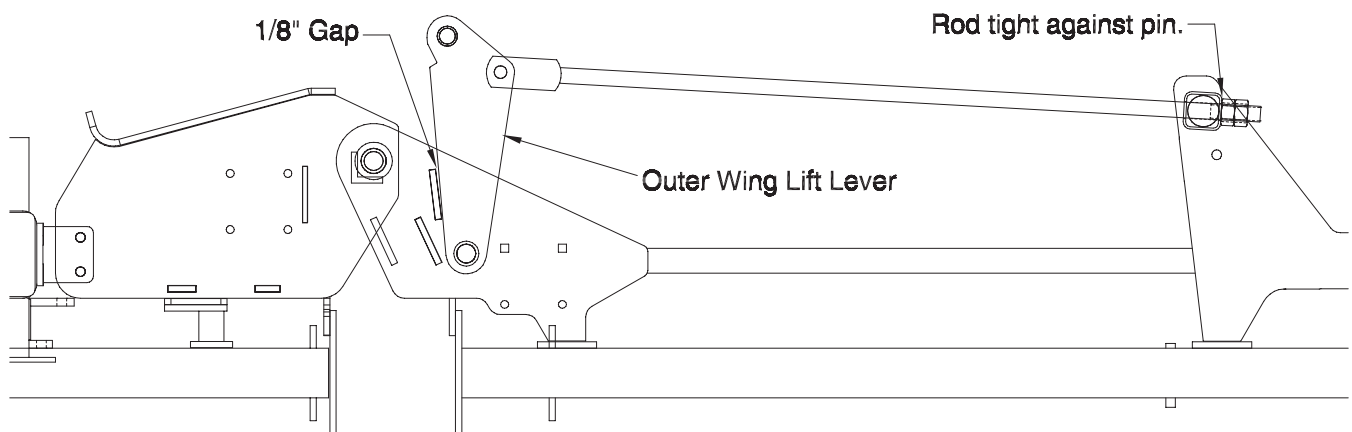
Adjust the Outer Wing Lift Rod as follows:

- With the cylinder disconnected pull the outer wing lift lever against the gusset in the lift arm.
- Adjust rod length until there is an 1/8" (3 mm) clearance between the outer wing lift lever and gusset.

**Note: Do not exceed 1/8" (3 mm) clearance. Damage to frame components may result.**

- Tighten jam nut to secure in place.

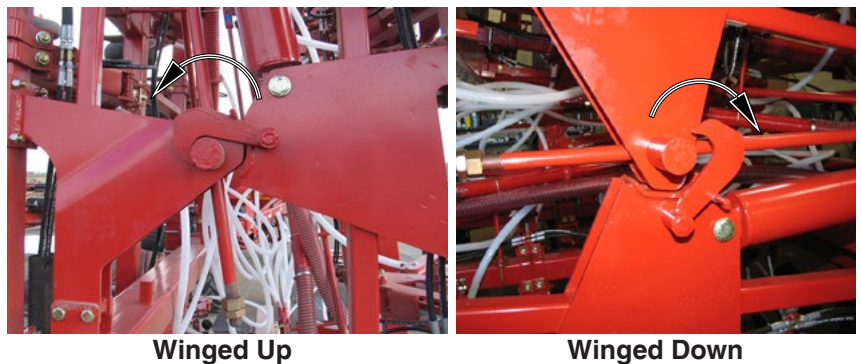
After initial wing-up the clearance will decrease, but do not re-adjust clearance.



## Gravity Lock

Ensure gravity locks move freely in both directions.

**Note: Damage to wing lift components will result if gravity locks malfunction.**



# Maintenance

---

Notes

# Section 7: Storage

**Section Contents**

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Wing Lift Cylinder Shaft Protection .....	7-3
Removing From Storage .....	7-3

# Storage

## Preparing for Storage

- To insure longer life and satisfactory operation, store the implement in a shed.
- If building storage is impossible, store away from areas of main activity on firm, dry ground.
- Clean machine thoroughly.
- Inspect all parts for wear or damage.
- Avoid delays - if parts are required, order at the end of the season.
- Lubricate grease fittings. (Refer to Maintenance Section).
- Tighten all bolts to proper specifications (Refer to Maintenance Section).
- For a safer storage, lower the implement into field position and release the hydraulic pressure.
- If implement must be stored in a raised position, ensure that wings are properly secured with lock pins.
- Level implement using hitch jack and block up.
- Relieve pressure from hydraulic system.
- Cover tires with canvas to protect them from the elements when stored outside.
- Coat exposed wing lift cylinder shafts (**Refer to Wing Lift Cylinder Shaft Protection**).
- Paint any surfaces that have become worn.



## Warning

**Do not allow children to play  
on or around the machine.**

MORRIS PAINT	
Part Number	Description
W-4647	Red MORRIS Spray Can
N31087	White MORRIS Spray Can
Z-10	Red MORRIS Paint/Litre Can

## Wing Lift Cylinder Shaft Protection

The steps summarized below should be followed when protecting chrome plated shafting on equipment:

- Position the equipment as it will be stored, and identify all the exposed portions of the chrome plated shafts.
- Clean dirt and dust from the exposed portions of the shafting using a dry cloth or a cloth which has been dampened with an appropriate solvent.
- Prepare a mixture of 60% oil-based rust inhibitor and 40% Kerosene. Apply a thin coating of this mixture to the exposed surfaces of the chrome plated shafting. No. 1 fuel oil may be substituted for Kerosene. A cloth dipped in the mixture can be used to apply the coating.
- Inspect the shaft surfaces after six months and apply additional corrosion preventative mixture.
- If the equipment is to be moved and then stored again for an extended period of time, the steps above should be repeated for all shafts that were stroked during the move.
- **Before retracting the cylinders the protective coating should be removed**, to prevent fine sand and dirt that has accumulated in the coating, from damaging the shaft seal. **Under no circumstances should sandpaper or other abrasive be used to clean the surfaces.** Plastic or copper wool in combination with an appropriate solvent will remove most of the dirt.

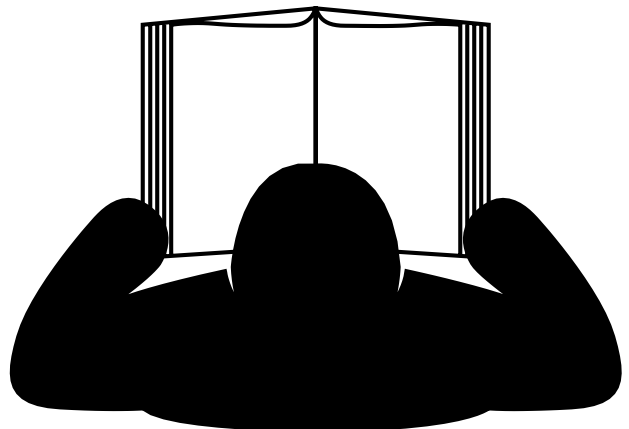


## Caution

Dirt in the hydraulic system could damage O-rings, causing leakage, pressure loss and total system failure.

## Removing From Storage

- Review Operator's Manual.
- Check tire pressure (Refer to Tire Pressure List)
- Clean machine thoroughly. Remove coating from exposed cylinder shafts (**Refer to Wing Lift Cylinder Shaft Protection**).
- Lubricate grease fittings. (Refer to Lubricating Section).
- Tighten all bolts to proper specifications (Refer to Bolt Torque Chart).



# Storage

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Notes



# Section 8: Troubleshooting

## Section Contents

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Openers can not be fully pressurized. ....	8-3
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Excessive seed depth and soil throw. ....	8-4
Openers not fully lifting to transport position. ....	8-4

# Troubleshooting

---

Problem	Cause	Correction
Machine not operating straight.	Uneven opener depth.	Refer to Operation Section on depth adjustment.
		Check tire pressure.
Lack of penetration.	Openers worn.	Replacement necessary.
	System pressure too low.	Refer to Operation Section on setting maximum system pressure.
Openers wearing unevenly	Tire tracks. Front row always wears more than the others.	Replace worn openers.
Wing lifting too slowly.	Tractor hydraulic pressure.	Repair pump. Pressure relief valve needs resetting.
	Hydraulic breakaways.	Foreign material or sticking. Check compatibility.
	Hose restriction.	Cylinder linkage binding.
Wings not lowering.	Transport valve in locked position.	Place opener valve into unlocked position.
One wing will lift, other will not.	Assembly.	Hoses reversed at cylinder.
	Restriction in line.	Clean.
	Internal cylinder leak.	Repair cylinder.
Oil accumulation.	Damaged seal.	Replace seals.
	Loose fittings.	Tighten hose and pipe connections.
	Scored cylinder shaft will damage shaft seal.	Replace.
	Normal.	Slight seepage from seal is normal.

# Troubleshooting

Problem	Cause	Correction
Accumulator system pressure drop excessive.	Valve in Bleed-Off position.	Place valve into operating position.
	Leaking opener cylinder.	Repair or replace cylinder.
Openers won't lift or lower.	Openers valve in locked position.	Place openers valve in unlocked position.
	Hydraulic line, fitting or cylinder leak.	Locate leaking line, fitting or cylinder and repair or replace.
	Low oil level.	Fill tractor reservoir.
	Hydraulics clogged.	Replace filter.
	Pivot bolts too tight.	Refer to Maintenance Section on Opener Body Assembly for adjusting procedure.
Openers can not be fully pressurized.	Hydraulic line, fitting or cylinder leak.	Locate leaking line, fitting or cylinder and repair or replace .
	Pressure reducing valve dirty or stuck.	Put openers in float and adjust the reducing valve fully in and out to loosen stuck spool.
Shanks hang back and trip out during normal operation.	System pressure too low for seed depth and soil conditions.	Adjust reducing valve to higher pressure until shanks no longer hang back.
	Air in hydraulic lines.	Bleed hydraulic system.
Seed rows covered in loose soil after seeding.	Ground speed too fast.	Reduce speed and check field finish.
	Back of drill frame is lifting.	Add factory weight kit to rear depth beams.
Packer wheels bounce and chatter excessively in field.	Packing pressure too low.	Adjust reducing valve to higher pressure until packer arms have desired pressure.
	Depth setting too deep.	Reduce opener seeding depth.
Openers drop quickly after transport lock valve is closed.	Hydraulic line, fitting or cylinder leak.	Locate leaking line, fitting or cylinder and repair or replace.

# Troubleshooting

---

Problem	Cause	Correction
Opener pressure drops quickly during normal operation. (more than 150psi after charging system).	Hydraulic line, fitting or cylinder leak.	Locate leaking line, fitting or cylinder and repair or replace.
	Damaged or stuck pilot operated check valve.	Replace valve.
Excessive seed depth and soil throw.	Soft field conditions.	Reduce pressure and seed depth settings.
	Ground speed too fast.	Reduce speed and re-check depth.
	Hydraulic pressure too high.	Reduce pressure and re-check depth.
Openers not fully lifting to transport position.	Air in hydraulic lines.	Bleed hydraulic system.
	Parallel link pivot bolts too tight.	Loosen pivot bolts in small increments until all openers will drop quickly from raised position under their own weight (put tractor remote in float to allow openers to drop).

# Appendix A: Active Hydraulic Operation

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# Appendix A - Active Hydraulic Option

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C2 Contour Air Drill Customers wanting to use Morris' Active Hydraulic System can order S68519 Active Hydraulic Kit. In addition to this kit the customer will require one of the following options to operate and control the functions of the active hydraulic system:

- i) Customer does not have an X35 Apollo System - N65144 JEM Kit is required.
- ii) Customer has 2-3 Tank X35 Apollo System - N67052 Control Kit is required.
- iii) Customer has 4 Tank X35 Apollo System - N67051 Control Kit is required.

The Active Hydraulic Kit eliminates the accumulator and passive valve block from the system replacing it with the active valve block.

This Appendix covers the operation of the Active Hydraulic System.

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## Hitching

### Hitching to Tractor

- Connect the hydraulic hoses to the tractor quick couplers. Opener lift / lower Hydraulics are normally connected to the #1 SCV.
- Mount the JEM Display in tractor cab with the LCD visible and with in easy reach to operate. See next page for harness details.
- Route the JEM harness away from moving parts and sharp protrusions. Connect the red wires to the 12v positive (+) terminal of the battery. Connect the black wires to the 12v negative (-) terminal of the battery.
- If equipped with a Topcon X35 Apollo system refer to X35 Operator's Manual N65100. See page 9-4 and 9-5 for harness details.
- **Tractor Hydraulics** - Set the tractor SCV to 40% see "Tractor User Guide" for setting of Hydraulic systems

**Tractor SCV should be set to 25gpm.**

**If not set the active hydraulic valve block will flow up to 35 gpm which could starve the oil flow from the Air Cart Fan.**

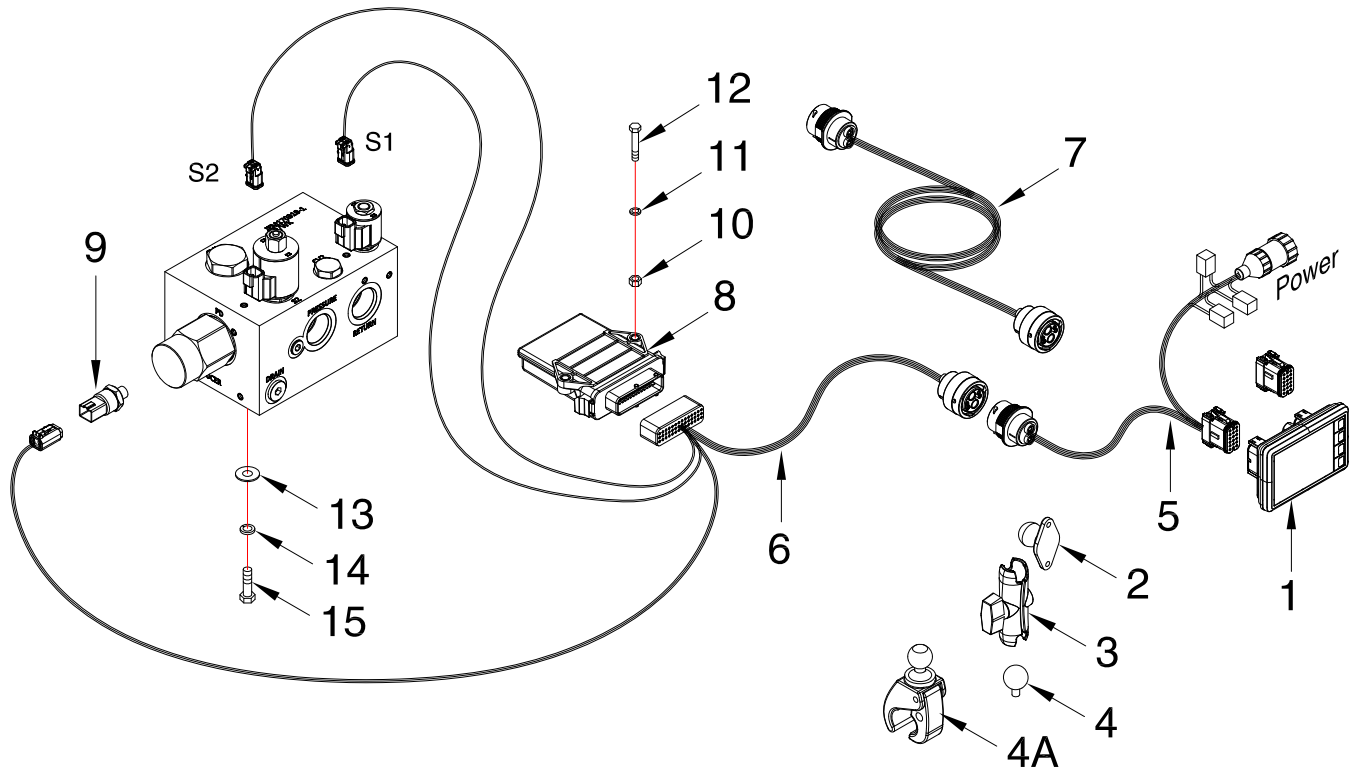
Refer to tractor manufactures information for optimal plumbing of hydraulic system.





## Hitching - Continued

### JEM CC Pilot Display Wiring

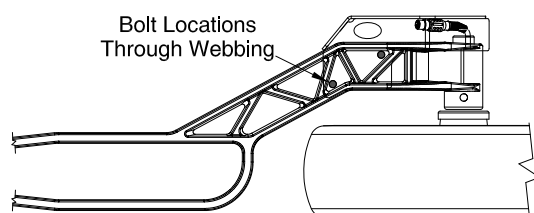
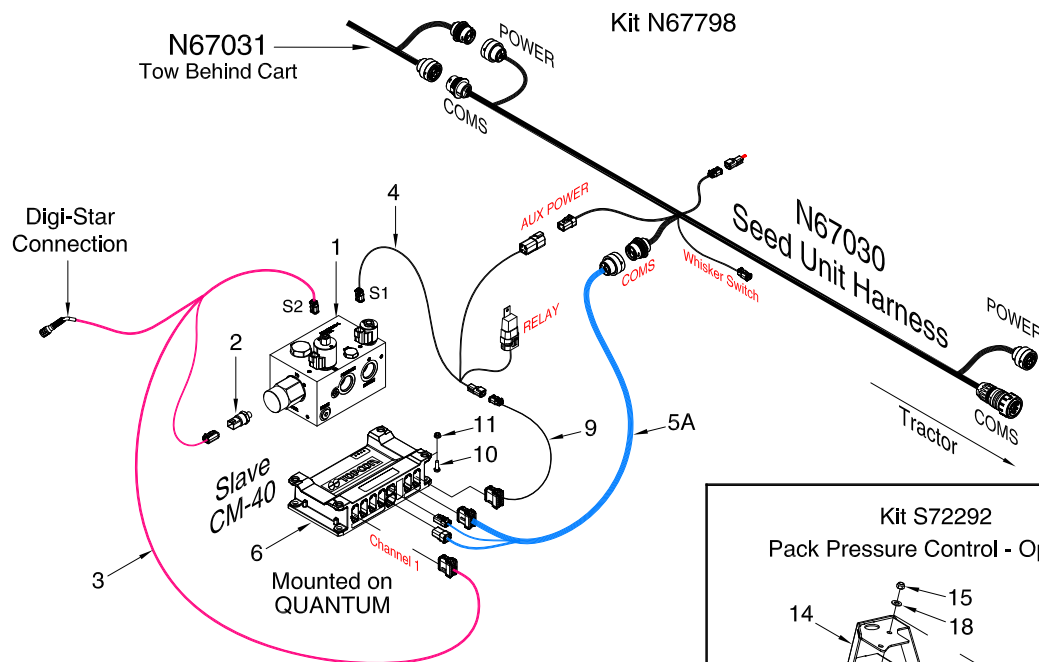
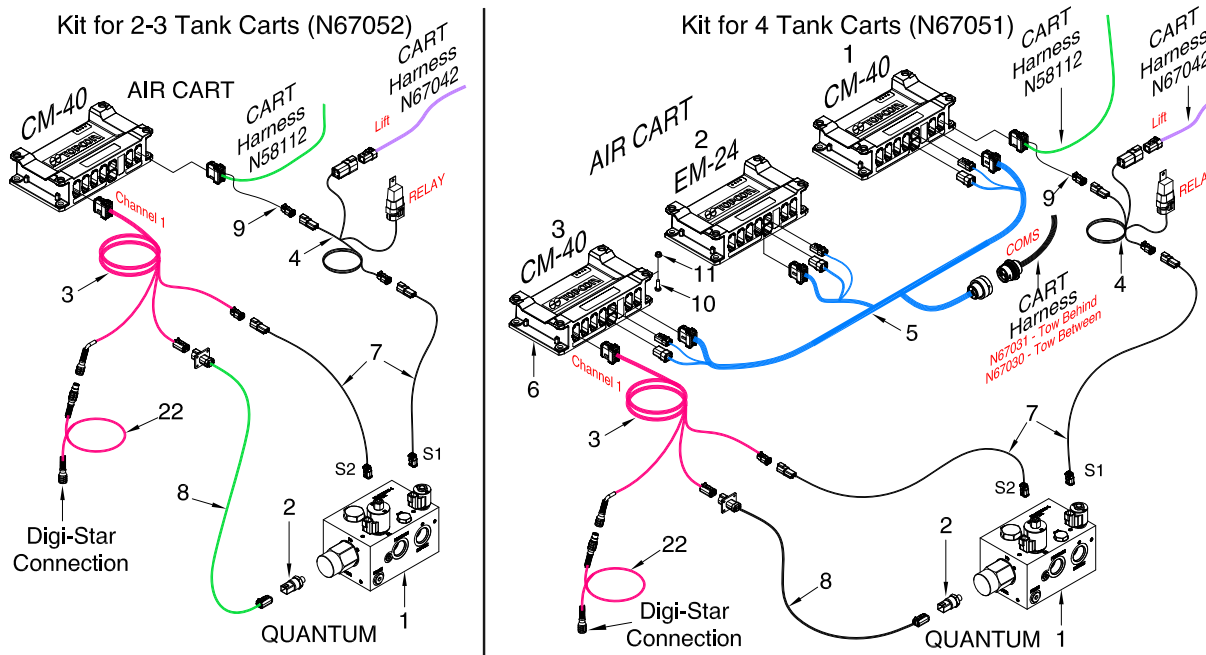


Item	Part No.	Description	Qty
1	N72180	CC Pilot Display Version 2 - 3 1/2 Full Color .....	1
2	N45644	Ram Mount - 1 7/16 x 1 5/16.....	1
3	N65147	Ram Short Arm .....	1
4	N65148	Ram Ball - 1 Diameter.....	1
4A	N65146	Ram Claw Mount	
5	N65141	Harness - Tractor (1000545) .....	1
6	N65142	Harness - Implement (1000546) .....	1
7	N65149	Harness - Extension (Tow Between Carts) (1000626) .....	1
8	N65143	ESX-10Xp ECU.....	1
9	K62977	Pressure Transducer .....	1
10	W-512	Hex Nut - 1/4 .....	2
11	W-521	Lockwasher - 1/4.....	2
12	C-1471	Hex Bolt - 1/4 x 1 3/4 Lg.....	2
13	W-538	Flatwasher - 7/16 ID x 1 OD x 14 GA.....	4
14	W-523	Lockwasher - 3/8.....	4
15	W-475	Hex Bolt - 3/8 x 1 Lg.....	4
	N72181	CC Pilot Display Kit - (Includes Items 1 to 4)	

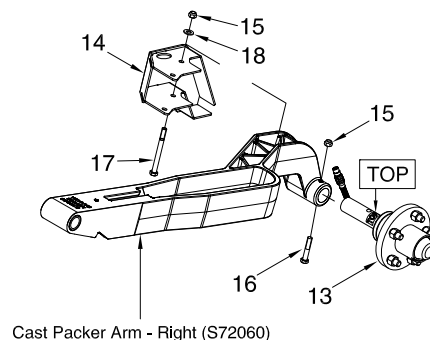
# Appendix A - Active Hydraulic Option

## Hitching - Continued

### X35 Apollo - Lift and Pressure Control Wiring

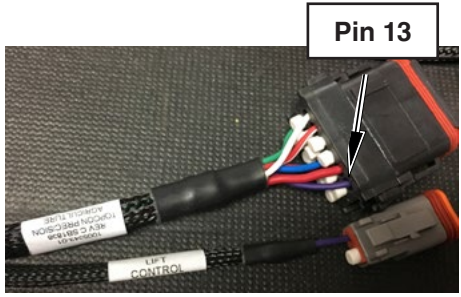


#### Kit S72292 Pack Pressure Control - Optional



## Hitching - Continued

### X35 Apollo - Lift and Pressure Control Wiring - Continued

Item	Part No.	Description	Qty
1	S64940	Manifold - Opener Control (Requires S68007 see note below).....	1
	S68006	Manifold - Opener Control - 2000 psi (Includes S68007).....	
2	K62977	Pressure Transducer .....	1
3	N67045	Harness - Pack Control (1026291-01) .....	1
4	N67046	Harness - Lift Control (1006258-01) .....	1
5	N67037	Harness - Triplex ECU Adapter (1005038-01).....	1
5A	N67038	Harness - Single ECU (1005036-01).....	1
5B	N68000	Harness Extension - 2m - (1028492-01) - Optional	
6	N68950	Apollo Master Module ECU - CM-40 Series 2 - (1024223-01) .....	1
7	N59010	Harness Extension - Work Switch - 5m - (AGA4468) .....	2
8	N64671	Pressure Transducer Extension Harness - 7m - (1024230-01) .....	1
9	N68001	AUX Lift Lower Signal Adapter .....	1
10	W-187	Hex Bolt - 3/8 x 1 1/4 Lg - Bolts ECU to plate under manifold .....	4
11	D-5279	Locknut - 3/8 Serrated Flange.....	4
12	N68002	Extension Cable - Pack Control .....	1
	N67052	Lift and Pressure Control Kit for 2-3 Tank Carts (Includes Items 3, 4, 7, 8, 9, 12)	
	N67051	Lift and Pressure Control Kit for 4 Tank Carts (Includes Items 3, 4, 5, 6, 7, 8, 9, 12)	
	N67798	Lift and Pressure Control Kit for 4 Tank Carts Tow Behind ONLY (Includes Items 3, 4, 5A, 6, 9, 10,11)	
		<b>Pack Pressure Control - Optional</b>	
	S72292	Pack Force Spindle and Guard Kit. (Includes ALL Items below)	
13	S72190	Packer Hub Assembly (Includes S72200 Spindle - Digi-Star).....	1
14	S72094	Guard - Pack Control - Cast Arm - Right .....	1
15	M-3388	Lock Nut - 3/8 Unitorque .....	3
16	W-480	Hex Bolt - 3/8 x 2 1/2 Lg.....	1
17	C-1550	Hex Bolt - 3/8 x 4 Lg.....	2
18	D-5489	Washer - 13/32 ID x 13/16 OD x 16 GA.....	2
<div style="text-align: right;">  </div> <p><b>X35 Apollo - Wiring</b></p> <p>Ensure the Single Purple wire is installed in pin 13 (Relay signal out on the Auxiliary harness) as shown. (Cart Harness N58112)</p> <p>Connect 1006258-01 Lift lower harness to the following connections:</p> <p><b>Trunk /Whisker</b> - to the single wire connection to pin 13 on Aux harness</p> <p><b>Relay Power</b> - to AGA5343 ECU harness DTP power connector - (remove dust cap).</p> <p><b>Lift Solenoid</b> - to S1 on JEM Manifold block on Quantum drill</p>			

# Appendix A - Active Hydraulic Option

## Hydraulic Flow Adjustment

With the unit in field position perform a hydraulic flow check.

- Perform a visual inspection for bystanders around and/or under the C2 Drill once clear, proceed to rotate the Openers ball valve into opener unlocked position.
- Push the Opener Hydraulic lever forward until it locks into continuous operation.
- **Tractor SCV should be set to 25 gpm** which is usually around a setting of 40% see “Tractor User Guide” for setting of Hydraulic systems.

**If not set the active hydraulic opener valve will flow up to 35 gpm which could starve the oil flow from the Air Cart Fan.**

With the tractor hydraulics engaged check the Controller Up/Down function of the openers.

**Note: If the openers do not raise or lower correctly, reverse the hydraulic hoses on the tractor.**

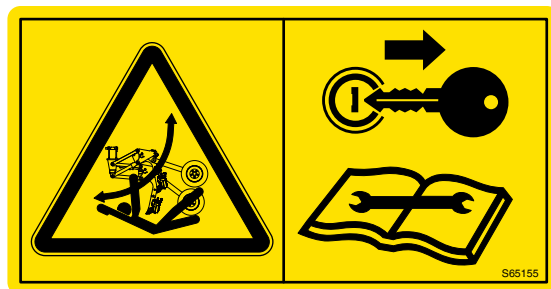
- Once satisfied that the openers are lifting and lowering correctly, bring Fan 1 and Fan 2 up to normal operating speed on the Air Cart.
- Perform additional raising and lowering tests of the drill, however pay close attention to the Fan speed.
- The Active Hydraulic system should be able to lower the openers into the working position within 7 seconds without any substantial fan speed interruption.
- Total Fan speed should not drop by more than **300 rpm** while the drill is lowered.
- If excessive fan speed drop is experienced the operator will need to adjust Opener flow to keep Fan rpm consistent.



## Warning

Openers drop with full down force when powering up or rebooting the controller with hydraulics engaged.

Ensure opener hydraulic system is disabled before working underneath machine.





## Controller Options

Two control options are available to suit Ground Drive and VRT/ICT style Air Carts.

- a) JEM - CC PILOT and ESX Controller
- b) Topcon - X35 Apollo CM-40 Master module. Refer to X35 Manual N65100 for details on operating the Pack Control System.

## JEM CC Pilot Display

**Opener: (S1)** Opener valve is either Up / Down

**Pressure: (S2)** Pressure Reducing valve set point adjusted by pressing the Pressure Increase / Pressure Decrease keys displayed

**Digital %:** Displays percentage open of S2 valve.

**PSI Analogue Gauge:** Displays **actual system** pressure from Pressure Transducer K62977.

**Comm:** Icon is only visible when there is no communication with the ESX Controller.

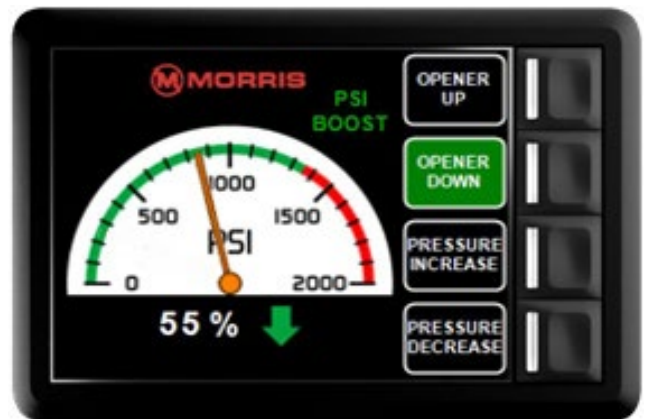
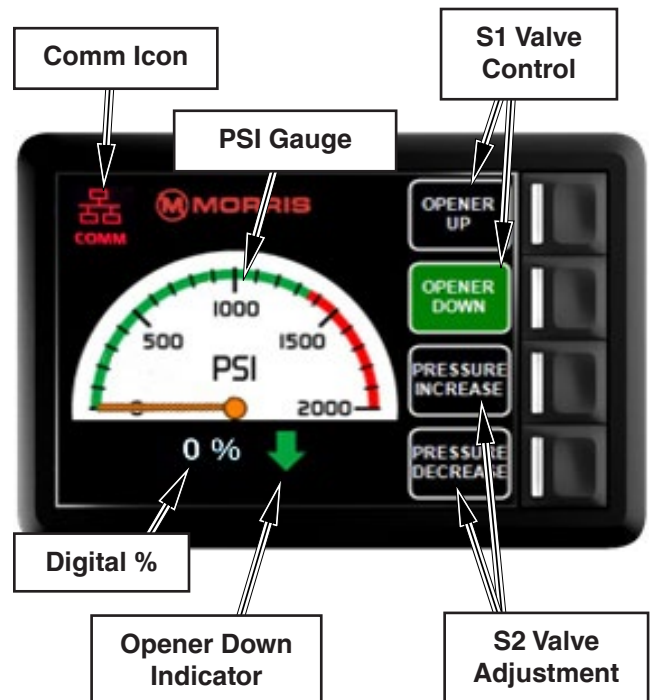
**PSI Boost:** Pressure Boost is active for 4 seconds after setting the OPENER DOWN.

**Revision Level:** Viewed when both “PRESSURE INCREASE” and “PRESSURE DECREASE” buttons are held down together.

Features:

- CC Pilot holds the last pressure used, example if the last entered pressure was set at 800 psi (5516 kPa) from the previous day upon powering on the unit the value will return automatically to the last value used of 800 psi (5516 kPa).
- Buzzer alarms when Pressure exceeds 1350 psi. (9308 kPa) (alarm is not user settable) the controller will auto adjust pressure back to 1350 psi.

**Note:** The operating temperature of the hydraulic fluid will affect the relation between the S2 % value and the actual system pressure. Adjust the S2 % value accordingly to maintain desired system pressure.



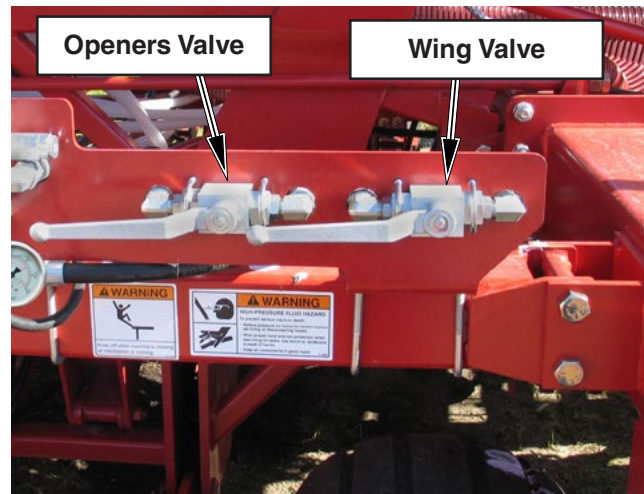
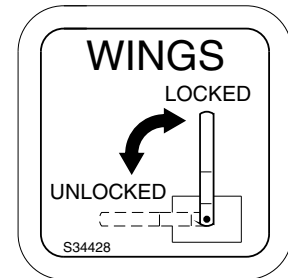
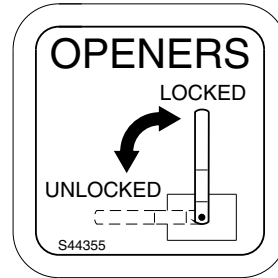
# Appendix A - Active Hydraulic Option

## Transport

### Transport to Field Position

- Position machine on **level ground**.
- Stop tractor, and engage park brake.
- As a precaution, check surrounding area to be sure it is safe to lower wings.
- Unlock the wing valve and opener valve. Do not walk under raised wings.
- Operate opener hydraulics, to ensure all openers are retracted.
- Operate wing lift hydraulics until wings are lowered and the cylinder shafts are completely extended to allow wings to float when working in uneven land. **Never raise or lower wings when moving.**

**Note:** When raising or lowering wings, do so in one continuous motion until fully up or down. Do not stop flow part way allowing wings to fold on their own. This may disrupt the sequence of operation.



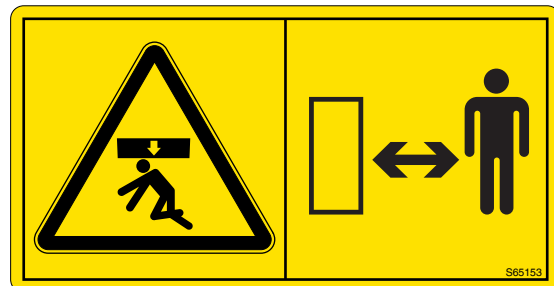
Valves in Unlocked Position

### **Danger: Crushing Hazard**

To prevent death or serious injury:

Always stay clear of wings being raised, lowered or in elevated position. Ensure cylinders are completely filled with hydraulic fluid - wings may fall rapidly causing injury or death.

Over Head Hazard - Gauge Wheels swing down. Keep clear of area after wings are raised.





### Transport - Continued

#### Field to Transport Position

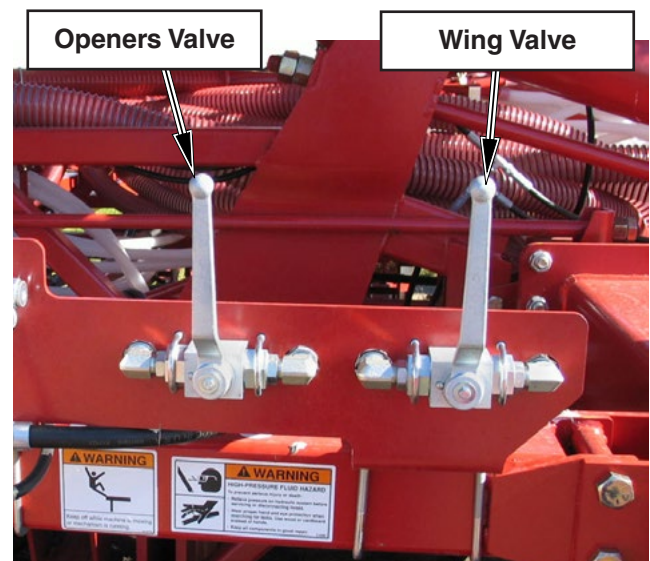
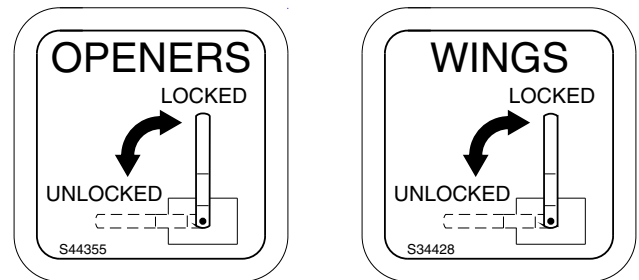
- Position machine on **level ground**.
- Stop tractor, and engage park brake.
- Ensure wing lift cylinders are fully extended.

**Note:** The wing lift cylinders must be fully extended to ensure proper operation of the flow control valve (FCV) manifold.

- Operate the opener hydraulics, to raise the openers fully.
- Disengage the tractor remote and turn the Control Console off. (JEM CC Pilot or Topcon X35)
- Operate the wing lift hydraulics, to raise the wings fully into transport position. **Never raise or lower wings when moving.**

**Note:** When raising or lowering wings, do so in one continuous motion until fully up or down. Do not stop flow part way allowing wings to fold on their own. This may disrupt the sequence of operation.

- Lock wing lift valve and opener valve. Do not walk under raised wings.
- Ensure safety chain is properly installed, see "Hitching to Tractor" of the Operation Section.



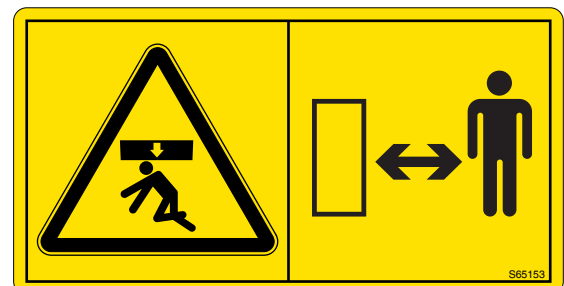
Valves in Locked Position

#### **Danger: Crushing Hazard**

To prevent death or serious injury:

Always stay clear of wings being raised, lowered or in elevated position. Ensure cylinders are completely filled with hydraulic fluid - wings may fall rapidly causing injury or death.

Over Head Hazard - Gauge Wheels swing down. Keep clear of area after wings are raised.



# Appendix A - Active Hydraulic Option

## Opener Hydraulic System

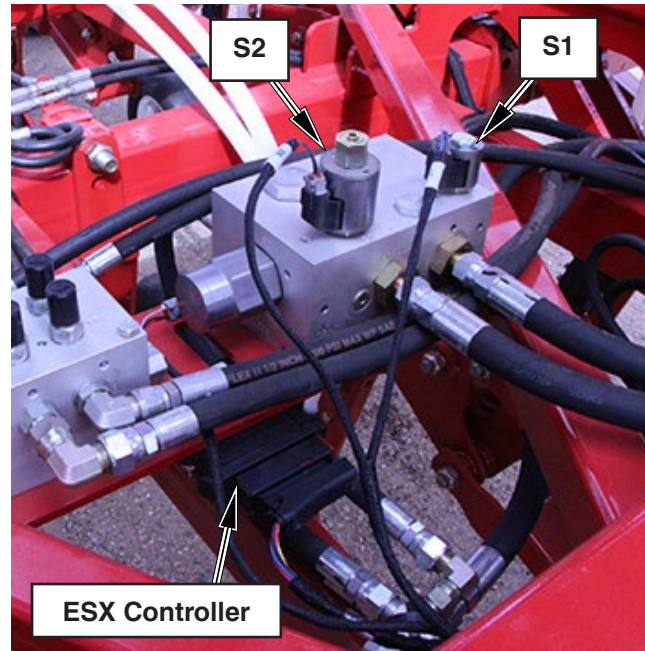
### Basic function of the system

- Tractor remote is set to continuous flow connected to the “Pressure” port on the Opener Control Block.
- Control the Lift-Lower and packing pressure functions through JEM display or X35 monitor.

**WARNING: Openers will drop with full operating force if the JEM display or X35 monitor is rebooted with hydraulics running.**

- Flow requirements during operation will be a continuous (3-4 gpm max) (11-15 lpm) for most conditions, but large changes in terrain (drainage ditches, terraces, water runs) will cause larger flow rates for short intervals. Minimum oil flow rate for the opener circuit would be 18 gpm (68 lpm); 25 gpm (95 lpm) is optimal. Lower flow rate = slower operation on headlands. Flow requirements are highest while lifting/lowering openers at headlands where full flow of the hydraulic remote will occur.

**Note: Operate system at the lowest system pressure that will keep shanks locked vertical during seeding and provide adequate packing pressure. Excessive hydraulic pressure may disturb rocks and damage carbides.**



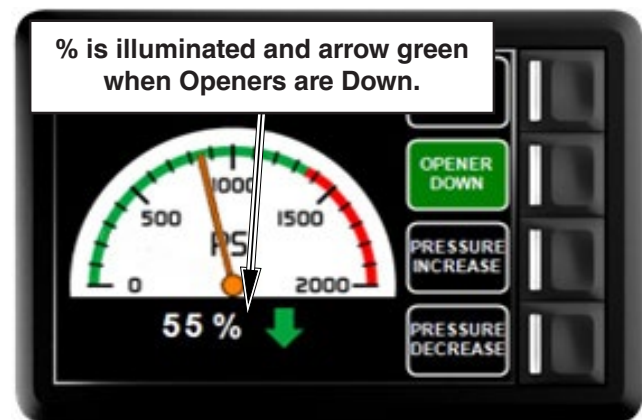
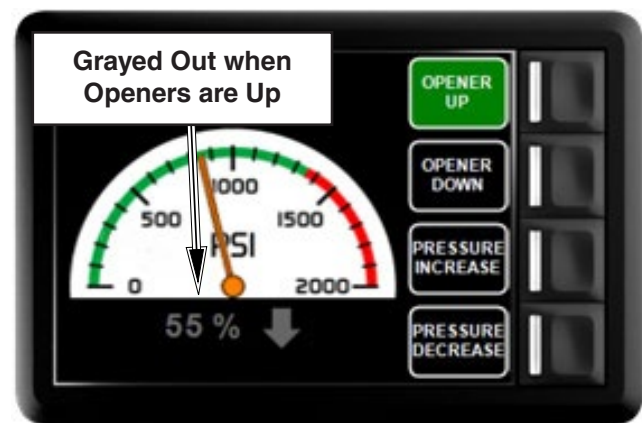
### Lifting/Lowering

- Pressing Opener “UP” button on the controller will lift the openers fully up by shifting solenoid valve “S1” to gland side of opener cylinders.
- Pressing Opener “DOWN” button on the controller will lower the openers all the way down and lock them into working position by shifting solenoid valve “S1” to its default position of flow straight through to butt end of opener cylinders.

**WARNING: Default valve position is openers down when applying flow at “Pressure” port.**

- The system will remember the last mode (“UP” or “DOWN”) that it was operating in and operate in that same mode at next start up.

**Note: If the controller is not present or connected, the tractor remote can be used manually to lift and lower the openers although no pressure control will be available; pressure down will be limited to the default of the reducing relieving valve “S2” (200 psi) (1379 kPa).**



### Opener Hydraulic System - Continued

#### Basic function of the system - Continued

##### Pressure Setting

- Pressure can be adjusted on the go from the tractor cab using the display.
- Pressing the “PRESSURE INCREASE” button on the display will increase the pressure by shifting proportional reducing/relieving valve S2 in the block; each press of the arrow will change the % value by 1 or 2% the pressure gauge will indicate psi change.
- Pressing the “PRESSURE DECREASE” button on the display will decrease the pressure by shifting proportional reducing/relieving valve S2 in the block; each press of the arrow will change the % value by 1 or 2% the pressure gauge will indicate psi change.

**Note:** Holding the button will cause the % to change rapidly for larger changes.

- The system will remember the last pressure setting that it operated at and revert to that at next start up.



In the diagram below, the relevant forces created by the hydraulic pressure applied to the row unit's cylinder are illustrated.

##### Definitions:

**Down Force** - vertical force that is pushing the opener downwards due to hydraulic pressure.

**Trip Force** - horizontal force that is holding the shankholder in place in working position, resisting against soil draft forces.

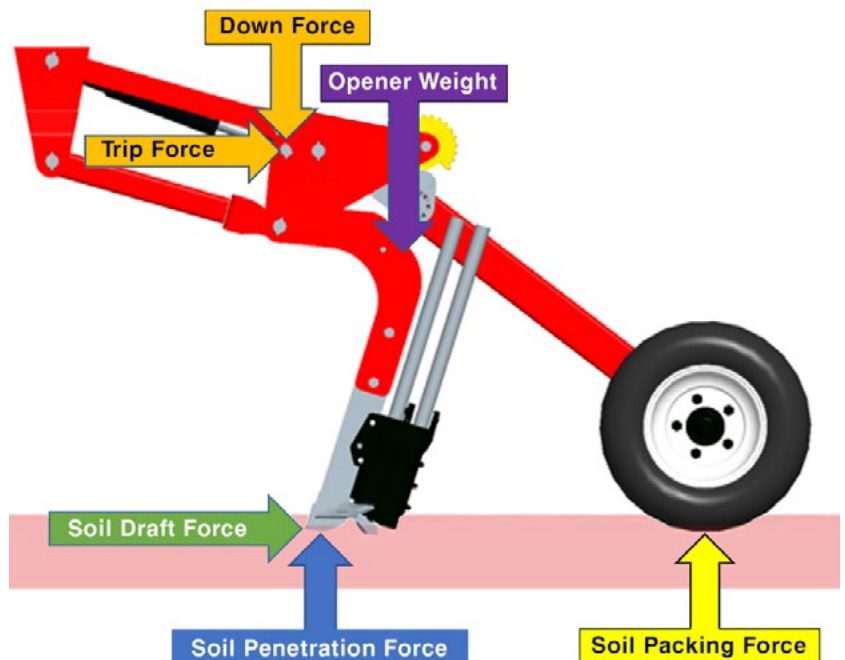
**Soil Draft Force** - horizontal force from soil resistance on the shank/opener trying to rotate shank backwards.

**Soil Penetration Force** - the amount of force required to push the shank/opener vertically into the soil; this varies based on:

- Opener type (single shoot, dual shoot paired row, dual shoot sideband etc).
- Soil type (clay, loam, sandy loam etc).
- Moisture conditions.

**Soil Packing Force** - the amount of force applied at the packer wheel of the row unit to pack/firm the furrow and maintain depth

**Opener Weight** - approximate static weight of opener affecting packer force.





# Appendix A - Active Hydraulic Option

## Opener Hydraulic System - Continued

### Basic function of the system - Continued

#### Pressure Setting - continued

The force applied by the hydraulic cylinder is split into two components: down force and trip out force. Geometry also sets the ratio of down force and trip force; as the hydraulic pressure is raised up, down force and trip force both increase.

During operation of the machine, the forces at any given time balance each other out in both horizontal and vertical directions. This means that the applied trip out force balances against the draft load forces and the shank stays locked in working position. Similarly, the applied down force will balance out against the soil penetration force and the applied packing force.

The row unit geometry is designed to produce the following force ratios:

$$\text{Trip Force (lbs)} = \frac{\text{Hydraulic Pressure (psi)}}{1.6^*} \quad \text{*ratio applies for standard Morris shank length}$$

Example: Trip force at 1000 psi =  $1000/1.6 = 625$  lbs trip force

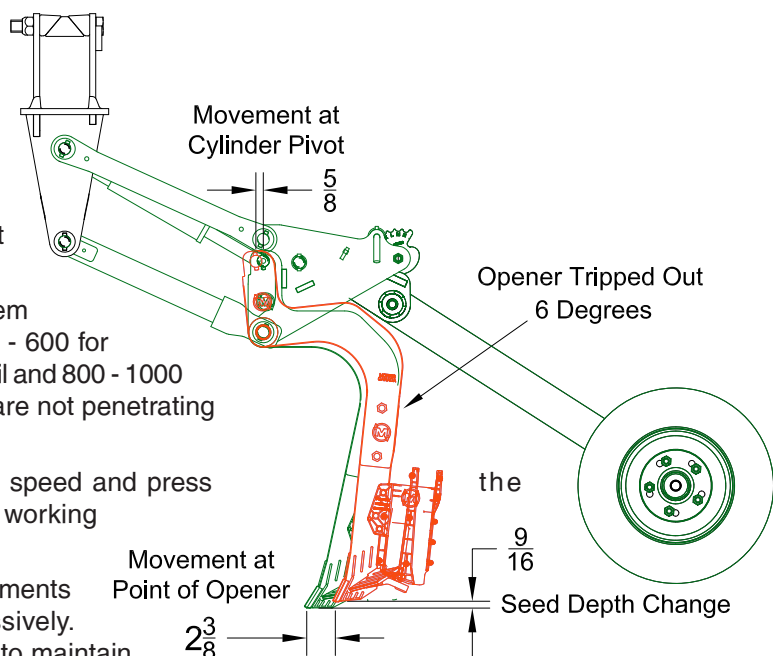
**Note:** Due to the variation of friction effects, this trip force is approximate.

### Operating Pressure Adjustment

To determine the operating pressure required, follow these steps to set the opener trip force required for the current field conditions:

1. Set each opener to the required seed depth to ensure the force required to keep the openers engaged in the soil will be the same as it would be during the seeding operation. Refer to "Depth Adjustment" for the correct procedure.
2. Turn Control Console on and set the system pressure, suggested starting pressure is 500 - 600 for light or preworked soil, 700 - 800 for medium soil and 800 - 1000 for heavy soil. Increase pressure if openers are not penetrating the ground.
3. Start across the field at the desired seeding speed and press Down button to lower the openers into the working position.
4. Increase the hydraulic pressure in 25 lb increments until the shanks are not tripping out excessively. This will be the minimum operating pressure to maintain.

**Do not adjust to pressures less than this unless it is necessary (for example if crossing a very wet spot)**

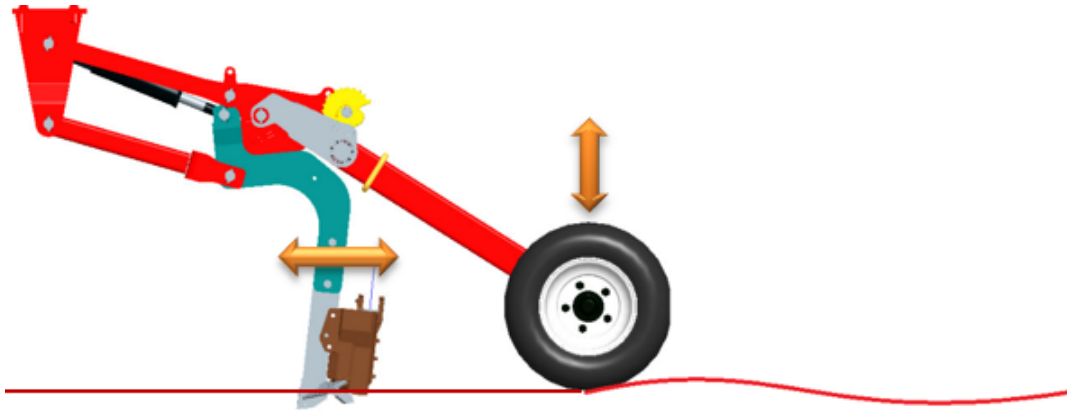


If the minimum operating pressure is set too low this could cause the openers to fall out of the locked working position. This is due to the draft forces of the soil exceeding the system hydraulic pressure, allowing the openers to drag backwards into a partially tripped position. If the opener shank assembly becomes partially tripped the seed depth accuracy will become compromised. Even if the openers are slightly pushed back 6° from the locked working position, the changes in geometry can alter the seed depth by over 1/2". See diagram above.

### Opener Hydraulic System - Continued

#### Operating Pressure Adjustment - Continued

- Experiment with different hydraulic pressure values to suit field conditions.



- During a test pass, have someone drive along side the C2 and inspect the openers. Communicate with each other on the current settings used and if the openers appear to be locked into the working position. If the openers appear to be kicking back or “dancing” increase the Pressure setting by pressing the “INC” button on the display. This will increase the hydraulic pressure in 25 lb increments.
- Set pack force at the minimum value that provides good firming of the soil over the seed and good seed to soil contact; if a lot of “lumps” of soil are noticed in the furrow, more force may be needed to break down these lumps
- Check behind the drill frequently during seeding to ensure adequate soil firmness over the seed in the furrows.

**Important:** Make sure the openers do not trip excessively and are penetrating the ground properly. Failure to use sufficient down pressure will cause poor seed placement.

**Note:** Maximum recommended continuous operating pressure of the opener hydraulic system should not be set above 1200 psi while in pressure control mode. Setting pressures above this point may result in damage to the row units, C2 drill frame and the hydraulic system.



# Appendix A - Active Hydraulic Option

## Opener Hydraulic System - Continued

### Field Operation

Follow the steps below to setup and operate the unit when starting a new field.

1. Lower unit into field position as outlined under “Transport to Field Position.
2. Engage the Openers and Air Cart fans hydraulic circuits and lock the remotes in the engaged position.
3. Switch the power on for the Control Console and Air Cart monitor.
4. Move forward with the tractor at the desired seeding speed and press down button on the JEM CC Pilot or lift control button on the Topcon X35 to lower the openers into the ground.
5. When the openers are fully engaged, turn on the Air Cart metering system to begin metering product into the airstream.
6. Drive for a reasonable distance so that seed depth can be checked behind the unit.
7. Turn the Air Cart metering system off and stop the unit with the openers engaged in working position.
8. Check the seed depth and soil packing in a few locations across the width of the unit.



**Note: Openers running in tire tracks may require additional adjustment.**

9. If any depth adjustments are required, adjust the depth cam on each opener. Refer to “Depth Adjustment” for details.
10. If the packing requires adjustment, change pressure setting on the JEM CC Pilot or Topcon X35.
11. Do another test pass to ensure that the desired seed depth and soil packing has been achieved.
12. Begin seeding by;
  - a. At the start of a pass, press down button on the JEM CC Pilot or lift control button on the Topcon X35 to lower the openers.
  - b. As the openers are entering the ground turn on the Air Cart metering.
  - c. Typically, it takes 7 seconds for the openers to lower fully and 3 seconds for product to reach the openers so account for this by switching the Air Cart metering on prior to reaching the unseeded area.
13. When approaching the headland at the end of a pass, first turn off the Air Cart metering as the drill fully enters the headland area.
  - a. After the drill has crossed into the headland area, press up button on the JEM CC Pilot or lift control button on the Topcon X35 to raise the openers.
  - b. Complete the headland turn, then repeat step 12 to start the next pass.
14. After the field is seeded, refer to “Field to Transport Position” for winging up unit.

Travel Distance			
MPH	Feet/second	kph	m/s
3.75	5.50	6	1.67
4	5.87	6.44	1.79
4.25	6.23	6.84	1.90
4.5	6.60	7.25	2.01
4.75	6.97	7.5	2.08
5	7.33	8	2.22
5.25	7.70	8.5	2.36
5.5	8.07	8.85	2.46
5.75	8.43	9.25	2.57
6	8.80	9.66	2.68
6.25	9.17	10	2.78
6.5	9.53	10.46	2.91



## Opener Hydraulics

The use of an active hydraulic control system means the tractor's hydraulic circuit to the C2 openers are **permanently engaged into the working position** through manifold block (S68006) which controls the Lift-Lower and packing pressure functions via a controller and an in-cab display.

The controller and display provide the user the ability to adjust the opener downforce packing pressure on the go from inside the cab while applying product.

The following is the oil flow for both operating types and can be used for problem diagnosis.

### To lower

- Pressing Opener "DOWN" button on the controller will lower the openers all the way down and lock them into working position by shifting solenoid valve "S1" which actuates pilot directional valve "PD"; "PD" valve in the diagram will be at its default position of flow straight through.

### To raise

- Pressing Opener "UP" button on the controller will lift the openers fully up by shifting solenoid valve "S1" which actuates pilot directional valve "PD"; "PD" valve in the diagram will be shifted to cross the flow over (arrows crossed symbol).

### Pressure Setting:

- Pressure can be adjusted on the go from the tractor cab using the display.
- Pressing the Pressure "INC" button on the display will increase the pressure by shifting proportional reducing/relieving valve S2 in the block; each press of the arrow will lift the pressure value by approximately 25 psi (172 kPa).
- Pressing the Pressure "DEC" button on the display will decrease the pressure by shifting proportional reducing/relieving valve S2 in the block; each press of the arrow will drop the pressure value by approximately 25 psi (172 kPa).
- The system will remember the last pressure setting that it operated at and revert to that at next start up.

## Trouble Shooting

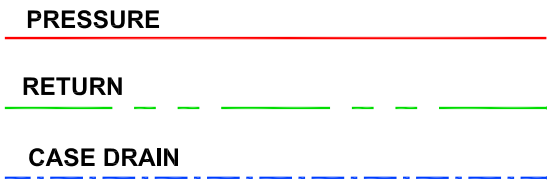
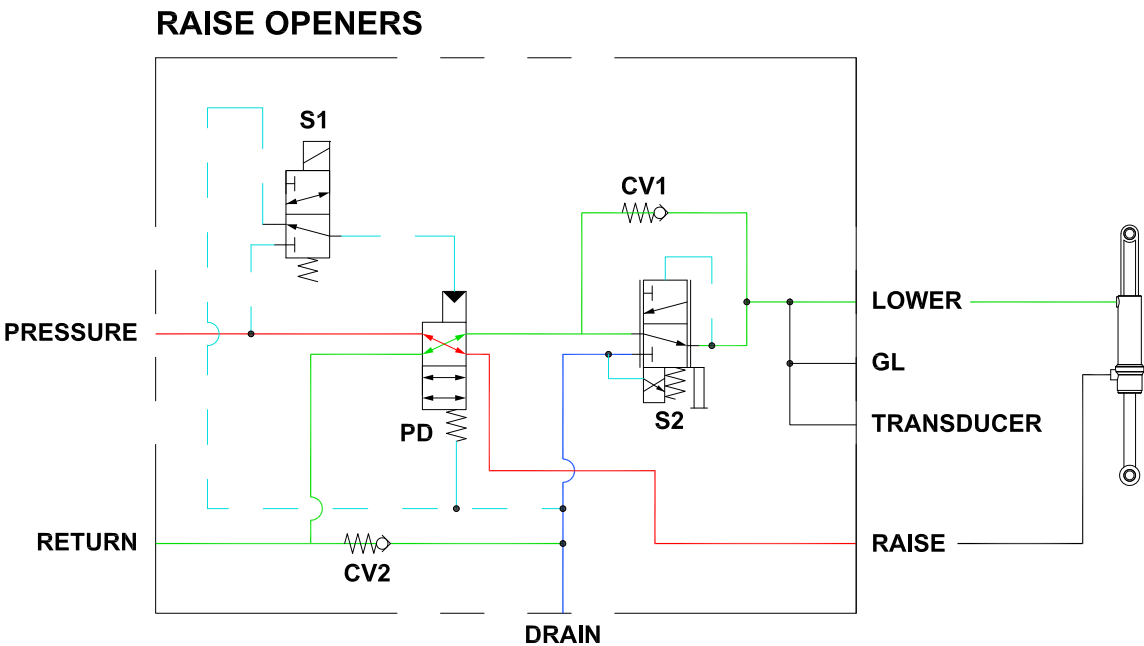
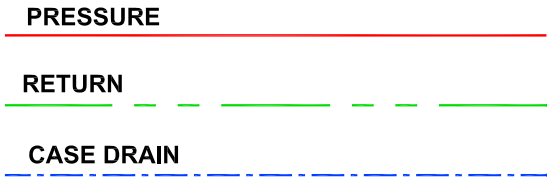
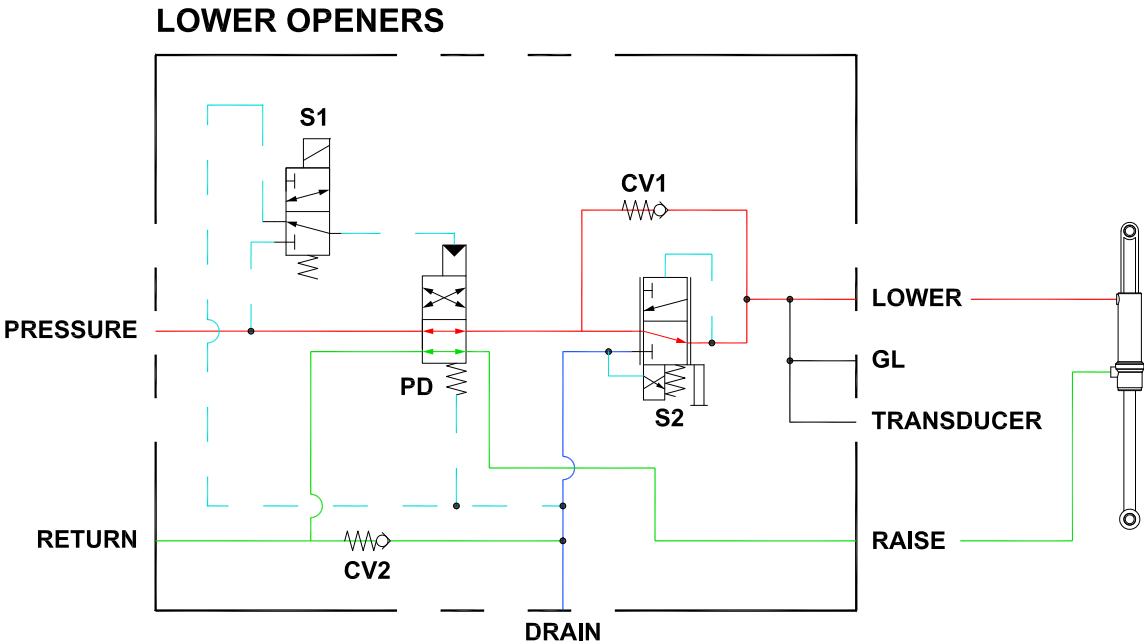
**The opener valve (S1)** has two states; **ON** (opener UP) and **OFF** (opener DOWN). When the opener valve is on/UP, the output is set to 3000mA (default value). When the opener is off/DOWN, the output is set to 0mA. These signals can be measure with a multi-meter directly at the valve connection. Just pull the plug out of the coil and measure the amperage across the two pins of the wire harness connector. Pin 1 of the S1 wire harness connector is connected to the controller output and pin 2 is connected to ground. **Check these values without any hydraulic power.**

**The pressure reducing valve (S2)** output is dependent on the state of the opener valve. If the opener is on/UP, the output to the S2 valve is 1050mA, or roughly 87.5% of the max value of that valve (approximately 1750psi). When the opener is off/DOWN, the output to the S2 valve is whatever value has been set by the user via the display. As it is now, this value can be anywhere from 350mA to 1200mA.

S1 and S2 are both current-controlled PWM outputs. Make sure to measure amperage and not voltage.

**Comm Icon:** Cable is not connected correctly, Cable is not terminated correctly, incorrect firmware loaded / Board Revision.

# Appendix A - Active Hydraulic Option



## Appendix A - Active Hydraulic Option

### Trouble Shooting - Continued

Problem	Cause	Correction
Openers won't lift or lower.	Openers valve in locked position.	Place openers valve in unlocked position.
	Hydraulic line, fitting or cylinder leak.	Locate leaking line, fitting or cylinder and repair or replace.
	Low oil level.	Fill tractor reservoir.
	Hydraulics clogged.	Replace filter.
	Pivot bolts too tight.	Refer to Maintenance Section on Opener Body Assembly for adjusting procedure.
Openers won't lift.	Tractor Hydraulics not working.	Engage Tractor Hydraulics.
	"S1" Solenoid not actuating.	Check for power and control connections on controller harnessing.
		Check wire connections to "S1" solenoid.
		Check wire connections throughout harness, ECU, monitor.
		Possible failed "S1" solenoid Possible display malfunction
Opener pressure won't change.	Tractor Hydraulics not working.	Engage Tractor Hydraulics.
	"S2" Solenoid not actuating.	Check wire connections to "S2" solenoid.
		Check wire connections throughout harness, ECU, monitor.
		Possible failed "S2" solenoid
		Possible display malfunction
Openers can not be fully pressurized.	Hydraulic line, fitting or cylinder leak.	Locate leaking line, fitting or cylinder and repair or replace .
	"S2" Solenoid not actuating.	Check wire connections to "S2" solenoid.
		Check wire connections throughout harness, ECU, monitor.
		Possible failed "S2" solenoid
		Possible display malfunction

## Appendix A - Active Hydraulic Option

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### Notes

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