



OPERATOR'S MANUAL

CX 8105
Air Drill
VRT

N50160-02A

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Section 1: 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.

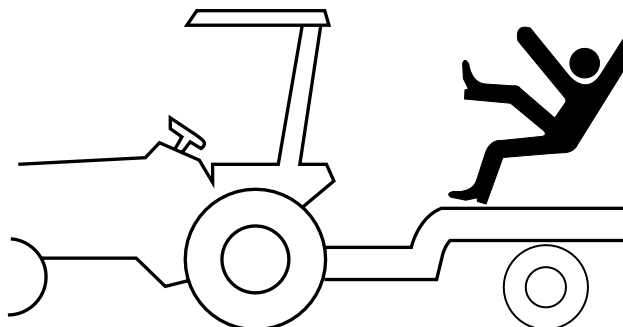
The words **Important** and **Note** are not related to personal safety but are used to give additional information and tips for operating or servicing this equipment.

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.

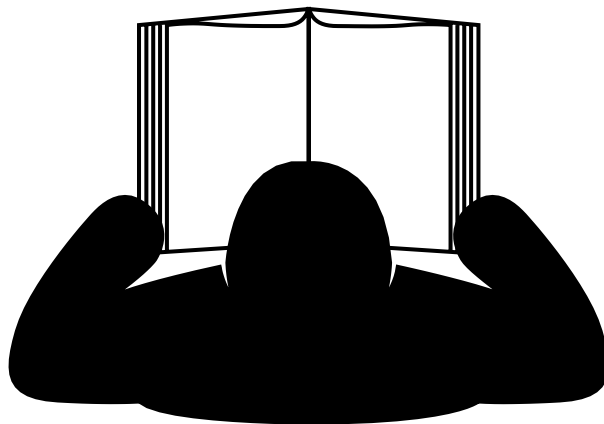
General Operation

- **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.
- **Keep all shields in place**, replace them if removed for service work.
- Always lock auger attachment in raised position.
- Keep hands clear of tank opening when closing lid. Keep lid seal clean to ensure proper sealing.
- **Do Not enter tank unless another person is present and the tractor engine has been shut off.**
- Wear close fitting clothing and appropriate personal protective equipment for the job.



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 follow 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 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 tank unless another person is present and the tractor engine has been shut off.**



Danger

Failure to comply may result in serious injury or death.

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.

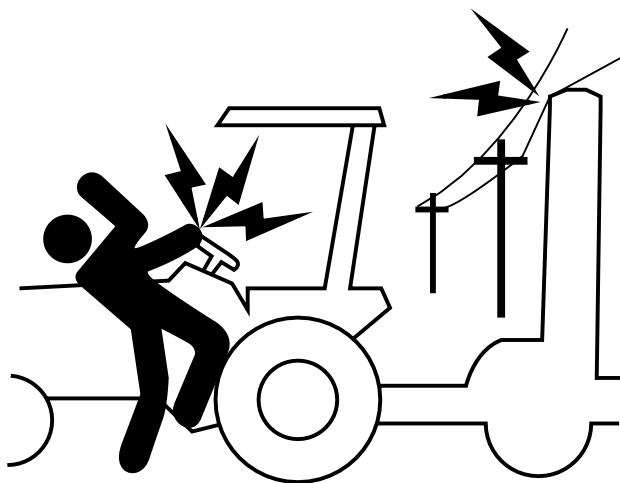
Always be sure pressure is relieved before disconnecting hoses or parts.

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.

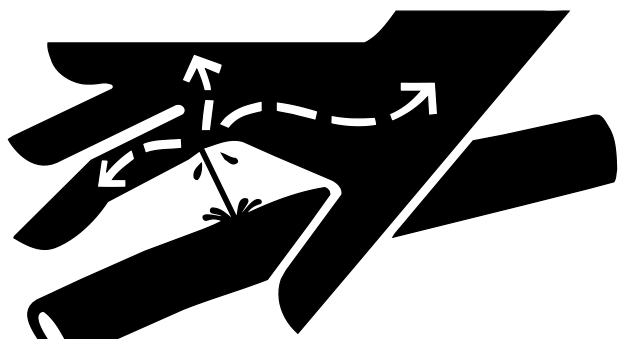
Transporting

- **Be aware** of the height, length and width of implement. Make turns carefully and be aware of obstacles and overhead electrical lines.
- Empty tanks before transporting. Do Not Exceed 20 mph (32 kph) with an empty air cart.
- 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 air cart.
- Check that wings are firmly seated in transport wing stops, and lock pins installed.
- Secure transport locks on depth control cylinders.
- Be familiar with, and adhere to, local laws.



Hydraulics

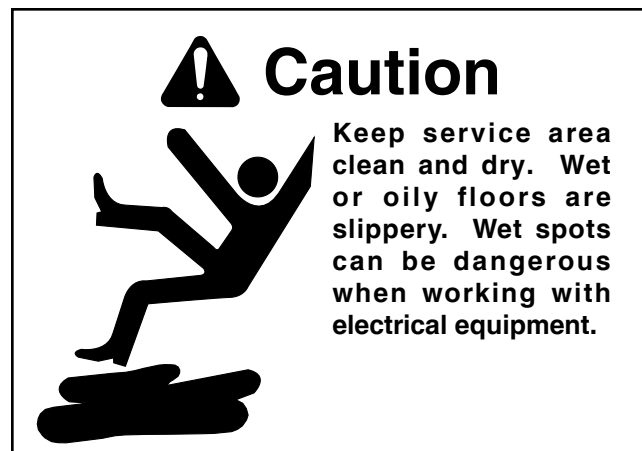
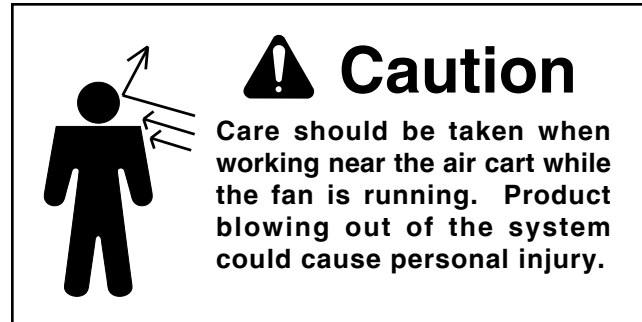
- **Do not** search for high pressure hydraulic leaks without hand and face protection. A tiny, almost invisible leak can penetrate skin, thereby requiring immediate medical attention.
- Use cardboard or wood to detect hydraulic leaks - never your hands.
- Double check that all is clear before operating 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

Maintenance

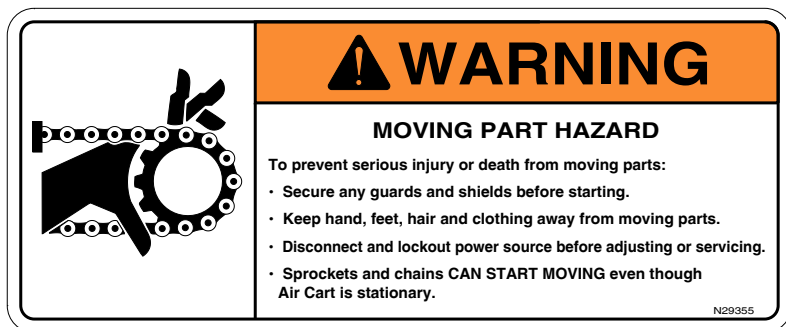
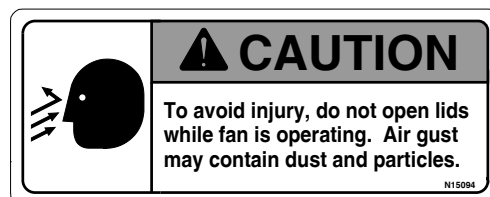
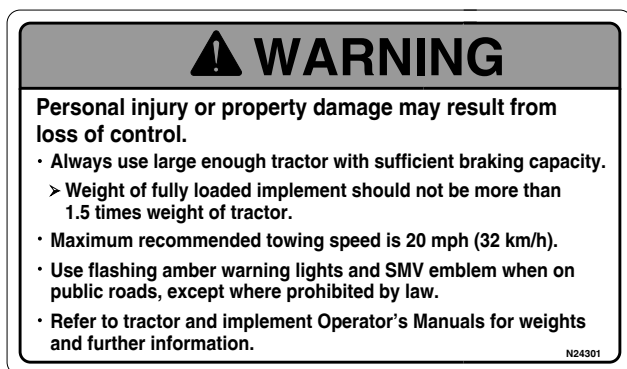
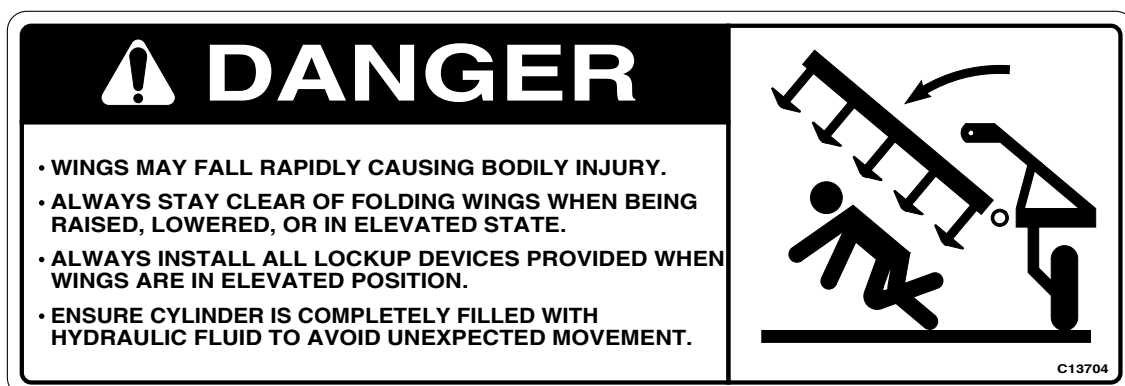
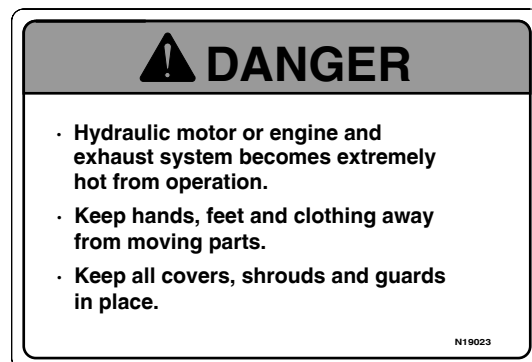
- **Shut tractor engine off** before making any adjustments or lubricating the machine.
- **Block** machine securely to prevent any movement during servicing.
- Wear close fitting clothing and appropriate personal protective equipment for the job.
- **Always wear** safety goggles, breathing apparatus 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.
- Refer to Storage Section for more details.

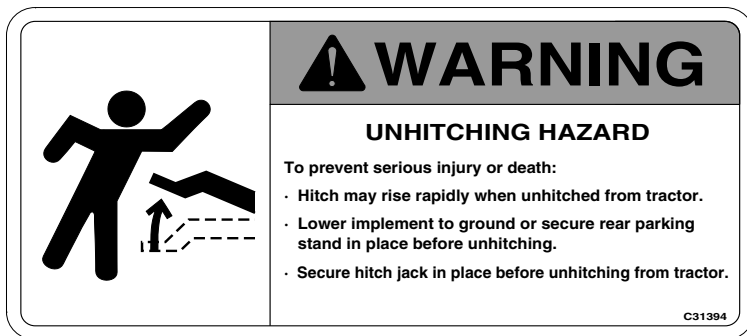
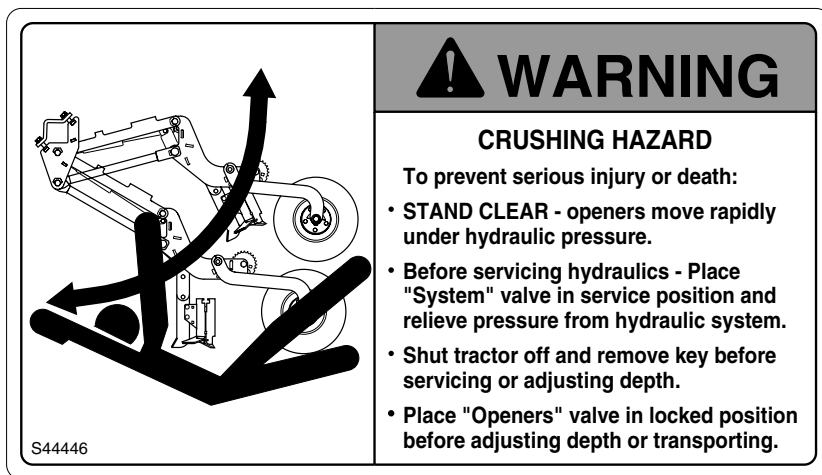
Safety Signs



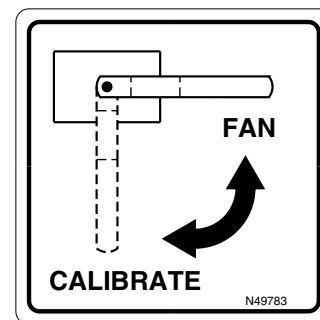
Familiarize yourself with the location of all decals. Read them carefully to understand the safe operation of your machine.

Safety

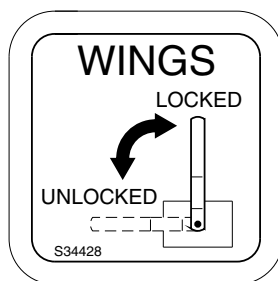
Safety Signs - Continued



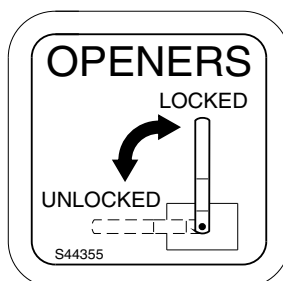
C31394 - Warning - Hitch



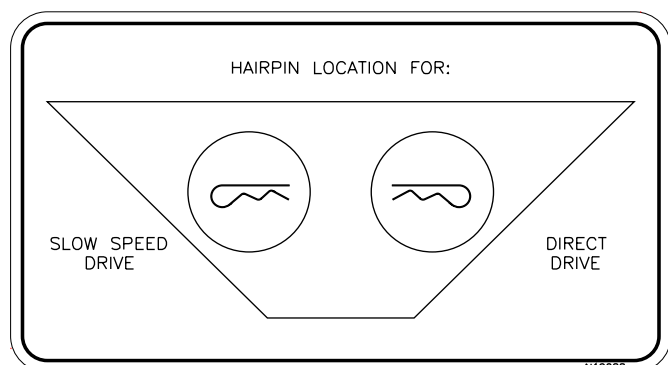
DECAL - N49783



DECAL - S34428



DECAL - S44355



N19028 - Slow Speed



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

Safety Signs - Continued

IMPORTANT

BEFORE FILLING TANK

- Ensure each meter is set correctly as described in the Operator's Manual.
- Ensure Tank clean out door is fully closed.

BEFORE APPLYING PRODUCT

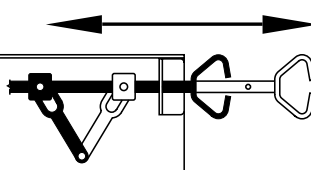
- Set rate according to the procedure and rate chart described in the Operator's Manual.
- Take a sample and adjust the rate, if necessary.

AIR LEAKS AFFECT METERING ACCURACY

- Ensure all seals are properly positioned and all lids are tightly closed.

N42356

IMPORTANT



Cycle Collector Valve Daily to ensure free movement. Minimum of 5 cycles.

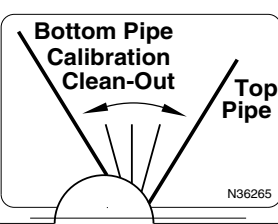
N36264

IMPORTANT

PREVENT CORROSION

Clean the Metering Body (Including Air Passages) and the Collector Body. A light coating of Silicone Lubricant or WD-40 or Penetrating Oil should be applied before storage.

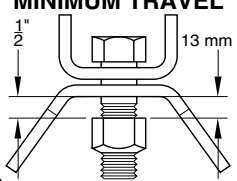
N21604



Decal on Collector

N36265

MINIMUM TRAVEL



IMPORTANT

TANK BOLTS MUST BE A LOOSE FIT.
DO NOT REPLACE WITH SHORTER BOLTS.

N29729

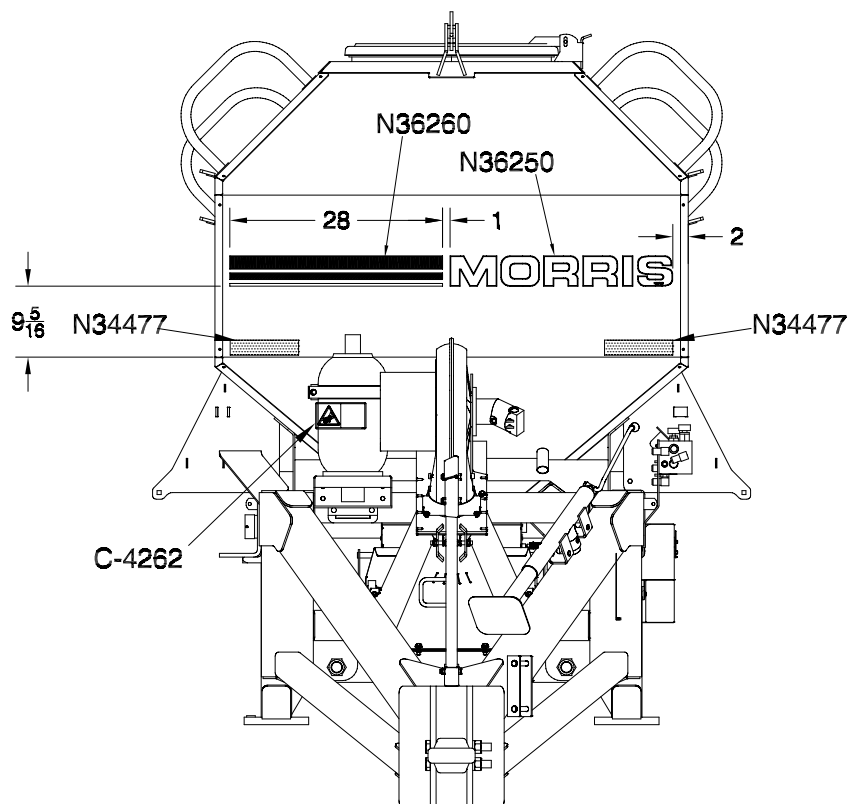


Familiarize yourself with the location of all decals. Read them carefully to understand the safe operation of your machine.

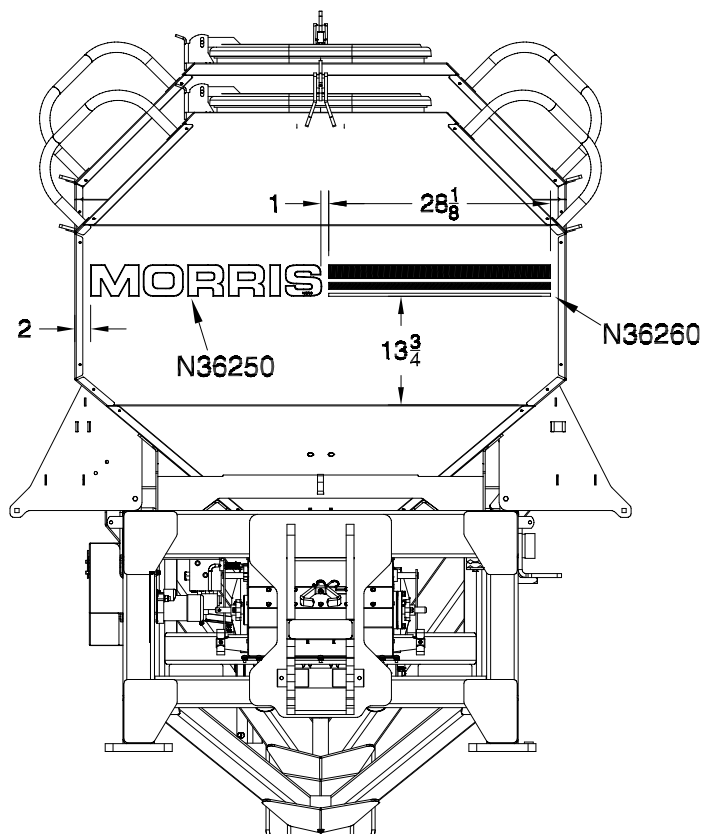
Safety

Safety Signs - Continued

Front Side

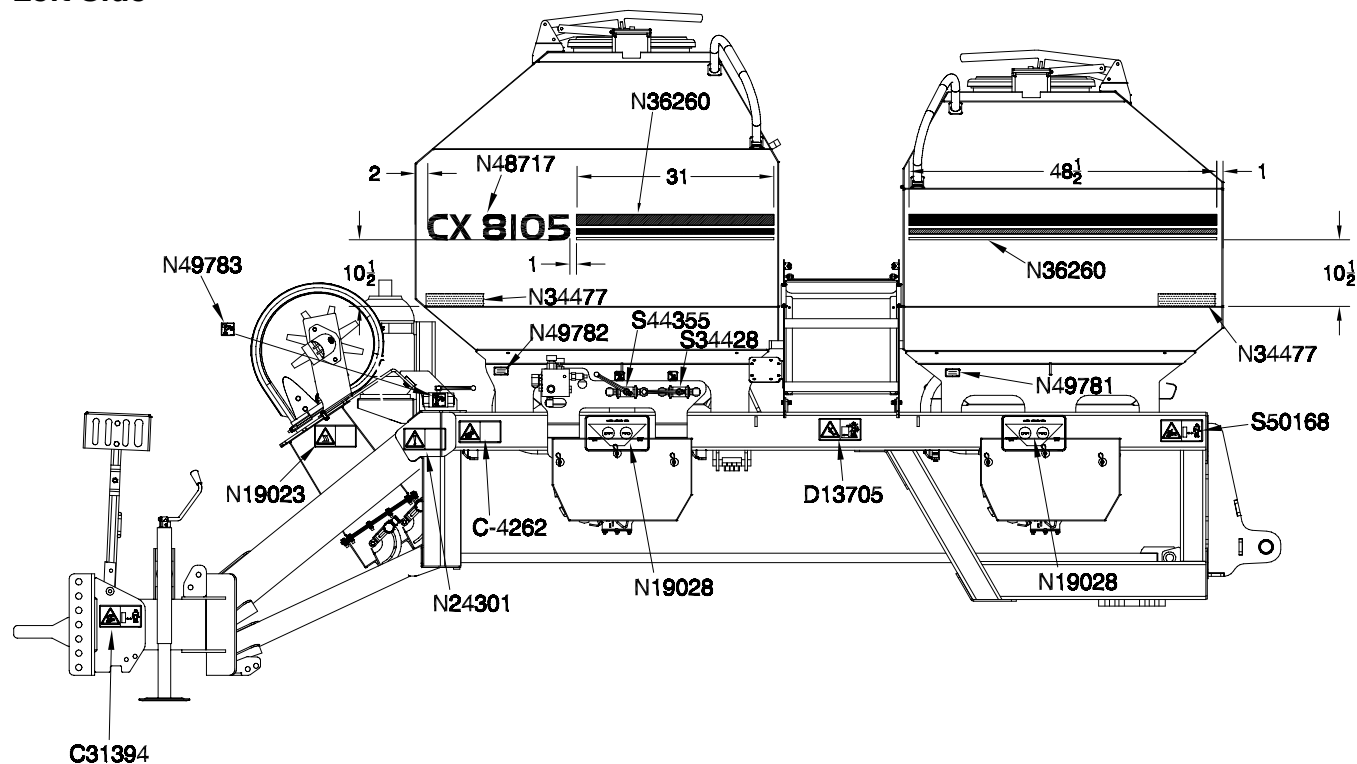


Rear Side

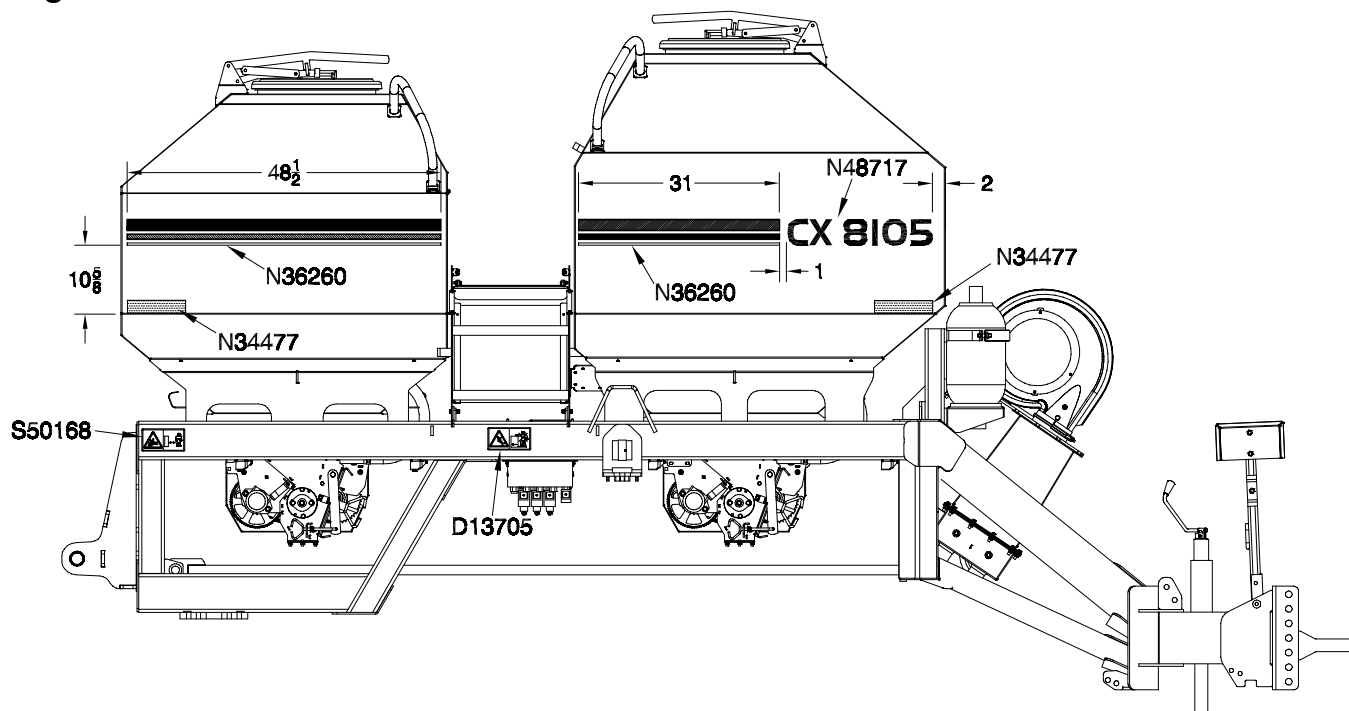


Safety Signs - Continued

Left Side



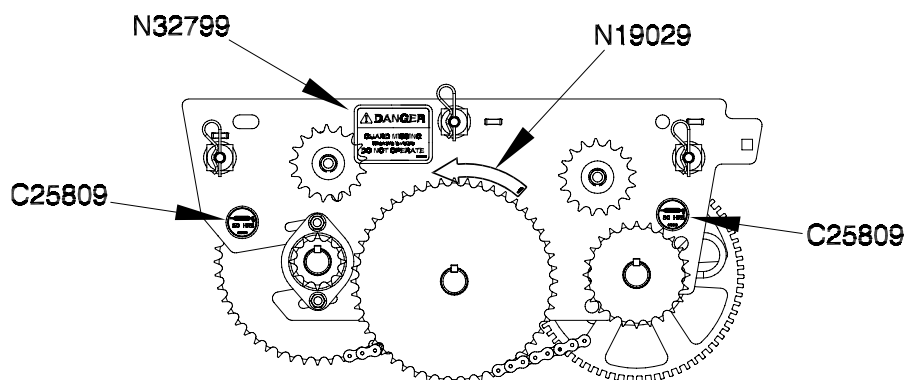
Right Side



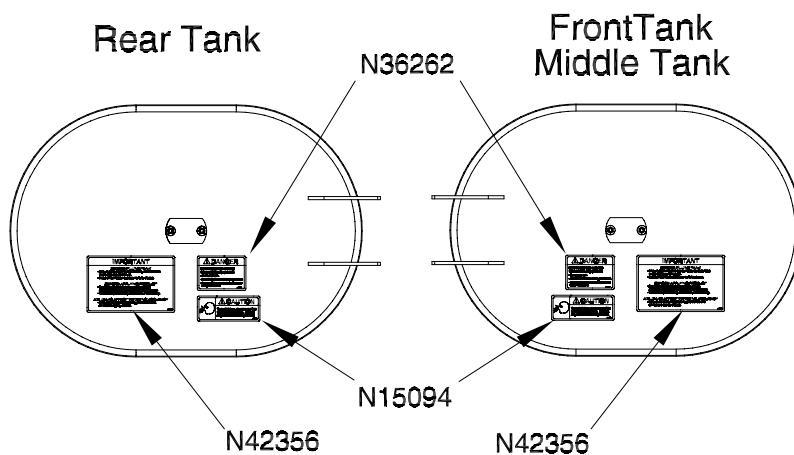
Safety

Safety Signs - Continued

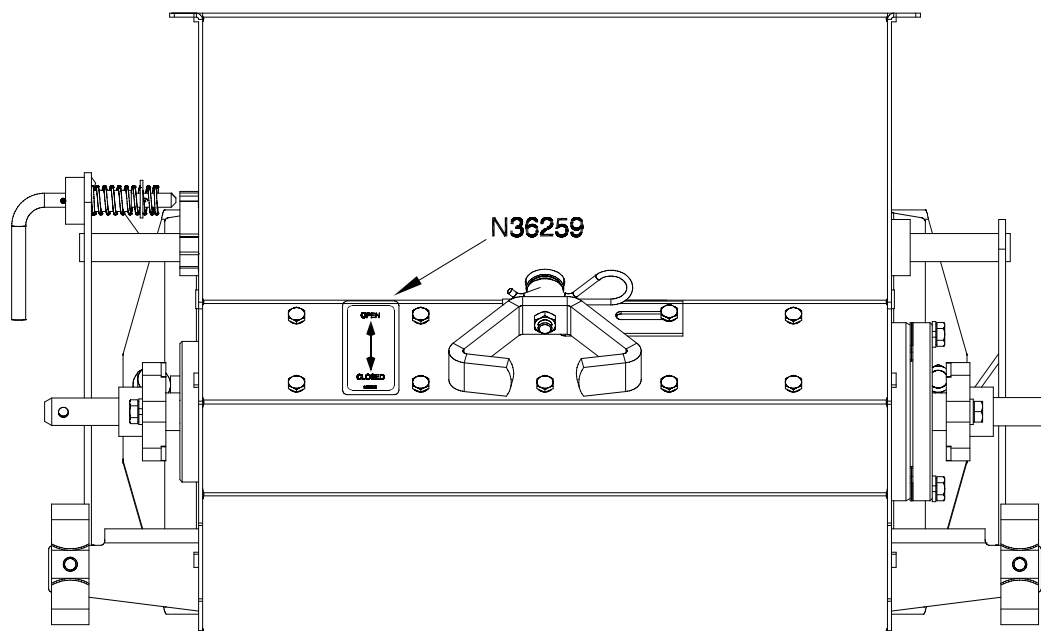
Transmissions



Tank Lids

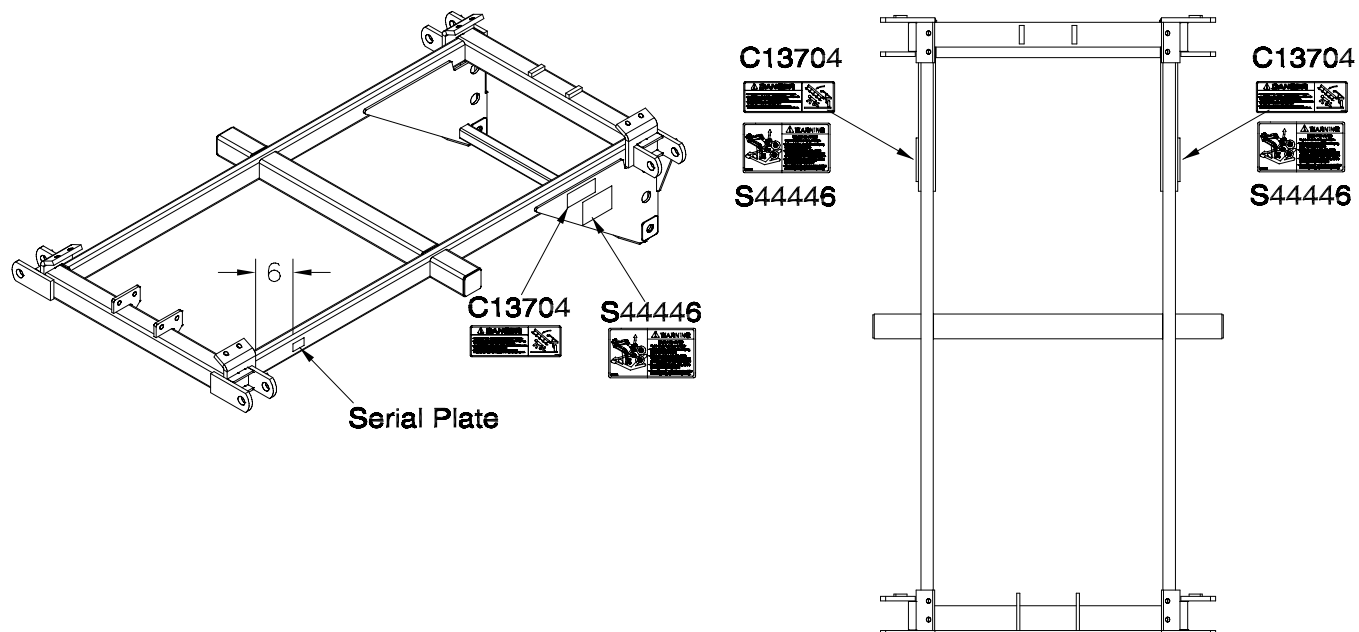


Meter Bodies

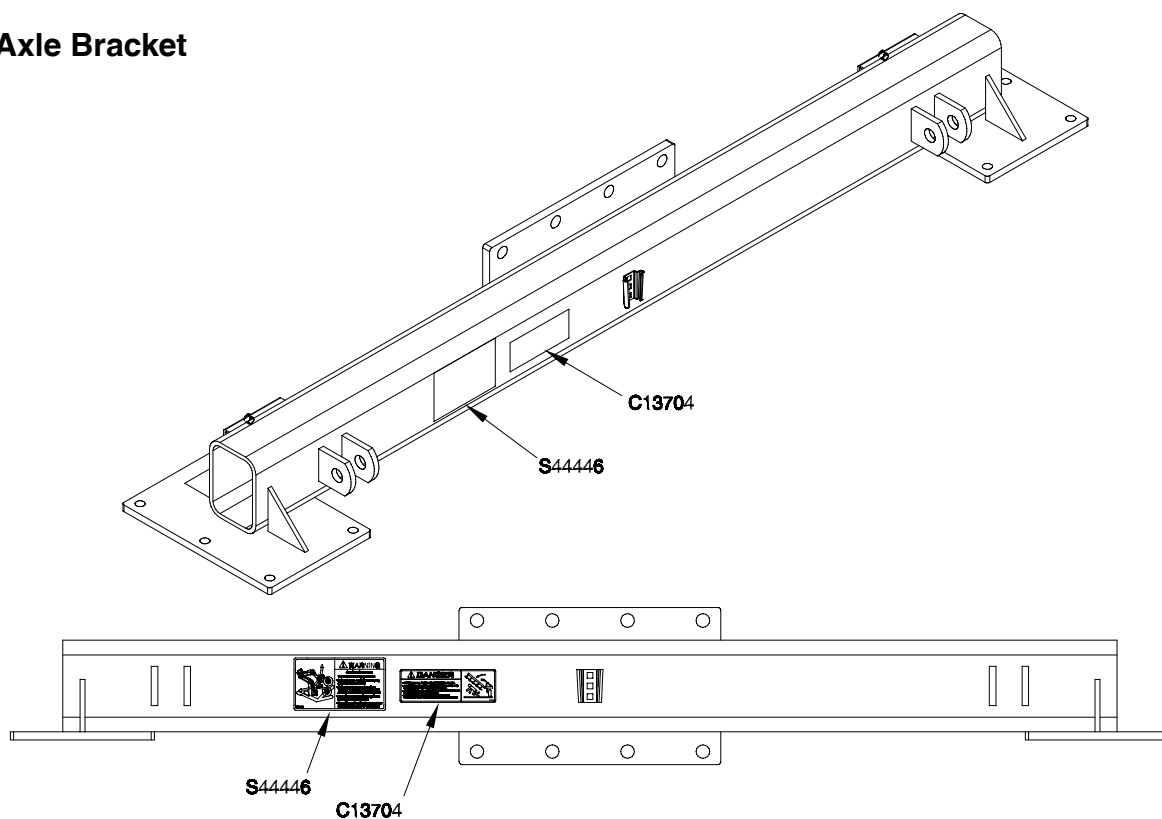


Safety Signs - Continued

Main Frame



Rear Axle Bracket



Safety

Lighting and Marking

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

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

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

Amber warning and red taillights 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 39 inches (99 cm) but not over 10 feet (3 m) above ground level.

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



Section 2: Specifications

Section Contents

Transport Dimensions2-3

Specifications

CX8105 Specifications and Options		
Base Size	25' (7.62 m)	31' (9.45 m)
Total Weight		
- 10" (25.4 cm) Spacing	20,119 lb (9145 kg)	21,404 lb (9729 kg)
- 12" (30.5 cm) Spacing	19,316 lb (8780 kg)	20,535 lb (9334 kg)
Axle Weight (Empty)		
- 10" (25.4 cm) Spacing	12,583 lb (5720 kg)	13,355 lb (6071 kg)
- 12" (30.5 cm) Spacing	12,100 lb (5500 kg)	12,833 lb (5834 kg)
Hitch Weight (Empty)	1672 lbs (760 kg)	1672 lbs (760 kg)
Working Width		
- 10" (25.4 cm)	25' (7.62m)	30' (9.14m)
- 12" (30.5 cm)	25' (7.62m)	31' (9.45m)
Number of Shanks		
- 10" (25.4 cm)	30	36
- 12" (30.5 cm)	25	31
Frame Width		
- Main	5' (1.524m)	5' (1.524m)
- Wing Inner	10' (3.048m)	13' (3.962m)
Transport Position		
- Width	9' 10" (3m)	9' 10" (3m)
- Height	13' 9" (4.19m)	16' 2" (4.93m)
- Length	36' 2" (11 m)	36' 2" (11 m)
Tires		
- Cart	(2) 600/50-22.5 Alliance Tire	(2) 600/50-22.5 Alliance Tire
- Main Frame Rear Wheels	(4) 12.5Lx15 FI Load Range F	(4) 12.5Lx15 FI Load Range F
- Wing Frame Front Castor Wheels (1 per wing)	(2) 12.5SLx15 12 Ply Rating	(2) 12.5SLx15 12 Ply Rating
- Wing Frame Rear Wheels (1 per wing)	(2) 12.5SLx15 12 Ply Rating	(2) 12.5SLx15 12 Ply Rating
Tank Capacity		
- Front Tank	60 Bu (2110 L)	
- Rear Tank	45 Bu (1585 L)	
- Third Tank - Optional	10 Bu (350 L)	
- Total	2 Tanks - 105 Bu (3695 L)	With 3rd Tank - 115 Bu (4045 L)
Tank Screens	Standard	
Fan		
- Rated Speed	Up to 5,000 r.p.m.	
- Impeller Diameter	13" (33 cm) Diameter	
- Noise Level	97.3 dB	
Hydraulic Drive		
- Blower drive piston type orbit motor 12cc (Closed Centre or Closed Centre Load Sensing systems required)	Blower and VRT (Minimum 21 U.S. gal./min.) (80 l/min.) (Minimum 2100 p.s.i.) (14,469 kPa)	
Metering		
- Variable Rate (VRT)	Standard	
- GPS Compatible VRT	Optional	
Opener		
- Trip Out Force	Increases proportionally with Packing Force to a maximum of 600 lbs (272 kg)	
- Packing Force	Adjustable from 70 lbs to 170 lbs (31.7 kg - 77.1 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	
Safety Chain	Standard	

Specifications are estimates and subject to change.

Transport Dimensions



Specifications

Notes

Section 3: Checklist

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Checklist

SAFETY-ALERT SYMBOL



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

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Your safety is involved.

Manuals

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

Warranty Void if Not Registered

Parts Manual

Order Part Number N50162

Assembly Manual

Order Part Number N50161

Checklist

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

Adopt a good lubrication and maintenance program.

OWNER REFERENCE

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

General

- ____ Check if assembled correctly.
- ____ Proper chain tension.
- ____ Check hose connections.
- ____ Ensure cleanout door and tank lid are connected correctly.

Lubrication - Grease

- ____ Metering Drive
- ____ Hitch Pivot
- ____ Castor Pivots
- ____ Opener Wheel Hubs
- ____ Wheel Hubs

Lubrication - Oil

- ____ Drive chains

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.



TAKE SAFETY SERIOUSLY.

**DO NOT TAKE
NEEDLESS CHANCES!!**

Checklist

Notes

Section 4: Introduction

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Introduction

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 CX 8105 Air Drill.

To protect your investment, study your manual before starting or operating in the field. Learn how to operate and service your CX 8105 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 CX 8105 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 CX 8105 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 CX 8105 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 Industries 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.

Introduction - Continued

The MORRIS CX 8105 is a 105 bushel two tank cart, with a 43:57 ratio tank split. The CX 8105 can be equipped with an optional 10 bushel third tank for use with small seeds. The high clearance frame gives easy access to the metering wheels and the easiest cleanout in the industry. The tank lids are easily accessed by the convenient stairs and tank walkway.

Each tank has its own metering system and metering drive. Included with the unit is a sample collector box that an operator can use to confirm seeding rates.

The metering system incorporates spiral fluted wheels. The size of the metering wheel is matched to the number of outlets on the patented flat fan divider giving the best in accuracy. The spiral fluted metering wheels combined with the multi-range transmission allows a full range of products such as canola and peas to be seeded without having to change the metering wheels.

The VRT system enables the operator the ability to increase or decrease application rates from the tractor seat by pressing a button. Application rates can be changed on the go in increments of 5% from the operator set application rate (Max/Min - 50%). This gives the producer the ability to match application rates to varying soil requirements.

The VRT monitor with its easy to read display and Smart Sensors make basic operation effortless with unmatched reliability. Advanced functions are simple to program and the monitor can be quickly plugged into the harness at the air cart for ease of calibration. The monitor constantly monitors shaft rotation and bin levels, and with just a push of a button displays fan speed, ground speed, field acres seeded, total acres seeded and actual application rates per acre. Real time actual application rate of two tanks can be displayed simultaneously on the monitor display.

Each metering shaft is independently driven by a hydraulic motor. The hydraulic motors are independently controlled through electric solenoid valves. The VRT system senses ground speed and adjusts the hydraulic valves to maintain precise meter shaft rotation vs ground speed at a frequency of 20 times per second. The VRT system has the flexibility to allow the use of either tank for fertilizer or seed.



Introduction

Notes

Section 5: Operation

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CAUTION



BE ALERT

SAFETY FIRST

REFER TO SECTION 1 AND REVIEW ALL SAFETY RECOMMENDATIONS.

Application

The Morris CX 8105 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 CX 8105 to be used in a variety of seeding applications from conventional to zero till applications.

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.

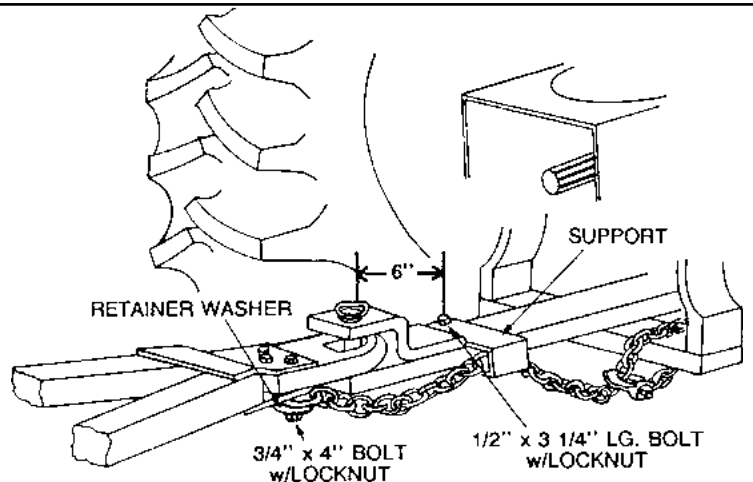
Operation

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.

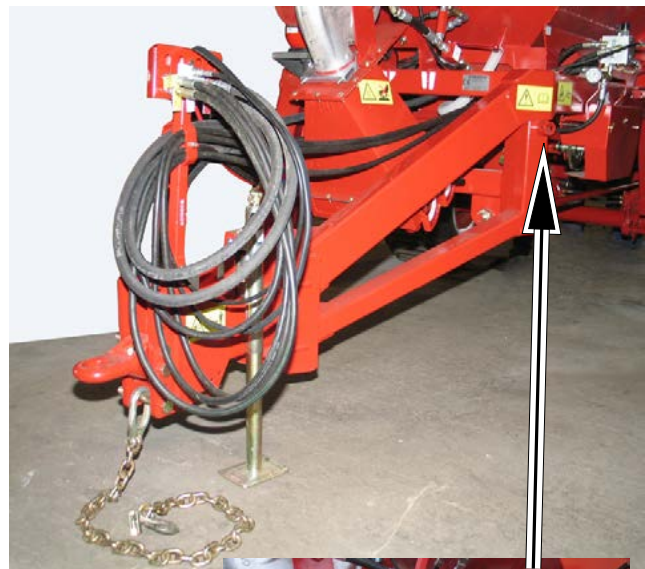


Attach safety chain to the tractor drawbar support or other specified anchor location with the appropriate parts.

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 transport 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.



Caution

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

Hitching to Tractor - Continued

- Place implement support stands into transport position.
- 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.

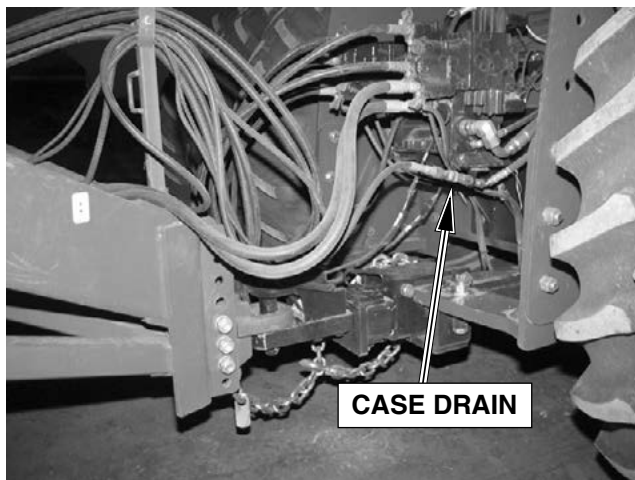
Note: The 3/8" diameter hose for fan motor case drain and pressure reducing valve, must be run directly into the hydraulic tank otherwise damage will occur to the seal in the motor. If the hose is run through the filler cap then ensure the cap is *VENTED*. A quick coupler can still be used between the tractor and the seeding tool.

- Mount digital pressure gauge and VRT console 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.



SUPPORT
STAND

Support Stands Raised



CASE DRAIN

Hydraulic Coupling on Tractor



PRESSURE
GAUGE

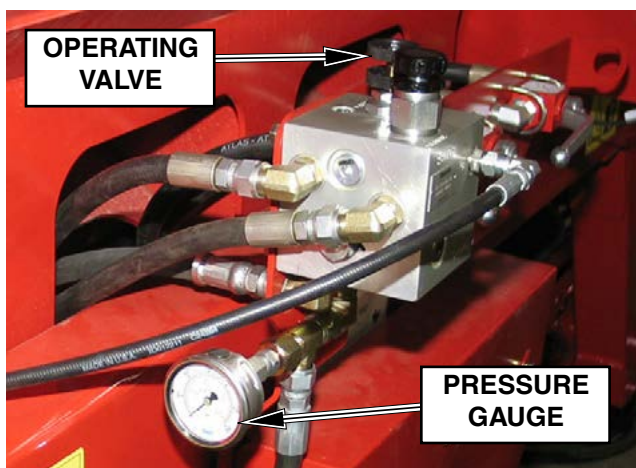
Operation

Unhitching from Tractor

- Place implement support stands into storage position.
- Pin hitch jack in storage position.
- Lower hitch jack taking the weight off the hitch clevis.

Note: For added safety it is recommended to unload any material that may be in the tanks.

- Ensure all transport locks are properly secured.
- Open “Operating” valve to 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 VRT controller and monitor cables.
- Disconnect the hydraulic hoses.
- Remove the safety chain.
- Remove the drawbar pin.
- Slowly move tractor away from cultivator.



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 INDUSTRIES 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.



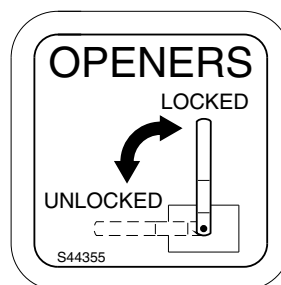
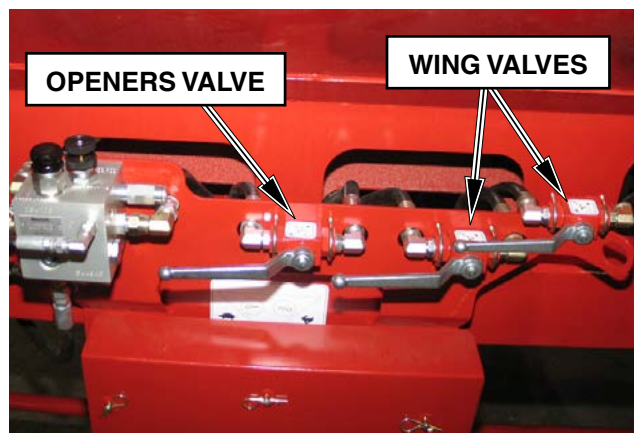
Operation

Transport - Continued

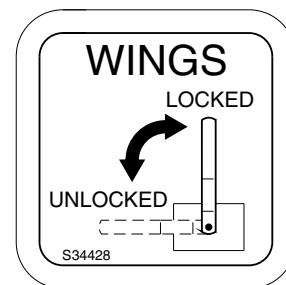
Transport to Field Position

- 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.
- Unlock both wing valves and the opener valve. Do not walk under raised wings.
- Operate opener hydraulics, to ensure all openers are retracted.
- Operate wing lift hydraulics to **ensure wings are fully retracted**.
- Operate wing lift hydraulics to first open transport lock, secondly to lower wings until fully 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.



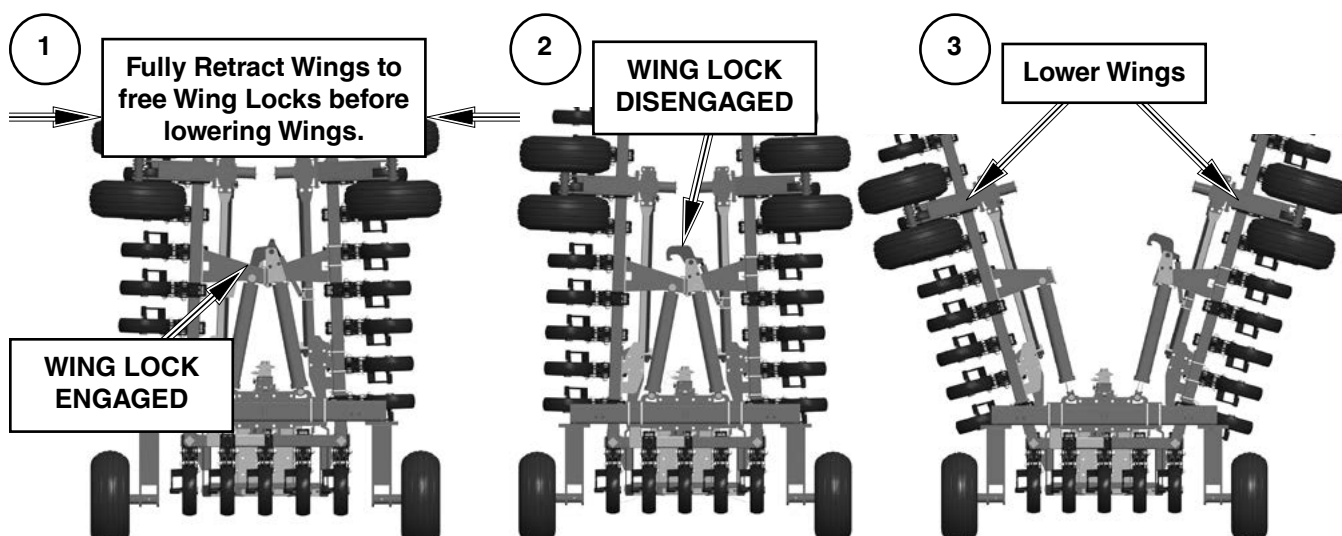
DECAL - S44355



DECAL - S34428

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.



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 first raise the wings fully into transport position, secondly to engage transport lock. **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.

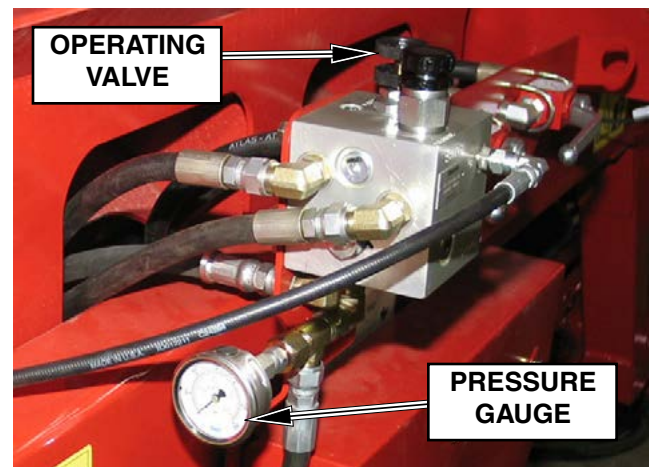
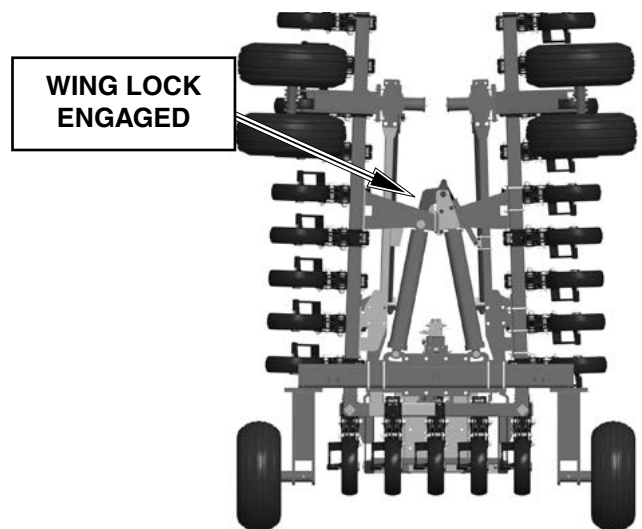
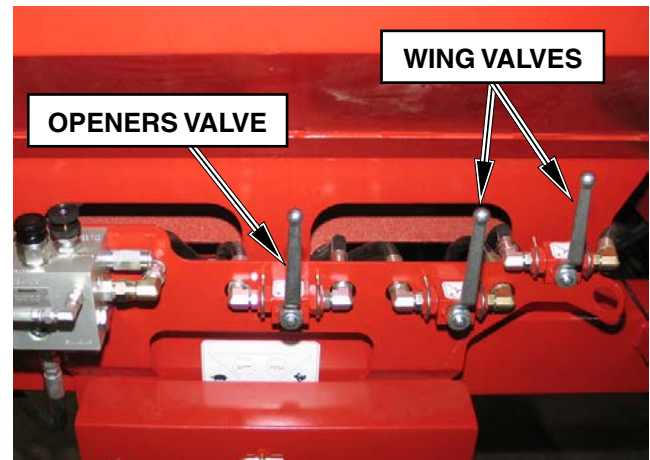
- Lock both wing lift valves and the opener valve. Do not walk under raised wings.
- Ensure safety chain is properly installed, see “Hitching to Tractor” of the Operation Section.

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.



Pressure Gauge

Operation

Preparing VRT

Zero Shaft Hydraulic Motor Solenoids

Upon initial setup the preload of the valves must be set to match the tractor hydraulics.

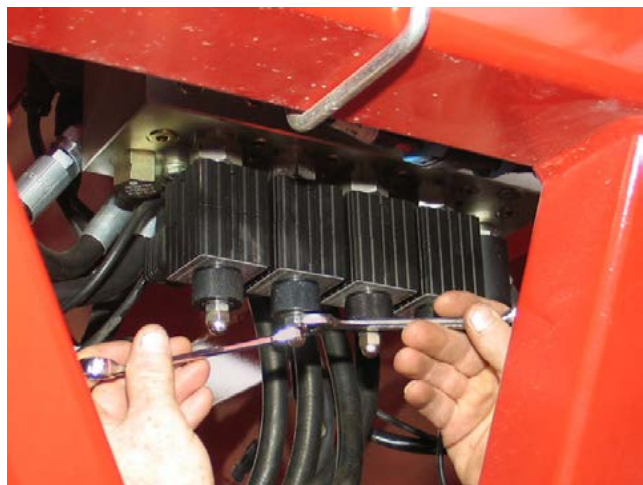
Note: Tanks must be empty.

Zero the shaft hydraulic motors by using the following procedure:

- Ensure there is no product in any tanks.
- Warm up hydraulic system by running fan system for 5-10 minutes. Hydraulic hoses at fan motor should be warm to touch.
- **Turn OFF** Monitor, VRT Console and Controller.
- Start with **all** adjusting screws **turned out fully**.
- Adjust each valve individually by following the procedure below:
 - Start with rear tank first adjusting screw '3' for three valve bank or screw '4' for four valve bank.
 - Remove cap nut and then loosen jam nut.
 - Turn adjusting screw IN until motor starts to turn.
 - Allow motor to turn for 1-2 minutes to allow for motor to reach optimal operating temperature.
 - Then turn adjusting screw OUT until motor stops turning.
 - Turn adjusting screw OUT an additional 1/2 turn.
 - Tighten jam nut to secure adjusting screw in place. Replace cap nut.
- Repeat the above procedure for the other valves.

Note: It is recommended to check the zero of the valves at the start of each season or if a different tractor is used on the system.

Note: If air cart is *NOT* equipped with a Third Tank or Granular Tank solenoid '1' must be unplugged and the adjusting knob turned out fully.



Remove Cap Nut and Loosen Jam Nut



Adjusting Screw

Preparing VRT - Continued

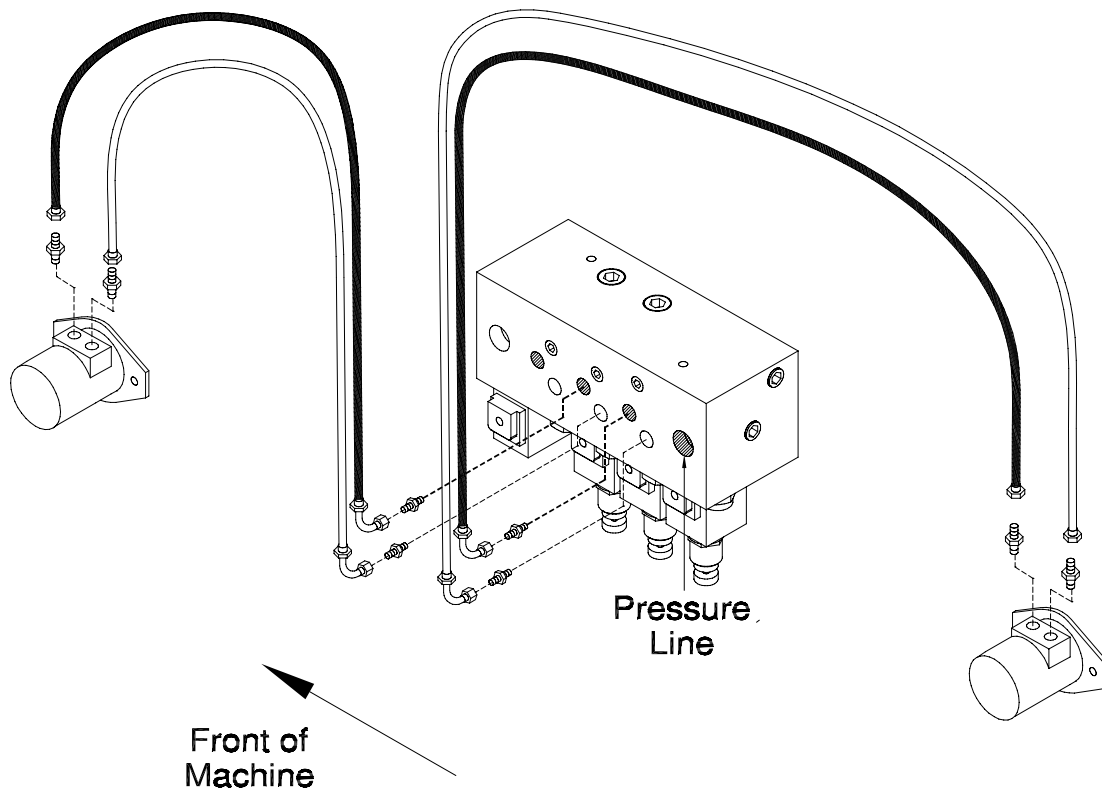
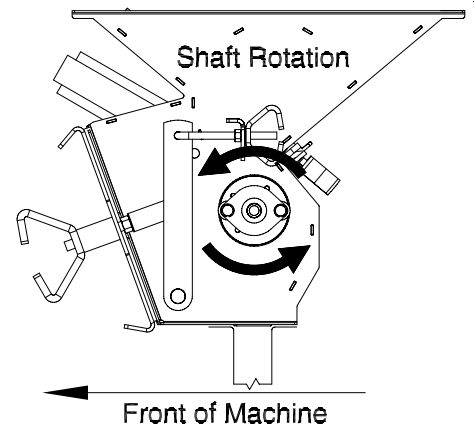
Verify VRT Hydraulic Assembly

VRT system should be run to confirm correct rotation of meter shafts.

The diagram below illustrates the correct hose orientations for the VRT valve body.

Note: The pressure line from the tractor is the front port of the valve body.

To ensure correct hose installation, the meter shafts will turn counterclockwise when viewed from transmission side during system operation.



Operation

Metering System

The 8105 Air CART uses a combination of metering wheels and spacers shown below. The metering wheel is individually sized to correspond to the number of outlets at the connected secondary head and the spacers make up the space between the wheel and the body. Some openings may be blanked off depending on the number of secondary divider heads used on the seeding tool.

The 8105 Air Cart can meter all types of seeds and fertilizers by simply installing the correct seed plate. See "Seed Plate Settings" for more details.

Different rates are easily obtained using the selection of quick change sprockets that attach to either of the two meter transmissions.

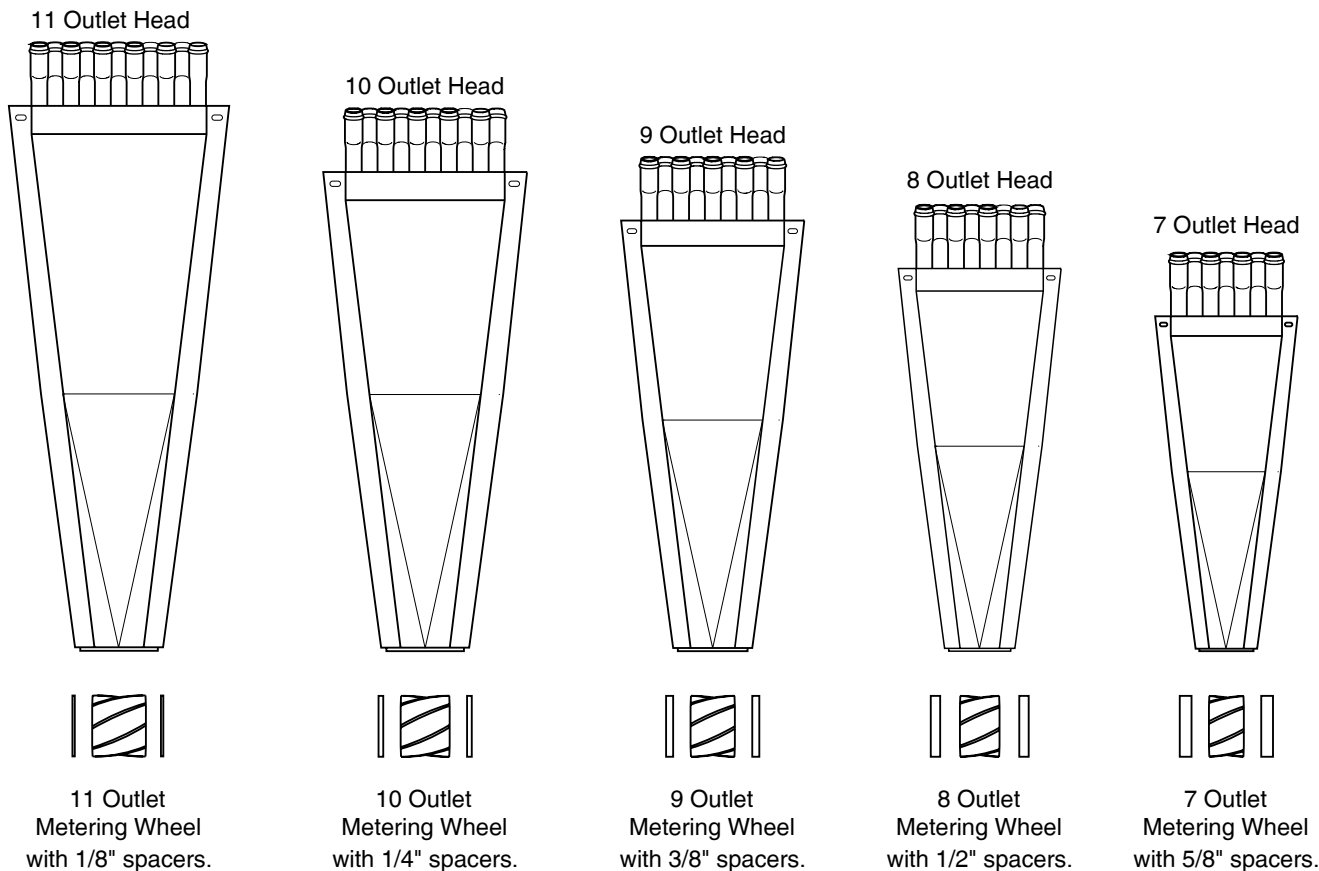
Note: Before putting product into the tanks check the following:

1. The correct Seed Plates are installed for the product being applied.
2. The clean-out doors are fully closed and sealed.
3. The plastic bag covering the fan is removed.

Important

Ensure distribution system is balanced. It is very important that head outlets only vary by one. (i.e. use only 7 and 8 together, 8 and 9 together, 9 and 10 together)

Note: The number of outlets on the divider head must match the metering wheel size.



Metering System - Continued

Secondary Hose Installation

The lengths of the 15/16" (24 mm) diameter hoses are **very important**.

For accurate distribution the secondary hoses have to be arranged by length symmetrically around the centre line.

The **longest** hoses **have to be** in the **centre** of the divider head. These hoses would normally feed the openers furthest away from the head.

- Ensure that the secondary hoses 15/16" (24 mm) diameter do not run higher than 3" (76 mm) above the height of the flat fan divider head.
- Allow an extra 3" (76 mm) of hose before cutting secondary hose for fitting in the seed boot.
- Always ensure that the secondary hoses are sufficiently long to accommodate tripping of trips.
- **Avoid sharp bends** in any of the hoses.
- Check for pinch points and clearances when folding in and out of transport.

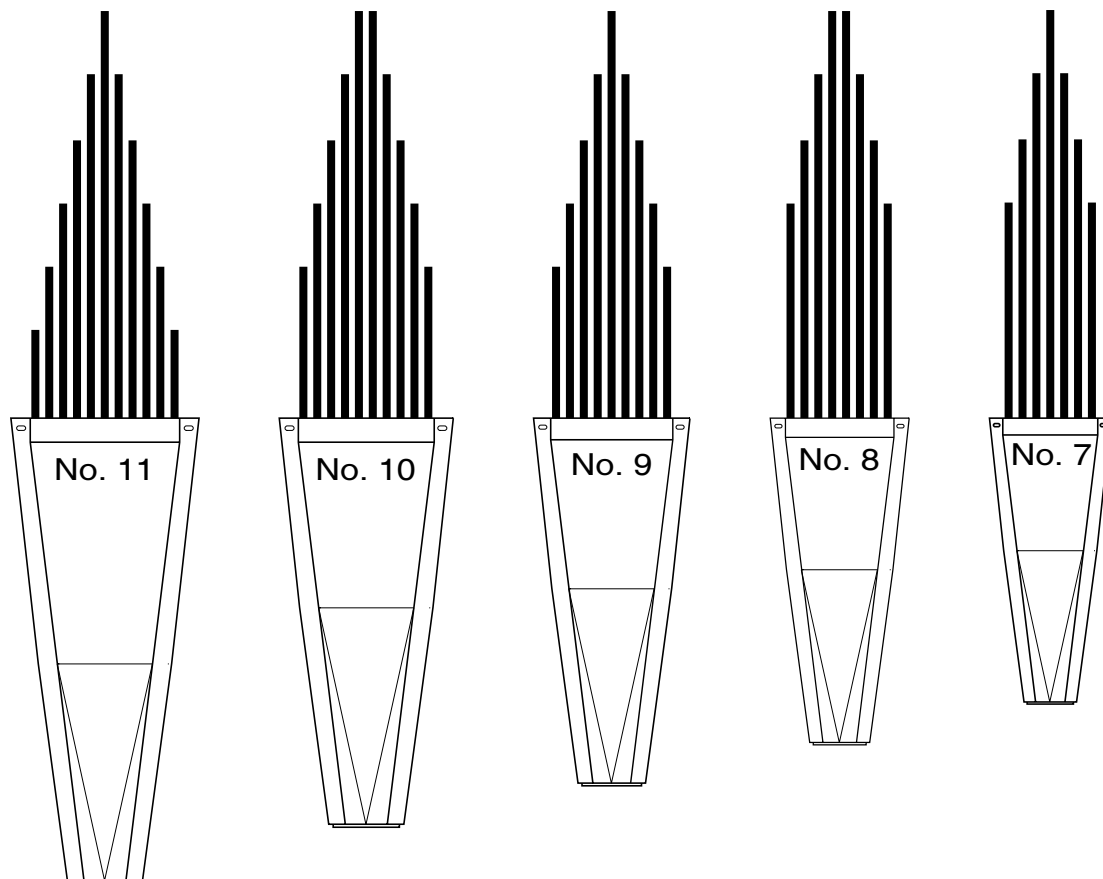
Important

Hot water is the only acceptable lubricant for the installation of the secondary hose.

The supplier advised MORRIS that WD-40 or any other lubricant (i.e. liquid detergent) will have a negative effect on the chemical stability of the hose, resulting in the degradation and failure of the hose due to Environmental Stress Cracking.

Important

Distribution uniformity will be adversely affected if hoses are incorrectly installed.



Operation

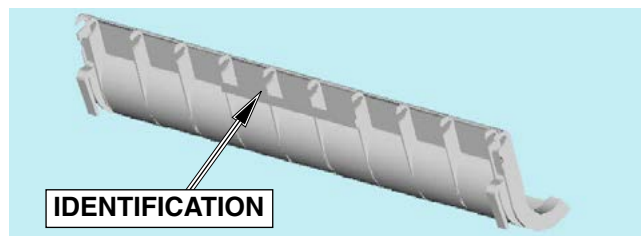
Metering System - Continued

Seed Plate Sizes

The seed plate comes in 3 different sizes, fine, medium and coarse. Each seed plate is designed for use with specific product types. The coarse seed plate is offered in two versions - standard and coated. The coated seed plate is recommended for DAP fertilizers.

The three different seed plates allow all types of seeds and fertilizers to be metered.

The seed plate has only one position, fully closed against the back plates assembled to the metering body.



Seed Plate - Stainless Steel

The stainless steel seed plates are identified by an inscription (FINE, MEDIUM, or COARSE) on the back as indicated.

Seed Plate Usage

Product	Seed Plate
Canola Canary Seed Clover/Alfalfa Flax Mustard Nitragin Edge Fortress Rival	Fine
Barley Lentils Milo Oats Rice Wheat Safflower Nodulator Tag Team Fine Fertilizer (no Sulphur or Potash) 28-0-0 Fertilizer 46-0-0 Fertilizer 34-17-0 Fertilizer 20.5-0-0-24 Fertilizer	Medium
Beans Peas Soybeans Sunflowers 0-0-60 Fertilizer 0-45-0 Fertilizer 10-46-0-0 Fertilizer 11-51-0 Fertilizer Fertilizers containing Sulphur and/or Potash	Coarse

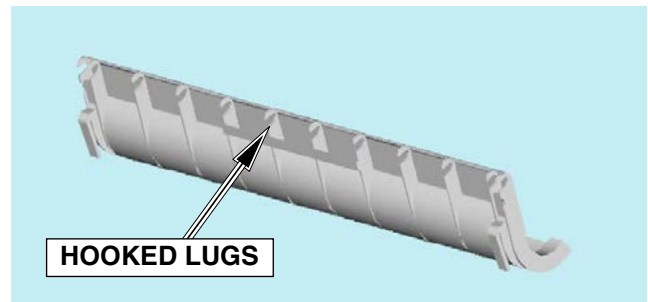
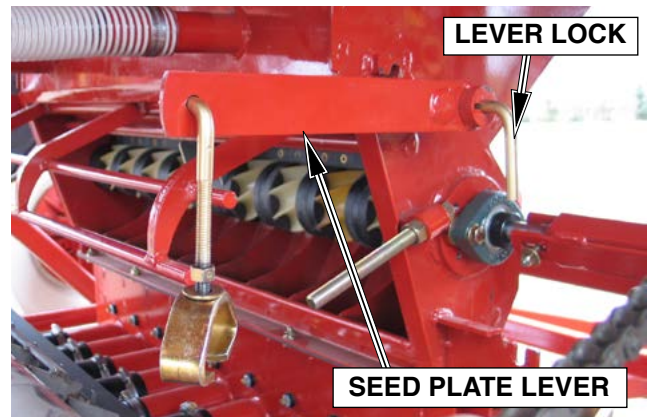
Metering System - Continued

Seed Plate Installation

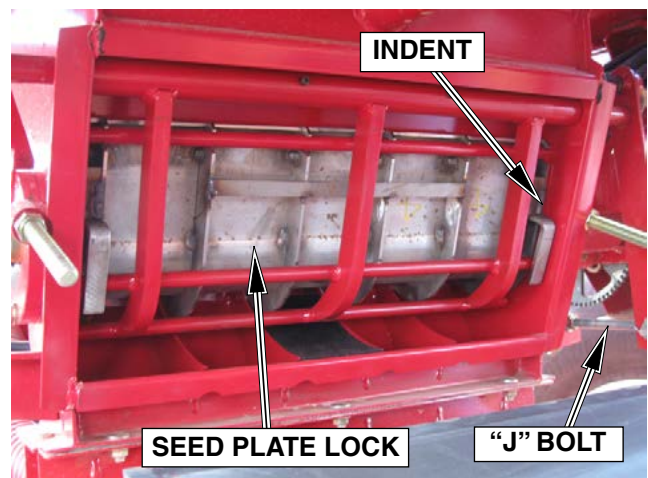
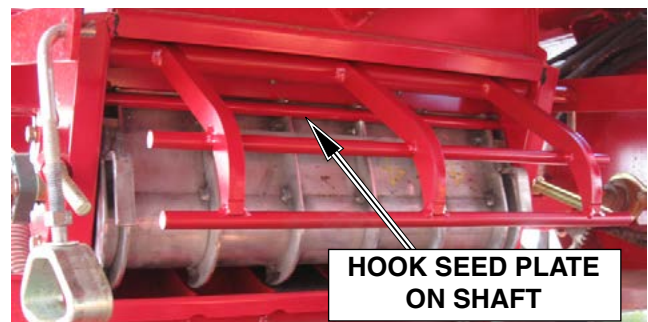
- Ensure Tank Shut-Offs are closed if there is product in the tanks.

Note: Tank Shut-Offs are only for use when inspecting/servicing meter body with product in tank.

- Install seed plate with hook to the top of the metering body.
- Rotate seed plate towards the metershaft with top part of seed plate hooked to the shaft running through the top of the meter body.
- Let the seed plate hang in the metering body.
- Rotate seed plate lock down to push seed plate against the back plate.
- Install the “J” bolts into the slotted lug welded to the meter body and tighten the wing nuts. **Do not** adjust the flange nuts on the “J” bolts. These nuts are preset on assembly. Refer to Maintenance Section under “Seed Plate Adjustment” for details.
- Ensure Tank Shut-Offs are opened.



Seed Plate



Important

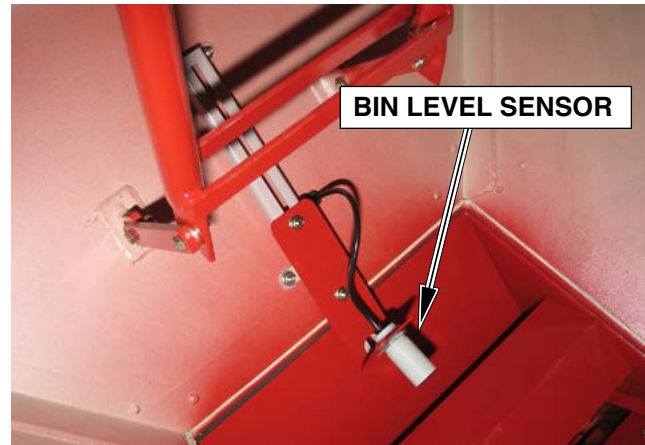
Seed Plate Position

Once “J” bolt wing nuts are tightened, indents in the side plates should just be visible in the slotted area of the hook.

Operation

Bin Level Adjustment

- Adjust bin level sensor to desired alarm point.
 - Top position for large seeds, high rates of fertilizer.
 - Middle position for cereal grains.
 - Lower position for fine seeds.



Filling Tank

The Morris 8105 Air Cart is equipped with 2 tanks. The front tank is for seed and the rear tank is for fertilizer. The optional third tank is for use with small seeds. However, ALL tanks can be used for the same product.

- Open lid fully on tank being filled.
- Check and remove any debris inside tank.
- Remove clean-out door.
- Remove seed plate.
- Check for debris inside metering body.
- Ensure Tank Shut-Offs work freely.



Warning

Do not enter tank unless another person is present.



Important

Before putting product into the tanks check the following:

1. The correct seed plate is installed for product being applied.
2. The clean-out doors are fully closed and sealed.
3. The plastic bag covering the fan is removed.
4. Inspect all augers used in handling the products for seeding. Run augers to clean out any debris inside auger so it does not get transferred to air cart tanks.



Inspect Metering Body

Filling Tank - Continued

- Check that the correct seed plate is installed for the product being applied.
- Fully close and seal the clean-out door.
- Ensure the auger screen is in place.
- Always use screen to filter debris when filling.
- Adjust bin level sensor to desired alarm point.

Note: Even small fertilizer lumps can cause problems with plugging. All possible precautions should be taken to prevent lumpy fertilizer from entering the tank.

- Clean lid seal and ensure lid seal is positioned correctly before closing tank lid.
- Remove the plastic bag covering fan.
- Check lid for air leaks with your hands once air cart fan is operational. See Maintenance Section 7.
- Check metering body for air leaks.

Note: Before seeding it is recommended that after a rain or dew that fan be run for a few minutes to eliminate moisture in the system.



Clean-Out Door



Tank Screen to filter debris

Important

Do not exceed 10 mph (16 kph)
in field operation.

Note: Only the two tank version has storage under walkway.



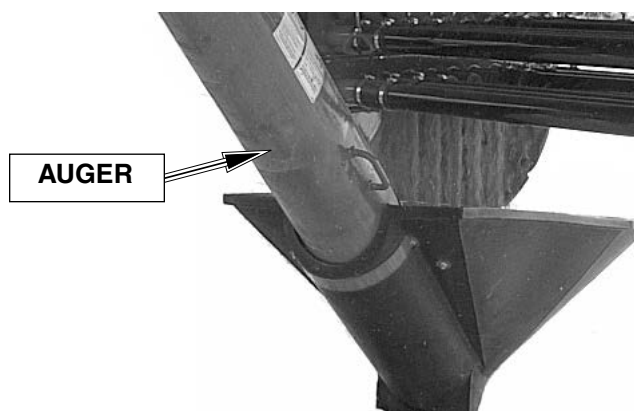
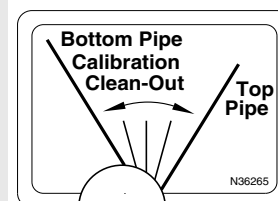
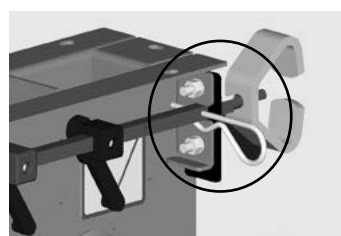
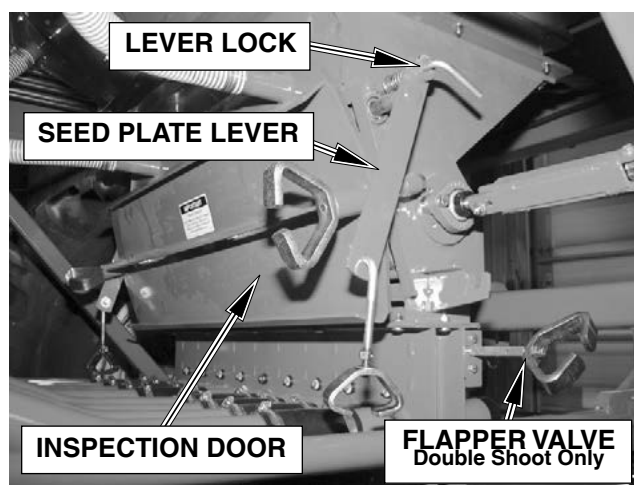
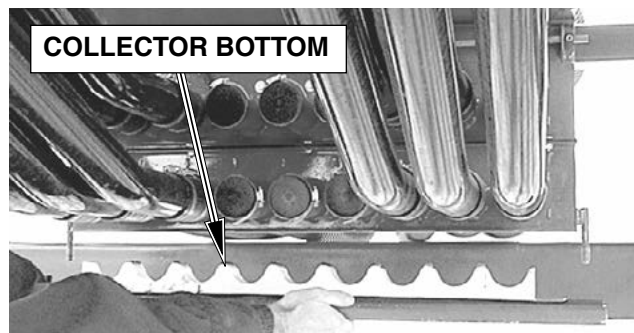
Walkway Storage

Operation

Unloading Tanks

Emptying tanks is quick and easy to do.

- Position an auger under the tank to be emptied. **Note:** Ladder must be in transport position to access tanks.
- Remove collector bottom.
- Move flapper valves to “**Bottom Pipe**” position on the collector body. (**Double Shoot Only**)
- Loosen inspection door approximately 1” (25 mm). **Note:** The wing nuts will be near the end of the threaded rod.
- Start auger.
- Open seed plate to first lock point, this will allow material to flow through the metering body into the auger.
- Once all material stops flowing, move “Shut-off” levers in and out a few times to dislodge any product and ensure free movement.
- Remove meter body inspection door and seed plate completely.
- Rotate meter shaft using crank to empty meter wheel flutes.
- Brush out remaining material in the corners and on top of the back plate.
- Reset flapper valves to correct position for product delivery. Ensure that the flapper settings are correct. This can be done by visually checking that the flappers are fully over and touching the side walls, sealing off the individual airstreams. The flappers can be adjusted by loosening the individual adjusting setscrews and applying pressure to the flapper forcing it against the side wall while tightening the setscrew.
- Reinstall correct seed plate for product being metered.
- Reinstall inspection door and collector bottom ensuring that the seals are free from leaks.



Danger

Keep all shields in place. Keep hands, feet and clothing away from auger intake, failure to do so will result in serious injury or death.

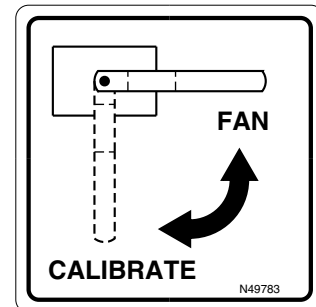
Rate Calibration

The practice of doing a rate calibration is strongly recommended, as it will confirm the **actual** amounts of product dispensed per motor revolution (**Weight/Rev**).

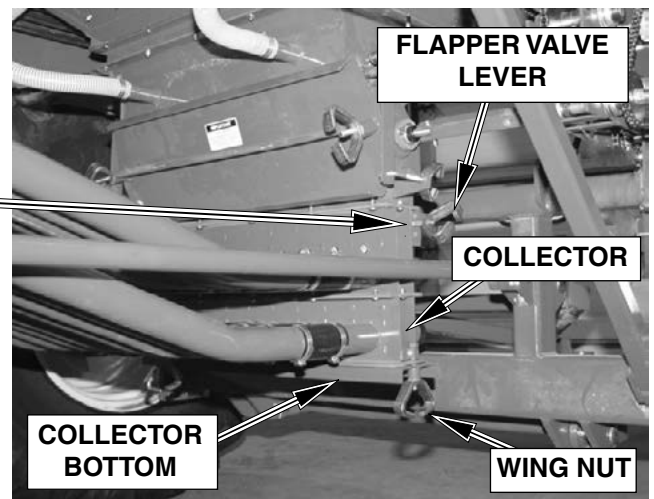
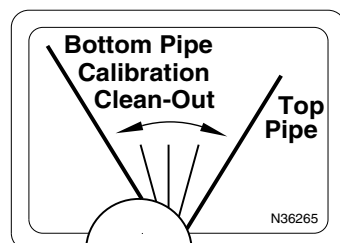
Weight/Rev is used by the monitor to determine the shaft motor rpm required to deliver the correct application rate.

The following procedure should be followed for every change of product.

- Engage hydraulic lever to run air cart.
- **Turn off fan** by switching selector valve (located in the fan supply line) to calibration position.
- Remove the wing nuts on the collector bottom.
- Remove the bottom of the collector.
- Set Flapper Valves to “**Calibration**” as per the decal located on the front of the Collector.



Selector Valve



Double Shoot Shown

Operation

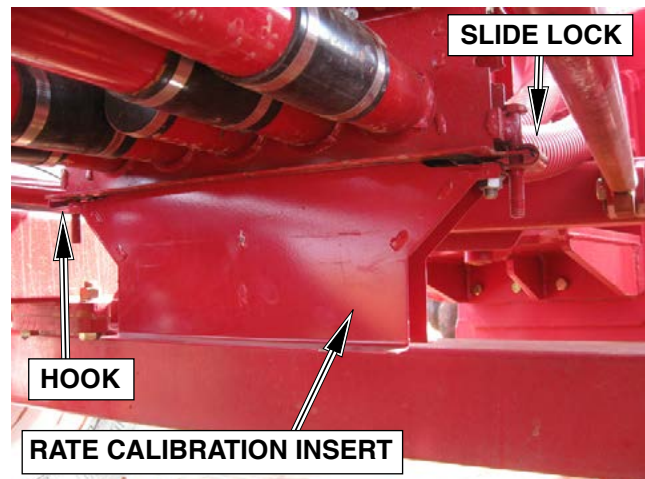
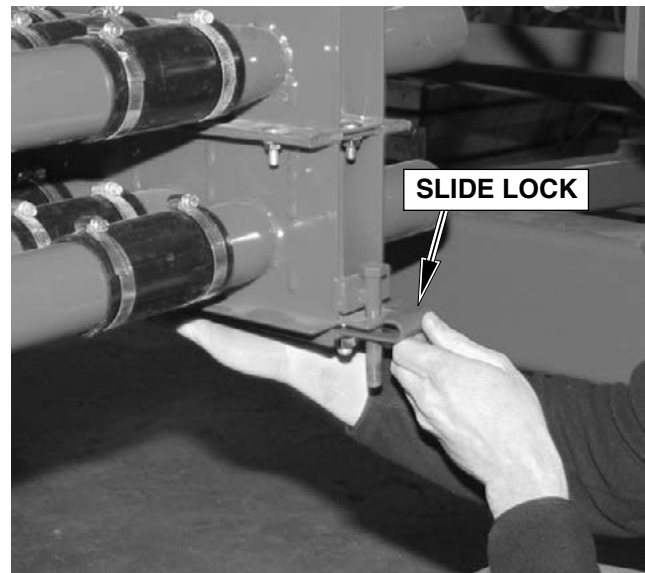
Rate Calibration - Continued

- Hook the Rate Calibration Insert on collector bottom and rotate up into position. Secure in place with slide lock.
- Slide the rate check box onto the collector body.
- **Prime metering wheels first** by using the Start/Stop button on the keypad to start and stop the meter drive. Allow the drive to run until material begins to fall through the collector body. Press the rest button for 5 seconds to zero monitor count before collecting sample.

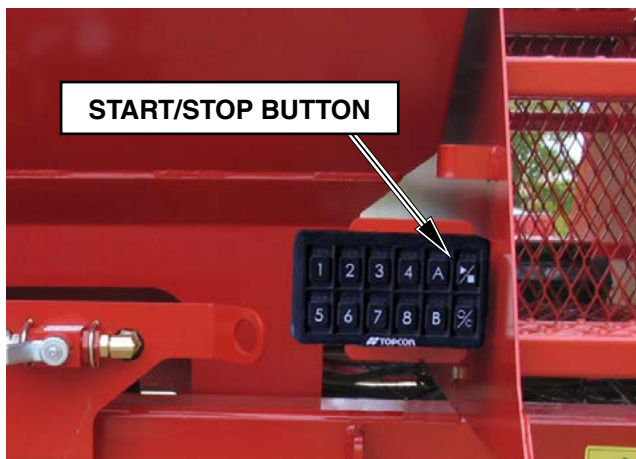
Note: The Topcon monitor must be turned ON in order for the primer switch to work.

Note: *Ensure the fan is not running.*

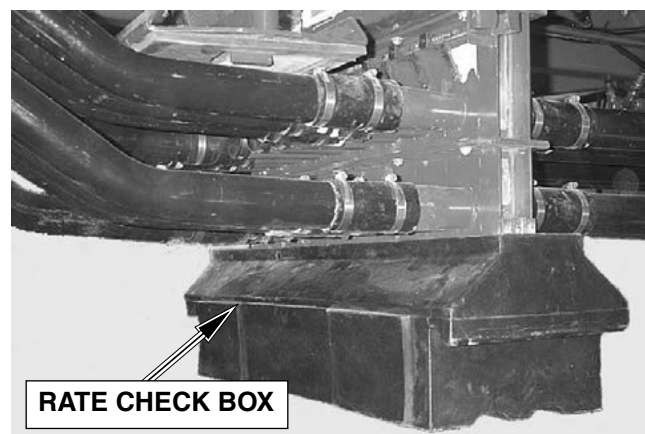
- Empty material from rate check box and reinstall it on the same collector.
- The monitor can be relocated to the frame near the primer switch for ease of calibration. The three-pin plug connects to the monitor harness and the two-pin plug connects to the VRT controller harness.
- Refer to TOPCON monitor manual for monitor calibration procedure.



Tow Behind - Calibration Insert



Keypad



Rate Calibration - Continued

- Perform calibration as outlined in the Topcon manual.
- Remove the rate check box from the collector body.
Weigh the sample by using tarp straps to hook rate check box to spring scale.

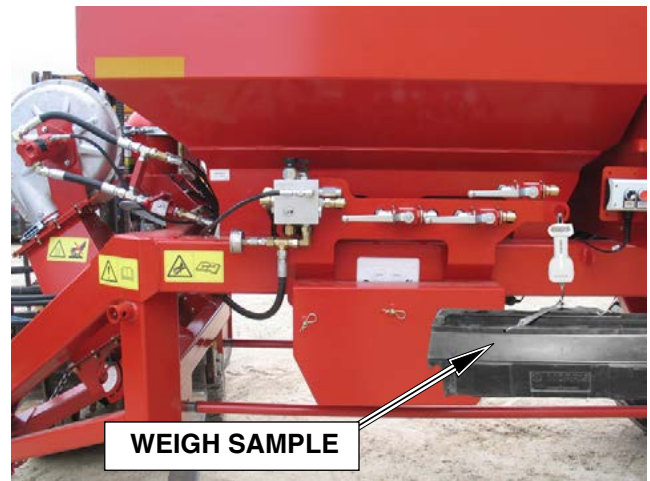
Note: Remember to subtract the weight of the rate check box from the total sample weight.

- Enter "Weight" of product collected as outlined in the Topcon manual.

Note: The Calibration Factor (Weight/Rev) is automatically calculated for the value being entered.

- Replace the bottom of the collector. Place rate check box into storage box.

Follow the above procedure to check the rate of the other tank.

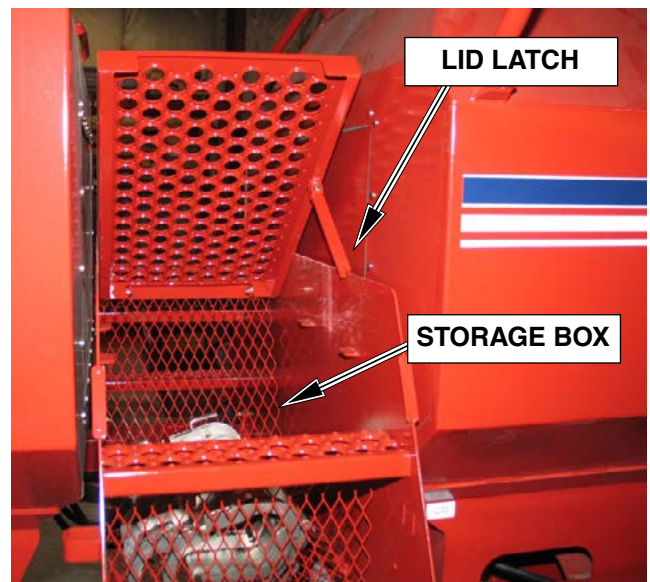


Important

Proper measurement of sample weight is critical for application rate accuracy.

Prime metering wheels before taking actual sample.

Remember to subtract the weight of the rate check box from the total sample weight.



Walkway Storage

Note: Only the two tank version has storage under walkway.

Operation

Seeding Fine Seeds (Canola, Mustard, etc.)

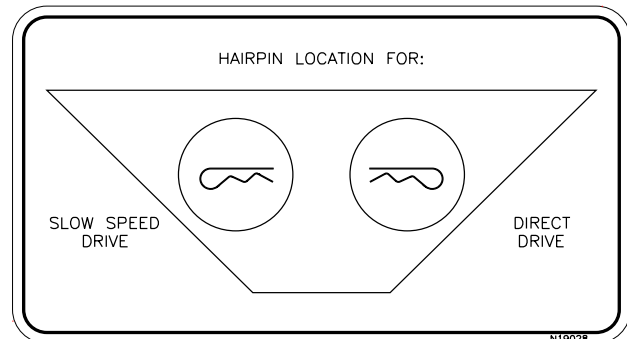
When seeding fine seeds such as canola or mustard, the slow speed transmission has to be engaged to ensure the low rates required for these products.

The slow speed transmission is incorporated in **All** the Posi-Drive Transmissions.

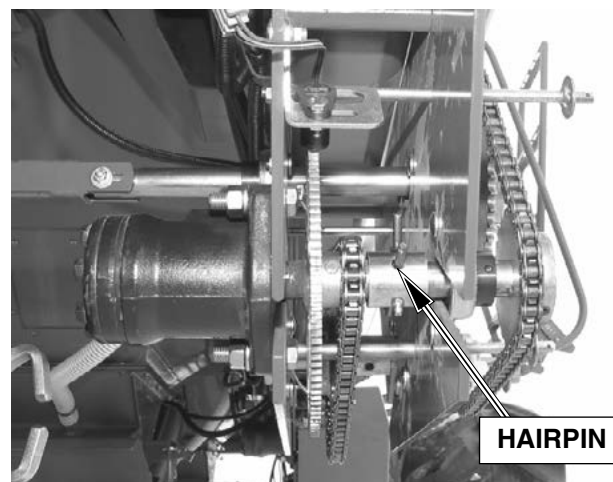
- To engage the slow speed, remove the large hairpin from the front shaft and install through the sleeve and shaft located at the rear of the transmission.

Note: Shaft will have to be rotated to align holes for pin insertion.

- To disengage the slow speed, reverse the above procedure.
- Rate checks can be performed the same way as for other seeds.
- Usually it is necessary to reduce the fan rpm when seeding fine seeds. See *"Fan Speed"* for specific fan speeds.



N19028 - Slow Speed



Applying Inoculant

When inoculant is applied at the time of seeding, once the air cart has been filled, the fill-lids should be left open and the fan run for 5-10 minutes at full rpm to dry the seed.

Calibration must be done after the seed is dried, otherwise the calibration will be incorrect.

Note: If the seed is not dried then the seed will have a tendency to bridge and not meter into the air stream.

Hydraulic Fan Drive

The piston type orbit motor on the fan requires tractor to have either a load sensing hydraulic system or a closed center hydraulic system with flow control.

The flow required is 18 U.S. gpm (68 liters) for the 12 cc motor at a pressure of 2,750 p.s.i. (18,960 kPa) However, smaller flows can be used depending on the product being metered.

Note: An additional 5 1/2 gpm (21 liters/min) is required for the VRT system.

For correct operation of the fan the hydraulic motor must be coupled to the priority valve (if tractor is so equipped) in the hydraulic valve bank.

Check with the tractor manual or manufacturer to determine if or which spool is a “priority valve”.

Speed fluctuations will result if the fan is not connected to the priority valve if hydraulic system is equipped with a priority valve.

Ensure couplers are free of dirt and are clean when connecting the fan hydraulics to the tractor.

Fan speed is adjusted by increasing the amount of oil being delivered to the motor by adjusting the respective flow control valve until the desired rpm is displayed on the monitor.

Note: There is a one-way check valve installed in the hydraulic circuit. If the fan does not rotate, then move hydraulic lever in the opposite direction; this will engage the fan. This valve prevents damage to the hydraulic systems when the fan is shut OFF, by allowing the fan to freewheel.

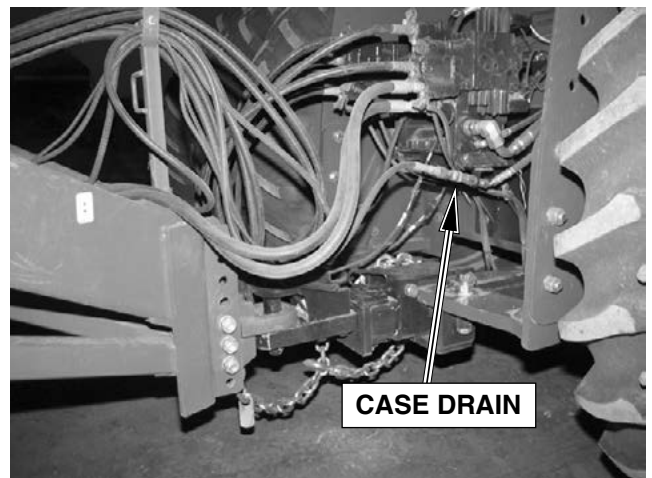
A piston motor creates leakage past the internal components for lubrication. This oil needs to go back to the oil reservoir at the lowest pressure possible. The motor has a 3/8” diameter case drain line. This line must be connected directly into the tractor hydraulic reservoir to ensure that there is zero back pressure in the drain line; otherwise damage will result to the motor.



Hydraulic Drive

IMPORTANT

Run hydraulic fan drive at lowest rpm possible (1,000-2,000) for 5-10 minutes before operating at set rpm. This is required to warm up the hydraulic fluid. Cold hydraulic fluid will cause pressure spikes in the system that will damage the case drain seal in the orbit motor.



Hydraulic Coupling on Tractor

Operation

Fan Speed Recommendations

Adequate air volume is necessary at all times to carry the product in the air stream. Air volume can be controlled by adjusting hydraulic oil flow on hydraulic fan drives or adjusting engine speed on engine fan drive models.

Air volume; hence fan speed requirements will vary with:

1. Ground speed
2. Metering rate
3. Number of primary runs
4. Width of machine
5. Density and size of material

Excessive fan speed can cause seed damage, seed bouncing and premature wear of the system.

Generally fan speed is adequate if product flows through the hoses without surging and the hoses empty quickly and evenly when the system shuts down.

The chart below list *suggested fan speeds* for various application rates.

Note: The charts should be used only as a guide. If plugging or surging occurs increase the fan speed to eliminate the problem.

Note: It is recommended that after a rain or dew the fan be run two to three minutes to expel any moisture in the system.

Important

Keep fan impeller blades clean at all times.

Note: Once fan speed is properly set, be sure to adjust the monitor fan alarm setting accordingly. See Monitor Section "Monitor Programming".

13 inch Diameter Impeller Suggested Fan RPM @ 5 mph		
Combined Application Rate	Fan Speed Setting	
	Single Shoot	Double Shoot
3 - 50 lbs/acre 3 - 56 kg/ha	3500 - 3750 RPM	3400 - 3650 RPM
50 - 100 lbs/acre 56 - 112 kg/ha	3750 - 4000 RPM	3650 - 3900 RPM
100 - 150 lbs/acre 112 - 168 kg/ha	4000 - 4250 RPM	3900 - 4150 RPM
150 - 200 lbs/acre 168 - 224 kg/ha	4250 - 4500 RPM	4150 - 4400 RPM
200 - 250 lbs/acre 224 - 280 kg/ha	4500 - 4750 RPM	4400 - 4650 RPM
250 - 300 lbs/acre 280 - 336 kg/ha	4750 - 5000 RPM	4650 - 4900 RPM
300 - 350 lbs/acre 336 - 392 kg/ha	5000 - 5250 RPM	4900 - 5150 RPM
> 350 lbs/acre > 392 kg/ha	5250 - 5500 RPM	5150 - 5400 RPM
Note: Fan Speeds given are when applying product. It is normal for fan speed to drop when not applying product.		

Double Shoot Settings

Plenum Damper Settings

Adequate air volume is necessary at all times to carry the product in the air stream. Air volume can be controlled by adjusting the plenum damper settings.

The table below lists initial plenum damper settings for certain products.

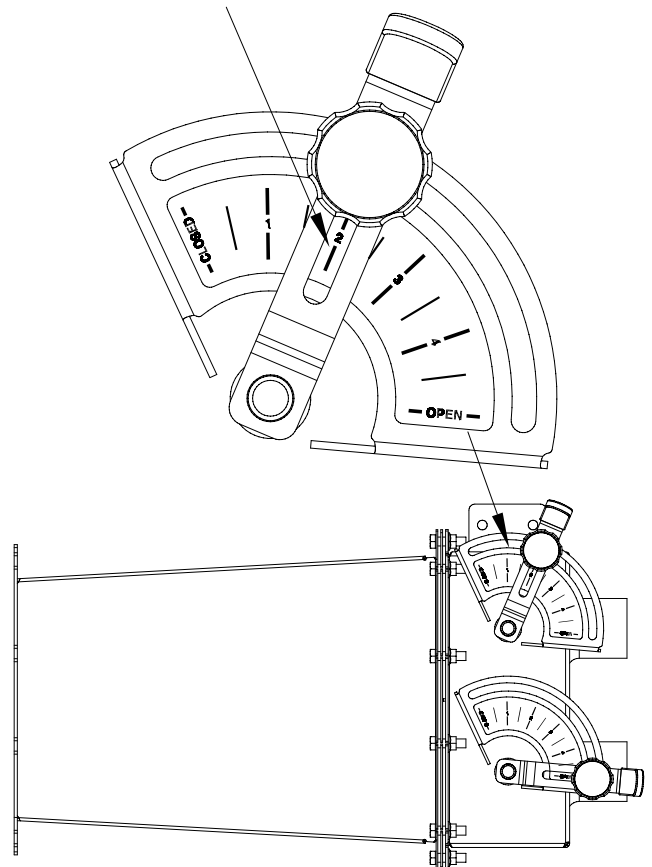
Note: The settings in the table should be used only as a guide.

- If **fertilizer** plugging or surging occurs **decrease** the seed damper setting to eliminate the problem.
- If **seed** plugging or surging occurs **increase** the seed damper setting to eliminate the problem.

Suggested Plenum Settings				
Product	Seed		Fertilizer	
	Rate lb/acre	Damper Setting	Rate lb/acre	Damper Setting
Fine Seeds	All Rates	1	All Rates	Open
Coarse Grains	90 lb (100 kg/ha)	Open	50 lb (56 kg/ha)	2
	90 lb (100 kg/ha)	4	100 lb (112 kg/ha)	Open
	90 lb (100 kg/ha)	3	150 + lb (168 kg/ha)	Open
Large Seeds	180 lb (200 kg/ha)	Open	40 lb (45 kg/ha)	2
Single Shoot	Lower Pipes - Top Damper Closed - Bottom Damper Open			
	Upper Pipes - Top Damper Open - Bottom Damper Closed			

Note: See “Fan Speeds” for Fan RPM.

Set Plenum Damper so that setting is in the middle of slot.
This Damper is set at the 2 position.



Operation

Double Shoot Settings - Continued

Collector Valve Settings

Located in each upper collector body are flapper valves for machines equipped with Double or Triple Shoot. The flapper valve must be properly set in order for product to flow correctly.

See illustrations on following pages for specific settings for various combinations for Triple, Double and Single Shoot set ups.

Flapper valves must be cycled daily to free valves of any fertilizer and grain dust accumulations.

Whenever valves are cycled or reset to a new position the position should be visually inspected as follows:

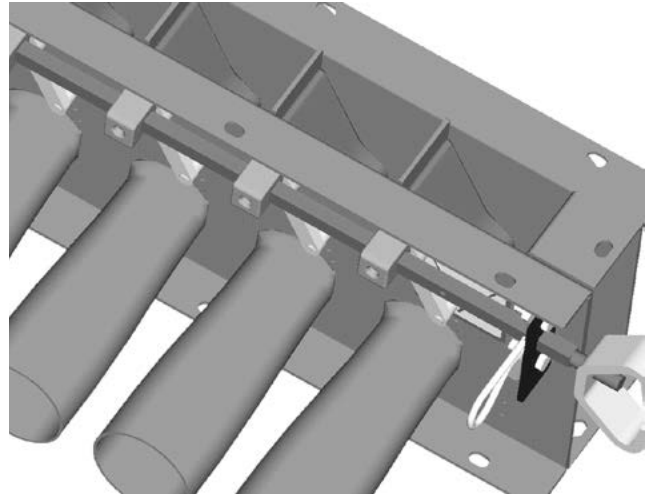
- Set flapper valves to correct position for product delivery.
- Remove the inspection door and visually check that the flappers are fully over and touching the side walls, sealing off the individual air streams.
- The flappers can be adjusted by loosening the individual adjusting setscrews and applying pressure to the flapper forcing it against the side wall while tightening the setscrew.

Note: The bottom airstream should be used to carry the higher rate of product.

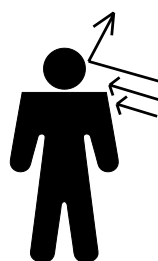
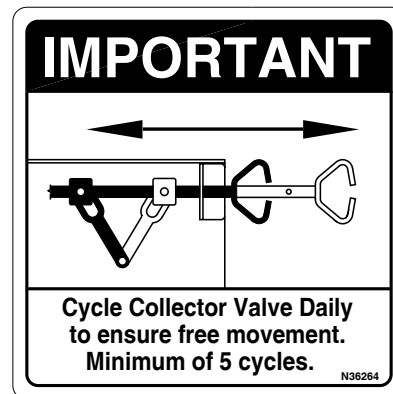
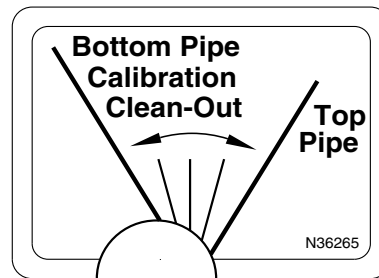
Flapper Valve Run Test

Use the following procedure to check that the flapper valves do not move when air pressure is applied to under side of flappers.

- Check flapper valves in both directions with air running.
 - If valve is set to direct product into the bottom pipe, have the plenum damper open for the top pipes and closed to the bottom pipes.
 - If valve is set to direct product into the top pipe, have the plenum damper open for the bottom pipes and closed to the top pipes.
- **Always wear** safety goggles, breathing apparatus and gloves when working with granular chemical or treated seed per the manufacture's instructions.
- With fan running check flapper valve position.
- The flappers can be adjusted by loosening the individual adjusting setscrews and applying pressure to the flapper forcing it against the side wall while tightening the setscrew.



Flapper in "Bottom Pipe" Setting



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.

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

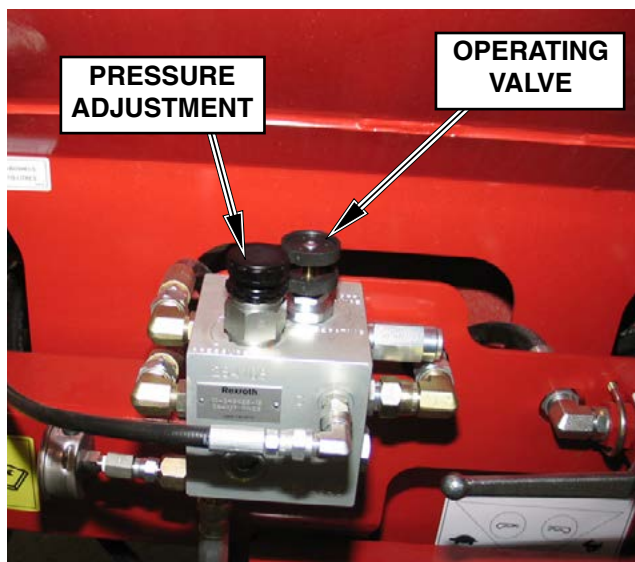
To prevent serious injury or death:

- 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.



Operation

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.

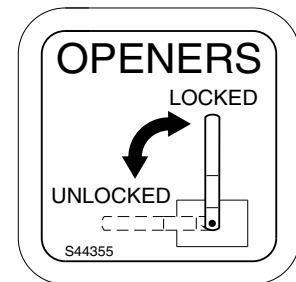
Note: Set "Pressure" valve pressure 100 - 150 psi above the desired working pressure in order to allow for pressure drop from accumulator cooling and valve hysteresis. System pressure will level off and hold after approximately 1 minute.

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.

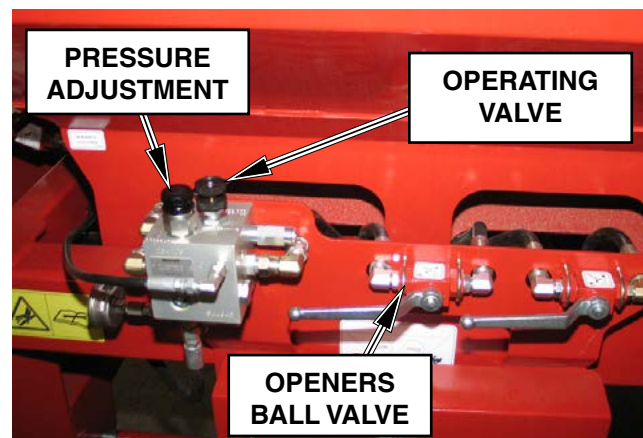
Note: Operate system at the lowest system pressure that will keep shanks locked vertical during seeding and provide adequate packing pressure. Excessive hydraulic pressure may disturb rocks and damage carbides.

Important

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



DECAL - S44355



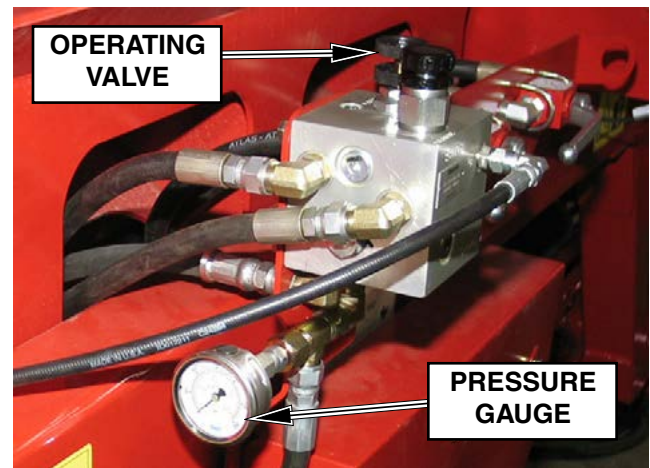
Valve Locations

Opener Operation - Continued

Relieve System Pressure

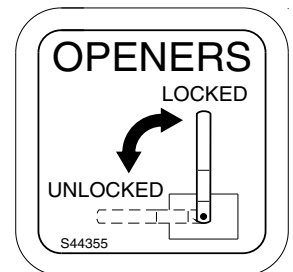
To bleed all pressure from Opener hydraulic system:

- 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.

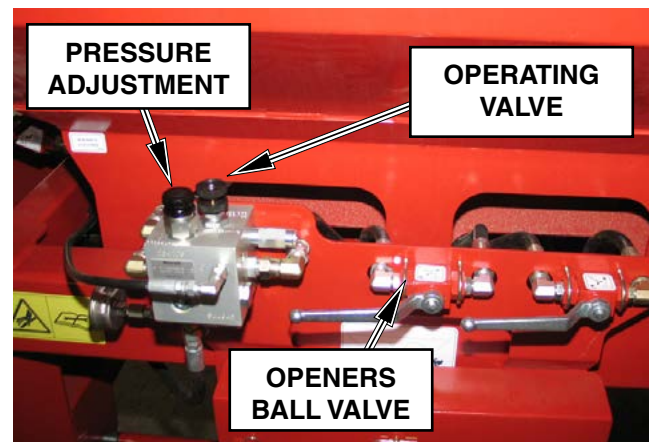


Normal Operation

- 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.



DECAL - S44355



Valve Locations

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



Operation

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.

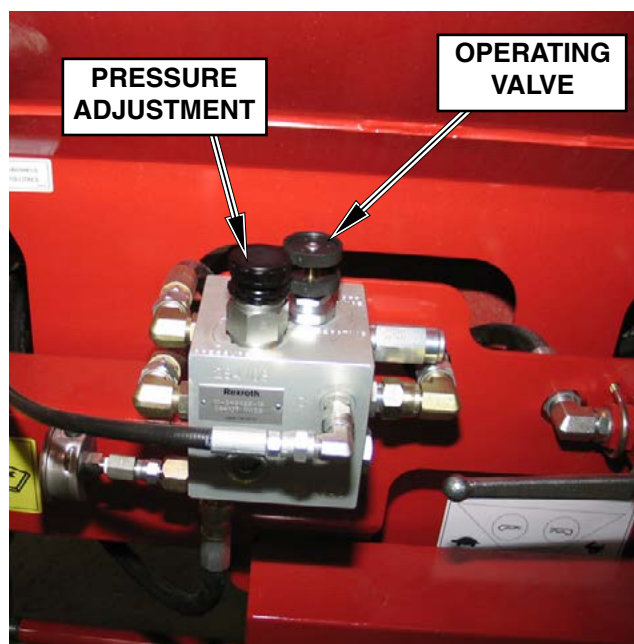
Note: If pressure drops too rapidly when tractor remote is put into float, the “Operating” valve can be turned in a few turns to reduce bleed-off speed.

To increase operating pressure:

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

Important

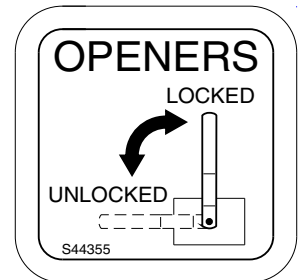
The “Operating” valve must be set to the “Bleed Off / Service” Position in order to lower accumulator pressure with openers in operating position.



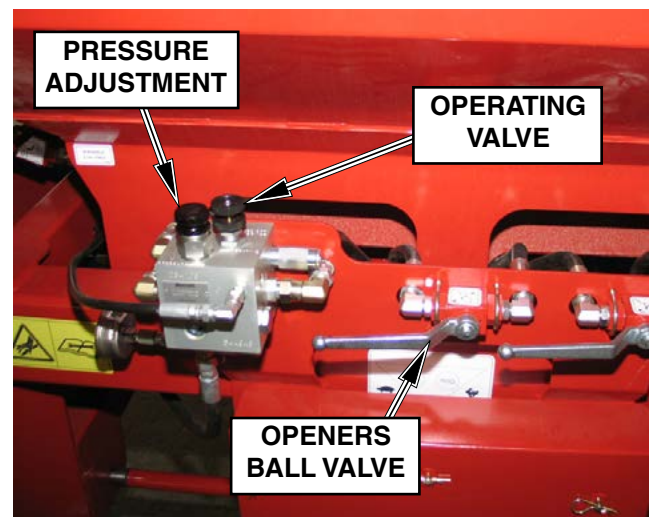
Depth Adjustment

To adjust seed depth:

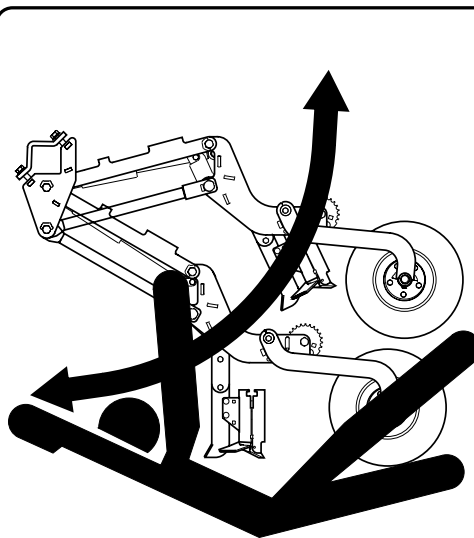
- Lift openers to raised position (allow pressure gauge to reach zero).
- Shut tractor off and remove key.
- Ensure tractor park brake is engaged before proceeding.
- Place "Openers" ball valve into locked position to prevent accidental oil flow to openers.



DECAL - S44355



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.

Operation

Depth Adjustment - Continued

- 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.

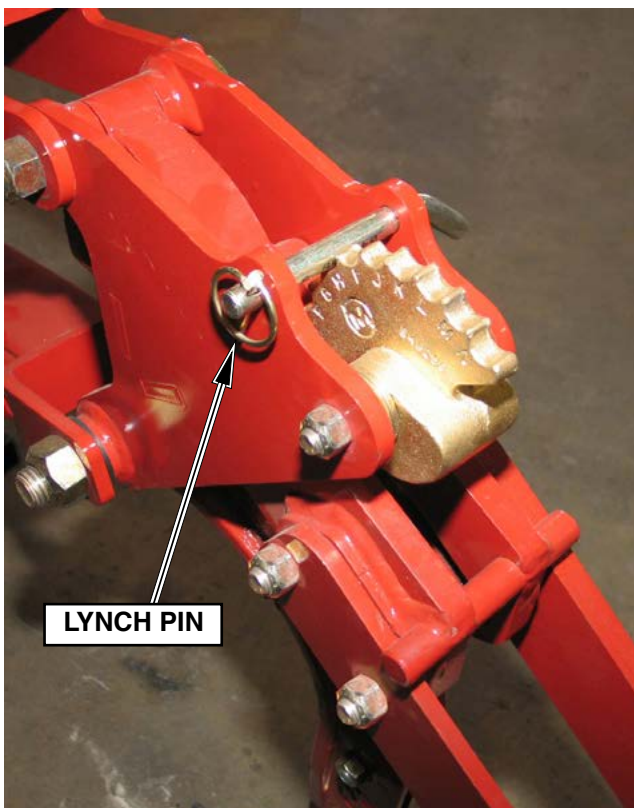
Note: For ease of adjustment, adjust a few openers across the drill to confirm desired seeding depth before adjusting the remaining openers.

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

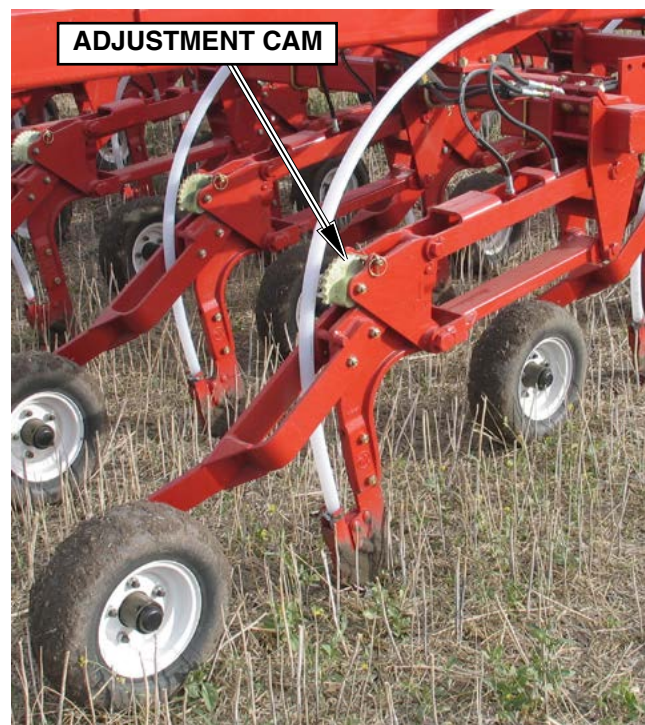
Important

Pneumatic Tires Only.

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



Adjustment Cam



Work Switch

(Optional equipment)

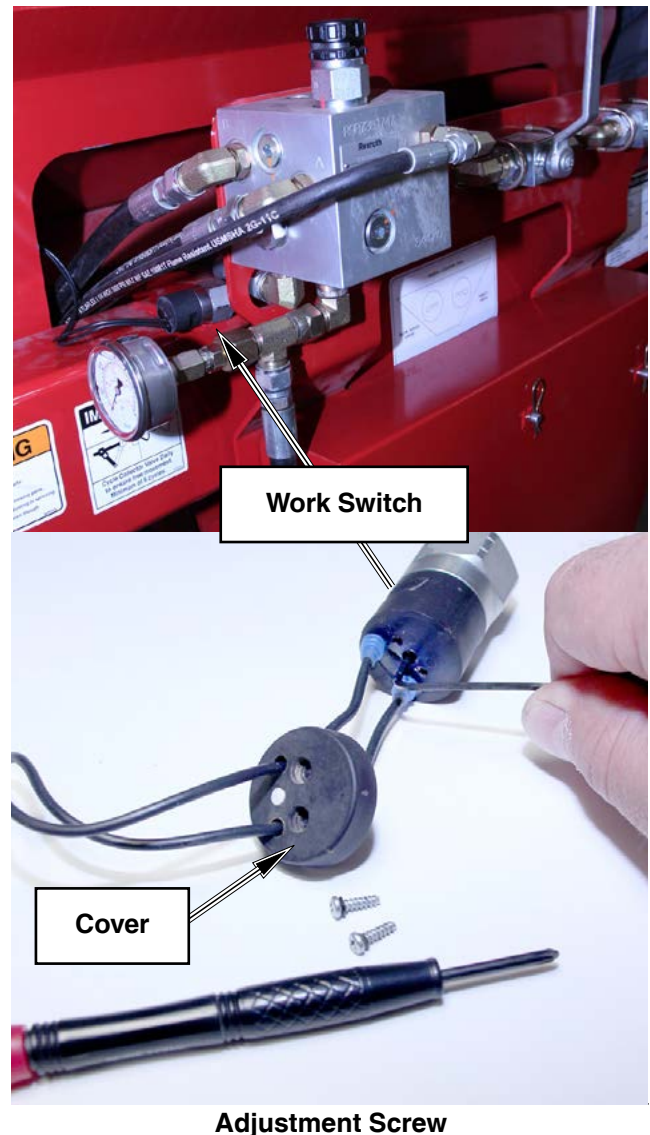
The pressure work switch activates the Air Cart Metering system by the hydraulic pressure on the opener lift side. When the openers are raised the switch opens at a pre-set pressure turning off the Air Cart metering and when lowered the switch closes at the pre-set pressure to turn on the metering.

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

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).

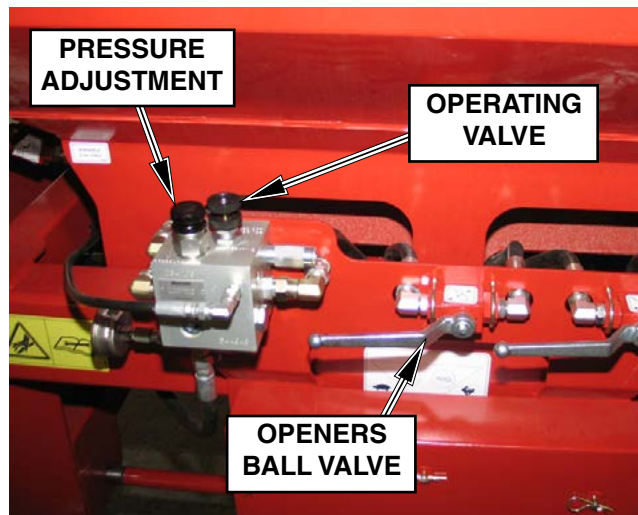
Hydraulic System

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.

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.



Valve Locations

1200 psi = 18274 kPa

750psi = 5171 kPa

150 psi = 1034 kPa

100 psi = 689,5 kPa

50 psi = 344,7 kPa

500 lbs = 226.8 kg

167 lbs = 75.75 kg

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

Operation

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.



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. Two hydraulic circuit Shut Off valves are 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 drill main frame and there are no adjustments associated with the valve.

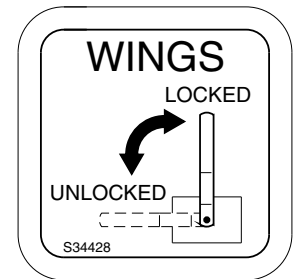
The Sequence Valves are located in front of the Flow Control Valve. The Top Sequence Valve may require adjustment to have wing lock cylinder close in correct sequence.

The Shut Off valves (Ball Valve) are located on the front left side of the cart frame for easy access.

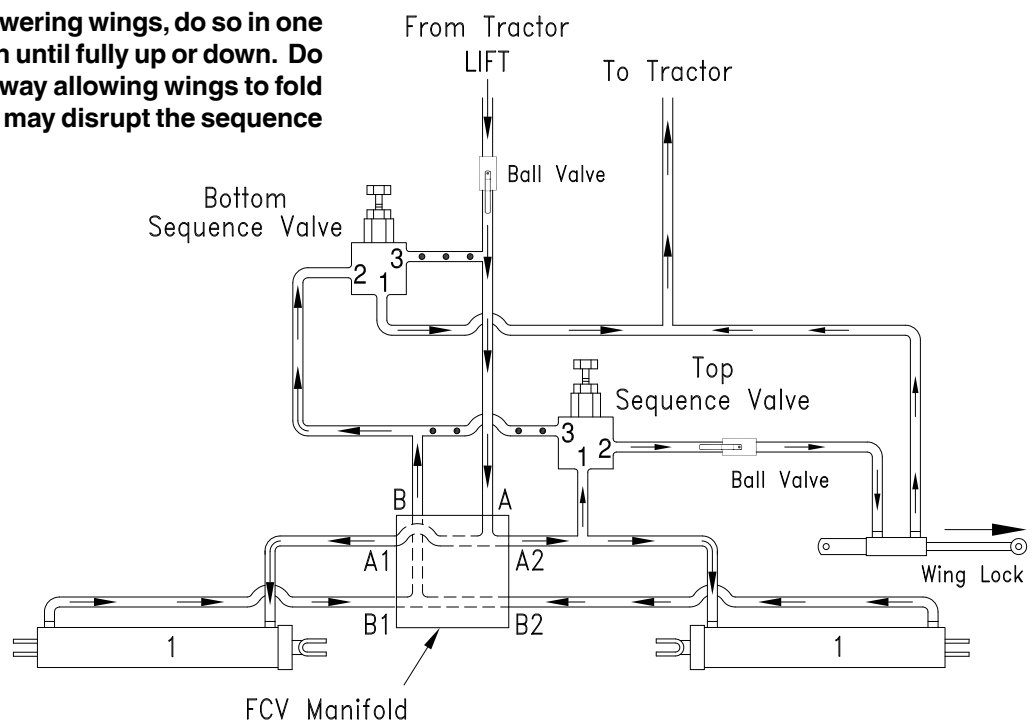
To unfold the Air Drill, the oil flows to the wing lock cylinder causing it to retract and open the transport lock. The oil flows to the Flow Control Valve, from there to the butt end of all the wing lift cylinders extending the shafts and lowering the wings. All wing lift cylinders must be fully extended 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 wing lift cylinders retracting the cylinders and lifting the wings into transport position. Then the sequence valves allow the wing lock cylinder to extend and engage transport lock.

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.

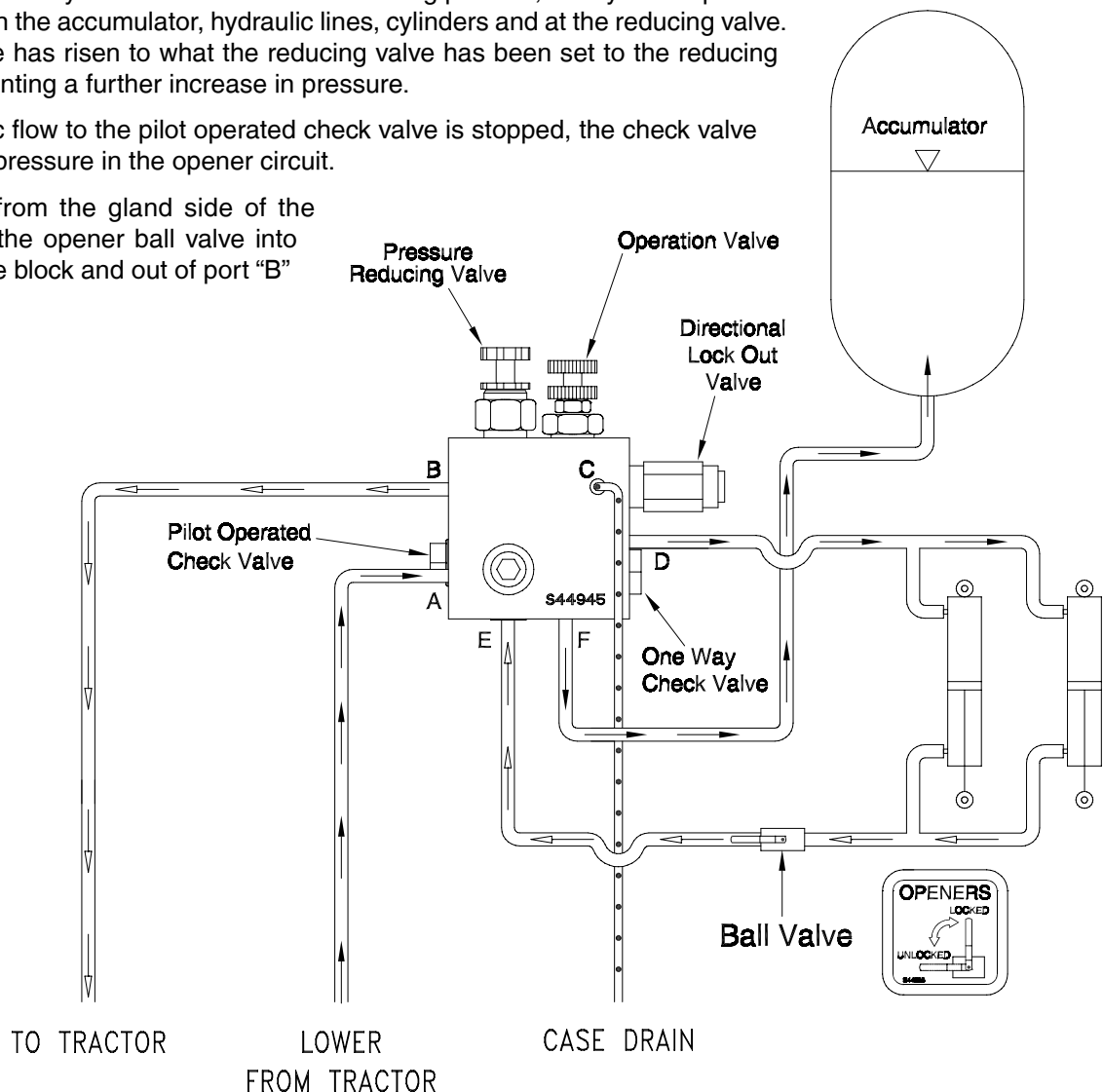
Once the operating pressure is reached the oil will stop flowing.

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

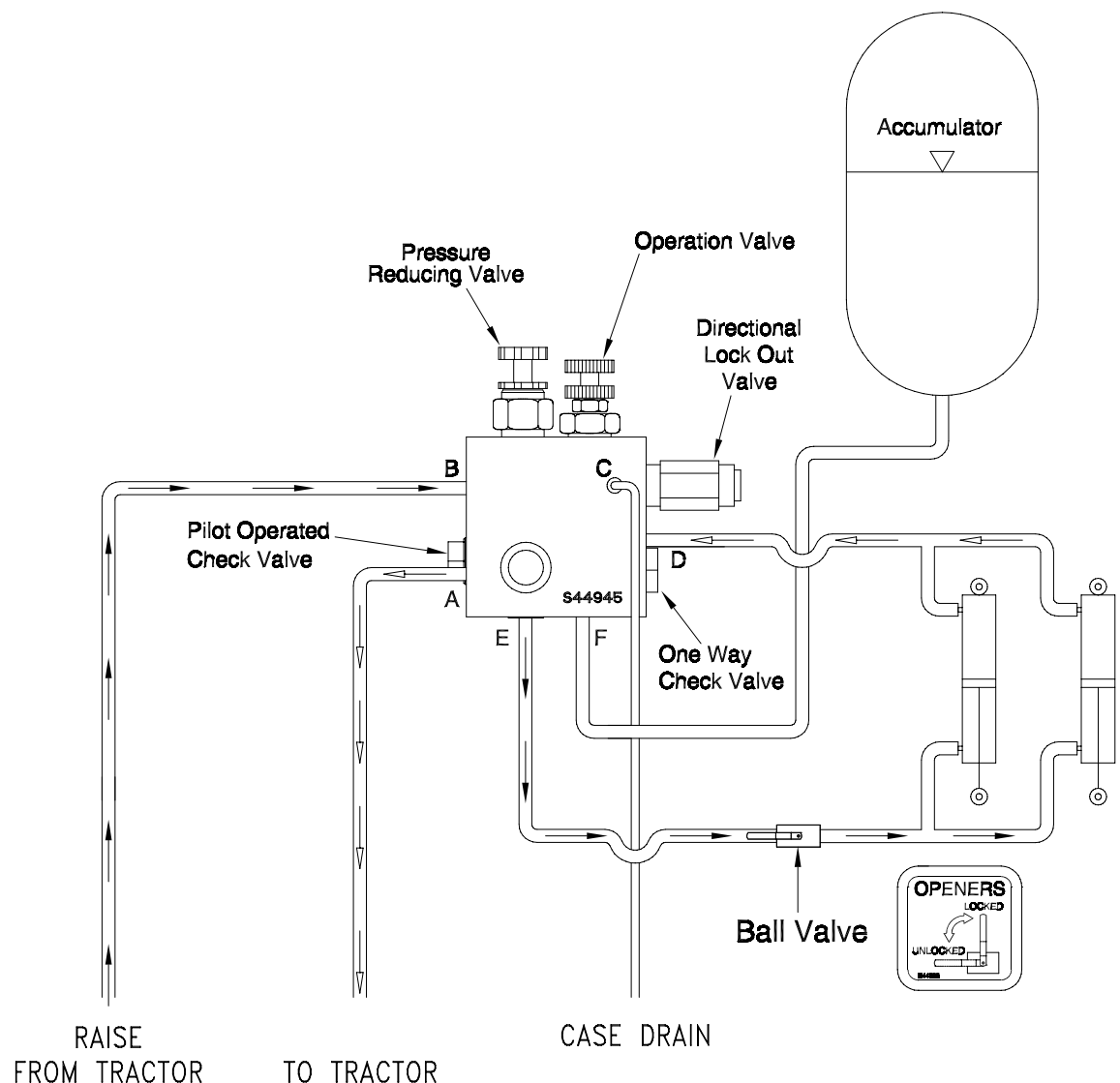
Normal Operation - Continued

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.

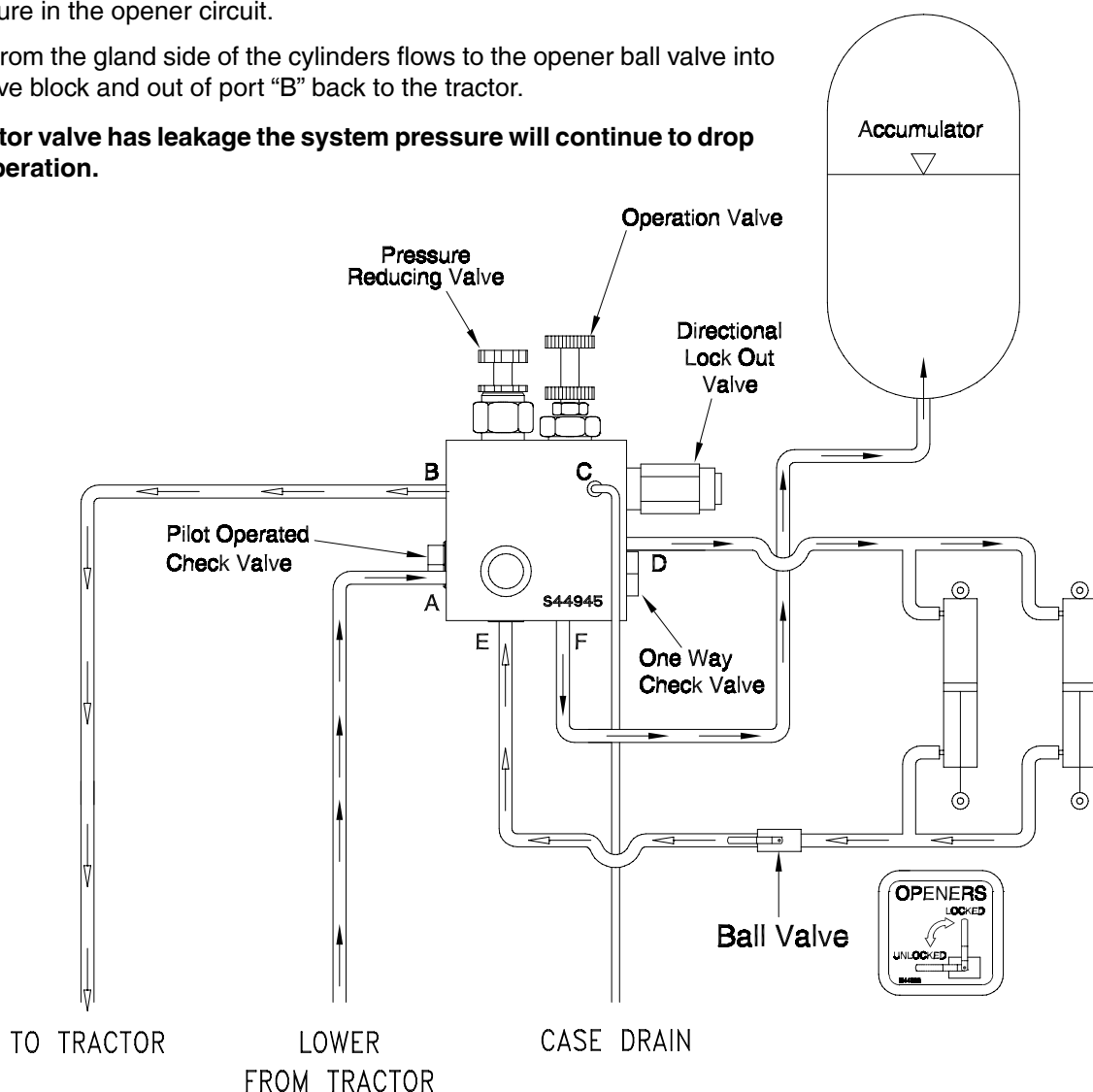
From port “A” of valve block, oil flows through the pressure reducing valve, to the pilot operated check valve unseating the check valve and out of Port “D” to the butt end of the opener cylinders causing the openers to lower. Simultaneously, oil flows from the check valve through the directional lock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

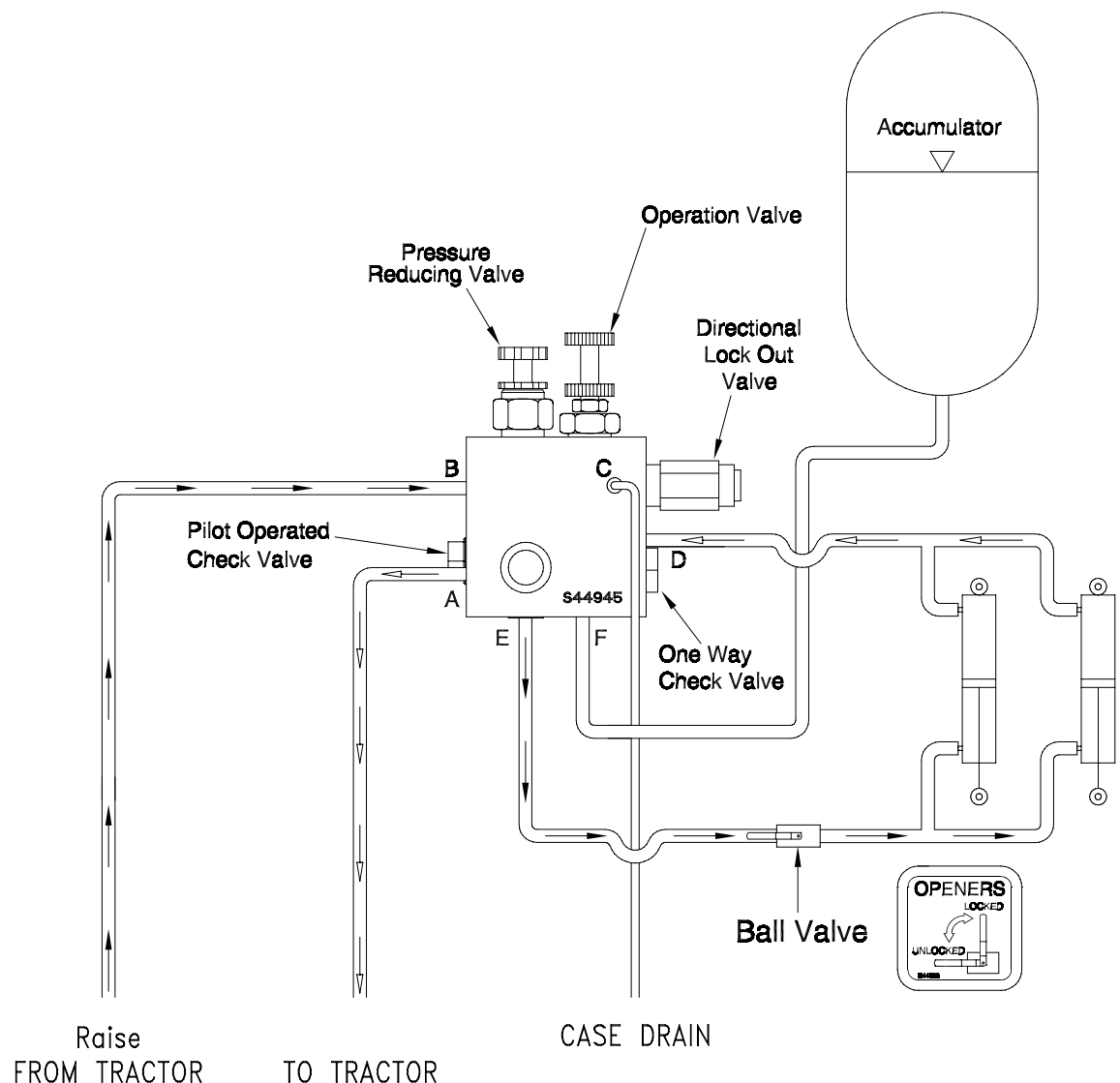
Pressure Adjustment (On the Go) - Continued

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.

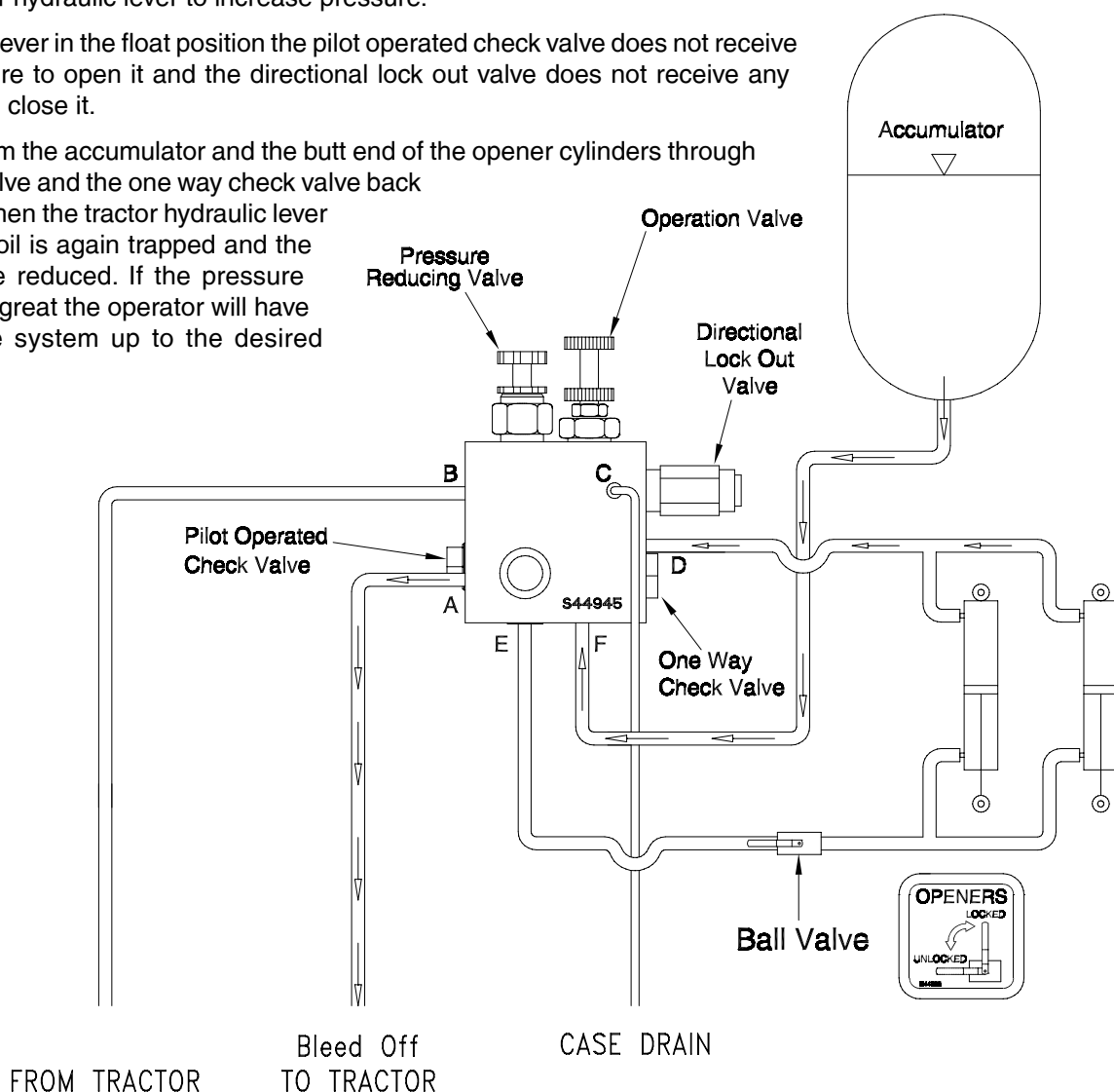
Note: If pressure drops too rapidly when tractor remote is put into float, the “Operating” valve can be turned in a few turns to reduce bleed-off speed.

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.



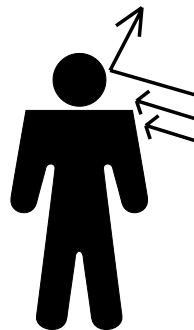
General Guidelines

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.

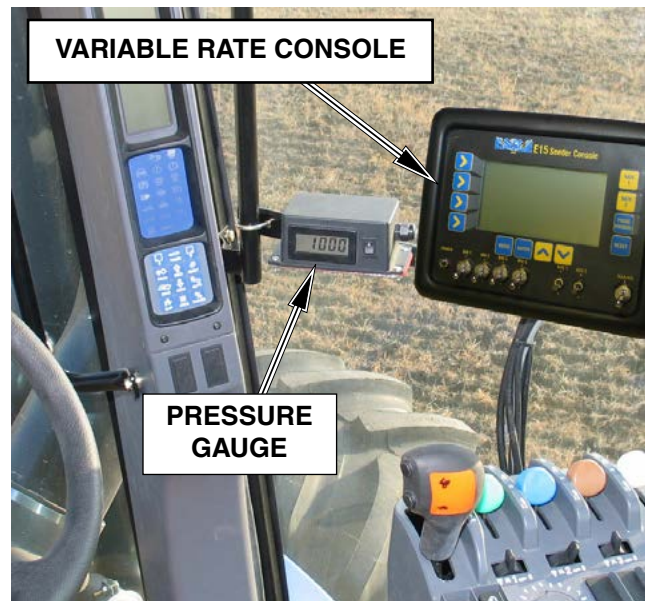


Operation

Operating Guidelines - Continued

Monitor

- Familiarize yourself with all monitor functions. Refer to TOPCON manual for details.
- Ensure all monitor “*settings*” are correctly set for the air cart/seeding tool combination.
- Recognize and correct alarm conditions as indicated on the monitor.
- Check all wire harness connections for corrosion and use a dielectric spray to clean. Inspect all sensors for proper gap.



Monitor System

General Field Operation

- Follow guidelines outlined in “*Operating Guidelines*”.
- Switch monitor on as outlined in the TOPCON manual.
- Start fan.

Note: Load sensing hydraulic systems require “*warming up*” before they function smoothly. See “*Hydraulic Fan Drive*” for more details.

- Move forward with seeding tool.
- Engage metering systems as outlined in the TOPCON manual .
- Lower seeding tool into ground.
- Product rates can be varied as desired see “TOPCON manual for details.
- Turning at headland: Switch metering systems off with the Master On/Off Switch, immediately raise seeding tool, fully rephasing hydraulics (see seeding tool manual).
- Once turn is complete engage metering systems with the Master On/Off Switch and lower seeding tool into ground.

Note: Do not attempt to meter product when fan is not running. Damage to the metering wheels may occur.

Note: Engage console master switch early enough to avoid misses. Forward travel should be equal to half the width of the seeding tool. [i.e. for a 40 ft (14 m) wide seeding tool the forward travel should be a minimum of 20 feet (7 m).]

Operating Guidelines - Continued

Turning

- Avoid sharp turns. Backing up of the outer wings with the seeding tool in the ground has a tendency to plug the seed boot with soil.
- Raise seed boots fully before making sharp turns or backing machine.

Note: It is strongly recommended to consult local agricultural extension offices for allowable product rates, which are dependent on soil moisture and type.

Seed Rate Settings

- Remove any caked-on material from seed plate and metering wheels.
- Ensure correct seed plate is installed and metershaft turns freely.
- Check product rates carefully by performing a calibration check.

Fertilizer Application

- Avoid using fertilizers that absorb moisture readily, especially during periods of high humidity.
- Also avoid fertilizers that contain a high percentage of fine dust, as these materials can plug metering wheels and coat the inside of seed distribution system.

Fan Setting

- Run fan at recommended speed. If plugging or surging occurs increase the fan speed to eliminate the problem. If plugging or surging continues reduce ground speed to eliminate the problem.
- Allow tractor hydraulic oil to warm-up thoroughly prior to seeding. Cold oil will cause slower fan speeds (Hydraulic driven fan).

Product Application

- Control product application with the VRT console switch in tractor.
- Have machine moving forward before lowering seed boots to avoid plugging.
- To prevent skipping, allow a minimum of 15 feet (5 m) of forward travel to ensure air system has delivered product to seed boots.

Forward travel should be equal to half the width of the seeding tool. [i.e. for a 40 ft (14 m) wide seeding tool the forward travel should be a minimum of 20 feet (7 m).]

Note: Do not attempt to meter product when fan is not running. Damage to the metering wheels may occur.

Operation

Operating Guidelines - Continued

Adjustments and Operational Checks

- When changing fields and periodically throughout the day, the seeding tool should be checked for level and depth and the seed boots for blockage.

Checking Seed Flow

The following procedure should be implemented throughout the day typically at each fill of the air cart:

- Raise the seeding tool out of the ground.
- With the fan running and monitor on, engage meter drives with the Start/Stop button on the keypad, rotating meter drives 4 to 5 times.
- Seed and/or fertilizer should appear at each outlet on the ground.
- If no seed or fertilizer appears on the ground at any of the openers check for hose blockage in both the 15/16" (24 mm) diameter secondary and the 2 1/2" (64 mm) diameter primary hose, as well as in the flat fan divider.
- See Trouble Shooting Section for possible causes of the blockage.

Moisture Alert

- Whenever air cart has been standing for an hour or more during period of high humidity or damp, rainy days, or after sitting overnight, run fan at recommended rpm, with machine stationary for 5 minutes.

Air Leaks

It is imperative that no air leaks occur in the air cart tank as even the smallest air leak from the lid will lead to material bridging in the tank thereby causing misses in the field.

Check the following areas for air leaks:

- Tank clean-out door
- Metering body assembly seals
- Collector assembly seals
- Tank lid

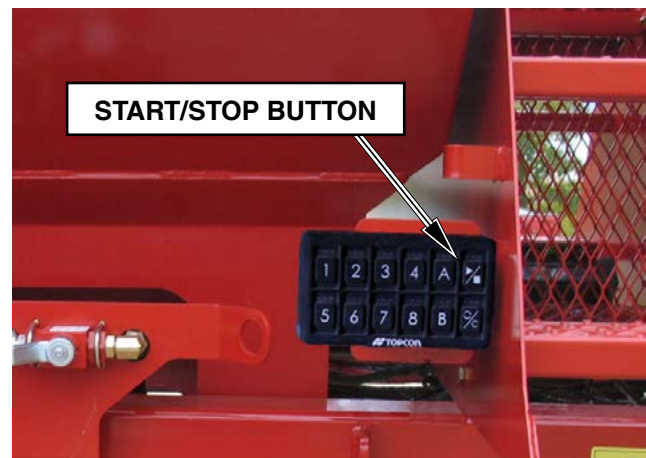
Tank Low in Product

- Refill tank before metering wheels are exposed.
- The metering wheels must be completely covered to avoid unseeded strips.

Important

Check Metering Wheel flutes in the event the primary lines plug.

Flutes may shear if the collector becomes plugged.



Keypad

Note : Check Seed Flow as described above, after running fan for 5 minutes.

Manual Override

If the variable rate control system fails, the independent manual override system can be used to maintain seeder operation.

The manual override system provides the ability to run the hydraulic motors at a fixed rate (**not proportional to ground speed**) and to turn the manual system ON and OFF from the tractor cab.

Rate Setting

To set the manual override system use the following procedure:

- Turn Monitor OFF.
- Empty product from tanks or close tank shut-offs.
- Refer to the appropriate “*Ground Speed Chart*” on the following pages or use the calculations below to determine the meter shaft RPM for the desired product.
- Adjust meter shaft RPM using following procedure:
 - Place hand held tachometer onto meter shaft.
 - Remove cap nut and then loosen jam nut.
 - Turn adjusting screw IN (Clockwise) until meter shaft turns desired RPM.
 - Tighten jam nut to secure adjusting screw in place. Replace cap nut.
- Repeat the above procedure for the other meter shafts.

Note: Re-zero shaft hydraulic motors once normal operation of system is resumed.



Remove Cap Nut and Loosen Jam Nut



Adjusting Screw

Calculating Meter Shaft RPM

If it is desired to calculate the exact rpm for a more specific ground speed use the following:

Know parameters:

Working Width	The operating width of seeding tool. (feet)
Working Speed	Operating ground speed. (mph)
Application Rate	Weight of product. (lbs/acre)
Product WT/REV	Known from calibration mode or can determine from Calibration Chart. (lbs/rev)

Operation

Manual Override - Continued

Calculating Meter Shaft RPM

Determine in the following order:

- 1) Travel Distance (feet per acre) = $43560 \text{ ft}^2 / \text{Working Width (ft)}$
- 2) Travel Speed (feet per minute) = $\text{Working Speed (mph)} \times 5280 \text{ ft/mile} / 60 \text{ min/hr}$
- 3) Travel Time (minutes per acre) = $\text{Travel Distance ft/acre} / \text{Travel Speed (ft/min)}$
- 4) Motor revs per acre = $\text{Application rate (lbs/acre)} / \text{WT/REV (lbs/rev)}$
- 5) Motor RPM = $\text{Motor Revs (revs/acre)} / \text{Travel Time (min/acre)}$

6) Meter Shaft RPM

Direct Drive = $\text{Motor RPM} / 2$

Slow Speed Drive = $\text{Motor RPM} / 16$

Operating in Manual Override

- Connect Manual Override switch to AUX connection on monitor harness.
- Refill tanks or open the tank shut-offs.
- Ensure Manual Override switch is in the OFF position, this will shut off the shaft motors.
- Start Fan.
- Move forward with seeding tool at desired speed.

Note: It is important to maintain a constant ground speed since product application rate will not adjust to any changes in ground speed.

- Engage metering system by turning ON the Manual Override switch.
- Lower seeding tool into ground.
- Turning at headland:
 - Disengage metering system by turning OFF the Manual Override switch, immediately raise seeding tool fully rephasing hydraulics (see seeding tool manual).
 - Once turned engage metering system by turning ON the Manual Override switch, and lower seeding tool into ground.

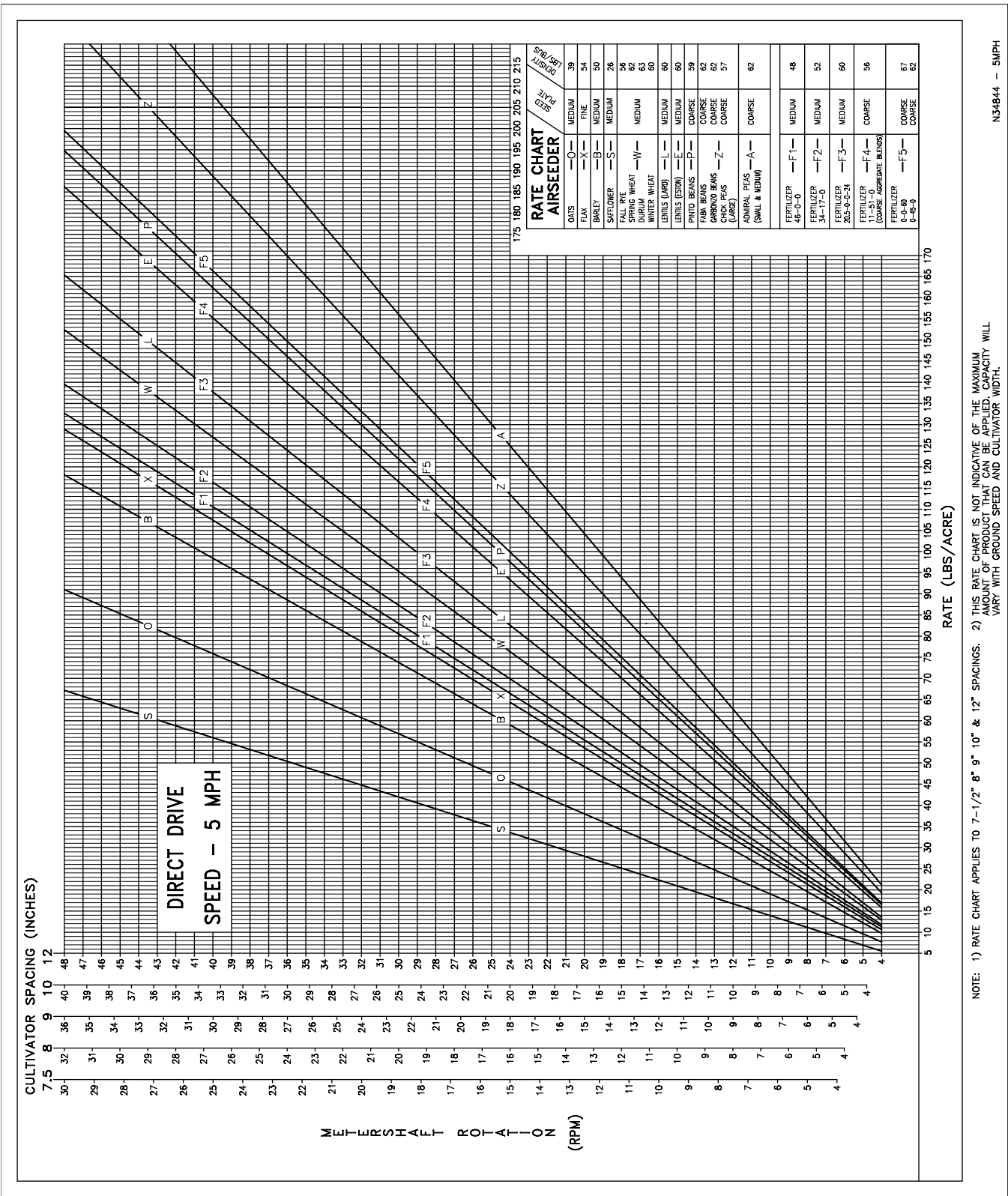
Note: Re-zero shaft hydraulic motors once normal operation of system is resumed.



Operation

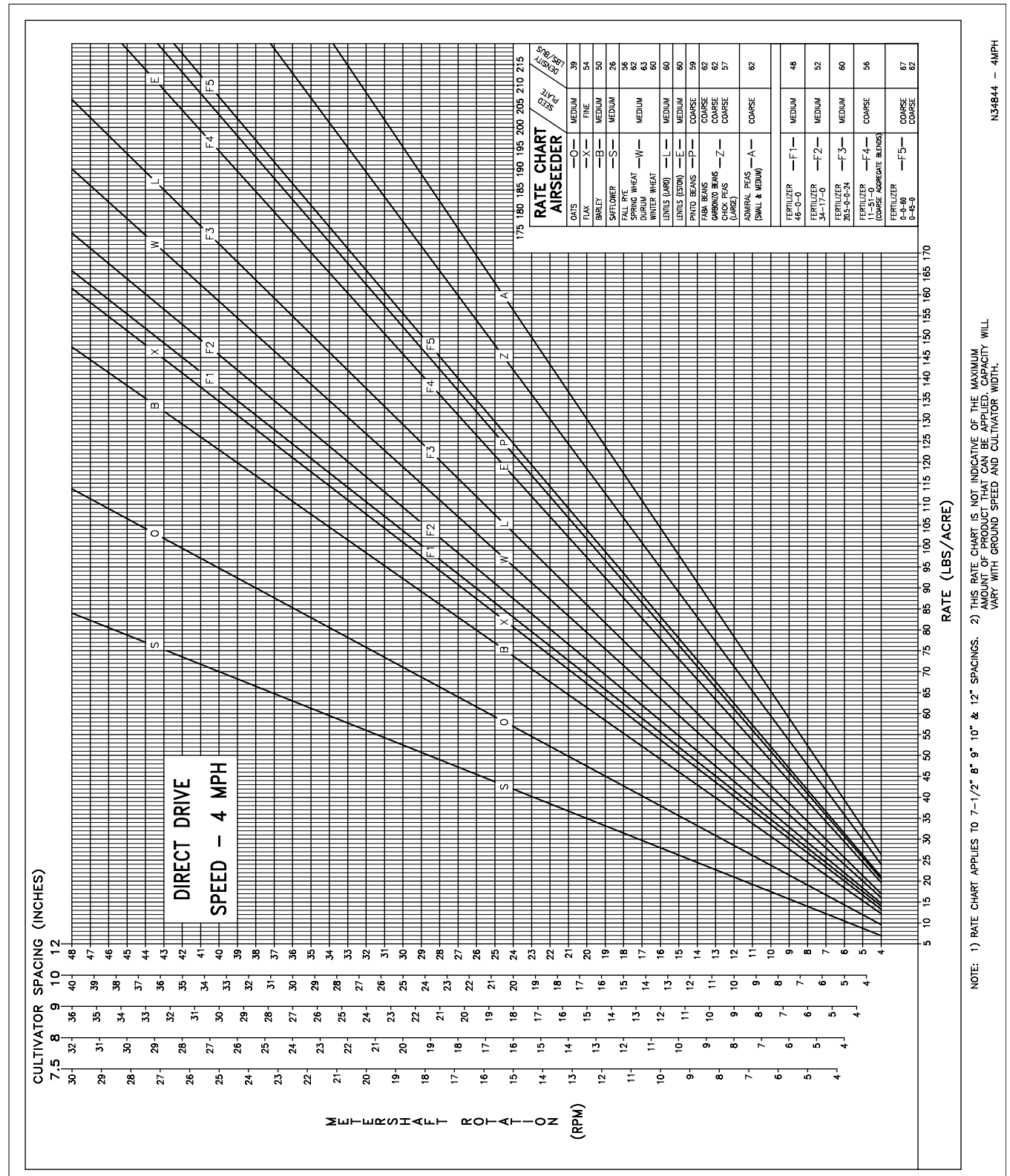
Manual Override - Continued

5 mph Ground Speed Chart - Direct Drive



Manual Override - Continued

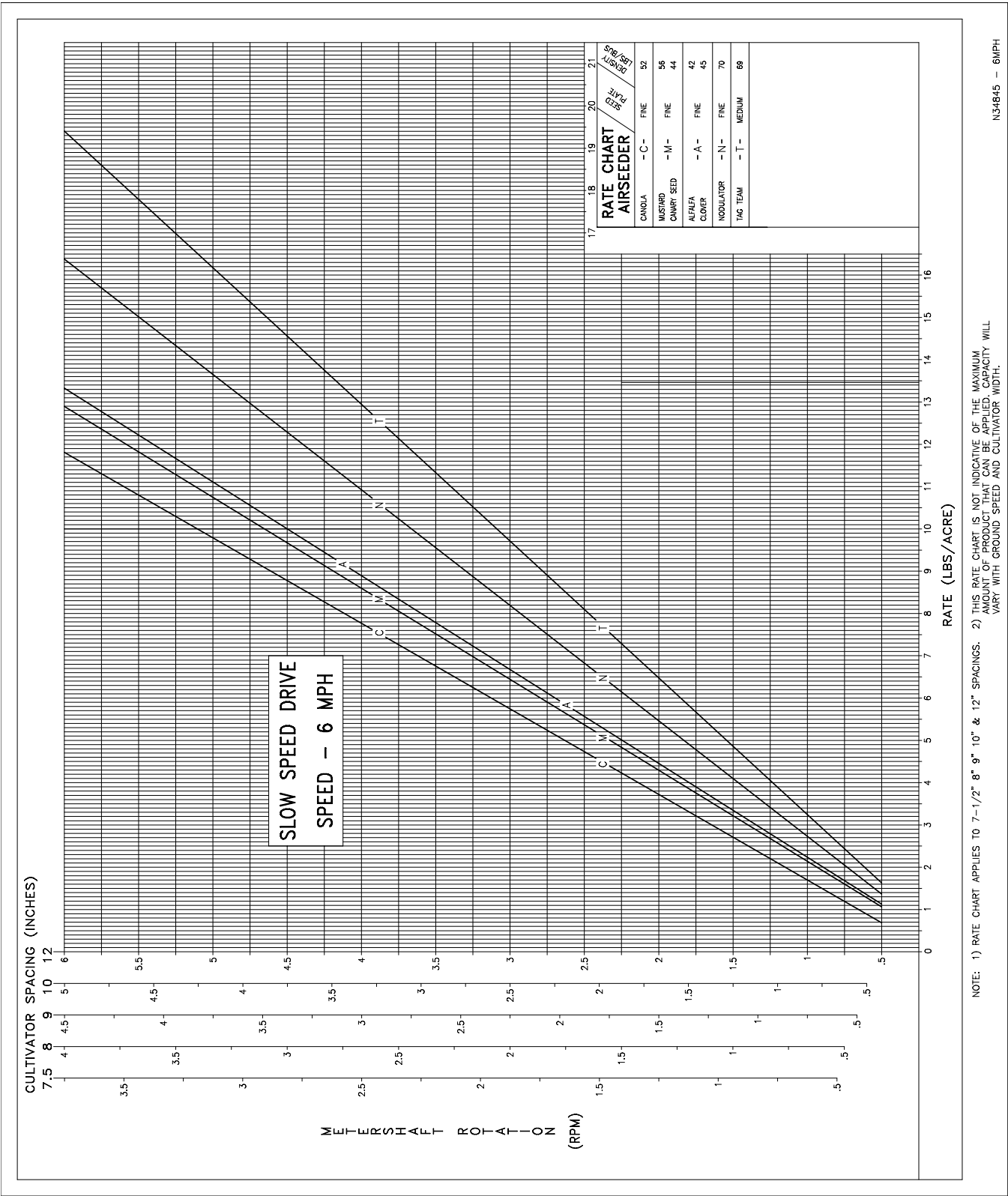
4 mph Ground Speed Chart - Direct Drive



Operation

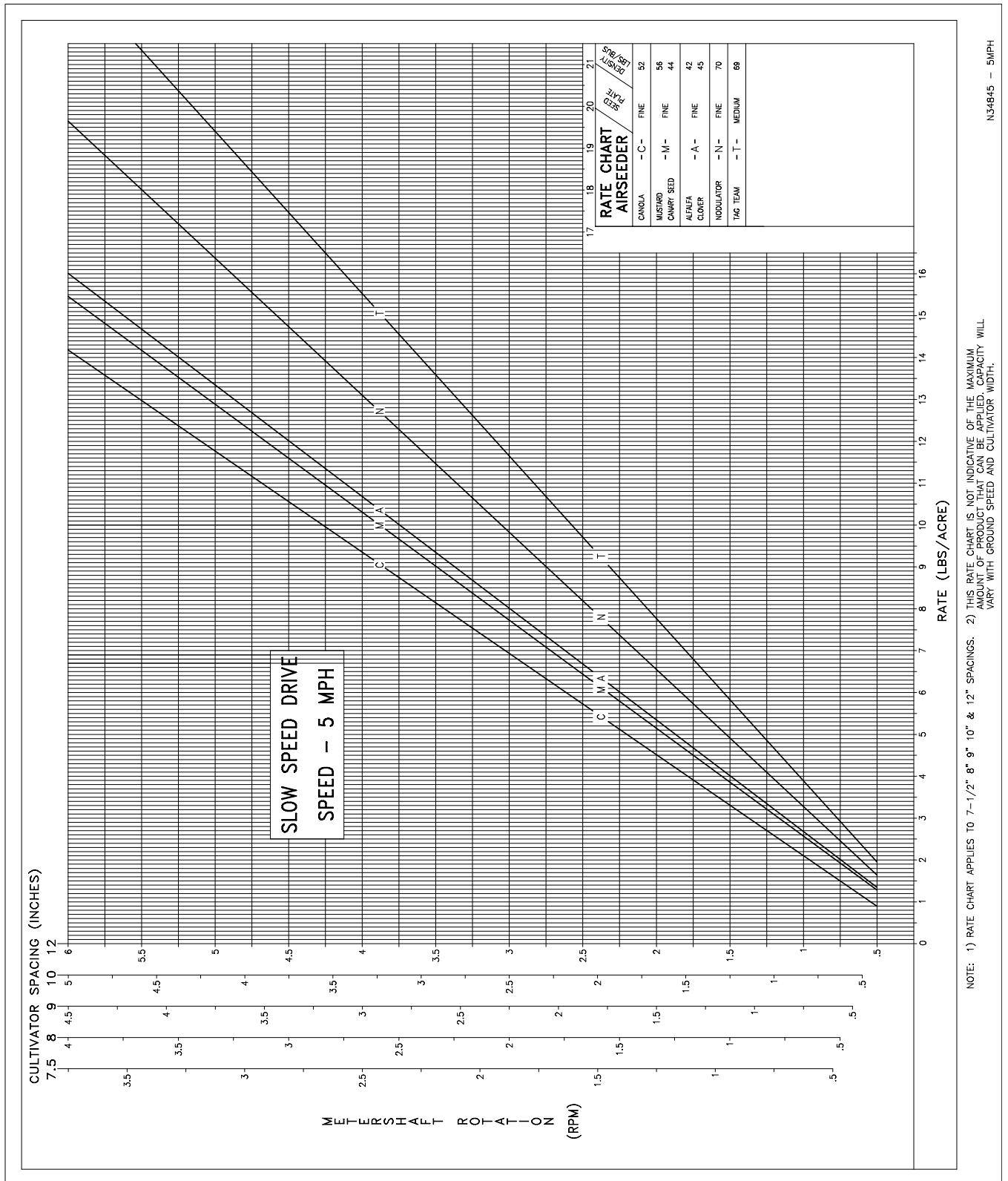
Manual Override - Continued

6 mph Ground Speed Chart - Slow Speed



Manual Override - Continued

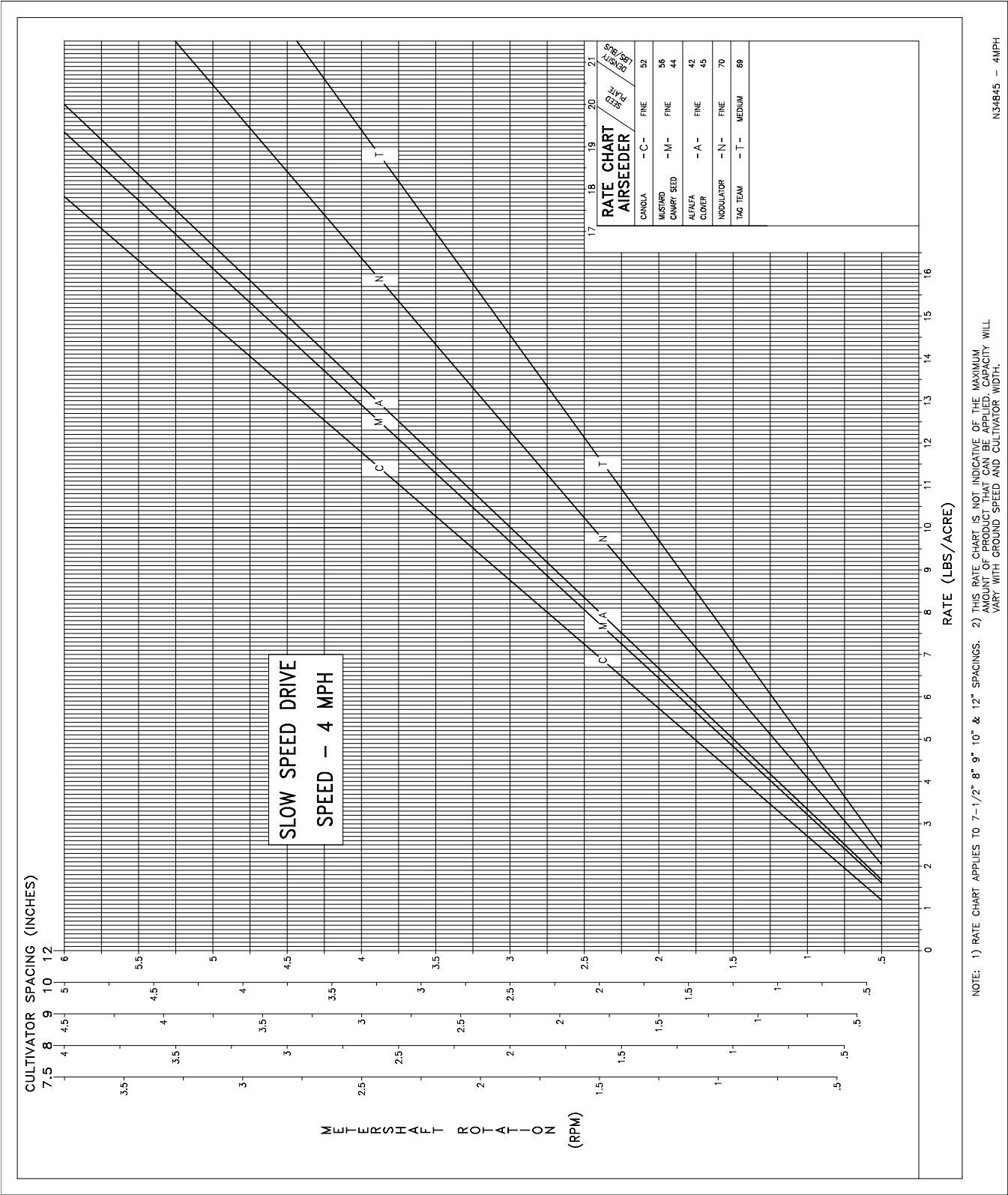
5 mph Ground Speed Chart - Slow Speed



Operation

Manual Override - Continued

4 mph Ground Speed Chart - Slow Speed



Section 6: 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.

Maintenance

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.
12.5L x 15SL	12 ply rating	52 P.S.I.
12.5L x 15FI	F	90 P.S.I.
600/50-22.5	16 ply rating	22 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)
3/4 Grade 8	400 lb. ft. (542 Nm)

Daily Maintenance

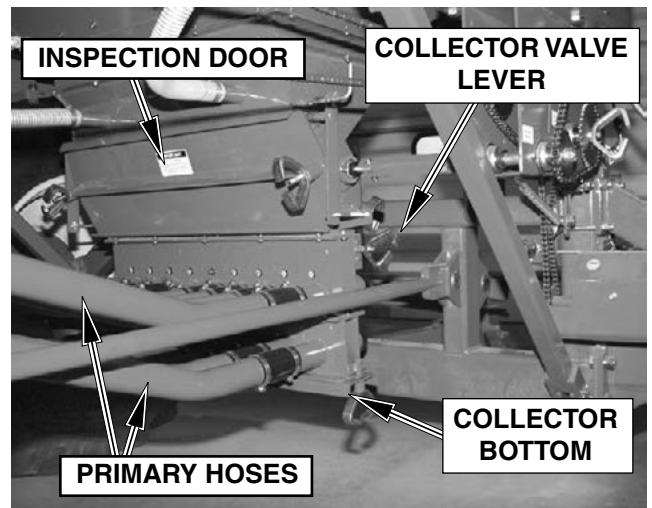
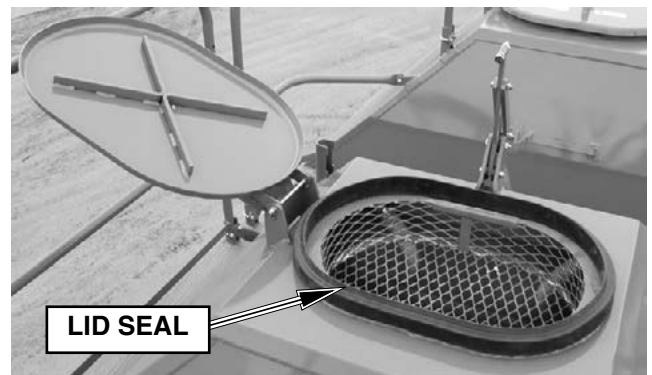
- Check for and remove any water in primary collectors and pressure lines after rainy weather. Remove all inspection doors and collector bottoms to drain water from the tanks and collectors.
- Reinstall collector bottoms and inspection doors.
- Ensure fan screen is clear of debris.

Note: Start fan and run for 3 - 5 minutes prior to loading machine to get rid of accumulated moisture.

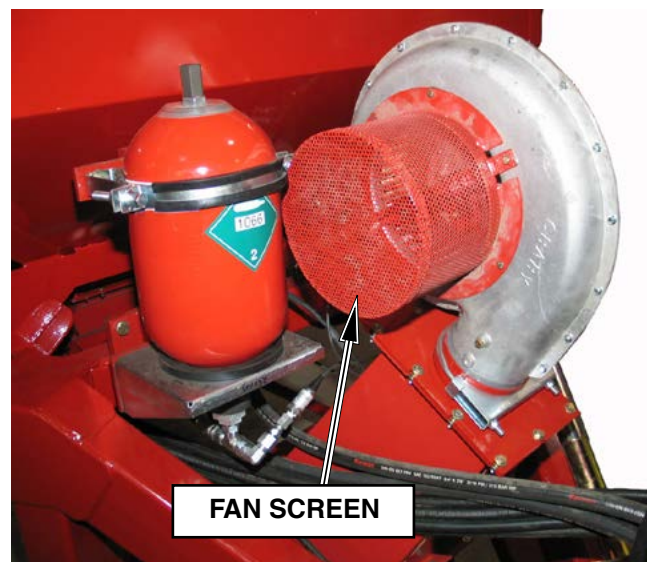
- Check lid seals for damage, and that they are sitting properly on steel ring.
- Check tank pressure hoses for leaks, cracks or plugging.
- **Check the following areas for air leaks:**
 - Tank inspection door
 - Metering body assembly seals
 - Collector assembly seals
 - Tank lid

Refer to "Air Leak Check" under Air System Maintenance.

- Check monitor wiring that all sensor wires are properly routed and retained.
- Check for plugged hoses.
- Cycle Collector Valve five times to ensure parts are free to move.
- Ensure drive chains are cleared of debris.
- Check torque on wheel bolts.



Double Shoot Shown



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 following photos for grease fitting locations.

1. Drive Chains

- Oil every 50 hours.

2. Slow Speed Drive

- Grease every 50 hours.

3. Articulated Hitch Pivot

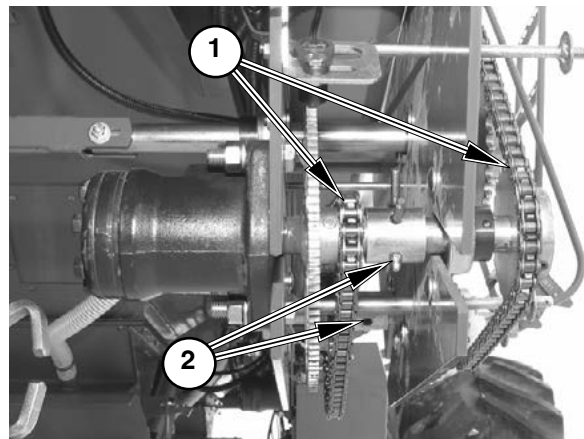
- Grease every 50 hours.

4. Cart Wheel Hubs with no Air Brakes

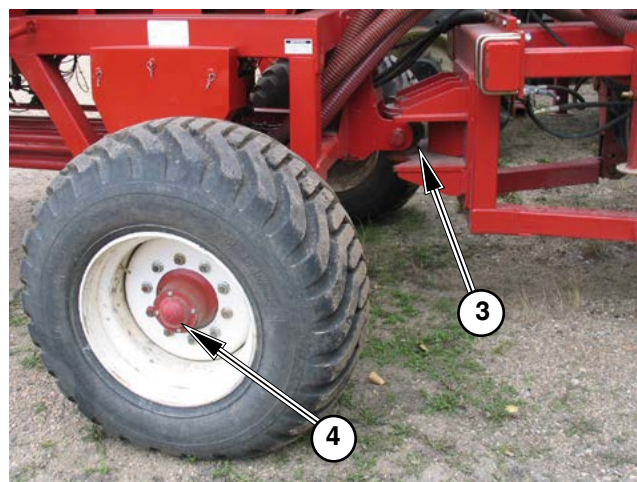
- Grease every 500 hours or seasonally, whichever occurs first.

5. Cart Wheel Hubs with Air Brakes

- Make sure hubs have oil and the plug is in the hub caps. Use 80-90 gear lube.



Transmissions



Lubrication - Continued

6. Packer Wheel Hubs

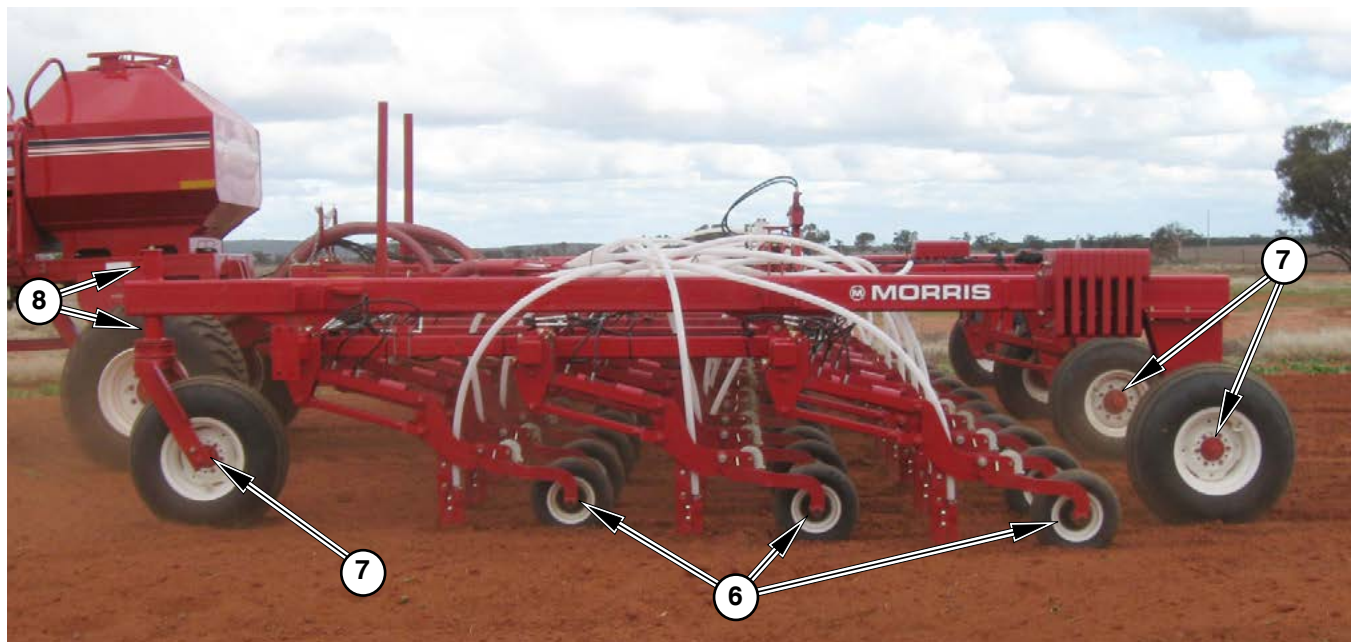
- Grease every 5,000 acres (2,000 hectares) or seasonally, whichever occurs first.

7. Wheel Hubs on Drill

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

8. Gauge Wheel Castor Pivot

- Grease every 50 hours.



Maintenance

Air Delivery System

General

The air delivery system of all air carts is extremely important for the proper metering of product to the openers. The metering system on all pressurized air carts is sensitive to air leaks. **Loss of tank air pressure could affect feed rates, which could become erratic or even stop.**

- Regularly check that all hoses are free from kinks or blockages throughout the day. To check for blockages raise seeding tool out of the ground and with the fan running engage meter drives with the Start/Stop button, rotating meter drives 4 to 5 times. Equal amounts of material should be deposited under each boot. If not, check the following for blockage:
 1. Seed openers and secondary hoses.
 2. Divider heads by removing access doors.
 3. Primary hoses and collectors.
 4. Metering wheels for damage to the flutes of the wheel.
- Keep fan inlet screen clear and free from debris.
- Place a plastic bag over the fan when the unit is not in use. This helps prevent moisture from entering the system.
- Check periodically and at the end of each season for air leaks at hose connections.
- Check periodically and at the end of each season for air leaks in the following areas:
 1. Tank lid seals.
 2. Metering body shaft seals.
 3. Metering body to tank seals.
 4. Collector to metering body seals.
 5. Fan to plenum.
 6. Plenum to collector.
 7. Inspection doors, for leaks and loss of seal memory.
 8. Collector door seals.
 9. Couplers between air cart and seeding tool.
 10. Access doors on divider heads.

Note: There must not be any air leaks from the tank. This air leakage causes air turbulence in the tank which can result in inaccurate metering rates.

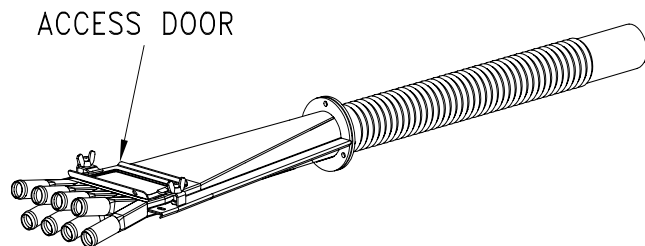
- Once a year check for wear of primary and secondary hoses.

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.



Keypad



Note: Extended life can be obtained if the hoses are rotated 1/4 turn once a year.

Air Delivery System - Continued

Tank Lids

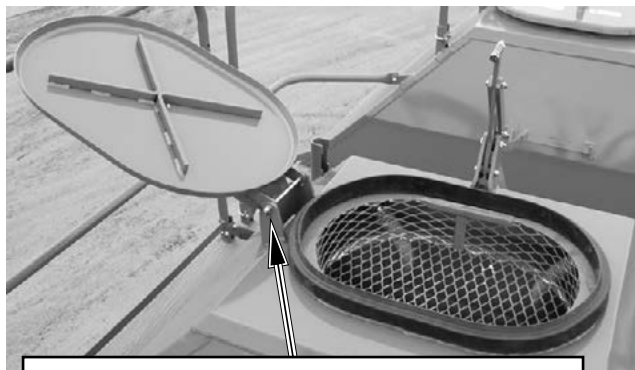
The lid seal is probably the area that sees the most abuse due to the activity associated with filling the tanks.

With each fill the lid seals should be inspected for cuts, abrasions, debris in the seal and ensure the seal is positioned properly on the steel rim around the tank opening.

Tank Lid Adjustment

Check Tank Lid tension on *all tanks* at beginning of each season and periodically during season for air leaks. The following checks and adjustments must be made to prevent air leaks from occurring:

- Check for any foreign material embedded into seal. Clean out foreign material from seal surface.
- Check seal for cuts and abrasions. If seal is cut or severely worn, then replace seal.
- Ensure seal is positioned properly on steel rim around tank opening.
- Use a 0 - 100 lb. (0-45 kg) spring scale to check the tank lid opening force. With the lid closed place one end of the scale *six inches* (15 cm) from the end of the tank lid lever. Pull straight up on the scale and note the maximum force it takes to open the lid. The force needed to open the lid **must be greater than 65 lbs (29 kg)**. Adjust the lid latch adjusting bolt as necessary. The lid latch should close with a **snap**. This will ensure that the lid is sufficiently tight and prevent any leaks.
- Re-check for leaks. If lids still leak turn down bolt one or two more turns. Re-check for leaks.

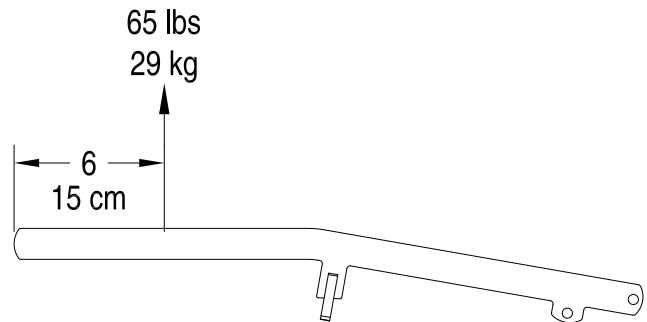


Note: This bolt should be loose enough to allow lid to float in the slot.

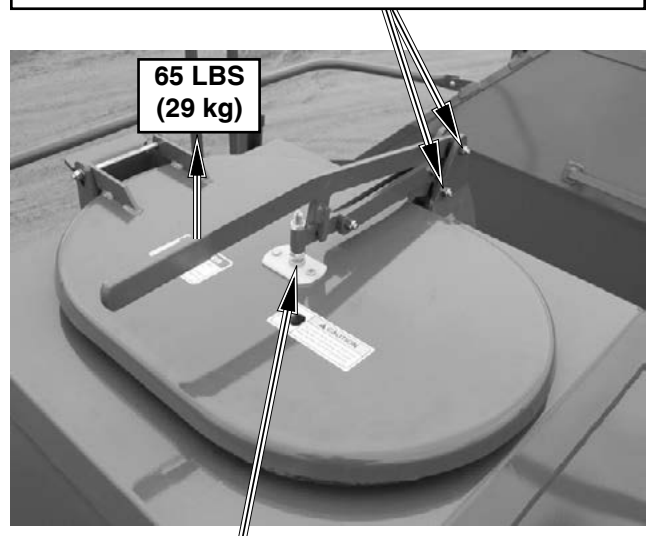
Important

It is imperative that no air leaks occur in the air cart tank as even the smallest air leak from the lid will lead to material bridging in the tank thereby causing misses in the field.

Note: When air cart is not in use, leave lid latches loose to help maintain resilience of the seals.



These bolts and lock nuts must be tightened to maintain a friction fit so the lid latch stays stationary when in open position.



Adjust the lid latch bolt to obtain a force greater than 65 lbs (29 kg) to open the lid.

Maintenance

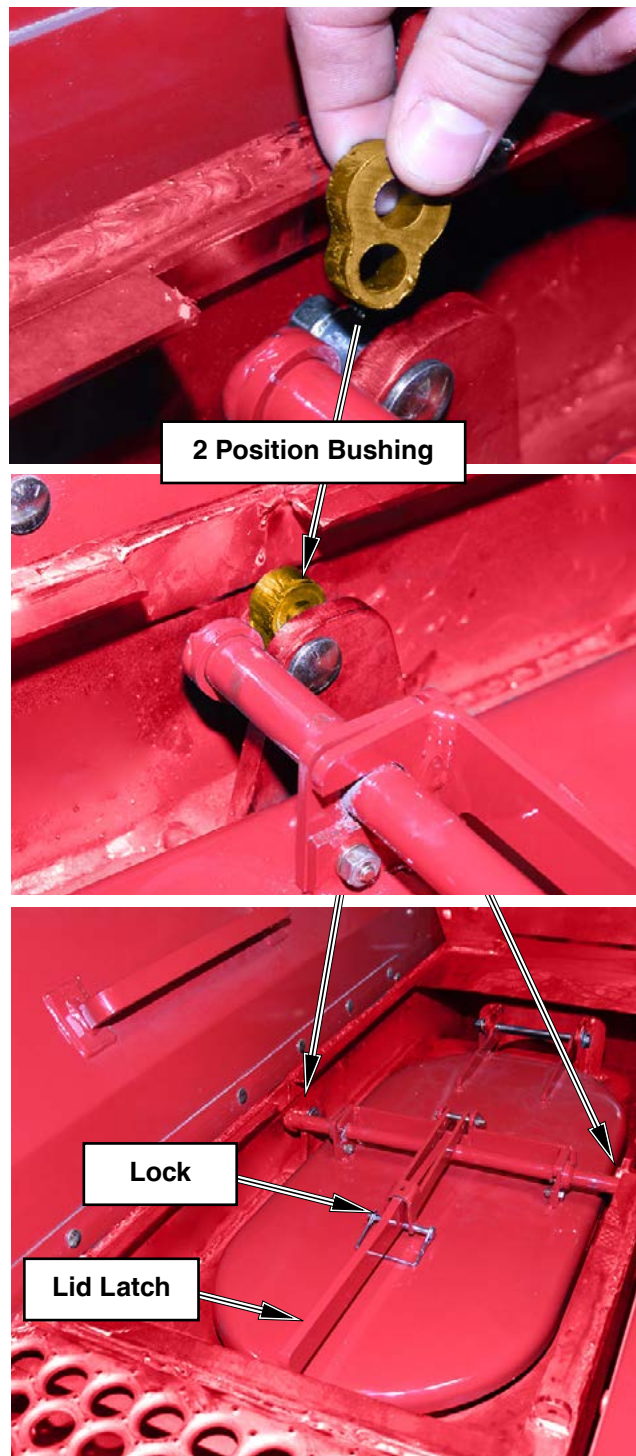
Air Delivery System - Continued

Tank Lid Adjustment - Continued

3rd Tank Option

- Check for any foreign material embedded into seal. Clean out foreign material from seal surface.
- Check seal for cuts and abrasions. If seal is cut or severely worn, then replace seal.
- Ensure seal is positioned properly on steel rim around tank opening.
- Lid cam lock uses a 2-position bushing initial setting is on the small diameter. If additional force is required flip both bushings to the larger diameter side.

Note: When air cart is not in use, leave lid latches loose to help maintain resilience of the seals.



Air Delivery System - Continued

Air Leak Check

It is **imperative that no air leaks occur** in the Air Cart tank. Any air leaks could cause loss of tank air pressure affecting feed rates, which could become erratic or stop.

To prevent this from occurring, it is strongly recommended that a pressure test be conducted prior to seeding time. This can be performed very easily and simply by completing the following steps:

- Clean fan impeller and adjust tank lids.
- Disconnect the 2 1/2" (64 mm) diameter primary hoses from the rear of the cultivator at the primary hose coupler(s) by loosening the four 3/8" bolts.
- Install the blank off plate that is supplied with the Air Cart at each coupler and retighten the 3/8" bolts. If the blank off plates are not readily at hand a piece of cardboard can be used in its place.
- Once the blank off plates have been installed, start the fan and run at 4,500 rpm.

Check the following areas for air leaks:

1. Tank lid seals.
2. Metering body shaft seals.
3. Metering body to tank seals.
4. Collector to metering body seals.
5. Fan to plenum and plenum to collector.
6. Clean-out doors, for leaks and loss of seal memory.
7. Collector door seals.
8. Diverter valves and double shoot mounting plates.
9. Tanks union plate.
10. Tank site glasses.

Air leaks can be detected by spraying a soapy water solution onto the seal area. If bubbling of soap occurs, the seal has a leak. Another method is to use your hand to feel for any air movement around the seal. This method requires a calm day, as the wind can make it difficult to detect a small leak.

- If any of the above areas leak, remove the parts and replace the seal. Ensure upon reassembly that the parts are tightened sufficiently to prevent air leakage.
- Remove the blank off plates before using the Air Cart.

Once the pressure test is complete, check the following areas for air leaks:

11. Couplers between seeder and cultivator.
12. Access doors on divider heads.

Important

It is imperative that no air leaks occur in the Air Cart tank, as even the smallest air leak will lead to material bridging in the tank, thereby causing misses in the field.

Note: When Air Cart is not in use leave lid latches and clean-out doors loose to help maintain resilience of the seals.

Maintenance

Air Delivery System - Continued

Fan

Debris can build up on the fan screen and blades causing reduced output of the fan. The lack of air flow even at higher fan speeds will cause material plugging of the air system.

The build up of material during operation can cause the following:

1. Fan rpm will increase without increasing oil flow to orbit motor.
2. Air Cart distribution system plugging from a lack of air flow (Increasing fan rpm has little or no effect).

Fan Screen

- Ensure fan screen is clear of debris. Check periodically through the day.

Fan Impeller

The fan blades may become plugged under high humidity/dusty conditions/high insect counts.

Under severe conditions the fan blades should be inspected daily and cleaned as required.

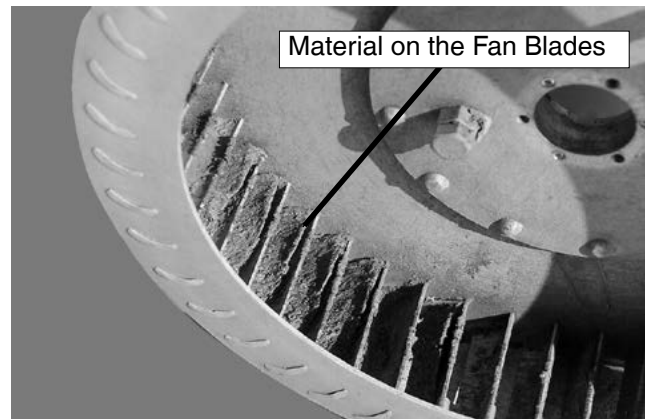
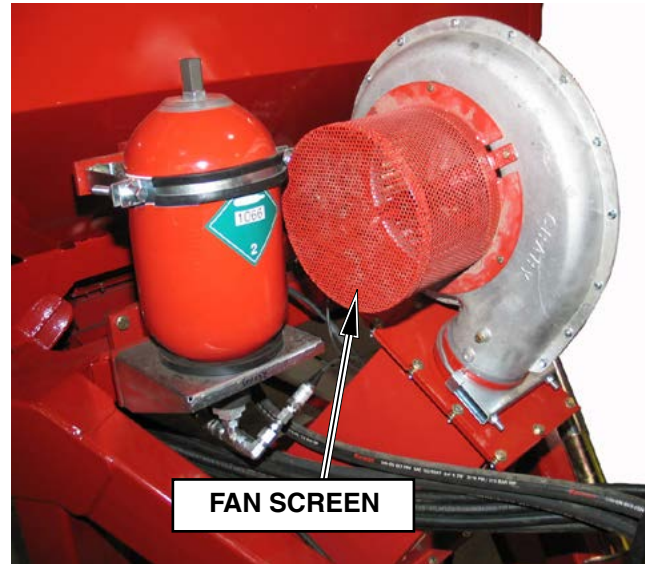
Under normal conditions the fan should be inspected and cleaned at least once a season.

- Care should be taken in cleaning all fan blades thoroughly to restore the fans peak performance.
- Ensure that the balance clips located on the fan blades are not removed, as this will put the fan out of balance.

Storage

To prevent water entering the air system, cover the fan intake with a plastic bag, whenever the seeder is not in use.

Note: Be sure to remove fan cover prior to starting fan. Serious damage could result to the fan.



Note: Material build up on the fan blades could cause the fan to be out of balance. The added vibration of the out of balance impeller will reduce the life of the fan components.

Air Delivery System - Continued

Impeller Clearance

The impeller should be centred inside the housing to avoid contact between the impeller and housing.

The distance “X” between the impeller and housing inlet, when centred, will be approximately 3/8” (9 mm) to 1/2” (12 mm).

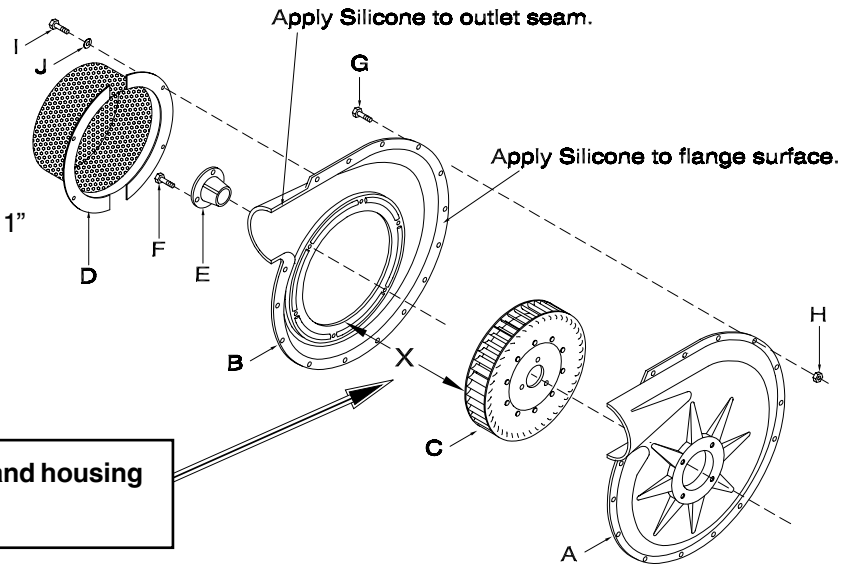
When assembling fan ensure flange surfaces of housing are clean.

Apply a 1/4” (6 mm) silicone bead to one flange surface of housing including outlet seam.

Mate surfaces and secure in place with 1/4” x 1” hex bolts (G) and 1/4” serrated lock nuts (H).

Note: Torque 1/4” bolts to 49 in. lb.

Set clearance “X” between the impeller and housing inlet from 3/8” (9mm) to 1/2” (12 mm).



Hoses

Inspect air delivery hoses for wear and replace as required. Check areas where hoses may be exposed to moving parts such as hitch hinge area.

Also, inspect hoses for blockage as rodents/birds may nest in hoses that have not been properly capped during storage.

To optimize the Air Cart air system on single shoot units the difference in length between the longest primary hose and the shortest primary hose **should not exceed six feet**.

Maintenance

Hydraulic Orbit Motor

The motor requires no maintenance itself.

It does, however, require clean oil so the tractor hydraulic filters must be replaced regularly.

Repair/Replacement

- Remove orbit motor from the fan.

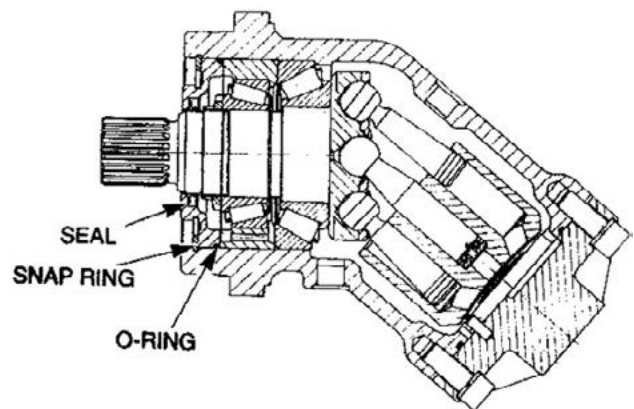
Note: The shaft should never be hammered on or forced in as this will result in motor damage upon startup.

- Remove the snap ring and front cover.
- Push out the old shaft seal and press in the new one.

Note: The bearings should never be removed from the shaft as they are pretensioned to the shaft with the motor spinning.

- Replace the O ring.
- Both the O ring and shaft seal should be greased with a “very clean” grease.
- Care must be taken when the front cover is installed so the shaft seal is not damaged.
- Reinstall the snap ring.
- Fill the motor case with “clean” oil before running.

Note: Any time a motor is replaced the case must be filled with oil before it is started, if not, a bearing failure could occur.



Tie Rod - Tow Between

- Check at 10 and 50 hours and periodically afterwards.
- Torque to 450 ft. lbs. (610 Nm).



Maintenance

Metering

The metering wheels come in 4 different sizes. Each wheel matches to a specific distribution head mounted on the seeding tool.

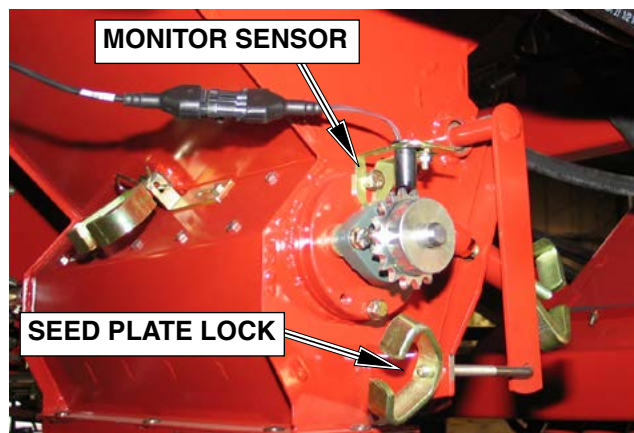
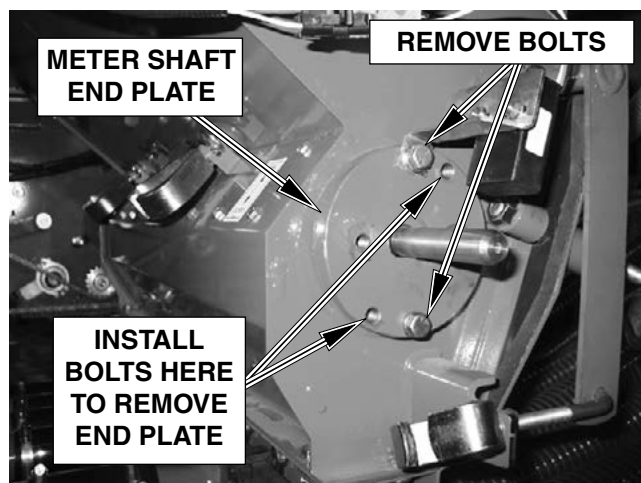
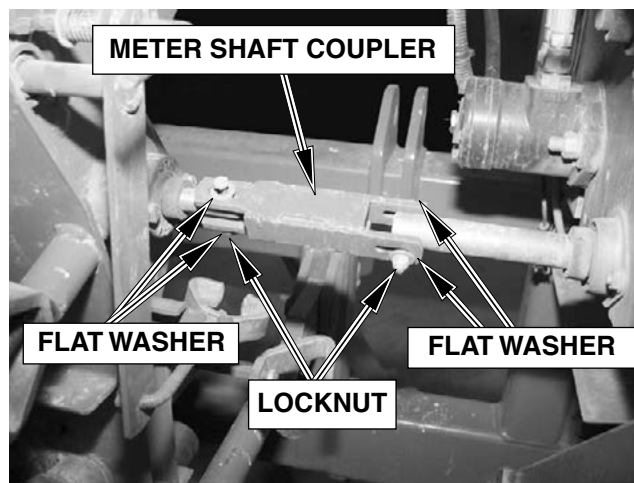
If the metering wheel and distribution head are not matched correctly, the distribution accuracy will be adversely affected.

Spacer plates are used to take up the extra space in each metering cup. These spacer plates vary in size according to the size of the metering wheel.

Metering Wheel Replacement

- Close tank Shut-Offs if there is product in tank.
- Remove inspection door and seed plate.
- Clean out any remaining material in the metering body and meterwheels.
- Remove all Blank Off plates.
- Remove the monitor sensor wheel and sensor mount from the right hand side of the metering body.
- Disconnect meter shaft coupler from the meter shaft and transmission drive shaft.
- Loosen the locking collars on **both** meter shaft bearings.
- Remove monitor donut and right hand metershaft bearing and spacers.
- Remove 3/8" bolts holding the meter shaft end plate on the right hand side and insert into threaded holes in end plate. Tighten down to pull end plate and remove.

Table 1				
Divider Head	Metering Wheel		Spacer	
Outlets	Number	Width	Qty	Width
-	Blank Off	-	2	1 1/2" (38 mm)
7	7	1 3/4" (45 mm)	2	5/8" (16 mm)
8	8	2" (51 mm)	2	1/2" (13 mm)
9	9	2 1/4" (57 mm)	2	3/8" (9.5 mm)
10	10	2 1/2" (64 mm)	2	1/4" (6.4 mm)
11	11	2 3/4" (70 mm)	2	1/8" (3.2 mm)



Metering - Continued

Remove the meter shaft from the right hand side.

Assembly Hint: Mark metering wheel size on the metering body. This will help in ensuring the correct order of metering shaft assembly.

- Remove nut from meter shaft and disassemble wheels and spacers.
- Replace damaged wheels and reassemble shaft. Ensure correct spacers and wheels are located and assembled in the correct order. See diagram on next page. **Note:** After each meter wheel configuration, including any "Blank Offs", add one 5/16" (8 mm) spacer. The distance between the 5/16" (8 mm) spacers should be 3" (76.2 mm) if wheels are assembled correctly.
- Tighten nut on metering shaft until it bottoms out against the shoulder.
- Check if spacers and wheels are tight. If the wheels and spacers are loose, measure shim thickness required. If 1/16" (1.6 mm) shim is required remove nut on meter shaft and install shim between the 1/4" (6.4 mm) end spacer and the spacer used for the run.
- If a 1/8" (3.2 mm) shim is required then remove nut and install 1/16" (1.6 mm) shim between 1/4" (6.4 mm) end spacer and the spacer used for the run. Remove the snap ring at the opposite end of the shaft and install the other 1/16" (1.6 mm) spacer before the 1/4" (6.4 mm) end spacer.
- Reassemble shaft and tighten nut.
- Repeat last two steps above if necessary.
- Clean out any debris remaining in the meterbody.
- Check seed plate setting - See "Seed Plate Adjustment"
- Install 'O' Ring onto meter shaft end plate.

Note: Apply thin layer of lubricant on 'O' Ring.

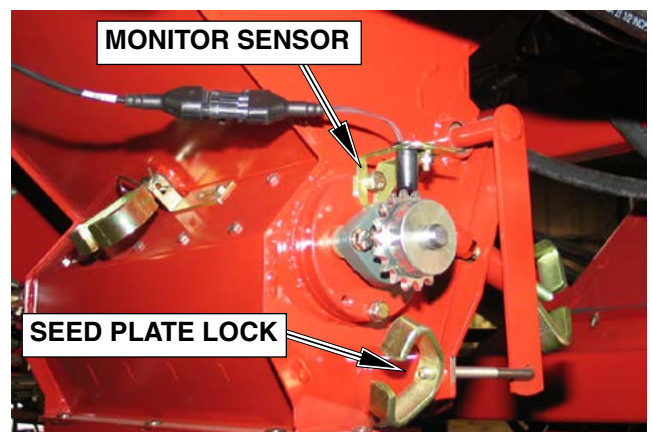
- Reinstall meter shaft assembly, snap ring end first into meter body.
- Install meter shaft end plate and monitor sensor bracket.
- Reinstall Stainless Steel Blank Off plates. See "Blank Off Installation" for more details.
- Reinstall right hand side meter shaft bearing and spacers.
- Reinstall left hand side meter shaft bearing and spacers.



Meter shaft removed



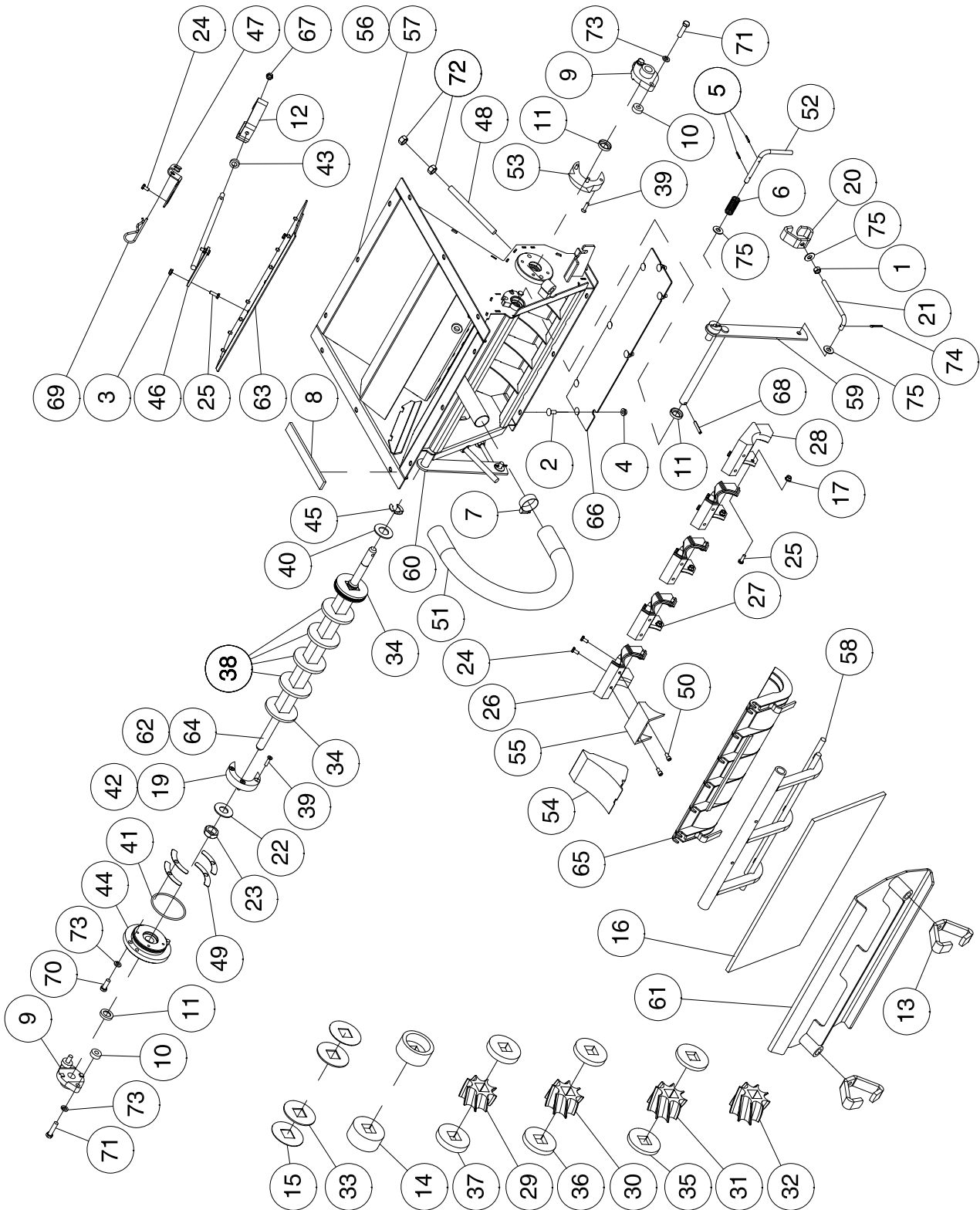
Blank Off



Maintenance

Metering - Continued

Note: The metering wheels can be installed with the metering body mounted to the air cart.

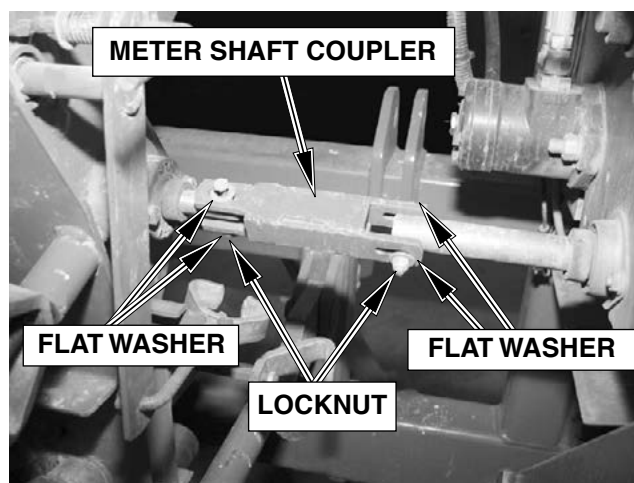


Metering - Continued							
Item	Part No.	Description	Qty	Item	Part No.	Description	Qty
1	A47821	Pre-Assembly.....	1	44	N36774	End Plate.....	1
2	D-5259	Carriage Bolt - 5/16 x 3/4 Lg.....	8	45	N36813	Retaining Ring - 1 Dia.....	1
3	D-5277	Serrated Flange Lock Nut - 1/4.....	2	46	N36945	Shutoff Handle.....	1
4	D-5278	Flange Lock Nut - 5/16.....	8	47	N37115	Retainer Clip.....	1
5	N11457	Roll Pin - 1/8 Dia x 3/4 Lg.....	2	48	N37120	Rod - 1/2 Dia.....	2
6	N11847	Spring.....	1	49	N37210	Shim - Metering Body End Cap.....	4
7	N11906	Hose Clamp - 1 1/2 Dia.....	1	50	N37339	Socket Head Capscrew - 1/4 x 1/2.....	2
8	N15716	Seal Strip 1/4 x 1 (Bulk/Ft).....	1	51	N38662	Presurization Hose - 1.5 Dia.....	1
9	N19269	Flange Bearing.....	2	52	N40688	Lock Pin - 3/8 Dia.....	1
10	N21602	Spacer - 13/32 ID x 3/8 Thick.....	4	53	N40805	Spacer.....	1
11	N21659	Seal.....	4	54	N40980	Blank Run Cover.....	1
12	N27350	Wing-Lock Nut - 3/8.....	1	55	N42540	Blank-Off 1 Wide.....	1
13	N27360	Wing-Lock Nut - 1/2.....	2	56	N47480	Metering Body Assembly.....	1
14	N36106	Blank Wheel Spacer Half.....	2	57	N47481	Metering Body.....	1
15	N36110	Meterwheel Spacer 0.0625.....	4	58	N47497	Seed Plate Activator.....	1
16	N36130	Seal Strip.....	10.75"	59	N47822	Seed Plate Activator Handle.....	1
17	N36143	Nylon Lock Nut - 1/4.....	4	60	N47823	Seed Plate Activator Handle.....	1
18	N36259	Decal - Shut-Off.....	1	61	N47825	Cleanout Door.....	1
19	N36401	Spacer - End Relief.....	1	62	N47827	Metershaft - Blank Assy.....	1
20	N36425	Wing - Lock Nut - 3/8.....	2	63	N47828	Shutoff Plate.....	1
21	N36427	Adjusting Rod.....	2	64	N47830	Metershaft.....	1
22	N36431	Washer - 7/8 ID Stainless Steel.....	1	65	N47831	Seed Plate - Coarse Seeds.....	1
23	N36432	Locknut - 7/8 Nylon Insert.....	1		N47834	Seed Plate - Coarse Seeds - Teflon Coated.....	
24	N36556	Hex Bolt - 1/4 x 1/2 Lg.....	10		N47832	Seed Plate - Medium Seeds.....	
25	N36597	Hex Bolt - 1/4 x 3/4 Lg.....	6		N47831	Seed Plate - Fine Seeds.....	
26	N36708	Backplate Left.....	1	66	N48482	Cover Plate.....	1
27	N36709	Backplate Center.....	3	67	S-748	Hex Jam Nut - 3/8.....	1
28	N36710	Backplate Right.....	1	68	S-4781	Spring Pin - 1/4 x 1 1/2.....	2
29	N36717	Meterwheel - 7 Outlet.....	1	69	W-131	Hairpin - 5/32".....	1
30	N36718	Meterwheel - 8 Outlet.....	1	70	W-475	Hex Bolt - 3/8 x 1 Lg.....	2
31	N36719	Meterwheel - 9 Outlet.....	1	71	W-477	Hex Bolt - 3/8 x 1 1/2 Lg.....	4
32	N36720	Meterwheel - 10 Outlet.....	1	72	W-516	Hex Nut - 1/2.....	4
33	N36731	Meterwheel Spacer 0.125.....	4	73	W-523	Lockwasher - 3/8.....	6
34	N36732	Meterwheel Spacer 0.25.....	2	74	W-528	Cotter Pin - 1/8 x 1 Lg.....	2
35	N36733	Meterwheel Spacer 0.375.....	2	75	W-538	Washer - 7/16 ID x 1 OD x 14 Ga.....	5
36	N36734	Meterwheel Spacer 0.5.....	2	76	W21476	Two Way Locknut - 3/8.....	2
37	N36735	Meterwheel Spacer 0.625.....	2				
38	N36736	Meterwheel Spacer.....	4				
39	N36738	Hex Socket Cap Screw.....	6				
40	N36744	Washer - 1" ID Stainless Steel.....	1				
41	N36748	O-Ring.....	1				
42	N36749	Right Bearing Assembly.....	1				
43	N36766	Seal - 1/2 In Shaft.....	1				

Maintenance

Metering - Continued

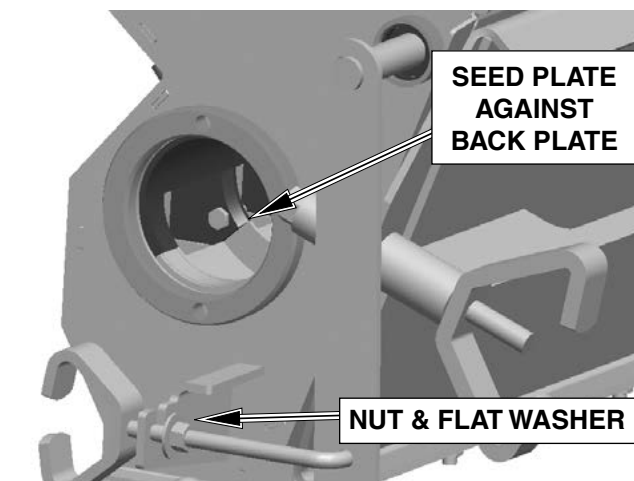
- Tighten locking collars by turning the collars in the direction of the shaft rotation. Lock the collar by tapping the collar with a punch in the direction of rotation of the shaft.
- Reinstall the monitor donut on shaft. Ensure donut is centred to pick-up. Set the gap between the pick-up and the donut at 0.030" (0.76 mm).
- Attach meter shaft coupler over the meter shaft and transmission drive shaft.
- Install the 1/4" x 2 1/4" special bolt with two flatwashers and locknuts. **Tighten locknuts to bottom of threads.**
- Install **Correct** seed plate for product being metered.



Seed Plate Adjustment

- **Remove** meter shaft from the meter body.
- Install the seed plate and adjust the seed plate locks so that the bottom of the seed plate comes against the bottom of the rear back plate. Tighten nuts so that the surface of the flatwashers are against the bracket.
- Remove the seed plate and set aside.
- Install meter shaft assembly, snap ring end first into meter body.
- Install 'O' Ring onto meter shaft end plate.

Note: Apply thin layer of lubricant on 'O' Ring.



Seed Plate Adjustment

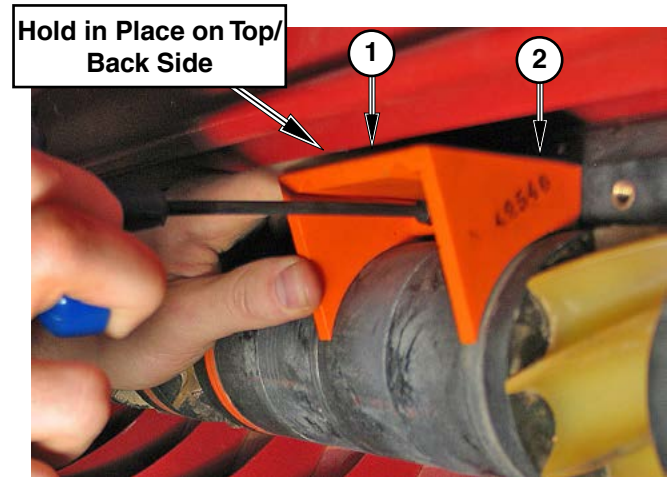
Metering - Continued

Blank Off Installation

Proper fit between the Blank Off and the spacer on the meter roller is important.

To ensure correct installation of the Blank Off follow the procedures listed below:

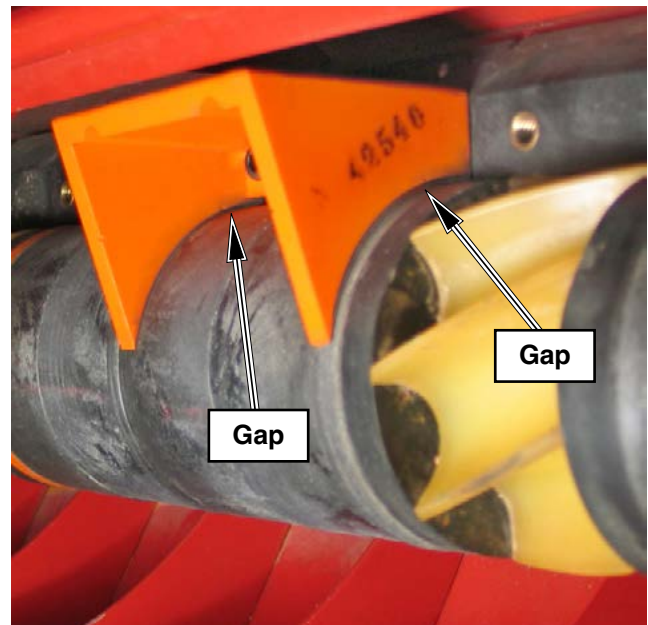
- Loosely install the Blank Off covers using (2) 1/4" Hex Socket bolts over the top of **all** the Blanked Off runs.
- Hold in place on top/back side of the Blank Off to align the radius with meter roller while tightening capscrews.
- Tighten capscrews starting with the left screw when facing body.



Blank Off Installation Procedure



Correctly Installed Blank Off



Incorrectly Installed Blank Off

Maintenance

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:

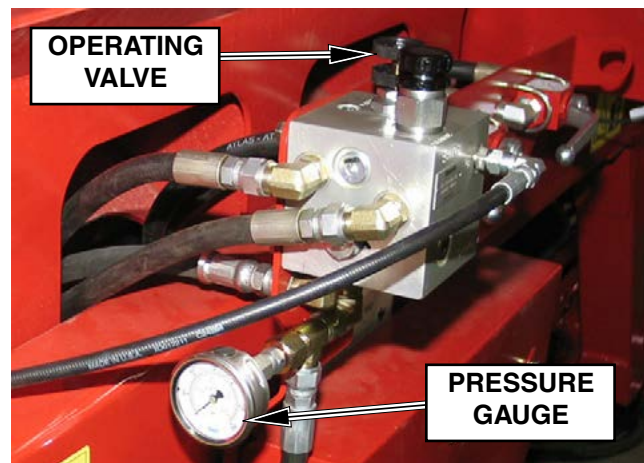
- Relieve pressure on hydraulic system before servicing or disconnecting hoses.
- Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.
- Keep all components in good repair.

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.

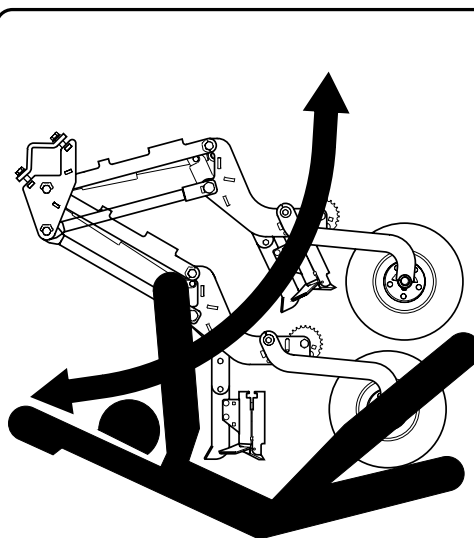
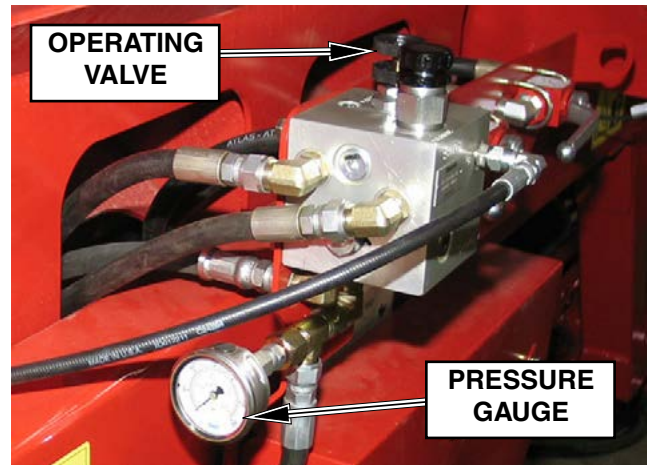


Opener Maintenance - Continued

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.



S44446

WARNING

CRUSHING HAZARD

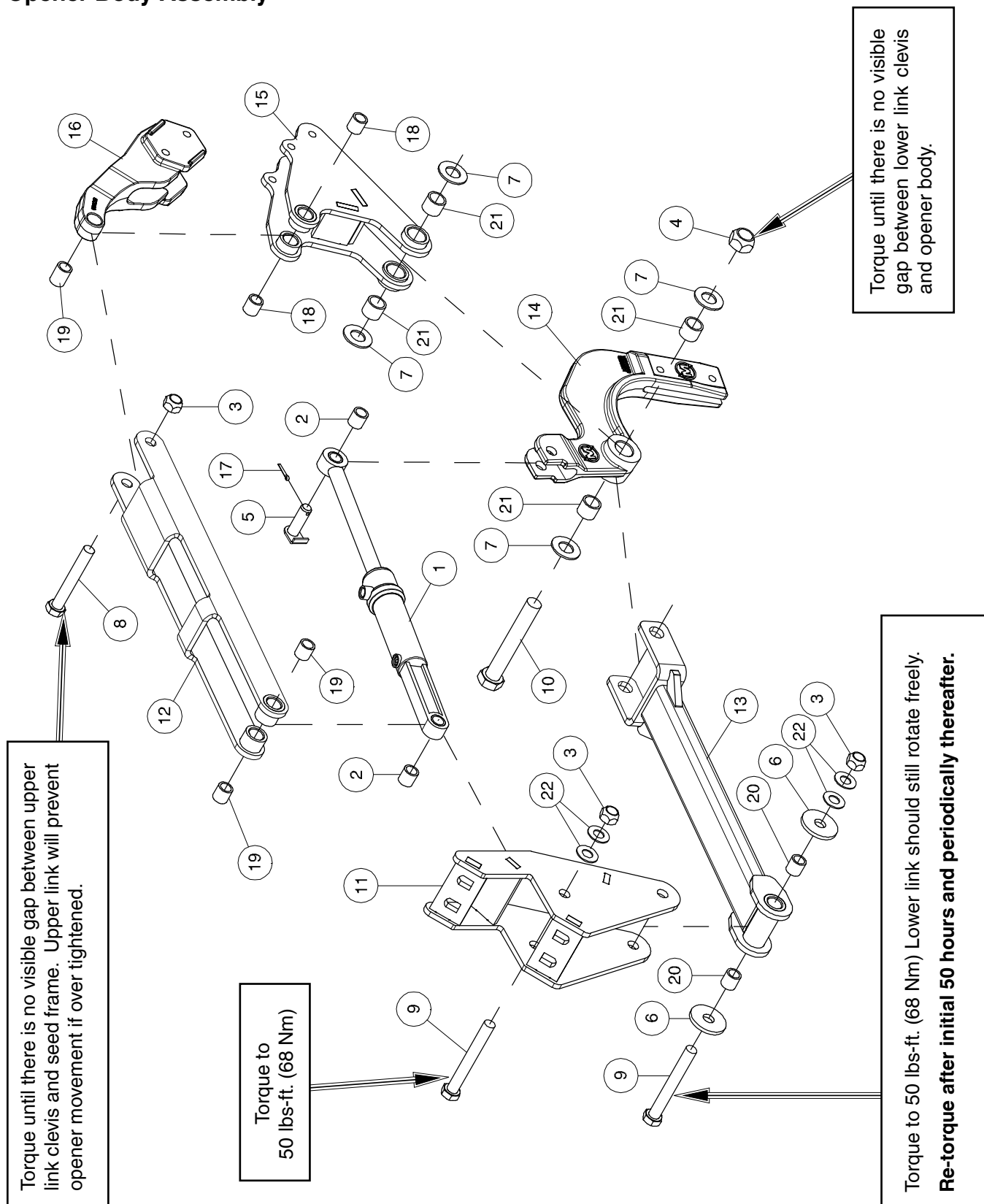
To prevent serious injury or death:

- **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.

Maintenance

Opener Maintenance - Continued

Opener Body Assembly



Opener Maintenance - Continued

Opener Body Assembly

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 itmes 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

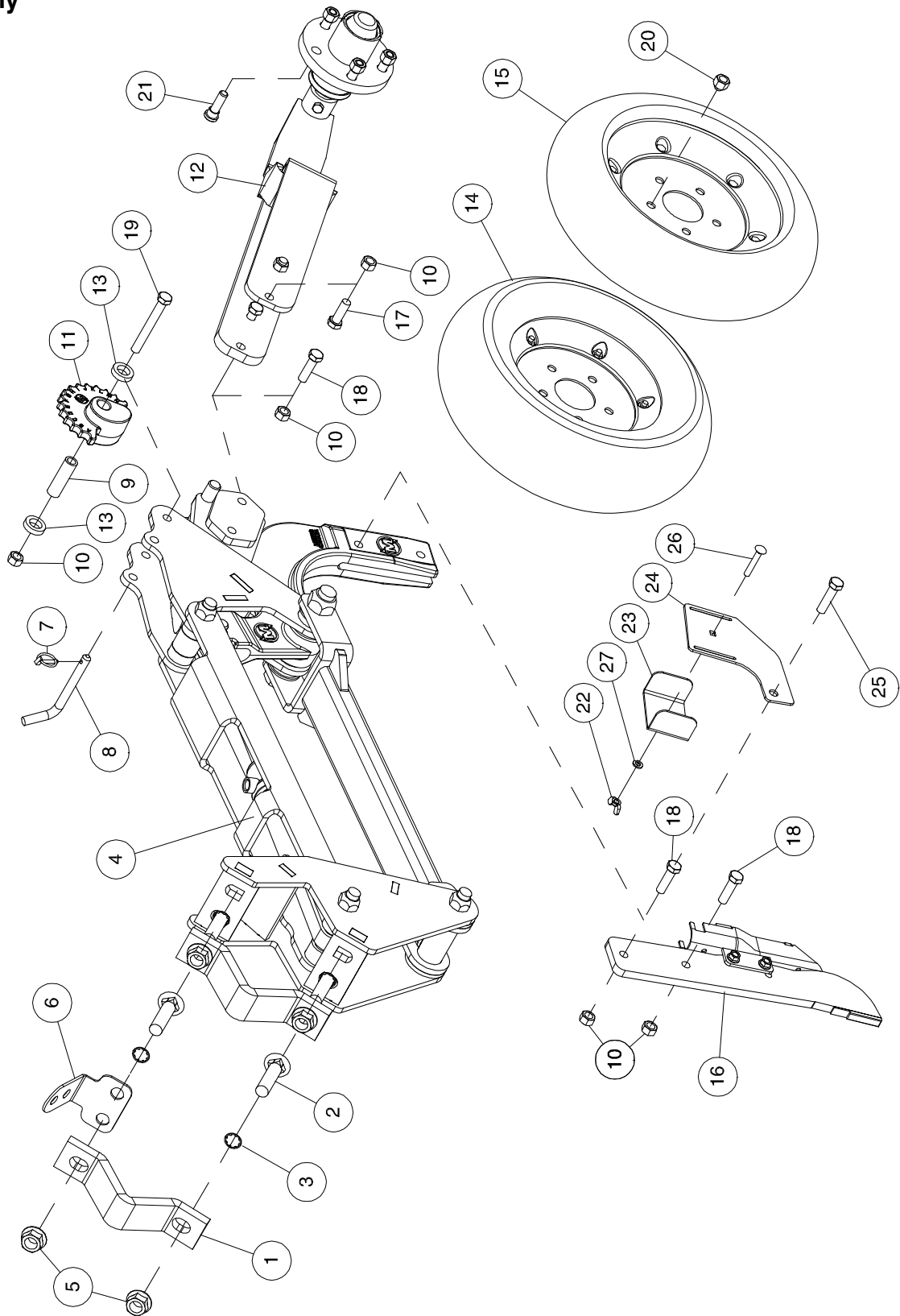
Opener Maintenance - Continued

Opener Assembly

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

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	S48860	Base Assembly - See Next Page	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.

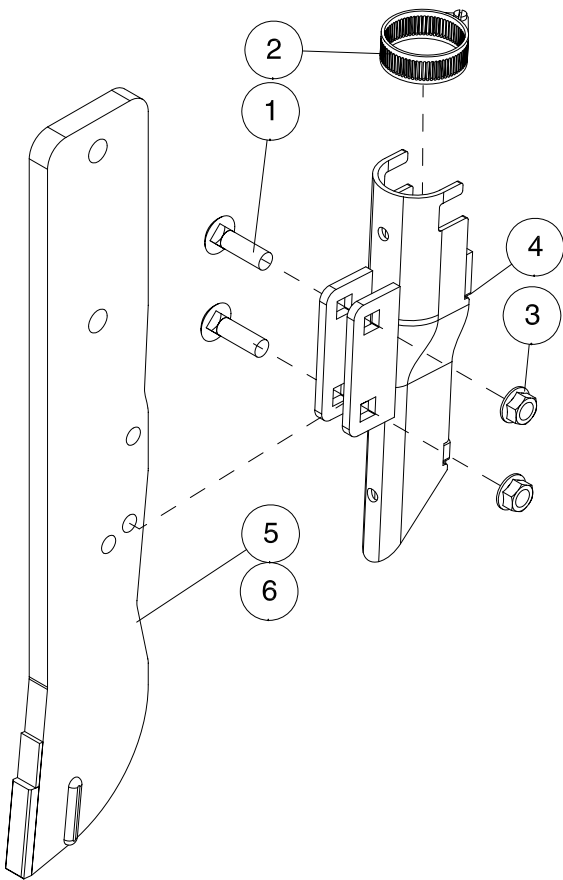
Hydraulic system must be bled after it has been serviced (if any portion of the system has been opened to atmosphere)

Maintenance

Opener Maintenance - Continued

Opener Assembly - Continued

Single Shoot Boot

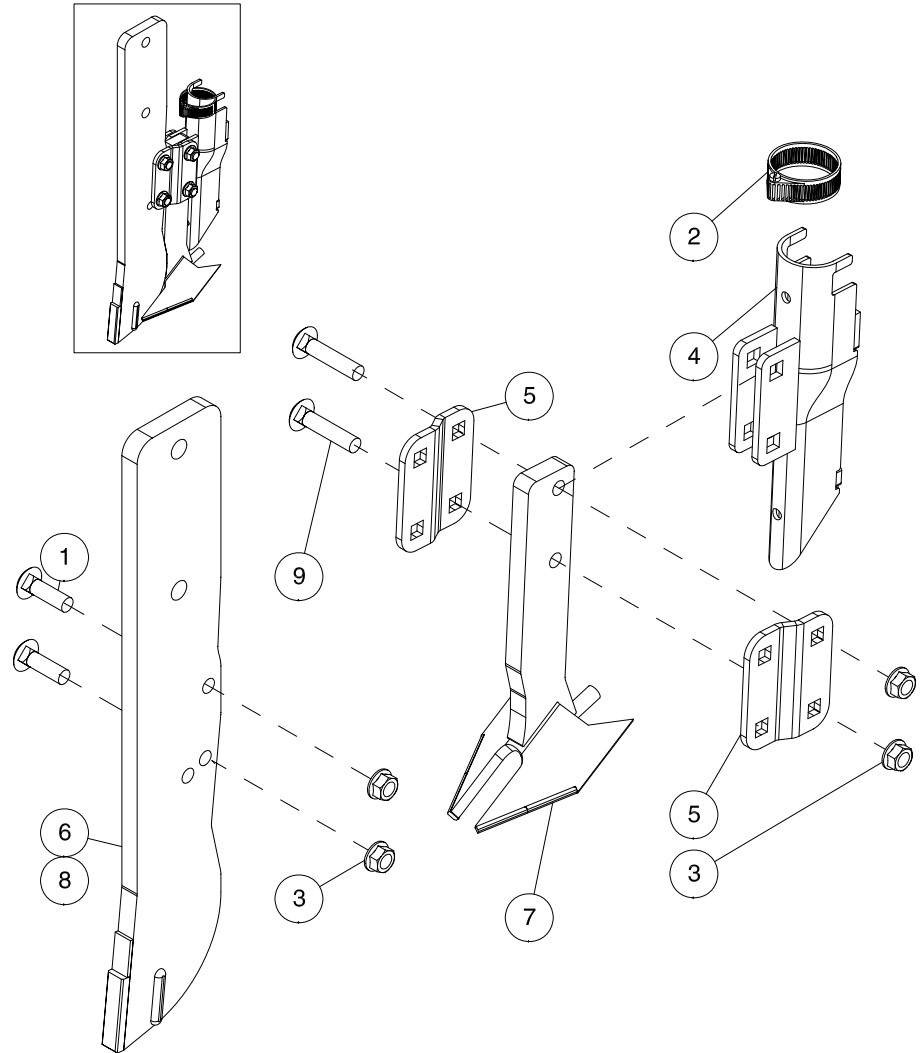


Item	Part No.	Description	Qty
1	D-5260	Carriage Bolt - 3/8 x 1-1/2 Lg	2
2	N11470	Hose Clamp	1
3	S27987	Center Lock Flange Lock Nut - 3/8	2
4	S42865	Single Shoot Boot	1
5	S45464	Wear Shank W/Carbide.....	1
6	S49538	Single Shoot Knife Kit (Contains Items 1, 3, 4 and 5)	1

Opener Maintenance - Continued

Opener Assembly - Continued

Single Shoot Boot - 3" Spread



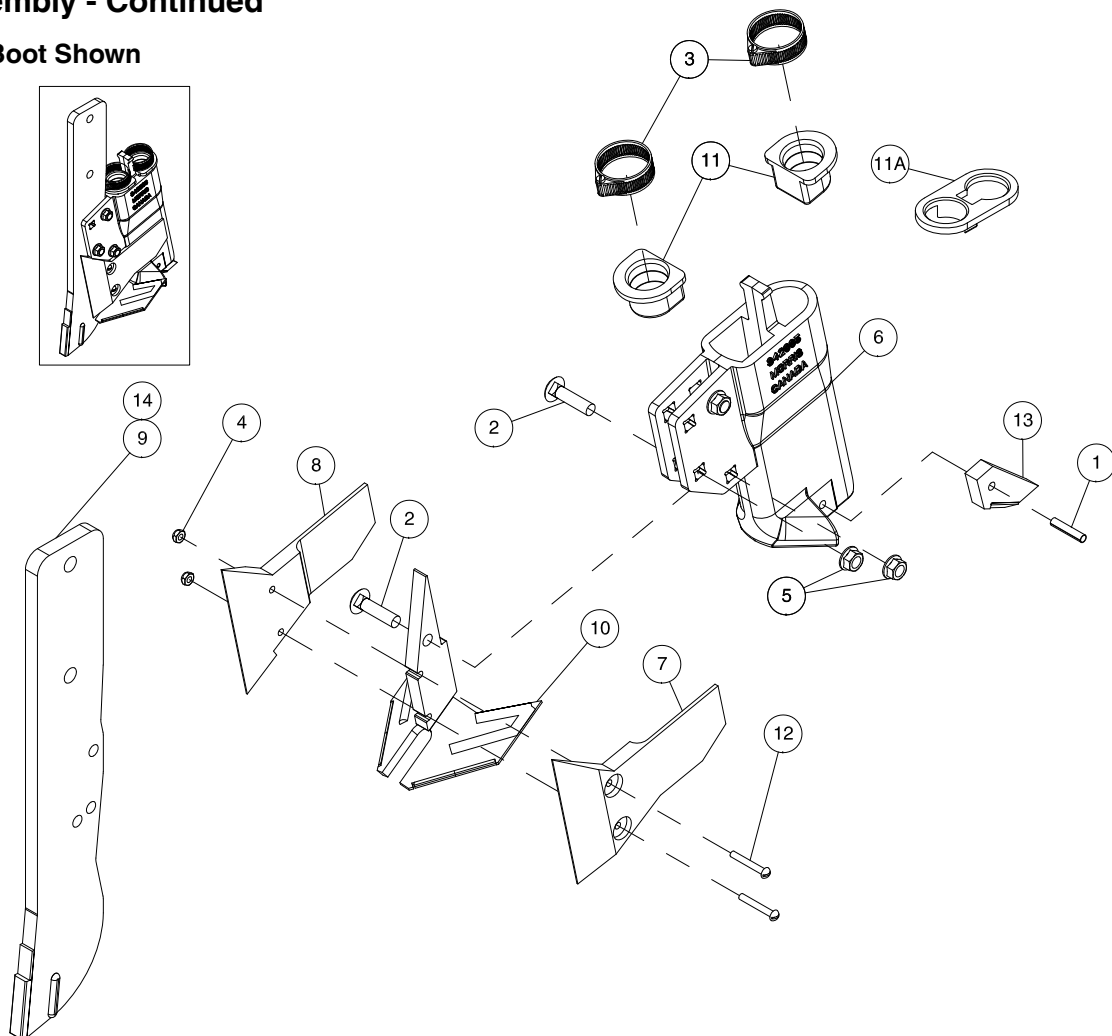
Item	Part No.	Description	Qty
1	D-5260	Carriage Bolt - 3/8 x 1-1/2 Lg	2
2	N11470	Hose Clamp	1
3	S27987	Center Lock Flange Lock Nut - 3/8	4
4	S42865	Single Shoot Boot	1
5	S45269	Mounting Plate	2
6	S45464	Wear Shank W/Carbide.....	1
7	S47337	3" Wear Shovel	1
8	S49540	Single Shoot 3" Spreader Kit (Includes Items 1, 3, 4, 5, 6, 7 and 9).....	1
9	S31980	Carriage Bolt - 3/8 x 1-3/4 Lg	2

Maintenance

Opener Maintenance - Continued

Opener Assembly - Continued

Double Shoot Boot Shown

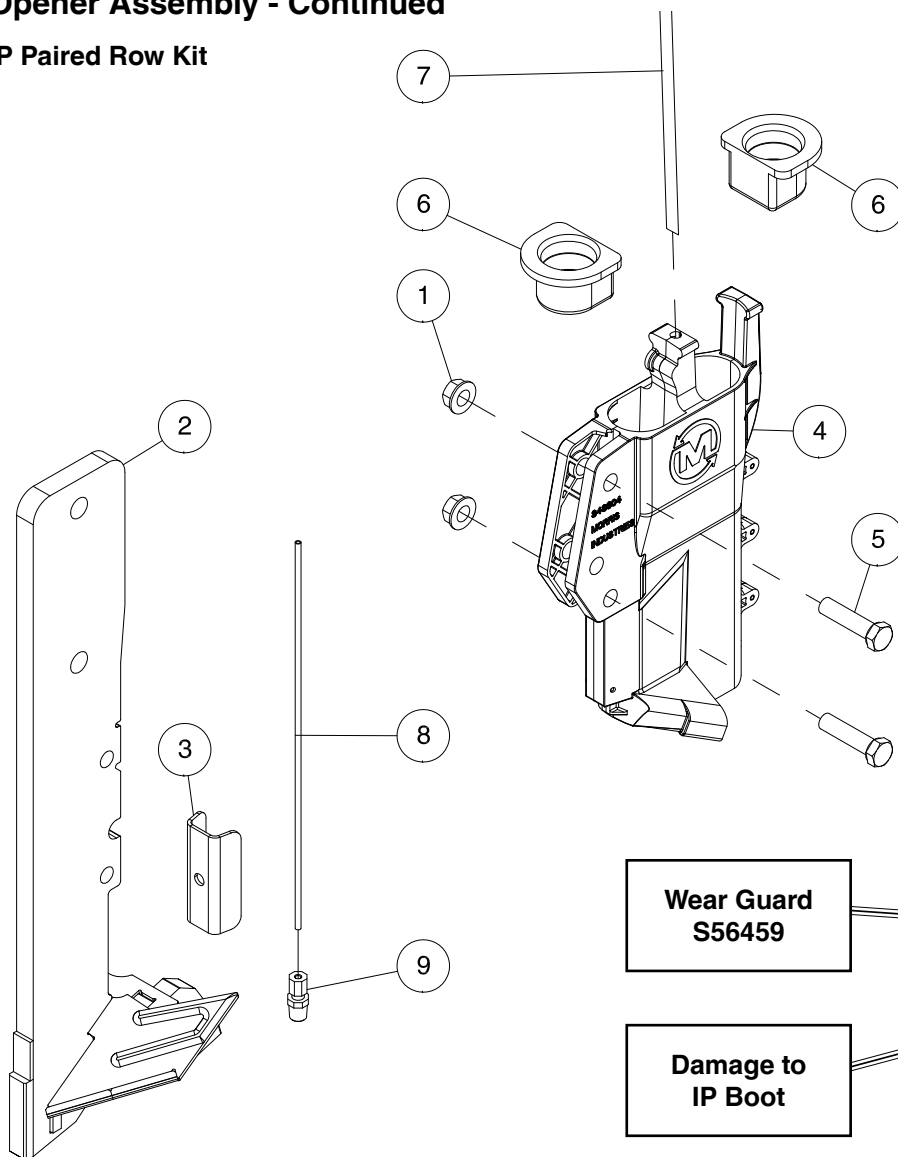


Item	Part No.	Description	Qty
1	D-5243	Roll Pin.....	1
2	D-5261	Carriage Bolt - 3/8 x 1-1/2 Lg	3
3	N11470	Hose Clamp	2
4	N37787	Nylon Insert Locknut - #10-24	2
5	S27987	Center Lock Flange Lock Nut - 3/8	3
6	S42965	Cast Double Shoot Boot	1
7	S45312	Mud Guard Option Left.....	1
8	S45313	Mud Guard Option Right	1
9	S45464	Wear Shank W/Carbide.....	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
14	S49539	Paired Row Shovel Kit (Includes Items 1, 2, 5, 6, 9, 10, and 13).....	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
S56459

Damage to
IP Boot



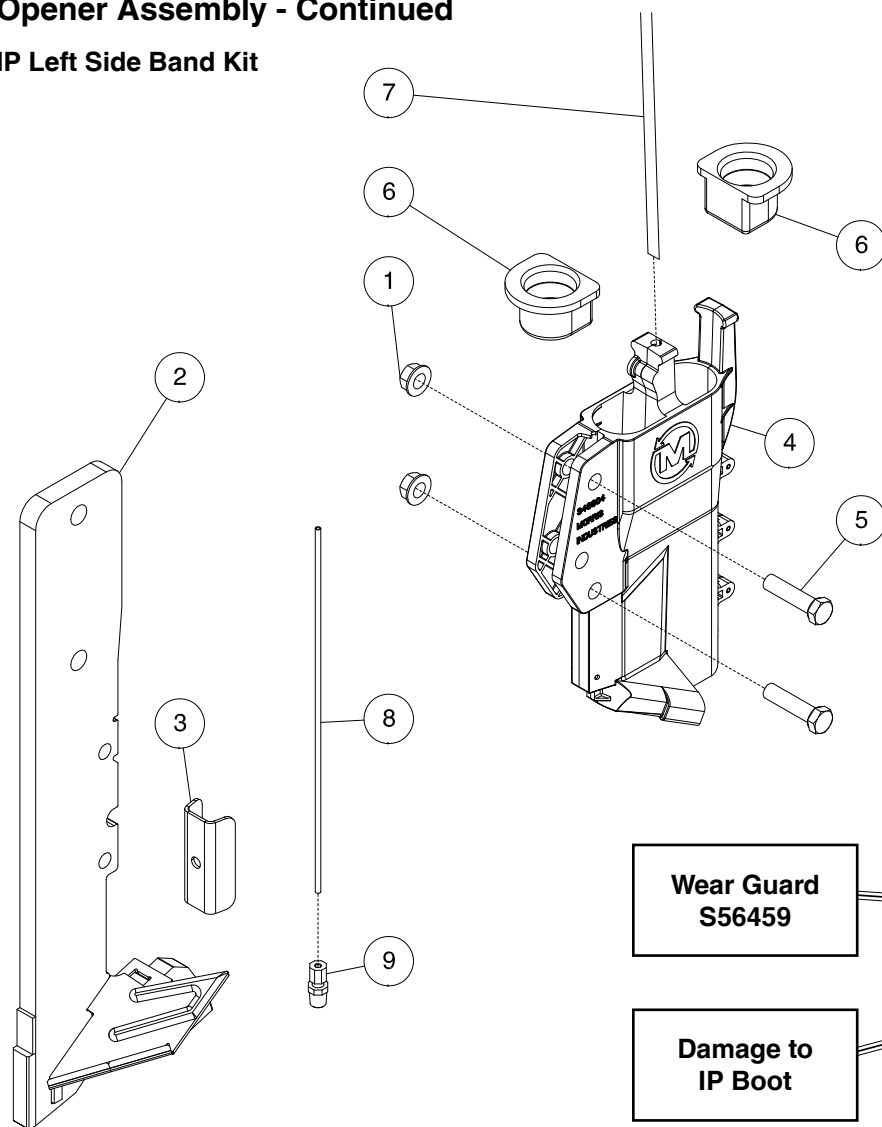
Item	Part No.	Description	Qty
1	S27987	Lock Nut - 3/8 Flange W/Center Lock	2
2	S55455	Paired Row Shank.....	1
3	S56459	Wear Guard.....	1
4	S56485	IP (Injected Polymer) Paired Row Seed Boot.....	1
5	W-477	Hex Bolt - 3/8 x 1 1/2 Lg.....	2
6	S47076	Secondary Hose Grommet - Option - 15/16 ID Hose.....	2
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
	S56550	IP Paired Row Boot Kit (Contains Items 1, 2, 3, 4 & 5)	1

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.

Wear Guard
S56459

Damage to
IP Boot



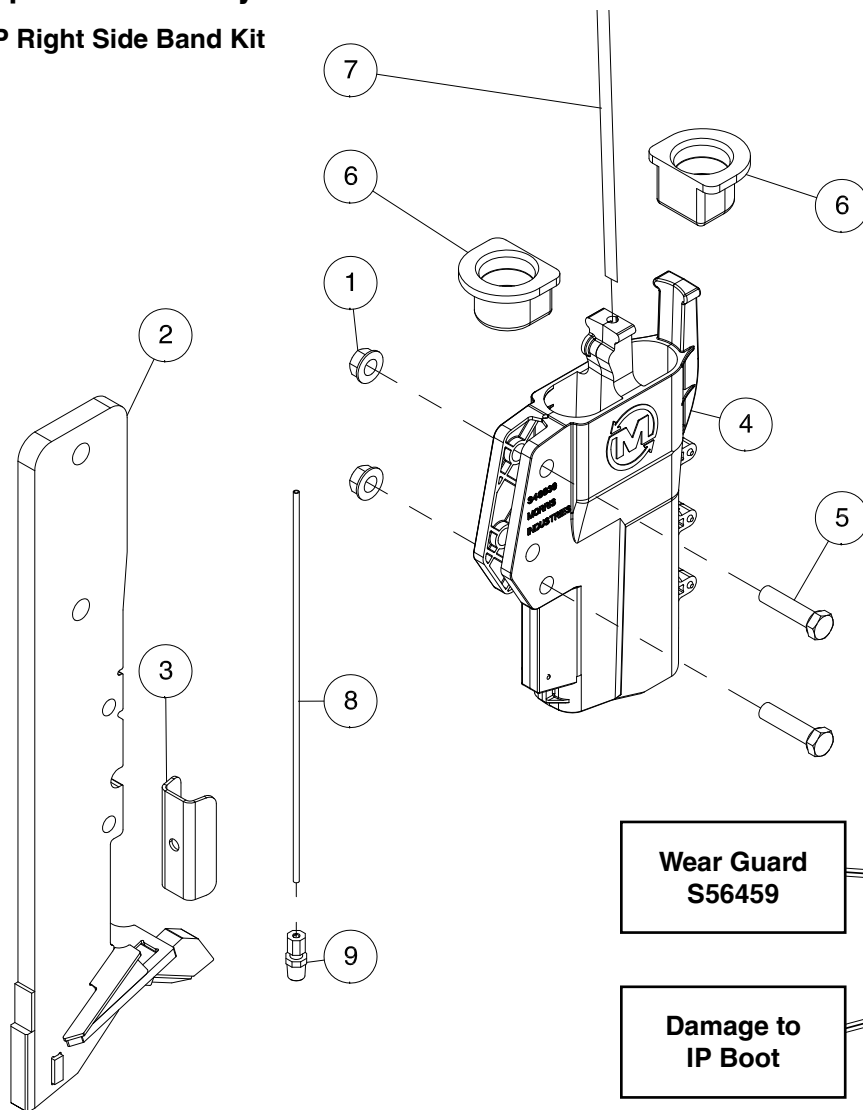
Mount the side band openers with the deflector and seed tube facing the center of the Contour Air Drill.

Item	Part No.	Description	Qty
1	S27987	Lock Nut - 3/8 Flange W/Center Lock	2
2	S55460	Sideband Shank - Left.....	1
3	S56459	Wear Guard.....	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 - Option - 15/16 ID Hose.....	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
	S56551	IP Left Sideband Boot Kit (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.



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

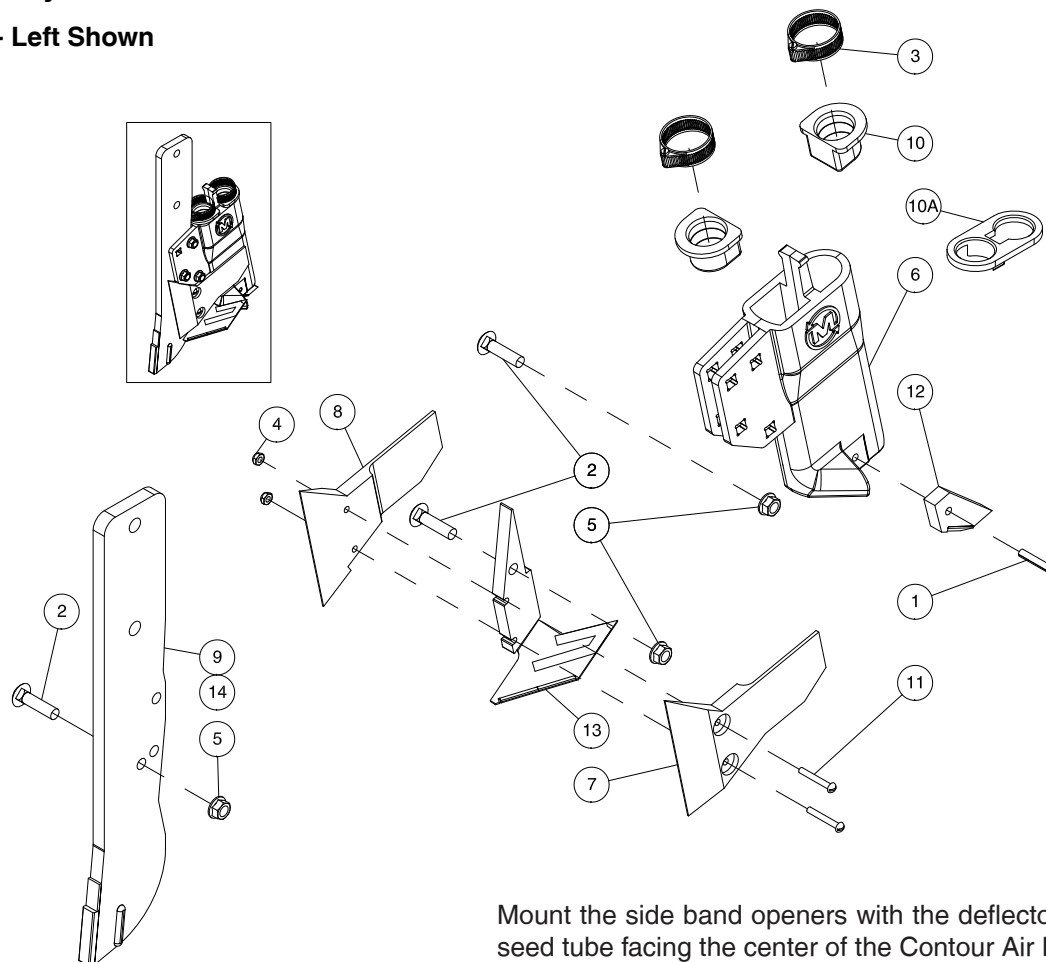
Item	Part No.	Description	Qty
1	S27987	Lock Nut - 3/8 Flange W/Center Lock	2
2	S55465	Sideband Shank - Left.....	1
3	S56459	Wear Guard.....	1
4	S56483	IP (Injected Polymer) Right Sideband Seed Boot	1
5	W-477	Hex Bolt - 3/8 x 1 1/2 Lg.....	2
6	S47076	Secondary Hose Grommet - Option - 15/16 ID Hose.....	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
	S56552	IP Right Sideband Boot Kit (Contains Items 1, 2, 3, 4 & 5).....	1

Maintenance

Opener Maintenance - Continued

Opener Assembly - Continued

Side Band Boot - Left Shown



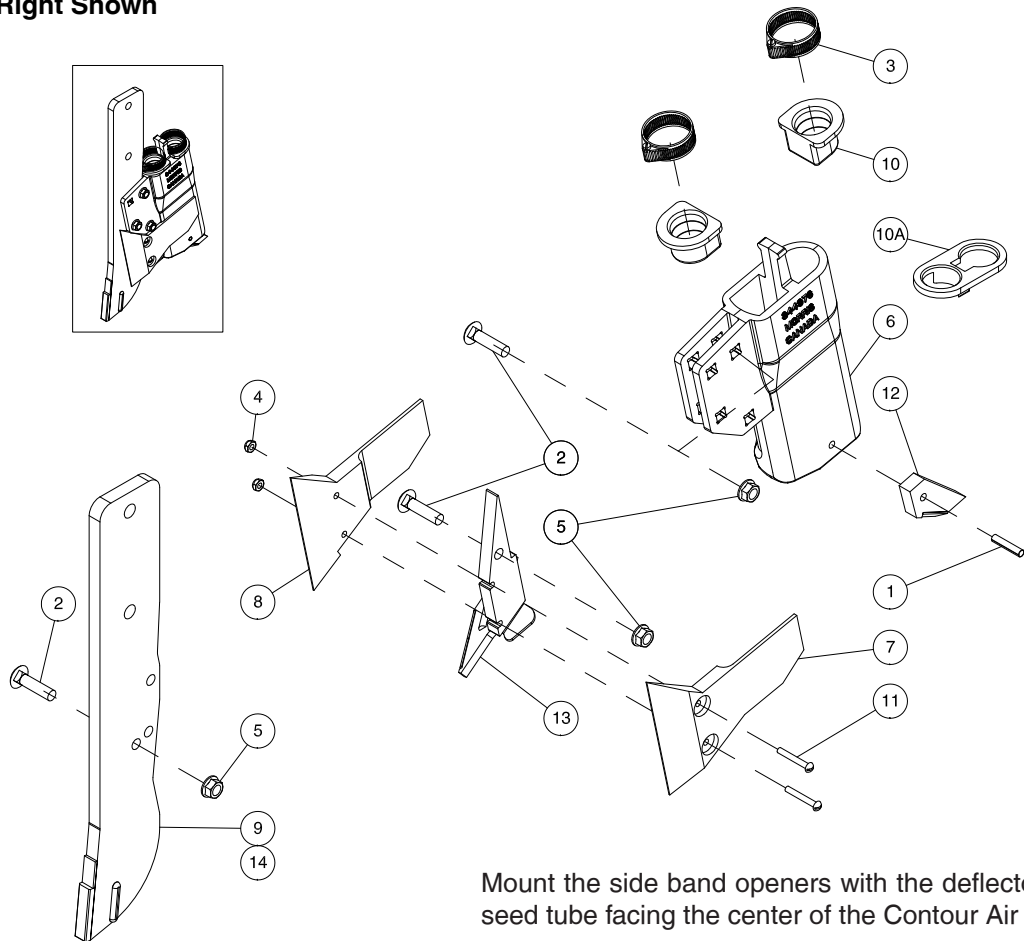
Mount the side band openers with the deflector and seed tube facing the center of the Contour Air Drill.

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	S45464	Wear Shank W/Carbide.....	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
14	S49541	Side Band Left Kit (Includes Items 1, 2, 5, 6, 9, 12, and 13)	1
	S55275	Side Band Left Kit (Includes Items 1, 2, 5, 6A , 9, 12, and 13)	
	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 - Carbide	
7	S45312	Mud Guard Option Left.....	1
8	S45313	Mud Guard Option Right	1
9	S45464	Wear Shank W/Carbide.....	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
14	S49542	Side Band Right Kit(Includes Items 1, 2, 5, 6, 9, 12, and 13).....	1
	S55274	Side Band Right Kit(Includes Items 1, 2, 5, 6A , 9, 12, and 13)	1
	S46181	Kit - Mud Guards (Includes Items 4, 7, 8, and 11)	

Maintenance

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:

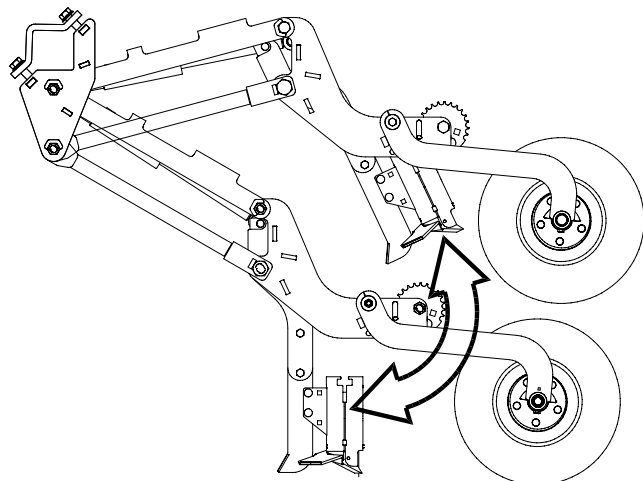
- Relieve pressure on hydraulic system before servicing or disconnecting hoses.
- Wear proper hand and eye protection when searching for leaks. Use wood or cardboard instead of hands.
- Keep all components in good repair.



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)



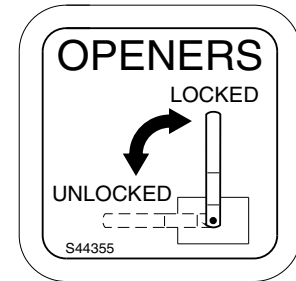
Opener Maintenance - Continued

Hydraulic System Trouble Shooting

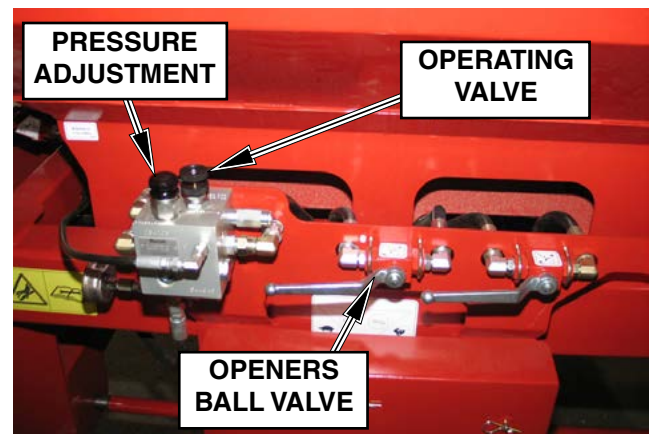
If pressure can not be maintained in the hydraulic system, or openers drop rapidly from transport position, a leaky hydraulic cylinder (bypassing oil across the piston seal) may be present. To locate a hydraulic leak in the Contour Air Drill hydraulic system, the following procedure can be used:

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

Maintenance

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.

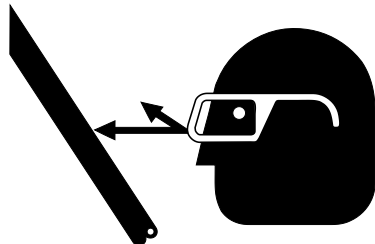


Contact your nearest Dealer for genuine repair parts. Dealers carry ample stocks and are backed by the manufacture and regional associations.

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

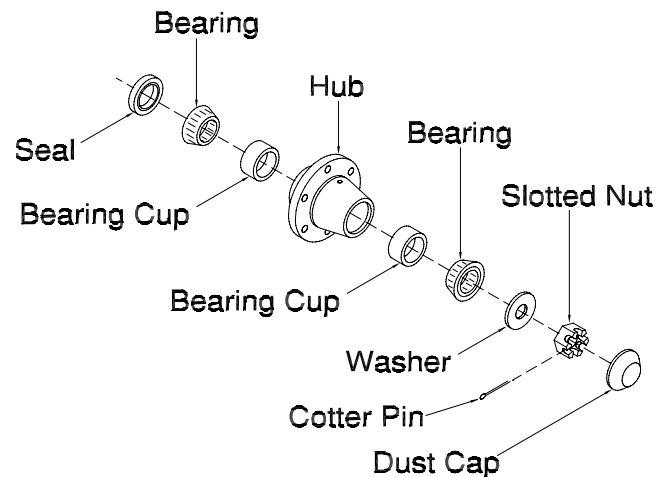
To prevent serious injury or death:

- 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.

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, whichever occurs first.
Tighten as required.

Maintenance

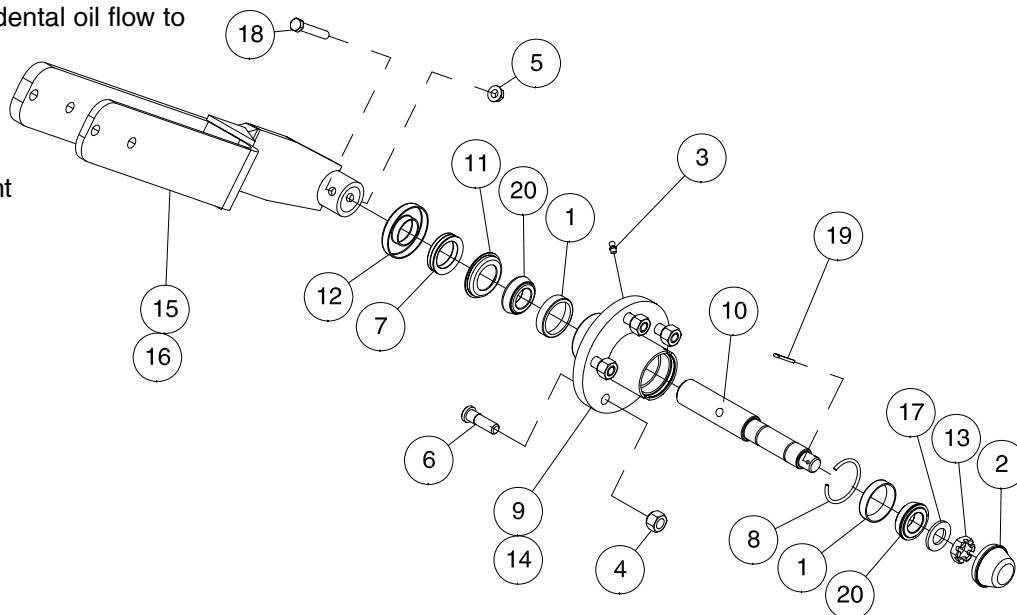
Wheel Bearings - Continued

Contour Opener Hub

- 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	S49299	Packer Arm.....	1
16	S49500	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

Wheel Bearing Adjustment

Wheel Bearing Adjustment Procedure (Double Nut Arrangement)

1. Prior to installing any wheel-end fasteners, make sure the spindle area is free of dirt and debris. As well, make sure all nuts and washers are free of dirt. Clean mating surfaces are important for proper wheel-end assembly.
2. After properly installing the bearing cones and wheel-end seal onto the spindle, and the wheel-end is slid onto the spindle, tighten the inner spindle nut with a torque wrench to 150-200 ft. lbs. to set the bearings and wheel-end. **CAUTION: DO NOT USE AN AIR IMPACT WRENCH TO TIGHTEN THIS NUT!**
3. Loosen this inner nut to allow the brake drum to rotate freely. Backing off one (1) full turn is recommended.
4. Re-tighten the inner spindle nut to 50 ft. lbs. by hand using a torque wrench to position the bearings for final adjustment. **CAUTION: DO NOT USE AN AIR IMPACT WRENCH TO TIGHTEN THIS NUT!**
5. Back the inner spindle nut off 1/4 turn.
6. Install the retaining fastener or fasteners onto the spindle according to the fastener used. If washers are used, be sure they are facing in the right direction and are clean. Make sure any washers with dowels fit properly into the mating holes.
7. Install the outer spindle nut. Using a torque wrench, tighten this nut to 250-300 ft. lbs. Resulting end play should be .001" - .005".

Note: If end play is not .001" - .005", disassemble and repeat this procedure.



Maintenance

Air Brake Maintenance

Every Three Months or 25,000 Miles

1. Check the condition of the foundation brakes, including drums, shoes and linings, cams, rollers, bushings, etc.
2. Check for structural damage of the housing, worn clevis, worn clevis bushings and condition of the boot for cuts or tears. Replace if necessary.
3. After allowing the brake drum to cool to room temperature, check for correct chamber stroke following the procedure on page 6-10. Due to different operating conditions, chamber stroke tests may be necessary at earlier intervals. See charts on page 6-10 for the recommended stroke measurements.

Note: An automatic slack adjuster should not have to be manually adjusted except for initial installation and at the time of brake reline.

Every Six Months or 50,000 Miles

Gunite slack adjusters are factory lubricated and extensively sealed to protect against dirt, water, salt and other corrosive elements. Nevertheless, periodic lubrication is recommended.

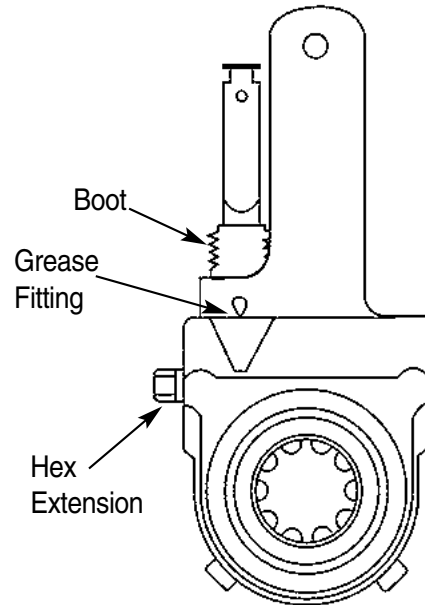


Figure 1 - Lubrication Points

Greasing the Slack Adjuster

1. A grease fitting is provided to allow lubrication during normal chassis servicing (see fig. 1). With a conventional grease gun, lubricate until grease appears on the camshaft, or grease flows from the grease relief.

Note: Slack Adjusters with a grooved and drilled worm wheel will not have a grease relief on the end cap opposite the adjusting hex.

2. The newest Gunite slack adjusters are produced without a grease relief, forcing lubricant through the drilled worm wheel onto the camshaft. Previous designs incorporated a grease relief (see fig. 2).
3. Lubriplate Aero is the grease used in the manufacture of Gunite slack adjusters. It is recommended for use in temperatures as low as -40 degrees F (-40 degrees C).

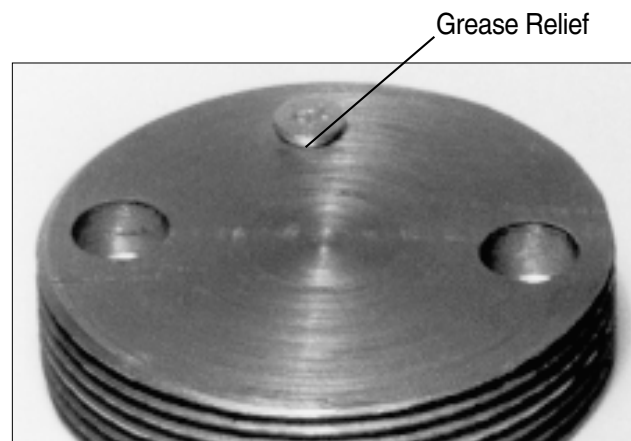


Figure 2 - Grease Relief

Air Brake Maintenance - Continued

Adjust the brakes as follows:

1. Rotate the hex extension clockwise until the brake linings contact the brake drum. Back off the slack adjuster by rotating the hex counterclockwise 1/2 turn.
2. Backing off the slack will require approximately 25 to 30 ft lbs of torque. When backing off the slack adjuster, a ratcheting sound will be heard.
3. Using a ruler, measure the distance from the face of the air chamber to the center of the large pin in the clevis (A) (see fig. 3). Make an 85 psi brake application and allow the chamber push rod to travel its maximum stroke. Measure to the center of the large pin (B). The difference between (A) and (B) is the push rod stroke. Check the following chart for proper maximum stroke after adjustment of the brakes.

Measuring the Free Stroke

4. Free stroke is the amount of movement of the slack adjuster required to move the brake shoes against the drum. With brakes released, measure from the face of the chamber to the center of the clevis pin. Use a ruler to measure the movement of the slack adjuster until the brake shoes contact the drum (fig. 4). The difference between the released and applied measurements is the free stroke. The free stroke should be 3/8" to 5/8". If the free stroke is good, but the applied stroke is too long, there is a problem with the foundation brake. Check the foundation brake for missing or worn components, cracked brake drums, or improper lining to drum contact. If the free stroke is greater than the recommended distance (3/8" to 5/8"), a function test of the slack adjuster should be performed (see page 6-11). If the free stroke is less than 3/8", a dragging brake can occur. Check to see that the manual adjustment procedure was followed correctly. Manually readjust the brake following the procedure on this page.

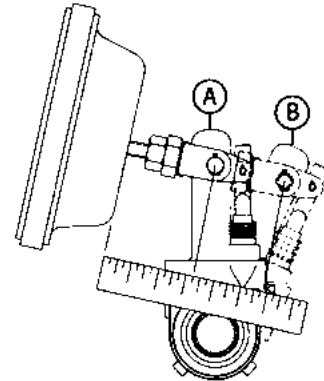


Figure 3 - Measuring Maximum Stroke

"STANDARD" CLAMP TYPE BRAKE CHAMBER DATA

Type	Outside Diameter	Rated Stroke	Maximum stroke at which brakes must be readjusted
9	5-1/4	1.75	1-3/8
12	5-1 1/16	1.75	1-3/8
16	6-3/8	2.25	1-3/4
20	6-25/32	2.25	1-3/4
24	7-7/32	2.25	1-3/4
30	8-3/32	2.50	2
36*	9	3.00	2-1/4

*Note: If type 36 chamber is used, slack length should be less than 6".

"LONG STROKE" CLAMP TYPE BRAKE CHAMBER DATA

Type	Outside Diameter	Rated Stroke	Maximum stroke at which brakes must be readjusted
16	6-3/8	2.50	2
20	6-25/32	2.50	2
24	7-7/32	2.50	2
24*	7-7/32	3.00	2-1/2
30*	8-3/32	3.00	2-1/2

*Note: Identified by square air port bosses.

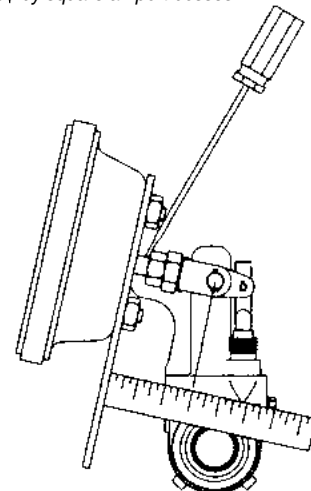


Figure 4 - Free Stroke

Maintenance

Air Brake Maintenance - Continued

Slack Adjuster Function Test

If the maximum stroke, with an 85 psi brake application is less than the distance shown in the chart on page 6-10, the Gunitite slack adjuster is functioning properly.

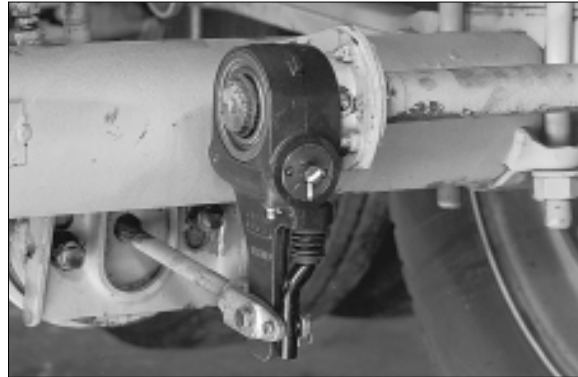
Troubleshooting

1. **The Gunitite slack adjuster should not require manual readjustment.** If the maximum chamber stroke is within the range for the size chamber used (see fig. 3), the slack adjuster should not be manually readjusted. If the chamber stroke exceeds the limit, measure the free stroke. If the free stroke is good, but the applied stroke is too long, there is a problem with the foundation brake. Check the foundation brake for missing or worn components, cracked brake drums, or improper lining to drum contact.

If the free stroke is **greater** than the recommended distance ($3/8"$ to $5/8"$), a function test of the slack adjuster should be performed. To test the function of the slack adjuster, place a $7/16"$ box wrench on the hex extension and rotate it $3/4$ of a turn counterclockwise. A ratcheting sound will be heard. Mark the $7/16"$ hex extension with chalk and apply the brakes several times and watch for the hex to rotate clockwise.

The hex extension must rotate clockwise. The adjustment is intentionally made in small increments so it will take several cycles to bring the adjuster within the stroke limit shown in the chart.

If the free stroke is **less** than $3/8"$, a dragging brake can occur. Check to see that the manual adjustment procedure was followed correctly. Manually readjust the brake following the procedure on page 6-10.



2. Check the torque by attaching a torque wrench to the hex extension and turning it in a counterclockwise direction and record the measurement.
3. If the hex extension did not rotate clockwise during brake application or there is less than 15 ft lbs of torque required to rotate the hex extension in the counterclockwise direction, the slack adjuster must be replaced. If immediate replacement is not possible, proper brake adjustment must be maintained by manual adjustment.
4. If the hex extension rotates clockwise and has a torque of greater than 15 ft lbs when rotated counterclockwise, the slack is functioning properly. Check the foundation brake for proper function, worn cam bushing, pins and rollers, broken springs, worn quick connect clevis, worn clevis bushings and clevis pins. Repair as necessary and repeat the function test.
5. Readjust the brake after the function test.

Air Brake Maintenance - Continued

FF2 Full Function Valve Fitting General Installation Guidelines

1. Dependent on sealant type, the basic guidelines for FF2 pipe fitting installation is finger tight, plus one or two turns **maximum**. Sealant is the variable with the greatest effect on fitting installation. Characteristics of different sealants are as follows:

Teflon Pipe Sealant

Teflon pipe sealant acts as a lubricant. Fittings go in farther with the same torque. They may not have to go a full turn past finger tight to seal.

Fittings Without Sealant

Fittings without sealant will seal adequately in plastic ports. They arrive at finger tight in less turns than lubricated fittings. Unlike lubricated fittings, fittings without sealant require more turns past finger tight to achieve a seal, typically one or two turns.

Fittings With Dry Sealant

Fittings with dry sealant become finger tight in less turns than fittings without sealant. The dry sealant increases the fitting size so it starts tightening sooner. As the fitting is wrench tightened the sealant compresses, Having variable effects on turns required to seal. Sealing still requires one to two turns past finger tight, but more attentions must be paid to fitting torque.

2. Start fittings straight to prevent crossed threads. Fittings should be started by hand for at least one turn before use of wrenches.
3. Dry sealant must be applied properly. If dry sealant is applied to the first thread of a fitting, it will be hard to start the fitting straight.
4. Any pipe fitting or sealant can be used in the installation of the FF2 Full Function Valve. The consistent use of one type of sealant will help you install fittings successfully.
5. The use of teflon tape on a regular basis is not recommended. Bits of tape break off during installation.
6. When the last thread or hex of a fitting is flush with the surface, the fitting has been installed past the point required to seal. **Do not install the fitting farther!**

Max Torque (in-lbs)

1/4"NPTF - 120

3/8"NPTF - 180

Maintenance

Notes

Section 7: Storage

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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).
- To prevent corrosion and damage by rodents, clean the hopper boxes and metering systems thoroughly and wash with mild soapy water solution. Rinse with water and dry thoroughly (Refer to Metering Body Storage).
- A light coating of silicone lubricant or WD-40 or penetrating oil should be applied to all metal metering system components before storage.
- Avoid lubricant contact with grain and fertilizer hoses and tubes.
- Relieve tension on tank lids.
- Loosen clean-out doors.
- Remove all chains and store in clean oil.
- 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

Spray Cans:

Part Number	Description
W-4647	Red MORRIS Spray Can
N31087	White MORRIS Spray Can

Litre Cans:

Part Number	Description
Z-10	Red MORRIS Paint/Litre

Preparing for Storage - Continued

Metering Body Storage

It is extremely important that the metering system is thoroughly cleaned before storing for any length of time.

The following procedure should be followed for both tanks:

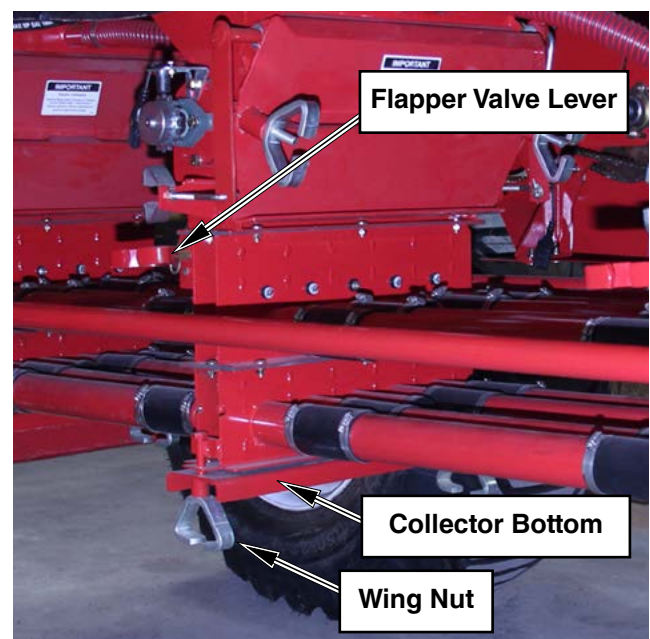
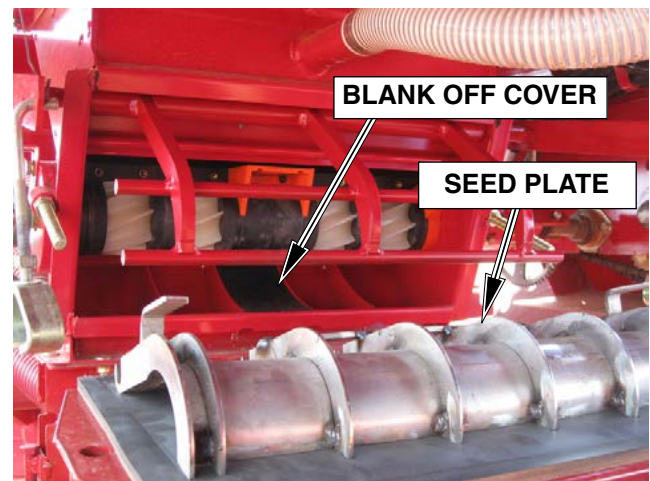
- Empty tanks (Refer to Unloading Tanks).
- Remove all seed plates.
- Remove the collector bottom.
- Remove blank off covers and the run caps on the collectors. Clean debris from chamber area.
- Run fan.
- Wash the interior of both tanks and metering system with soapy water. Wash the collector.
- Rinse with cold water and let the unit air dry.
- Coat metal parts with silicone lubricant or WD-40.

Note: Diesel fuel will harm seals.

- Reinstall blank off covers and the run caps on the collectors.
- Reinstall seed plates.
- Replace the inspection door and the bottom of the collector.
- Start the fan and operate for 5 minutes to dry out any remaining moisture in the system.
- Leave inspection doors loose to help prevent condensation building up inside the tank.
- Leave lid latches loose to help maintain resilience of the seals.

Important

At no time should corrosive fertilizer or similar materials be allowed to remain in the tank or metering body cavity.



Double Shoot Shown

Storage

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)
- Tighten lid latches.
- Lubricate and install chains.
- Spray internal parts of the metering body with silicone lubricant or WD-40 or penetrating oil to loosen any corrosion buildup.
- Clean machine thoroughly. Remove coating from exposed cylinder shafts (**Refer to Wing Lift Cylinder Shaft Protection**).
Check for air leaks (Refer to Maintenance Section).
- Lubricate grease fittings. (Refer to Lubricating Section).
- Tighten all bolts to proper specifications (Refer to Bolt Torque Chart).

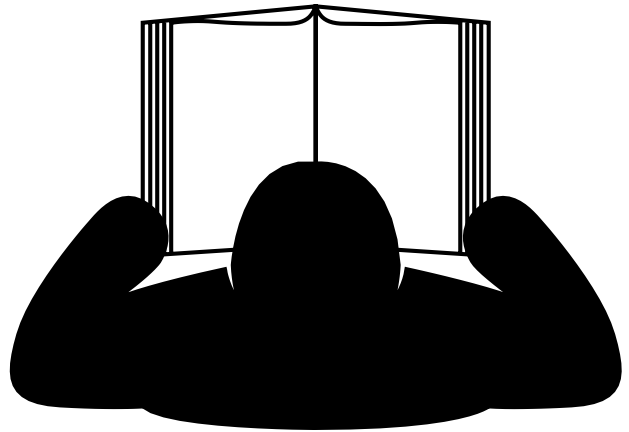
Monitor

Familiarize yourself with all monitor functions. Ensure all monitor *"settings"* are correctly set for the air cart/seeding tool combination. Recognize and correct alarm conditions as indicated on the machine. See Monitor Section for more details.

Check all wire harness connections for corrosion and use a dielectric spray to clean. Inspect all sensors for proper gap. See Monitor Section for more details.

Auger/Conveyor

Inspect all augers/conveyors used in handling the products for seeding. Run augers to clean out any debris inside auger so it does not get transferred to the tank.



Storage

Notes

Section 8: Troubleshooting

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Troubleshooting

Problem	Cause	Correction
Air Delivery		
Delivery hoses plugged	Insufficient air flow.	Clean fan impeller blades. Clean fan intake screen. Increase fan rpm.
	Hose sag.	Shorten hoses or add additional supports.
	Seed boots plugged with dirt.	Clean seed boots. See “Seed Boot Plugging” below.
	Hose obstruction.	Remove obstruction from hose.
	Air delivery hose partly off manifold.	Reinstall hose properly on manifold.
	Kinked hoses.	Straighten hoses and properly secure them to framework.
	Obstruction in divider head.	Remove access door and clear obstruction from appropriate outlets - be sure to use appropriate screens when filling.
	Exceeding machine's delivery capabilities.	Reduce ground speed and speed up fan.
Hydraulic fan will not turn	Poorly mounted hoses.	Reroute hoses.
	Selector valve in wrong position.	Switch the selector to fan position.
	Hydraulic hoses not connected properly to tractor.	Reverse hydraulic hoses.
	Insufficient oil flow.	Perform flow test.
Fan turning too slow	Flow to hydraulic motor.	Increase flow control setting.
	Low hydraulic pressure.	Check hydraulic pressure minimum 2100 psi.
Material flowing thru system when unit is stationary and the fan running	Damaged metering wheel.	Replace metering wheel.
	Incorrect Seed Plate installed.	Adjust as required. See “Seed Plate Settings”.
Material not being divided in distribution head	Head partially blocked.	Remove blockage and reinstall hose.
	Kinked hose running to shank.	Straighten or replace hose.

Troubleshooting

Problem	Cause	Correction
Air Delivery - Continued		
Material not being divided in distribution head	Head partially blocked.	Remove blockage and reinstall hose.
	Kinked hose running to shank.	Straighten or replace hose.
	Damaged distribution section on head.	Replace head with new one.
	Bent or damaged diffuser pipe.	Straighten or replace diffuser pipe.
	Secondary hose length.	See “Secondary Hose” in Operation Section.
	Tanks not pressurized.	Inspect lid seals. Clean pressurization hoses.
Material not being metered out	Main drive chain not installed.	Install drive chain properly on Drive Sprocket.
	Drive chain or chains broken.	Install new chain. Ensure connecting link is installed correctly. Curved part of spring clip should face the direction of chain travel.
	Massive air leak in tank, resulting in material being blown up out of the metering cup.	Repair the air leak. See “Air Leaks” in Maintenance Section. See “Tank Lid Adjustment” in Maintenance Section.
	Material caked up in tank.	Remove material and completely clean out the tank.
	Excessively wet material in tank.	Remove wet material and use reasonably dry material.
	Coupler bolt sheared.	Replace with Grade 8 bolt.

Problem	Cause	Correction
Air Delivery - Continued		
Material not being accurately metered out of the metering body	Air delivery hoses loose, cracked or pulled off.	Tighten the hoses, replace cracked hoses or install hoses pulled off their respective locations.
	Inlet screen to fan blocked off.	Clean off material that is blocking the fan screen.
		Install correct Seed Plate
	Incorrect Seed Plate installed.	Adjust Seed Plate lock - See Maintenance Section.
	Seed Plate lock not adjusted correctly.	Clean out caked up material.
	Material caked up above one or more of the metering cups.	Use reasonably dry, fresh material only.
	Excessively damp material in tank.	Remove obstruction, and always fill tanks through the screen.
	Foreign obstruction in tank above metering wheels.	Clean out the metering cups and wheels.
	Caked up metering wheels on some or all of the metering cups.	Replace broken metering wheels.
	Damaged metering wheels.	Install correct wheels to head. 1 3/4" wide wheel for 7 outlet head.
	Metering wheels mismatched to secondary outlet.	2" wide wheel for 8 outlet head. 2 1/4" wide wheel for 9 outlet head. 2 1/2" wide wheel for 10 outlet head. Be sure appropriate spacers are also used.
		See Operation Section.
	Collector Valves set incorrectly on Double Shoot machines.	
	Air Leak in System.	Adjust lids and doors as necessary. Replace damaged seals. See Maintenance Section.
	Meterbody pressurization hose disconnected.	Reconnect hose to meterbody/plenum.

Troubleshooting

Problem	Cause	Correction
Air Delivery - Continued		
Plugged seed boots	Backing up with openers near or in the ground.	Lift machine all the way up before backing up.
	Turning very sharp with openers near or in the ground.	Lift machine all the way up when making sharp turns.
	Lowering machine without any forward motion.	Always have forward motion when lowering machine.
	Worn openers or sweeps.	Replace openers.
	Severely bent or damaged boots.	Straighten or replace as required.
	Excessively wet conditions.	Change openers, operate when drier.
	Opener Adjustment.	See “Opener Adjustment” in Operation Section.

Problem	Cause	Correction
VRT System		
Motors will not turn in Manual Mode (Controller OFF)	Not equipped with a Third Tank.	Disconnect wire harness from solenoid '1' and turn adjusting knob fully out.
	Selector valve (Fan/Auger).	Switch selector valve to fan position.
	Hydraulic oil flow.	Ensure hydraulic lever is properly engaged.
Motors will not turn in Operation Mode (Controller ON)	Not equipped with a Third Tank.	Disconnect wire harness from solenoid '1' and turn adjusting knob fully out.
	Selector valve.	Switch selector valve to fan position.
	Hydraulic oil flow.	Switch selector valve to fan position.
	VRT Sensor Gap.	Ensure hydraulic lever is properly engaged. Gap should be 0.030" (0.76 mm).
Motors turn continuously in Operation Mode	Shaft Motor Solenoids.	Zero Shaft Motors.
	VRT Sensor Gap.	Gap should be 0.030" (0.76 mm).
Motors turn continuously in Calibration Mode	VRT Sensor Gap.	Gap should be 0.030" (0.76 mm).

Troubleshooting

Problem	Cause	Correction
Monitor		
Monitor lights up but does not seem to work	Faulty monitor.	Replace monitor.
	Completely disconnected harness.	Connect harness.
No fan display	Incorrect gap between sensor and target.	Gap should be 0.030" (0.76 mm).
	Faulty sensor.	Replace sensor.
	Broken or shorted wire.	Replace or repair harness.
No ground speed display	Sensor to magnet gap too large.	Gap should be 0.030" (0.76 mm).
	Faulty sensor.	Replace sensor.
	Broken or shorted wire.	Replace or repair harness.
No display, no back light	Switched off.	Switch unit on.
	Poor power connections at the battery.	Ensure good connections. Replace monitor.
	Battery below 8 volts.	Check battery voltage.
	Temperature below -10C or above +40C.	Operate between -10C and +40C.
Bin indicates always empty	Broken wire.	Repair wire.
	Faulty sensor.	Replace sensor.
	Wires not hooked to sensor.	Hook up correctly.
Bin indicates always full	Blocked light beam on photoelectric sensor.	Remove object blocking the beam.
	Wire shorted to ground.	Repair or replace wire.
	Faulty sensor.	Replace Sensor.

Troubleshooting

Problem	Cause	Correction
Seed Unit		
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.
	Assembly.	Hoses reversed at cylinder.
One wing will lift, other will not.	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
Seed Unit - Continued		
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.

Problem	Cause	Correction
Seed Unit - Continued		
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).

Troubleshooting

Problem	Cause	Correction
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