Read the operator manual entirely. When you see this symbol, the subsequent instructions and warnings are serious - follow without exception. Your life and the lives of others depend on it!

Illustrations may show optional equipment not supplied with standard unit.
Machine Identification

Record your machine details in the log below. If you replace this manual, be sure to transfer this information to the new manual.

If you or the dealer have added options not originally ordered with the machine, or removed options that were originally ordered, the weights and measurements are no longer accurate for your machine. Update the record by adding the machine weight and measurements with the option(s) weight and measurements.

<table>
<thead>
<tr>
<th>Model Number</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number</td>
<td></td>
</tr>
<tr>
<td>Machine Height</td>
<td></td>
</tr>
<tr>
<td>Machine Length</td>
<td></td>
</tr>
<tr>
<td>Machine Width</td>
<td></td>
</tr>
<tr>
<td>Machine Weight</td>
<td></td>
</tr>
<tr>
<td>Year of Construction</td>
<td></td>
</tr>
<tr>
<td>Delivery Date</td>
<td></td>
</tr>
<tr>
<td>First Operation</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dealer Contact Information

Name:______________________________________________
Street:____________________________________________
City/State:________________________________________
Telephone:__________________________________________
Email:_____________________________________________
Dealer’s Customer No.:______________________________

⚠️ WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov
To our customer:

Congratulations on the purchase of your Great Plains product. Great Plains welcomes you to its growing family of new product owners. Your product has been designed and built by skilled workers using quality materials.

Your dealer has performed the necessary pre-delivery service to your machine, and will advise you of the proper maintenance and operating practices that will give you long, satisfactory use of your machine. Do not hesitate to contact your dealer when you have a question related to your machine.

Your machine has been designed to run efficiently in most operating conditions, and will perform relative to the service it receives. If you need customer service or repair parts, contact your dealer who has trained personnel, repair parts, and equipment specially designed for Great Plains products.

Read this manual carefully before using the machine. It will familiarize you with safety, operation, adjustments, and maintenance of your new equipment. This manual must always be kept with your machine.

Great Plains wants you to be satisfied with your product. If for any reason you do not understand any part of this manual or are otherwise dissatisfied, please take the following actions first:

1. Discuss the matter with your dealership service manager. Make sure he is aware of any problems so he can assist you.
2. If you are still unsatisfied, seek out the owner or general manager of the dealership.

If your dealer is unable to resolve the problem or the issue is parts related, please contact:

Great Plains Service Department
1525 E. North St.
P.O. Box 5060
Salina, KS, USA 67402-5060

Great Plains reserves the right to revise and improve its products at any time. This publication describes the state of this product at the time of its publication, and may not reflect the product in the future. The content of this publication may be changed without notice.
# Table of Contents

**Introduction** ........................................... 1  
Intended Use Statement .................................. 1  
   Prohibited Use .................................. 1  
CE Identification ........................................ 1  
   Machine Identification ............................ 1  
**Safety Information** ................................... 2  
   Before Getting Started ............................ 2  
Operation .............................................. 2  
   Handling and Disposing of Chemicals ............ 3  
   Operation Noise Hazard ......................... 3  
PTO ...................................................... 3  
   Maintenance ...................................... 3  
   Tire Safety ...................................... 3  
   High Pressure Fluids ............................ 4  
Transporting .......................................... 4  
   Safety Chain .................................... 4  
   Safety Lights and Devices ....................... 4  
   Shutdown and Storage ............................ 4  
   Proper Waste Disposal ........................... 4  
**Safety Decals** .......................................... 5  
**Preparation and Setup** ................................ 17  
   Initial Setup ..................................... 17  
   Seasonal Setup .................................... 17  
   Pre-Planting Setup ............................... 17  
   Terminal Installation ................................ 17  
   Hitch Tractor to Drill ............................ 18  
   Hydraulic Hose Connections .................... 18  
   Fan Hydraulic Motor Seals ....................... 19  
   Brake Connections ................................ 19  
   Hydraulic Brakes ................................ 20  
   Air Brakes ........................................ 21  
   Electrical Connections ............................ 22  
   Beacon Operation ................................ 22  
   Wheel Chocks (S/N C1009F-) ..................... 22  
   Drill Height and Leveling ....................... 23  
   Tongue Height ..................................... 23  
   Checking Drill Height ............................ 24  
   Weight Transfer Setup ............................ 25  
   Fold Assist Valve (S/N C1009F-) ................ 25  
   Marker Setup ....................................... 25  
**Operation** .............................................. 26  
   Pre-Start Checklist ................................ 26  
   Field Operation .................................... 26  
   First Operation Checklist ....................... 26  
   Unfolding and Folding ............................ 27  
   Unfold/Fold Hydraulics .......................... 27  
   Unfolding ........................................... 27  
   Folding ............................................. 28  
   Lowering and Raising ............................ 30  
   Lowering ........................................... 30  
   Raising ............................................. 31  
   Implement Flex ....................................... 32  
   Brake Operation .................................... 32  
   Parking Brake System ............................. 33  
   Hydraulic Brake System .......................... 33  
   Air Brake System .................................. 34  
   Transporting the Machine ....................... 34  
   Transport Checklist ............................... 34  
   Flat Bed Transporting ............................. 34  
   Loading the Machine on a Trailer ............. 35  
   Unloading the Machine from a Trailer ......... 35  
   Ladder .............................................. 35  
   Using Ladder ...................................... 36  
   Raising Ladder ..................................... 36  
   Hopper Lid ......................................... 36  
   Hopper Lid Opening ............................... 37  
   Hopper Lid Closing ................................ 37  
   Seed Meters ........................................ 37  
   Meter Doors ....................................... 37  
   Final Drive Ranges ............................... 38  
   Metering Shafts .................................... 39  
   Changing a Metering Shaft ...................... 39  
   Loading Hopper Materials ....................... 41  
   Loading Seed or Dry Fertilizer ................ 42  
   Planning Re-Loads ................................ 43  
   Calibration .......................................... 43  
   Calibration Procedure ............................ 43  
   Planting Rate Information ....................... 46  
   Air System Operation (S/N C1009F-) ............ 47  
   Air System Operation (S/N C1010F+) ............ 49  
   Shoot Conversion for Dual-Hopper .......... 50  
   Double-Shoot to Single-Shoot .................. 50  
   Single-Shoot to Double-Shoot ................... 51  
   Fan Operation ....................................... 51  
   Fan Field Operation ............................... 52  
   Air System Adjustments ......................... 52  
   Markers (Option) .................................... 55  
   Marker Unfold and Fold .......................... 55  
   Special Dual-Marker Operations ................ 55  
   Marker Adjustments ................................ 56  
   Planting Depth Adjustments ..................... 58  
   Adjusting Tool Bar Height ...................... 58  
   Weight Transfer ..................................... 59  
   Weight Transfer Operation ...................... 59
Introduction

The Great Plains SpartanII 607 Air Drill is a pull-type integrated air drill seeder. The implement folds for narrow 3 m transport.

- Intended Use Statement

The SpartanII 607 Air Drill with standard equipment and/or authorized attachments and options is intended to be used as a seeding/fertilizing implement when operated according to instructions and safety precautions in this manual, machine decals, or other information provided with the machine.

The cart has single or dual hoppers for separate or simultaneous delivery of seed and/or granulated dry fertilizer. Each hopper has an independent metering system that is controlled by the monitor.

The hydraulic fan supplies the material delivery system. Hydraulically-driven fluted shafts below the hoppers meter the seed or fertilizer (the materials) into the air flow. Meter chambers and tower manifolds evenly divide the material flow, and deliver equal volumes to each opener row.

The drill openers are suitable for conventional till and minimum-till conditions. With optional coulters, the drill is suitable for moderate no-till conditions.

Service brakes are operated by air or hydraulic lines to the tractor.

Use this drill to seed and fertilize production-agriculture crops only. Do not modify the drill except as instructed by Great Plains. Do not use attachments other than as provided by or authorized by Great Plains.

Prohibited Use

Do not use this machine for any purpose or in any way other than what is described in this manual, machine decals, or any other information provided with the machine. These materials define the intended use of the machine.

Unauthorized modifications to the machine will relieve the manufacturer of all liability for any resulting injury or damage.

- CE Identification

The CE identification is located at the front, left-hand side of the cart, near the ladder.

Machine Identification

Your machine’s parts were specially designed and should only be replaced with Great Plains parts. Always use the serial and model number when ordering parts from your dealer. Record your drill model and serial number on the inside cover of this manual for quick reference.
Safety Information

The safety symbol indicates a potential safety hazard to persons operating or near the machine and advises on how to avoid it.

The notice symbol indicates a potential for machine or property damage from operator error and advises on how to avoid misuse.

The information symbol indicates useful - but not crucial - information for machine operation, assembly, or adjustment.

Before Getting Started

1. Read this manual in its entirety before attempting to start and operate the machine.
2. Only use operators that are thoroughly trained by the owner or trained by someone with the owner’s consent. The operator must be familiar with all functions of the tractor and attachments, and be able to handle emergencies quickly.
3. Maintain attention on operation at all times. Do not operate if using a smart phone, tablet, or similar electronic device, and never operate machine while impaired by alcohol, medication, any controlled substance, or while fatigued.
4. Do not ever allow passengers to ride the machine at any time, for any reason.
5. Before operation, make sure that all tractor cab levers are in their neutral positions and that the parking brake is engaged.
6. Check brakes, link pins, and other mechanical parts for wear before using machine.
7. Never wear loose or bulky clothing around machine. Use additional safety equipment, such as hard hats, eye and ear protection, safety boots, etc., as needed.
8. Do not modify the machine. Unauthorized modification can result in unsafe conditions that lead to machine damage or personal injury.

Operation

1. Always stop the tractor, put in Park and turn off engine before leaving the cab. Dismounting from a moving tractor can cause serious injury or death.
2. Consider turning radius of tractor and implement in the field. Turning tractor too tight can cause hitched implement to ride up on wheels which can result in injury or equipment damage.
3. Pull machine only from the hitch at the end of the tongue. Never pull from jack stand, safety chain, or any point other than the hitch.
4. Never leave the tractor cab unattended while the implement is running. Remove key and turn off tractor before exiting the tractor cab.
5. Watch your surroundings at all times. Do not operate with bystanders nearby, and avoid contacting overhead obstructions.
6. Check that all guards and shields are undamaged, installed, and secure before operating implement.
7. Keep children out of the work area. Do not operate or turn on machine while children are in the area.
8. Do not operate near ditches, holes, steep slopes, embankments, or other surfaces which may collapse under the machine’s weight or tip the machine over.
9. Never stand between tractor and implement unless parking brake is applied.
Handling and Disposing of Chemicals

Agricultural chemicals can be dangerous. Improper use can seriously injure persons, animals, plants, soil and property.

1. Read chemical manufacturer’s instructions carefully, and then take appropriate precautions before use.
2. Wear protective clothing.
3. Wash hands and face before eating after working with chemicals. Shower as soon as application is completed for the day.
4. Apply only with acceptable wind conditions. Make sure wind drift of chemicals will not affect any surrounding land, people or animals.
5. Dispose of unused chemicals and chemical waste as specified by the manufacturer. Observe all the local ordinances and regulations in your area.

Operation Noise Hazard

1. Use proper ear protection like headphones or earplugs while working.

PTO

1. Wait until all moving components have completely stopped before adjusting, cleaning, or servicing any PTO driven equipment.
2. Before installing or using PTO driven equipment, read the tractor manual and review the safety labels attached to the equipment.
3. When operating stationary PTO driven equipment, always apply the parking brake and place chocks behind wheels.
4. Stay clear of and never step over any rotating parts.

Maintenance

1. Understand procedure before doing work. Use proper tools and equipment.
2. Work in a clean, dry area.
3. Lower the implement. Put tractor in Park, turn off engine. To prevent unauthorized starting, remove key before performing maintenance or service work.
4. If work must be performed with wings raised, set the wing tilt locks to the road position.
5. Make sure all moving parts have stopped and all system pressure is relieved.
6. Relieve hydraulic pressure before disconnecting hydraulic lines or performing any work on the system.
7. Do not work underneath any hydraulically supported components. Hydraulics can settle, leak, or be accidentally lowered. If working underneath hydraulically supported components is necessary, secure implement with stands or suitable blocking beforehand.
8. Disconnect electronic monitor and lighting harness from the tractor before servicing or adjusting electrical systems.
10. Remove buildup of grease, oil, or debris.
11. Check and replace worn brake lines as needed.
12. Remove all tools and unused parts from implement before operation.

Tire Safety

1. Check tires for cuts, bulges, and correct pressure. Replace worn or damaged tires.
2. Tire changing can be hazardous and must be performed by trained personnel using correct tools and equipment.
3. Tire explosion and/or serious injury can result from over inflation. Do not exceed tire inflation pressures.
4. When removing and installing wheels, use wheel-handling equipment adequate for weight involved.
5. Tighten wheel bolts only to the specified torque.
High Pressure Fluids

1. Escaping fluid from holes in hydraulic lines is difficult to spot. Do not use your hands or bare skin to search for suspected leaks; instead, use a piece of cardboard or wood. If injured by escaping hydraulic fluid, see a medical professional immediately. Exposure can result in gangrene or severe allergic reaction.

2. Check that hydraulic fittings are tight and all hydraulic hoses and lines are in good condition before applying pressure to the system.

3. Wear protective gloves and safety glasses or goggles when working with hydraulic systems.

Transporting

1. As with transporting any piece of heavy machinery, comply with all local laws and regulations before and during transport process.

2. Transport only at recommended transport speed for implement. Some rough terrains require a slower speed. Sudden braking can cause a towed load to swerve and upset.

3. Before towing implement on roads, make sure to empty out all material from the hoppers or boxes.

4. Know transport height and width of implement.

5. Do not tow an implement that, when fully loaded, weighs more than 1.5 times the weight of towing vehicle.

6. Keep clear of overhead power lines and other obstructions when transporting.

7. Do not fold or unfold the implement while the tractor is moving.

8. Reduce speed when turning, and make as wide a turn as possible. Turning tractor too tight can cause implement to tip over.

9. When towing on a trailer, secure implement with tie downs and chains.

10. When towing on a trailer, sudden braking can cause a trailer to swerve and upset. Reduce speed if trailer is not equipped with brakes.

Safety Chain

1. Use a chain with a strength rating equal to or greater than the gross weight of towed machinery.

2. Replace chain if any links or end fittings are broken, stretched or damaged.

3. Do not use safety chain for towing.

Safety Lights and Devices

1. Always use safety lighting. Slow-moving tractors and towed machinery can create a hazard when driven on public roads. They are difficult to see, especially at night.

2. If equipped, use flashing warning lights and turn signals whenever driving on public roads.

3. Use safety devices provided with implement.

4. Keep safety lights and signs clean and visible from front and rear of machine.

5. Keep lights in operating condition.

Shutdown and Storage

1. Park the tractor and implement on a solid, level surface where children normally do not play.

2. Fold and tilt wings.

3. Put tractor in park or set the parking brake. Turn off engine and remove switch key to prevent unauthorized starting.

4. Wait for all components to come to a complete stop before leaving the operator's seat.

5. Turn lockout valve and wing lock levers to locked position to prevent the wings from lowering.

6. Detach the tractor. Secure the implement using blocks.

Proper Waste Disposal

1. Dispose of waste properly to avoid threatening the environment and ecology. Potential harmful waste includes oil, fuel, filters, and batteries.

2. Use a leak-proof container for draining fluids. Do not use a food or beverage container that may be mistaken for a consumable product.

3. Do not drain or pour waste onto the ground, down a drain, or into any water source.

4. Contact your local environmental or recycling center for the proper way to recycle or dispose of waste.
Safety Decals

Your implement comes equipped with safety reflectors and decals in place.
Read and follow decal directions. Keep all safety decals clean and legible. Replace all damaged, faded, or missing decals.
Order new decals from your Great Plains dealer. Refer to this section for proper decal placement.
When ordering new parts or components, also request corresponding safety decals.
To install new decals:
- Clean the area on which the decal is to be placed.
- Peel backing from decal. Press firmly on surface, being careful not to cause air bubbles under decal.

Reflectors - Red Triangles

833-399C
Two red triangles at rear of drill under fluorescent panels.
S/N C1009F-
S/N C1010F+

Reflectors - Fluorescent Panels

833-398C
One each side cart front frame, one each side rear implement frame
S/N C1009F-
S/N C1010F+

Red Reflectors (S/N C1009F-)

838-266C
Two reflectors at rear of drill.
S/N C1009F-
S/N C1010F+
Daytime Reflectors (S/N C1009F-)
838-267C
Two reflectors at rear of drill.

Amber Reflectors (S/N C1009F-)
838-265C
Four reflectors - one on each side of cart frame above tires and at front of ladders.

Yellow Reflectors (S/N C1010F+)
833-886C
Four reflectors - one on each side of cart frame above tires, and under ladders.

Yellow Reflectors (S/N C1010F+)
833-886C
Two reflectors - one on outside of each light bar at rear of drill.

Yellow Reflectors (S/N C1010F+)
833-886C
Four reflectors - one on outside of each caster and one at bottom of each wing pivot (faces out when wings are folded).
White Reflectors (S/N C1010F+)
858-877C
Two reflectors, one on front of cart frame under each fluorescent panel

Shock Hazard (S/N C1009F-)

WARNING
THIS UNIT GENERATES HAZARDOUS VOLTAGES. TO PREVENT ACCIDENTAL SHOCK, DISCONNECT POWER AND WAIT 5 MINUTES BEFORE SERVICING UNIT. FAILURE TO COMPLY COULD RESULT IN SERIOUS INJURY OR DEATH.

One decal on base of beacon is not separately available. If missing or damaged, replace entire beacon unit.

Transport Speed (S/N C1009F-)
858-533C
40 km/h
One decal on rear beacon decal plate.

Transport Speed (S/N C1010F+)
848-398C
30 km/h
On rear beacon decal plate
**Safety Decals**

### Fan Hazard (S/N C1009F-) 838-508C
Do not operate or work on machine while fan is moving and exposed.

One decal on tongue near fan.

### Fan Hazard (S/N C1010F+)
838-508C
Do not operate or work on machine while fan is moving and exposed.

One decal on front of fan.

### Radar Hazard
848-506C
To avoid possible eye injury, do not look directly into the face of radar when in operation.

One decal on top side of tongue near hitch.

### Falling Hazard
848-507C
Do not stand on or use tires as a step. Always use ladder provided.

Two decals - One on rear above caster wheels.
Two decals - one on each side of cart frame above tires.

Falling Hazard
848-511C
Do not ride or allow others to ride on moving machine to avoid risk of falling off.

Two decals - One on right-hand side of cart frame, and one on left-hand side at ladder.

Flying Debris Hazard
848-510C
Avoid flying debris contacting eyes by wearing approved eye protection.

Read Operator Manual
848-512C
Carefully read all instructions and understand their meaning for the machine and any installed options.

One decal on left side of tongue near hitch.
Crushing Hazard (S/N C1009F-)
848-513C
Stay clear of moving parts to avoid injury. Do not stand between hitches while tractor is moving.

Two decals, one on end of each wing.

Pinch Point Hazard (S/N C1009F-)
848-514C
Do not stand near wings during folding operation.

Four decals - one on front of each wing pivot link, and on each side of rear parallel arms.

Pinch Point Hazard (S/N C1010F+)
848-514C
Do not stand near wings or markers during folding operation.

Two decals - one on front of each wing pivot link.

Electrocution Hazard
848-516C
To avoid electrocution, do not drive under low overhanging power lines.

Two decals - one on front of right-hand hopper, and one on left side of tongue near hitch.
Two decals, one on each side of cart frame above tires.

High Pressure Fluid Hazard
848-517C
Relieve pressure in system, shut off engine and remove key before repairing, adjusting, or disconnecting. Consult operator manual for service procedures.

Confined Space Hazard
848-519C
Avoid working in confined spaces on the machine without assistance.

Two decals, one near each lid.

Chemicals Hazard (S/N C6009F-)
848-520C
Chemicals can cause serious burns, lung damage, and even death. Do not work with chemicals without protective face covering to avoid inhalation of fumes and particles.

One on each hopper near lid.
One decal on right-hand end of rear axle.

Chemicals Hazard (S/N C1010F+)
848-520C
Never work with chemicals without protective face covering to avoid inhalation of fumes and particles.

Two decals, one near each lid.

Two decals, one near each caster wheel.

Entanglement Hazard
848-522C
Keep hands away from moving parts when machine is in use.

One on bottom of each hopper above gears.

Hitch Crushing Hazard (S/N C1009F-)
848-523C
Stay clear of moving parts to avoid injury. Do not stand between cart and implement while tractor is moving.

Two decals on rear of cart frame.
Overhead Crushing Hazard
848-524C
Do not stand under wings when folded to avoid crushing hazard.

Four decals - one on bottom front of each wing pivot (faces out when wings are folded), and one on bottom of each rear wing extension (faces out when wings are folded).

Pinch Point Hazard (S/N C1009F-)
848-525C
Do not stand between wings during folding operation.

Pinch Point Hazard (S/N C1010F+)
848-525C
Do not stand between wings during folding operation.

Four decals - one on each side of flex link, and one on each side of cylinder lug above wing gauge wheels.

Four decals - one on inside and one on outside of each gauge wheel cylinder mount.
**Falling Hazard (S/N C1009F-) 848-527C**
Always use handrail when climbing ladder or walking on walkboard to avoid risk of falling.

Two decals - one on right-hand side of cart frame, and on left-hand side at ladder.

---

**Crushing Hazard (S/N C1009F-) 848-528C**
Do not stand between folding marker parts.

Two decals, one on end of each wing.

---

**Falling Hazard (S/N C1010F+) 848-527C**
Always use handrail when climbing ladder or walking on walkboard to avoid risk of falling.

One decal on left-hand side at top of ladder.

---

**Crushing Hazard 848-530C**
To avoid wings unexpectedly falling, always use wing locks when wings are not in use.

Two decals, one on each side of center frame.
Pinch Point Hazard (S/N C1009F-)
848-531C
Do not reach into folding area when parts are moving.

On top outside face of cart-implement link arms

Pinch Point Hazard (S/N C1010F+)
848-531C
Do not reach into folding area when parts are moving.

Two decals - one on outside of link arms.

Transport Clearance (S/N C6009F-)
848-756C
One on front of hopper.

Rolling Hazard (S/N C1009F-)
848-757C
To avoid serious injury from free rolling machine, use wheel chock blocks to chock tires in direction of grade when machine is parked. Chock both sides of tires if grade is undetermined.

Two decals - one on each side of cart frame above tires.
Tire Pressure
848-498C
Inflate tires no more than maximum pressure.

Two decals - one on outside rim of each cart wheel

Tire Pressure
858-614C
Inflate tires no more than maximum pressure.

Two decals - one on each rim of implement gauge wheel on drills with brakes

Tire Pressure
858-660C
Inflate tires no more than maximum pressure.

Two decals - one on each rim of implement gauge wheels on drills without brakes
Preparation and Setup

This section helps you prepare your tractor and drill for use, and covers seasonal tasks, and tasks when the tractor/drill configuration changes.

Before using the drill in the field, you must hitch the drill to a suitable tractor, inspect systems and level the drill. Before using the drill for the first time, and periodically thereafter, certain adjustments and calibrations are required.

- **Initial Setup**

The following are first-time and infrequent setup tasks:

- Install the terminal in the tractor.
- Adjust the weight transfer system (page 59).
- Adjust the fold cylinder counterbalance valves and the fold assist counterbalance valve (page 25).
- Remove protective film from large highway reflectors.
- Set marker extension (page 56) and speed.

- **Seasonal Setup**

Complete these items and then complete the “Pre-Planting Setup”:

- Bleed hydraulic system (page 76).
- Leveling implement (page 23).
- Calibrate speed sensor (Refer to the terminal operation manual).
- Blow out entire air system to remove condensation. Check air flow at each row, for evidence of plugging.
- De-grease exposed cylinder rods if so protected at last storage.

- **Pre-Planting Setup**

Complete this checklist before routine setup:

- Read and understand “Safety Information” starting on page 2.
- Check that all working parts are moving freely, bolts are tight, and cotter pins are spread.
- Check that all grease fittings are in place and lubricated. See “Lubrication” on page 83.
- Check that all safety decals and reflectors are correctly located and legible. Replace if damaged. See “Safety Decals” on page 5.

- Inflate tires to pressure recommended and tighten wheel bolts as specified. See “Tire and Wheel Information” on page 102.
- Make sure that caster locks are not engaged when operating the machine in the field.

**Serious Implement Damage Risk**

Serious damage can be done to the implement if attempting to steer the implement side-to-side with caster locks engaged.

**Terminal Installation**

*Visibility Hazard*

Mount the terminal so it is easy to monitor during planting, but does not interfere with safe operation of the tractor in the field or on public roads.

This machine requires an existing universal terminal be installed in the cab of the tractor. The terminal must have an ISOBUS compatibility of level 3 or higher and be a touch screen. If you are unsure whether your terminal is ISOBUS level 3 compatible, have a dealer examine your terminal software and perform any upgrades necessary. To ensure quality and long lasting performance, you should take your terminal to a dealer for software updates regularly.

If your tractor has no pre-existing terminal, a Mueller terminal (shown below) is available. Contact your dealer for more information.

For setup, refer to the user guide for your terminal.
## Hitch Tractor to Drill

### Crushing Hazard

You may be severely injured or killed by being crushed between the tractor and drill. Do not stand or place any part of your body between drill and moving tractor. Stop tractor engine and set tractor parking brake before attaching cables and hoses.

1. With the drill still on the parking jack (1), check that the drill cart frame is level. See "Implement Leveling" on page 62 for details.

### Implement Lift and Speed Error Risks

The frame must be level both for proper operation of the implement, and to avoid frequent calibration of the speed radar.

2. Move the tractor to near hitching position. Put the tractor in park and shut down the tractor. If the tractor drawbar height is not compatible with the drill hitch height, move and/or turn the hitch to match.

### Hitch Failure Risk

Always have two bolts (2) in two holes of both the tongue and hitch.

3. Remove the hitch pin.
4. Back the tractor to align the drawbar and drill hitch.
5. Stop the tractor engine, put the tractor in park, and take the key with you.
6. Use the jack to lower the drill tongue onto the tractor drawbar. Secure the hitch with the hitch pin. Secure the hitch pin.
7. Use the crank to raise the jack foot. Remove the pin and jack.
8. Store the jack (1) on the inside of the tongue.
11. Install the terminal in the tractor cab and connect all electrical cables. See “Electrical Connections” on page 22.
12. Release the drill parking brake.

## Hydraulic Hose Connections

### High Pressure Fluid Hazard

Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. Check all hydraulic lines and fittings before applying pressure. Use paper or cardboard, not body parts, and wear heavy gloves to check for suspected leaks. If injured, seek immediate medical attention from a physician familiar with this type of injury.

This implement is compatible only with tractors having closed center hydraulics.

Make sure tractor engine is shut off before connecting any hydraulic hoses.

Hydraulic hoses are color coded to help you connect hoses to your tractor outlets.

<table>
<thead>
<tr>
<th>Color</th>
<th>Hydraulic Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Fan</td>
</tr>
<tr>
<td>Yellow</td>
<td>Hydraulic Drive / Weight Transfer / Fold</td>
</tr>
<tr>
<td>Green</td>
<td>Optional Marker</td>
</tr>
<tr>
<td>Blue</td>
<td>Lift</td>
</tr>
<tr>
<td>Fitting</td>
<td>Sump</td>
</tr>
<tr>
<td>Fitting</td>
<td>Hydraulic Trailer Brakes (Option)</td>
</tr>
<tr>
<td>Fitting</td>
<td>Case Drain</td>
</tr>
</tbody>
</table>
The fan pressure hose (black) must be connected to a circuit capable of continuous flow at high volume.

To distinguish hoses on the same hydraulic circuit, refer to the handle symbols. The hose with an extended-cylinder symbol feeds a cylinder base end. The hose with a retracted-cylinder symbol feeds a cylinder rod end.

For the hydraulic fan, connect the hose with a retracted cylinder symbol to the pressure side of the motor.

The fan motor further requires connecting a (third) case drain line, which returns lubricating/cooling fluid.

Marker hoses are provided on the cart even if markers are not installed on the implement.

**Fan Hydraulic Motor Seals**

**Equipment Damage Risk**

Case drain hose must be attached first, before the inlet and return hoses are connected, to prevent damage to hydraulic motor seals.

The case drain has the smaller 6.4 mm ID hose and small, flat-face, low-seep connector. Do not connect the case drain line to a power-beyond port.

The case drain hose must be detached last, to prevent damage to the fan motor.

To allow pressure relief during temperature cycles, it is normal for this line to release small amounts of oil even when stored with the connector elevated.

Low pressure (case) drain connection:

1. Attach the case drain hose to the low pressure drain connection.

2. Connect the low pressure motor return hose, marked SUMP, to a high volume low pressure return port. The sump line has a large 2.7 cm diameter quick coupler.

3. Connect hydraulic hoses to tractor remotes.

**Brake Connections**

---

**Braking Hazards**

The operator must understand when drill brakes are engaged and when they are released. Also understand and comply with tractor operational restrictions when trailer brakes are used.

Hydraulically controlled or air controlled braking systems are available for the drill.

In both systems, the tractor's trailer brake system actuates the brakes on the drill.

Tractor trailer braking systems are normally integrated with the tractor brakes, and operate the trailer brakes when tractor brakes are used during tractor movement.

The trailer braking system may or may not be integrated with the tractor parking brake system.

Trailer brakes typically are not automatically engaged when the tractor transmission is in park, and may not be engaged by any tractor emergency brake.
Hydraulic Brakes
Hydraulic brakes are connected to the drill with a single hydraulic line.

To connect the hydraulic brake:
1. Make sure the tractor engine is shut off before connecting any hydraulic hoses.
2. Connect the hydraulic line from the drill to the tractor trailer brake outlet.

3. The factory default connector is a 19 mm poppet-style quick disconnect. If this is not compatible with your tractor, it may be replaced by an appropriate connector, or can be adapted to:
   - 19 mm male O-ring boss (ORB), or
   - 19 mm female Joint Industry Conference, 37° flare (JIC).

Emergency Brake
4. Route the rope from the hairpin (1) on the brake emergency valve (2) on the drill to the tractor.

5. Tie the rope to the tractor. Leave enough slack in the rope to allow for turns and going over hills. If the tractor breaks away from the drill, the rope will cause the hairpin to rotate the shaft in the emergency valve and seal off the brake system with an emergency accumulator. To make sure the emergency accumulator is recharged, when the trailer is connected, push the brake for at least five seconds while the engine is running.
Air Brakes

**Braking Hazard**

⚠️ Do not use the drill with a single-line air brake system. This drill is designed for transport speeds that require a dual-line air brake system. A single-line tractor system cannot charge the tank that powers the brakes on the drill.

**Roll-Away Hazard**

⚠️ When unhitching, disconnect the red line first. This sets the brakes on the drill.

Air brakes are connected to the drill with two air lines.

1. The button (1) for the shunt valve is on the left-hand side of the machine near the ladder (2). Make sure the button is pulled all the way out.

2. Inspect the gladhands before connecting. Clean the elastomer seal surfaces (1). Blow debris out of the inlet ports. Check the screen condition.

3. First, connect the yellow (brake, service or control) gladhand. This gladhand is coded yellow. Always connect the yellow gladhand first.

4. Next, connect the red (provision or supply) gladhand. This gladhand is coded red.

   The brakes are applied with air pressure. Brakes are released by spring tension when the air pressure is released from the brake system.

5. Pull the ring (1) on the bottom of the air reservoir (2) to open the drain valve. Drain any water from the air reservoir. Release the ring to close the drain valve.
Make sure tractor is shut down with accessory power off before making connections.

1. Connect the lighting harness to the tractor outlet.
2. If necessary, mount the terminal in the tractor cab. See “Terminal Installation” on page 17.
3. Connect the terminal harness to the terminal.
4. Connect any optional or after-market electrical connectors.

Make connections before moving the drill. Some hydraulic circuits are controlled through the terminal.

**Beacon Operation**

The beacon should be on whenever the machine is being transported. The beacon is part of the main light circuit and is on when the lights are on.

Disable the beacon and rear plate illumination lamp for field operations using the switch (1) below the beacon.

This switch does not control the brake/turn/running lights.

---

**Wheel Chocks (S/N C1009F-)**

**Rolling Hazard**

To avoid serious injury from free rolling machine, use wheel chock blocks to chock tires in direction of grade when machine is parked. Chock both sides of tires if grade is undetermined.

**Roll-Away Hazard**

If one wheel chock is extremely difficult to remove, and/or the drill moves significantly when the chock is removed, investigate the cause before removing the chocks on the other side. If no tractor is hitched, or the tractor is not securely parked, the drill could roll away after chock removal, and cause an accident resulting in death, serious injury, or substantial property damage.

Two sets of wheel chocks (4 chocks total) are provided to secure the drill when parked. Install ahead and behind the cart tires. Wedge the chocks (1) tightly under the cart tires.

When not in use, store the chocks in holders (2) mounted under each end of the walkboard.

1. Make sure the tractor transmission is in Park, and that the tractor’s parking brake is applied.
2. Remove the chocks from the wheel on one side.
3. Store one chock right-side-up in the bottom of the holder, tall end of chock toward frame.
4. Store the other chock in the top channel guides of the same holder, upside-down, short end toward frame.

5. Repeat step 2 through step 4 for the other side.

■ Drill Height and Leveling

All frame sections must be at the correct height and level to maintain even planting depth. The hitch height sets the cart frame level.

Periodic leveling adjustments should not be necessary. If you are having problems with uneven depth, check drill levelness and follow these procedures.

Consistent Seeding Depth Risk

Level the frame in the current field conditions. Failure to do so may result in the implement not producing the desired results.

Tongue Height

Drill must be unfolded for this procedure.

1. Bleed the hydraulics. See “Bleeding Hydraulics” on page 76.
2. Unfold the drill fully.
3. Set the initial tongue height, tractor hitch, and change implement hitch configuration as necessary. Measure the distance at the bottom of the hitch to ground level.

4. If you cannot get the desired height with the normal range of the hitch, relocate the hitch in the tongue bolt holes. Always have two bolts in two sets of hitch holes and two sets of tongue holes.

<table>
<thead>
<tr>
<th>Hitch Position</th>
<th>Hitch Height Bottom to Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>38.1 cm</td>
</tr>
<tr>
<td>B</td>
<td>45.7 cm</td>
</tr>
<tr>
<td>C</td>
<td>53.3 cm</td>
</tr>
<tr>
<td>D</td>
<td>61.0 cm</td>
</tr>
</tbody>
</table>
Checking Drill Height

The drill is designed to operate with all sections of the main tool bar 65cm above the planting surface, at a planting depth of 3.8cm and a coulter (option) depth of 5.1cm.

**Measurement Error Risk**

The drill must be fully lowered to field position, with openers into ground, and hitch height set before checking tool bar height.

Tool bar height is measured to the bottom of the tool bars on which the row units are mounted.

At the suggested default setting, the implement frame is level with the ground during planting, and the row units operate at their most consistent planting depth.

Your crop, soil conditions, disk wear, and other factors may create a need to use a different tool bar height.

Tool bar height is set using combinations of the spacer bushings (1) on the rods of the master lift cylinders ahead of the implement center section, described on page 58.

The wing end tool bar heights are controlled by slave cylinders that stop retracting when the master cylinders stop. Only weight transfer adjustment is usually required for wing height, although eye bolt adjustment is available.

When checking tool bar height:

1. Move the drill to similar planting soil conditions.
2. Check the tongue height (page 23).
3. Unfold and lower the implement (page 27).
4. Pull forward a meter or so to put the openers in the ground.
5. Check the tool bar height across the drill.
6. If the center section is not at the desired height, see “Adjusting Tool Bar Height” on page 58.
7. If wing tool bar heights do not match the center section, this usually means that wing weight transfer needs to be set or adjusted. See “Weight Transfer” on page 59 before considering an eye bolt adjustment (page 62).
- **Weight Transfer Setup**
  Before the first folding operation, adjust the wing and cart weight transfer circuits. These circuits require some transfer pressure in order to operate correctly in fold and lift lock.

  See “Wing Weight Transfer Adjustment” on page 61. Set the wing-transfer circuit to 17.3 bar. Set the cart-transfer circuit to 6.9 bar.

- **Fold Assist Valve (S/N C1009F-)**
  Before the first folding operation, check the adjustment of the fold assist counterbalance valve. The fold assist counterbalance valve (1) controls the speed of the fold assist cylinders. The fold assist counterbalance valve is located in the top of the implement frame.

  1. Loosen the jam nut (2) on the valve stem (3).
  2. Turn the valve stem all the way in.
  3. Turn the valve stem out six full turns.
  4. Prevent the valve stem from turning and tighten the jam nut.

- **Marker Setup**
  Before first use, set or review marker extension and tension. See “Marker Adjustments” on page 56. Before each planting session, check and adjust. See “Marker Adjustments” on page 56.
Operation

This section covers general operating procedures and adjustments necessary for the best field performance and results. Experience, machine familiarity, and the following information will lead to efficient operation and good working habits. Always operate farm machinery with safety in mind. Even if drilling conditions rarely change, some items need periodic adjustment due to normal wear.

Pre-Start Checklist

High Pressure Fluid Hazard

Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. Check all hydraulic lines and fittings before applying pressure. Use paper or cardboard, not body parts, and wear heavy gloves to check for suspected leaks. If injured, seek immediate medical attention from a physician familiar with this type of injury.

Perform the following steps before transporting the drill to the field.

- Review “Safety Information” starting on page 2.
- Lubricate as indicated in “Maintenance Schedule” on page 69.
- Check all tires for proper inflation. See “Tire and Wheel Information” on page 102.
- Check all bolts, pins, and fasteners. Torque as shown in “Torque Values Chart” on page 103.
- Check drill for worn or damaged parts. Repair or replace parts before going to the field.
- Check hydraulic hoses, fittings, and cylinders for leaks. Repair or replace before going to the field.
- Check that caster locks are not engaged.

Field Operation

Electrocution Hazard

Keep clear of overhead power lines when unfolding, operating, folding, or transporting the drill. Machine is not grounded. At higher voltages, electrocution can occur without direct contact. Any line voltage present on implement, cart, or tractor can cause severe injury or death.

Equipment Damage Risk

Check and adjust hopper strap tension before and after each material load on the first day, then daily thereafter. Loose straps can result in excess meter fluctuation as hoppers near empty.

First Operation Checklist

- Unfold drill and align with opener disks about 3m before the field edge.
- Run fan for at least 15 minutes before planting.
- Unfold marker on next-row side.
- Set fan hydraulic circuit to low flow, engage the circuit. Gradually adjust the fan hydraulic flow to obtain 3800 rpm.
- Check the terminal for alerts. Refer to the terminal operation manual.
- Pull forward, lower the drill, and begin planting for a short distance.
- Stop. Check the coulter depth, planting depth, and press wheel operation.
- Make necessary adjustments.
Unfolding and Folding

Overhead crushing hazard

Unfold and fold implement only if fold hydraulics are bled free of air and fully charged with hydraulic oil. Keep away and keep others away when unfolding or folding.

Electrocution Hazard

Keep clear of overhead power lines when unfolding or folding the drill. Contact with power lines can cause severe injury or death.

Pinch Point and Crushing Hazards

Keep people away from the drill and tractor during unfolding and folding. Risks include pinching or crushing at pivot points and at multiple sites in pivoting assemblies.

Crushing Hazard

Use wing fold locks. If a hydraulic failure occurs, or hydraulic levers are moved, unlocked wings could fall suddenly causing a major road accident or crushing, resulting in death or serious injury, and property damage.

Falling Hazard

Do not use tires as steps or platforms. All tires can be in light ground contact, or free to spin, when implement is lowered. Wing gauge wheel tires are off the ground in lift.

Wing Tilt Risk

Fold only on hard level ground. If parked across a slope, wing lock bars could be difficult or impossible to engage or release.

Equipment Damage Risk

Raise implement before unfolding or folding. Folding with openers lowered causes wing inside rows to dig or drag sideways. Machine damage is likely.

Unfold/Fold Hydraulics

Part of the unfold/fold operation involves the lift circuit. To meet highway clearance requirements, the wing gauge wheels must be in the lowered configuration during fold, and moved to the raised configuration before unfold.

When the terminal is not activated, the wing gauge wheels must be positioned manually using a tractor remote lever.

Unfolding

1. Move the drill to solid, level ground with adequate overhead and side clearances for the unfold operation.

2. Set locks for disengage.

   If the service locks were previously engaged, rotate the orange wing service lock handle (1) (top forward). The locking bar (2) may or may not raise to vertical at this time.

   3. Retract fold cylinders.

      a. Press Fold Enable softkey (if displayed).

      b. Retract the fold circuit to lift the wings off the wing fold lock bars. Set the circuit lever to neutral (not float) to hold wings off locking bar.

4. Fully raise the machine (page 31).

   If the terminal is not turned on, use the hydraulics to lift the implement frame slightly at the lock. Hold the circuit at extend for a few seconds after the gauge wheels are fully deployed.

   Gauge wheel cylinder locks are provided for maintenance, but are not used in typical storage or transport. Normally, they are not installed at this time, and do not need to be removed for lowering.
5. Extend the fold cylinders to:
   - Extend the gauge wheels to the raised position.
   - Lower the wings.

   One wing may reach the ground before the other. It is common for the unfolding to be slightly non-symmetrical.

6. Hold the lift circuit at extended for several seconds after the gauge wheels contact the ground to:
   - Make sure the center lock cylinder activates and disengages the lift lock.
   - Re-phase the lift cylinder to make sure the lift cylinders are at the same heights.

7. Set the fold circuit to float or neutral.

Folding
Fold the drill for moves between fields, transporting over public roads, parking, and storage.

1. Make sure markers, if installed, are fully folded (page 55).
2. Move the drill to solid, level ground with adequate overhead and side clearances for the fold operation.
3. Locate the wing lock bars (1). Make sure they are not in the wing lock lugs (2).

As needed, rotate the orange wing service lock handle (3) (top forward) until the locking bar is raised to and held at vertical.

4. Extend the lift cylinders to fully raise the machine. Hold at raised for a few seconds. Set the circuit to neutral. Do not install cylinder lock channels.
5. Press **Enable Fold** softkey (if displayed). Depending on recent machine operations, this key may or may not appear. If it does not appear, **Fold** is already enabled.

6. Activate the fold/tilt/marker circuit to retract the fold cylinders.
   
   One wing may reach the stop before the other. It is common for the folding to be slightly non-symmetrical.

7. Continue to hold the fold circuit in retract until the gauge wheels are completely folded in to the transport position.

8. When both wings are in contact with their stops, hold the fold circuit in retract for a few seconds to engage the center section lock cylinder.

9. If the terminal is not turned on, retract the lift circuit to retract the gauge wheels for transport clearance. Set the circuit to neutral to hold the gauge wheels for transport.

10. Set fold circuit to neutral (not float) to hold at folded.

11. At each wing, rotate the orange wing service lock handle (1) until the locking bar (2) is lowered to and held at horizontal in the wing lock lugs (3).

   The wing service locks are only needed when servicing the drill or for long term storage.

---

**Verify Lift Lock**

**Crush/Pinch Hazards**

If pull link lug is not engaged, the implement will slowly lower after hydraulic power is removed resulting in serious injury or death for anyone working on or under the implement.

Make sure the lift lock is engaged. Lift and lower again if it is not.

Inspect the center section lift lock to make sure that:

- weight transfer cylinder is fully retracted,
- lock cylinder (1) is extended, and
- lock lug (2) is below the tops of the lock plate post tops (3).

If the cylinder is extended, but the lock lug is not fully engaged, extend the lift circuit to allow the lock lug to snap into position.

If the lock lug is not fully seated in the lock plate slots, it may not engage the pull link lug (4), and the implement will slowly lower after hydraulic power is removed.
Lowering and Raising

Crushing Hazard

Wings are extremely heavy and are driven down with hydraulic pressure. Coulters and opener disks are sharp. Stay clear and keep others away from wings and openers during lowering and raising to avoid serious injury or death.

Crushing Hazard

Use lift lock and gauge wheel lock channels when working above or beside openers. Without locks, center section and wings are held up only by hydraulic pressure, and slowly lower over time. They may lower more rapidly if the hydraulic system is damaged and hydraulics fail, or the lift circuit is set to float or retract.

Shoving Hazard

Drill length changes by 56 cm during raising and lowering. Set tractor brakes. Put tractor in park to avoid tractor movement. Remain clear of all tires and row units during raise and lower to avoid serious injury.

Equipment Damage Risk

Do not lower while any folding or unfolding operations are under way or partially complete. Openers can dig in or drag on the ground and be damaged.

Gauge wheel lock channels are provided to hold the wings of an unfolded implement at the fully raised position for maintenance only. These lock channels are important for maintenance, but are not used in normal operations.

Lowering

Falling Hazard

Wing gauge wheels, caster wheels, and seed cart wheels, may have little or no weight on them, and may turn suddenly if used as a step. Do not stand on tires when implement is lowered to avoid serious injury.

1. Check that maintenance lock channels are not installed on the gauge wheel lift cylinders.
2. Check that the center section lift lock is disengaged.
   - If lock cylinder is extended, perform a brief unfold operation (extend the fold circuit) to retract the lock cylinder.
   - If the lock cylinder will not retract, perform a brief lift operation (extend the lift circuit) to free the pawl. If this fails to disengage the lock, see “Lift Lock Troubleshooting” on page 98.

3. Unfold the drill before lowering (page 27).
4. Make sure all persons are clear of opener sections.

Implement casters, row units, and gauge wheels move during raising and/or lowering. The casters may swivel. The tractor may move in some circumstances. Set the tractor brakes.
5. Activate dedicated lift circuit (normally retract).

Raising

Equipment Damage Risk
Raise the implement for folding and unfolding. If lowered, inside wing openers drag or dig sideways during fold/unfold, and damage is likely.

Equipment Damage Risk
Always raise the implement for tight turns and reverse/backing operations. Backing with openers lowered causes row unit plugging, and may cause opener damage. Tight turns with openers lowered may damage openers near the turn center.

Equipment Damage Risk
On tractors with electronic timer controls for hydraulic circuits, lift timers must be set to no more than 2 seconds longer than needed to fully raise drill. To reduce oil heating and system wear, do not set for continuous mode.

Regulatory Requirement
Unless the gauge wheels are in the lowered (tucked) positions when the drill is folded, the drill may not meet transport clearance requirements that apply to your operations.

1. Make sure all persons are clear of opener sections.
2. Activate dedicated lift circuit (normally extend).
3. Extend the cylinders until all sections are raised. Hold for a few seconds to re-phase the cylinders.
4. Set the circuit to neutral to temporarily hold the sections at raised.

Wing Pinch and Crushing Hazards
The lift lock prevents the center section from lowering, but only hydraulic oil prevents wings from lowering at the tips. Use maintenance locks to hold wings raised for extended periods.

During field turns, the center section lift lock does not automatically engage during lift. The lock does automatically engage during full fold. To engage the lock without folding, follow these steps:

5. Verify that all persons are safely clear of implement sections.

6. Have an observer stand where the observer can see the lock cylinder, and the tractor operator can see the observer.

7. Press Enable Fold softkey on the terminal.

8. Activate the fold circuit for folding (typically retract). Hold at fold until the observer signals that the lock cylinder has extended. The lock cylinder normally extends early in the fold cycle.

9. Gradually move the fold circuit to neutral, to allow any wing folding to reverse, but not cause the lock cylinder to retract.

10. Lower the implement until stopped by the lock. This also prevents the lock from releasing. Set the lift circuit to neutral.
Implement Flex

The implement on your drill is equipped with either full flex or limited flex. The difference between full flex and limited flex is different planting width and different row spacing at the hinge.

- **Full flex** - allows more down travel at the pivot without crashing the openers, but pushes the openers apart at the pivot which ends up with a wider planting width to have enough clearance.
- **Limited flex** - holds the row spacing steady and the planting width at a true 6.0 meters. The wings pivot downward very little to prevent the openers from hitting each other.

<table>
<thead>
<tr>
<th>Spacing</th>
<th>Flex Type</th>
<th>Swath Width</th>
<th>Frame Gap</th>
<th>Down Flex</th>
<th>Up Flex</th>
</tr>
</thead>
<tbody>
<tr>
<td>15cm</td>
<td>Limited flex</td>
<td>6 meters</td>
<td>15.2cm</td>
<td>2 1/2 degrees</td>
<td>unlimited</td>
</tr>
<tr>
<td></td>
<td>Full flex</td>
<td>6.13 meters</td>
<td>21.1cm</td>
<td>10 degrees</td>
<td>unlimited</td>
</tr>
<tr>
<td>19cm</td>
<td>Limited flex</td>
<td>6 meters</td>
<td>19cm</td>
<td>2 1/2 degrees</td>
<td>unlimited</td>
</tr>
<tr>
<td></td>
<td>Full flex</td>
<td>6.08 meters</td>
<td>21.6cm</td>
<td>10 degrees</td>
<td>unlimited</td>
</tr>
</tbody>
</table>

Brake Operation

Know Your Tractor Systems

Applying tractor parking and/or emergency brakes may or may not operate the drill service brake system, depending on the design of the tractor systems.

The service, or trailer, brake system is controlled by the brake system on the tractor. The drill brake system consists of main cart wheel brakes and a hand brake. There are brake shoe pairs on each of the main cart wheels.

On drills with hydraulic brakes, the brakes are spring-released. Drill braking is released shortly after unhitching the drill.

On drills with air brakes, the brakes are spring-released. The air brakes may not be applied when the air lines are disconnected. If there is not enough air pressure in the air reservoir, the drill brakes will be released by spring pressure. If there is enough air pressure in the air reservoir, the brakes will be applied.

See your tractor operator manual for details on when remote brake ports are engaged and released. Note any difference of function in the table below. The tractor operator must know when drill brakes are engaged and released.

<table>
<thead>
<tr>
<th>Tractor Braking Event</th>
<th>Trailer Brake Port Response</th>
<th>Record How Your Tractor Operates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal tractor braking</td>
<td>Activates trailer brakes</td>
<td></td>
</tr>
<tr>
<td>Differential tractor braking</td>
<td>Reduced trailer braking</td>
<td></td>
</tr>
<tr>
<td>Tractor parking brake</td>
<td>Activates trailer brakes</td>
<td></td>
</tr>
<tr>
<td>Tractor emergency brake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor transmission to park</td>
<td>No effect on trailer brakes</td>
<td></td>
</tr>
</tbody>
</table>
Parking Brake System

On drills with brakes, the parking brake handle (1) controls the brake cables (2) connected to the brake linkage (3). When the parking brake is applied, the cables pull the brake linkage. The brake linkage pushes the brake shoes out against the brake drums (4).

To apply the parking brakes, swing the parking brake handle out away from the machine. Rotate the parking brake handle clockwise until there is enough tension on the cable to prevent the braked wheels from turning. Swing the park brake handle in toward the machine to the storage position.

To release the parking brakes, swing the park brake handle out away from the machine. Rotate the parking brake handle counterclockwise until there is slack in the parking brake cables. Swing the park brake handle in toward the machine to the storage position.

Hydraulic Brake System

Application and release of tractor brakes applies and releases the brakes on the drill.

A single hydraulic line (1) connected to the tractor trailer brake port sends hydraulic oil to the emergency valve (2).

Hydraulic oil flows from the emergency valve through the T-fitting (4) to the brake chambers (5). Braking is immediately available when the tractor hydraulic system is active. Engage the service brakes for 5 seconds before moving the drill to adequately charge the emergency brake accumulator. See “Hydraulic Brakes” on page 20.
Air Brake System

**Air Brakes Delay Hazard**

Drill service braking may not be immediately available upon tractor connection with the air system. Tractor and drill reservoir tanks must be pressurized. Before moving, wait for the tractor air system to reach full charge after drill is connected to tractor.

The brakes are applied with air pressure. Brakes are released by spring tension in the brake chambers (1).

The brakes are controlled by air pressure from the tractor through the yellow-coded air line (2). The air reservoir (3) on the drill is pressurized by the tractor through the red-coded air line (4).

When the trailer brakes on the tractor are applied, air pressure is released through the yellow-coded air line to the relay-emergency valve (5). The relay-emergency valve regulates the amount of pressure being released from the air reservoir into the brake chambers. Air pressure enters the two brake chambers and applies the brakes.

Before disconnecting the brakes, determine the position of the button for the shunt valve (6). The button is located on left-hand side of the machine just behind the ladder.

- If the button is all the way out when the air lines are removed and there is enough air pressure in the brake system, the brakes will be applied.
- If the button is all the way in when the air lines are removed, air pressure will be released from the brake system, and the brakes will be released.

Transporting the Machine

**Inadequate Tractor Hazard**

Using an inadequate tow vehicle can result in loss of control, serious injury, and death. Do not tow if drill exceeds the load rating of the vehicle.

**Excessive Speed Hazard**

Do not exceed the maximum transport speed. Towing the drill at high speeds can lead to loss of vehicle control and a serious road accident.

**Accident Hazards**

Use wing fold lock. Check that implement center section lift lock is engaged. Failure to do so can result in serious injury or death, and equipment damage.

Transport Checklist

Material may be loaded before transport, but increases stopping distance, increases the need for caution in turns and braking, and increases tire and brake wear.

- Hitch the tractor to the drill. Make hydraulic, electrical and optional braking connections. See “Hitch Tractor to Drill” on page 18.
- Close hopper lids.
- Check that ladders and markers are stowed.
- Inflate tires to factory specifications.
- Raise, fold, and lock the drill.
- With tractor in park, remove the wheel chocks, if supplied.
- Turn on beacon.
- Turn on all lights for highway operation.
- Comply with all national, regional and local safety laws when traveling on public roads.
- Release all brakes.

**Flat Bed Transporting**

When moving the machine onto or off of a flat bed trailer, the caster wheels can be locked so the machine can be moved in a straight line making it easier to load or unload.
A caster lock pin is located near each caster wheel pivot point. Once the machine is on the ground, disengage the caster pivot lock pins before moving any further.

Serious Machine Damage Risk:

Do not attempt to move the machine any further than just off the trailer with the caster lock pins engaged. Serious damage could be done to the machine.

3. To disengage the caster lock pins, lift up on the handle (1). Rotate the handle 90°. Make sure the caster lock pin is completely out of the notch (2) on the circular plate.

Loading the Machine on a Trailer

1. Line up the machine with the trailer.

2. Lift up the caster lock pin handle (1) and rotate 90°. Make sure the pin is aligned with the notch (2) in the circular plate on the caster weldment. Repeat for other caster wheel

Once the caster lock pins are engaged, the casters will not rotate.

Serious Machine Damage Risk

Do not attempt to steer the machine side-to-side with the caster lock pins engaged. Serious damage could be done to the machine.

3. Back the machine onto the trailer and secure for transport.

Unloading the Machine from a Trailer

1. Before attempting to move the machine off the trailer, check to make sure the caster lock pins are fully engaged in the notches on the circular plate.

2. Hook up the tractor to the machine and carefully pull the machine off the trailer.

Ladder

Falling Hazard

Never allow riders on the walkboard. Use only the ladder to ascend the cart. Always face the cart when ascending or descending the ladder. Use the hand-holds and handrails. Make sure raised ladders are latched. A fall from the ladder or walkboard could result in serious injury or death.

Overhead Ladder Hazard

Make sure horizontal pin at ladder left, near pivot, is fully engaged when ladder is in the raised position. If the ladder is not pinned in the raised position, it could swing down and strike someone, or pinch a hand or arm, resulting in serious injury.

Regulatory Requirement

Raise and latch the ladder for transport. A lowered ladder may not meet highway clearance requirements that apply to your operations.

A ladder is provided on the left end of the cart walkboard for material loading and routine lid or hopper maintenance. This ladder pivots vertically, and is held in the raised position by a spring-loaded pin. A gas piston regulates the tilting speed.
Using Ladder
1. Use one hand to hold the ladder up, while pulling the horizontal pin (1) to the right.
2. Carefully swing the ladder out and down.
3. Climb up and down the ladder while facing the drill.
4. Use the handrails when on the higher steps.

Raising Ladder
1. Swing the ladder up. The pin engages automatically, and does not need to be held open.
2. Check that the tip of the pin (1) is visible at the outside of the ladder frame.

Hopper Lid

Entrapment and Suffocation Hazard
A hopper that is full, or appears full, can be an entrapment hazard. You can sink into the grain and suffocate in a matter of seconds. Grain bridges and crusts are especially dangerous.

When hazardous fumes or low oxygen levels are present, you can be quickly overcome even in an empty hopper with the lid open. There may be no odors to alert you to the hazard.

Never enter a hopper for loading, unloading or routine maintenance. Keep lid locked closed or, during storage, locked slightly open. Store ladder to discourage access to lid area. Keep children away from drill.

Blowing Debris and Inhalation Hazards
Hoppers are mildly pressurized and air is circulating in the hopper when the fan is running. Opening a lid with the fan running can expose you to blowing seed, fertilizer and treatment chemicals. Even with the fan off, adding seed or fertilizer will create a dust cloud. Risks include exposure to hazardous chemicals, lung and eye irritation. Turn off fan before opening hopper lids. Wear eye protection and dust mask or respirator.

Keep lids closed. Leave strainer in place except when instructed to remove it. Keep tightly closed for operations. Open only for material loading, hopper clean-out, and maintenance.

Avoid metering problems caused by air leaks:

- Check lid seals for damage frequently.
- Check that latch closes lid tightly.
- Check hopper pressure reported by the terminal.

Planting Consistency Risk
Air leaks can cause irregular metering of materials.

Hopper Lid Opening
1. Lift the handle (1).
2. Swing the handle out until the hook (2) releases from the u-bolt (3).
3. Move the hook clear of the u-bolt and close the handle.
4. Lift the lid slightly at the pivot end to clear the strainer.
5. Swing the lid away from the strainer. Open only enough to accomplish the present task.

Each hopper is equipped with a strainer intended to:
- capture large foreign matter in seed and materials,
- prevent entry by animals if lid left open, and;
- discourage hopper entry by children.
The strainer is secured by two bolts. Leave the strainer in place except during strainer and hopper cleaning.

6. Each time the lid is opened, inspect the strainer for debris, and if clear, inspect the hopper itself.
7. If the strainer needs to be removed for cleaning, do not perform these steps until immediately ready to clean the strainer and return it to the hopper:
   - Wear gloves suitable for protection against recent fertilizers or seed treatments.
   - Fully open the hopper lid.
   - Remove the strainer bolts.
   - Lift the strainer out of the hopper.
   - Immediately close and latch the lid.
   - Clean and dry the strainer.
   - Return the strainer to the hopper. Install the strainer bolts.

Hopper Lid Closing
1. Swing the lid over the opening until the hook (2) is centered on the u-bolt (3).
2. Open the handle (1) and engage the hook on the u-bolt.
3. Close the handle for operations or short-term parking. For long-term storage, do not engage the hook or latch handle to avoid deforming the seal.

For storage, particularly unlatched, use a padlock through both u-bolts to discourage unauthorized entry by persons not aware of possible confined space risks. It also prevents entry of pests, debris, and precipitation.

Seed Meters

Meter Doors
Each meter box has two meter doors. Both meter doors are used for meter clean-out.
The meter doors are closed during transport, loading, and planting. The meter doors may be open slightly in storage to allow drainage of condensation.
The meter doors need to be closed and sealed tightly during planting. Periodically inspect the handles for proper tension. Also inspect the elastomer seals for integrity and resiliency.
The meter doors are used for cleaning out the meter. Do not open the meter doors until preparations have been made to capture any material to be reused.

Material Loss / Air Leak Risks
As soon as meter doors are open, any material present will flow immediately, possibly in large volume. It is not possible to close the meter doors with an adequate air seal until the hopper is empty.
To open the meter doors:
1. Lower the chute (1).
2. Rotate the front handle (2) all the way down to open the front meter door.
3. Rotate the rear handle (3) all the way to the rear to open the rear meter door.

To close the meter doors:
1. Use a clean rag to wipe any remaining material from the seals on the meter doors (1). Also clean the bottom face (2) of the meter box.
2. Rotate the front handle all the way forward to swing the front meter door up into closed position.
3. Rotate the rear handle all the way down to swing the rear meter door up into closed position.
4. Inspect the meter door closures for possible air leaks. Replace a seal if it is deformed.
5. Raise the chute.

Final Drive Ranges

**Entanglement Hazard**

*Do not operate the machine with meter guards removed.*

The metering shaft is driven by the agitator shaft (1) through a pair of gears (2), (3). The positioning of these gears creates two final drive ranges.

Each seed rate chart is based on a specific final drive range. The ranges are:
- High range, which is used for larger seeds and higher seeding rates
- Low range, which is used for smaller seeds and lower seeding rates

Changing Final Drive Range Gears

1. Remove the pins (4) from both shafts.
2. Remove and position the gears as suggested in “Planting Rate Information” on page 46.
3. Install the pins in the shafts.

Gear Sets for S/N C1010F+

There are two sets of gears for each meter:
1. A 10DP profile, 54 tooth to 36 tooth, that is installed at the factory.
2. A 8DP profile, 54 tooth to 17 tooth, that can be used for higher rates.

When not used, the gears can be stored in the tool box.
**Metering Shafts**

The configuration of the metering shaft (number and type of stars) effects the seeding rate.

A star (1) for a 2-, 3-, and 4-star metering shaft is made of two halves (2) that are aligned. Each star is offset from the adjoining star (3).

Stars for small seed (4) are made of two halves that are not aligned. For a lower small seed planting rate than the chart on page 46, plastic spacers (5) can be used. To use the spacers, disassemble the small seeds shaft and replace half of a small seeds star assembly with a spacer. The spacers are stored in the tool box.

If the material rate needs to be changed, first find the configuration of the metering shaft. It is not necessary to remove the metering shaft to determine the configuration.

To determine the configuration of the metering shaft installed in the drill:

- First make sure the hoppers and the meters are empty. See “Unloading Hopper Materials” on page 71.
- Inspect the metering shaft from the hopper lid. Do not enter the hopper.
- Inspect the metering shaft more closely from under the meter with the front meter door fully open.

Compare the metering shaft to the ones illustrated below to determine the configuration.

(1) small seed rate metering shaft.
(2) 4-star metering shaft. (Factory installed.)
(3) 3-star metering shaft (S/N C1009F- only).
(4) 2-star metering shaft.

**Changing a Metering Shaft**

The hopper must be empty for this procedure. See “Unloading Hopper Materials” on page 71.

**For S/N C1009F-**

If your seeding rates need to be lower, select one of the lower rate shafts.

- Replacing the standard 4-star metering shaft with a 3-star metering shaft decreases the seeding rate by approximately 25% (to 75% of standard rate).
- Replacing the standard 4-star metering shaft with a 2-star metering shaft decreases the seeding rate by approximately 50% (to 50% of standard rate).
- For compatible seeds, replacing the standard 4-star metering shaft with the small seeds metering shaft reduces the seeding rate by approximately 90 to 75% (to a net of 10% to 25% of standard rate).
- For small seeds or other seeds substantially smaller than 12 to 4.7 mm, the standard metering shaft may not provide enough precision and uniform flow at very low rates. The small seeds metering shaft includes two half-width shallow flute stars per compartment.
To order other metering shafts, see “Metering Shafts (S/N C1009F- only)” on page 104.

To install a set of these metering shafts, start with the front meter.

1. Remove and save the pins (1) from the final range gears (2) and (3).
2. Remove the spring clip (4).
3. Remove and save the final range gears. Note the location for proper installation.
4. Carefully remove the current metering shaft (5).
5. Store the old metering shaft in the carton in which the new metering shaft was supplied. Mark the carton with the number of active hoses (towers) and the number of stars. This will reduce the risk of mistaking the carton/contents in the future.
6. Carefully insert the new metering shaft (6) in the meter box.
7. When the flange is fully seated against the box, secure the flange with the six saved bolts. Give the metering shaft a few turns.
8. Mount the final range gears. Note the pin hole orientation on the shaft and on the gears. The gears can only be pinned in 2 of the 6 possible ways they can be placed on the shafts.
9. Install the pins.

For S/N C1010F+

If your seeding rates need to be lower, select one of the lower rate shafts.

- Replacing the standard 4-star metering shaft with a 2-star metering shaft decreases the seeding rate by approximately 50% (to 50% of standard rate).
- For compatible seeds, replacing the standard 4-star metering shaft with the small seeds metering shaft reduces the seeding rate by approximately 90 to 75% (to a net of 10% to 25% of standard rate).
- For small seeds or other seeds substantially smaller than 12 to 4.7 mm, the standard metering shaft may not provide enough precision and uniform flow at very low rates. The small seeds metering shaft includes two half-width shallow flute stars per compartment. For even lower rates, plastic spacers can be used for one small seeds star in each star assembly (page 39).

All three types of metering shafts are standard.

To change metering shafts:

1. Remove the gear cover.
2. Remove and save the lynch pins (1) from the final range gears (2) and (3).
3. Pull the retainer clip (4) to remove.
4. Remove and save the final range gears (2) and (3), and the hub assembly (5).

   Temporarily leave the gear on the metering shaft to make a handle to pull the metering shaft out of the meter.
5. Carefully remove the metering shaft.
6. Store the metering shaft in the tool box.
7. Carefully insert the new metering shaft in the meter box.

8. Install the hub assembly and secure with the retainer clip. Turn the metering shaft a few times.

9. Mount the final range gears and install the lynch pins.

---

### Loading Hopper Materials

#### Entrapment and Suffocation Hazard

A hopper that is full or appears full can be an entrapment hazard. You can sink into the grain and suffocate in a matter of seconds. Grain bridges and crusts are especially dangerous. When hazardous fumes or low oxygen levels are present, you can be quickly overcome even in an empty hopper with the hopper lid open. Never enter a hopper for loading or unloading.

#### Chemical Hazard

Agricultural chemicals can be hazardous, including treatments on seeds and components of fertilizers. Improper use can seriously injure persons, animals, plants, soil, and property.

Take the necessary precautions for handling materials. Review the materials safety data sheet (MSDS).

With material present, and once used for hazardous fertilizers, or seeds with hazardous treatments, your hoppers may become permit-required confined spaces under applicable statutes, regulations, insurance rules or business policy. The venting tube structure in the hoppers has rungs for escape, and is not an entry ladder.

Loading materials increases the hitch load. With the implement lowered, and the circuits in float, a full material load results in a hitch load of nearly 1900 kg. This results in a jack load of up to 25 kg/cm².

#### Variable Hitch Load

Even if the currently dry ground supports the jack, sudden wet weather could result in the jack becoming stuck in mud.

The implement does not need to be in any particular configuration for material loading. Raising it, however, does reduce the hitch load.

Check hopper strap tension before every material load on a new drill, and again after material is loaded. See page 70.
Loading Seed or Dry Fertilizer

1. Securely hitch the drill to a tractor with adequate weight and power. See “Specifications” on page 101 for tractor requirements.
   If a suitable tractor is not available, make sure the tongue jack is on solid ground, and block multiple tires.
2. Park the drill on solid, level ground.
3. Lower the ladder on one side.
4. Select the hoppers to use:
   a. **Single-hopper configuration** - All materials are delivered to the row unit seed tubes, and are placed in a furrow.
   b. **Dual-hopper single-shoot configuration** - Either hopper may be used for seed and/or dry fertilizer. All materials are delivered to the row unit seed tubes, and are placed in a furrow.
      If applying the same material from both hoppers, you can meter from both at the same time, or from one at a time. For one at a time metering, the unused hopper is disabled by removing a final range gear.
      Simultaneous metering avoids weight imbalance and eliminates stopping before the halfway point for meter change-over.
      If metering simultaneously, set each meter for one half the rate. Do not use half the single-meter scale setting, as this is usually not half the rate. See “Metering Shafts” on page 39 and “Planting Rate Information” on page 46 for more details.
   c. **Dual-hopper double-shoot configuration** - The factory default configuration is that the hoppers and delivery hose routing are set up for specific uses. See the table below.

### Table: Hopper Intended Use

<table>
<thead>
<tr>
<th>Hopper</th>
<th>Intended Hopper Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Seed or In-Furrow Dry Fertilizer</td>
</tr>
<tr>
<td>II</td>
<td>Dry Fertilizer or Broadcast Seed</td>
</tr>
</tbody>
</table>

Auger discharge heights are as follow:

<table>
<thead>
<tr>
<th>Hopper</th>
<th>Elevation to Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>2890 litre</td>
<td>2.83m</td>
</tr>
<tr>
<td>5290 litre</td>
<td>2.97m</td>
</tr>
</tbody>
</table>

5. At each empty hopper to be loaded, open both meter doors. Wipe the seal on the meter doors and meter bottom flanges clean. Close and latch both meter doors.
6. If the drill has been parked for more than a day, condensation may have caused moisture to accumulate. Run the fan system for several minutes to blow moisture out of the meters and seed hoses.
7. With the fan running, check the hopper-lid and meter-box seals carefully for air leaks. Adjust the bin latch or replace seals to prevent leakage.

8. Before filling the hoppers at the beginning of each season, check the entire hopper for leaks.

Material Application Risk

A small air leak can cause large variations in seeding rates.

9. Shut off all hydraulic power to the drill (unless using a tractor or cart circuit for an auger).

Entanglement Hazard

Keep loose hair, clothing and body parts away from rotating auger. Do not remove or modify guards.

If markers are not installed, circuits are available at the rear of the cart frame and may be used for auxiliary purposes, such as an auger. Auger height required is:

- 3.0m for 5290 litre hopper, and
- 2.8m for 2890 litre hopper

10. Open the lid of the hopper to be loaded.

11. Check that the strainer is in place. Remove any foreign material from the strainer.

12. Load seed or dry fertilizer at the open hopper lid.

13. Check the strainer periodically for foreign matter. Remove any foreign material from the strainer basket.

14. Wipe any grain or foreign matter from the lid seal area. Close the lid(s) and latch securely.

15. Return the ladder to the storage position.

Planning Re-Loads

A level sensor in each hopper reports to the terminal when the hopper is empty. An alert occurs when there is 25 litres of remaining material.

- Calibration

Blowing Debris and Inhalation Hazards

Wear eye protection and dust mask or respirator. Exposure to hazardous chemicals, can result in lung and eye irritation.

Calibration is essential for accurate application. The terminal reports and controls seed rates.

A calibration bag and digital scale are stored in the tool box near the ladder on the left side of the machine.

Do this calibration procedure when:

- Using the drill for the first time.
- At the beginning of each season.
- When changing material.
- When changing meter gearing.
- When changing metering shaft.

Calibration Procedure

1. Park the drill on a solid level surface. Apply the tractor parking brake, stop the engine, and take the key with you.

2. Chock the cart wheels.

3. Make sure the correct product is in the hopper.

4. Turn the tractor key to ACC.

5. Select the field underneath Target Rate and enter the rate you are wanting to plant at. The values for your Calibration Factor will be found by running a calibration test. Great Plains recommends not entering these values manually.

6. To start your calibration run, from metering settings, enter your desired rate.

Tap to begin the corresponding hopper's calibration routine.
7. From the meter calibration screen, make sure that hydraulic flow to the motors is on if using hydraulic motors. Enter your desired travel speed.

You can tap \( \text{to run one test revolution with the speed selected.} \)

8. Tap \( \text{to run the calibration. If the calibration is in the process of running, you should see the following calibration running screen:} \)

   This screen will automatically go to the calibration confirmation screen once you have finished running the machine calibration.

9. Remove the calibration bag and scale from the drill. Hang the scale (1) on the hook (2) provided on the right-hand front corner of the cart frame. Hang the empty calibration bag on the scale. Zero the scale.

10. Locate the metering hose (3) at the rear of the drill. There is one metering hose for each meter on the drill. Select the metering hose for the meter being tested. Install the calibration bag (4) on the metering hose.

11. Locate the calibration slide (5) for the metering hose. Move the calibration slide to the open position.

12. Start the tractor engine and start the fan. Set the fan speed. See “Air System Adjustments” on page 52.

13. Adjust the weight transfer system. See “Weight Transfer” on page 59.
14. Locate the red test button (1) at the rear of the drill. Press and hold the red test button until a reasonable sample has been collected. Release the red test button.

Do not fill the calibration bag completely.

15. Remove the calibration bag from the meter hose. Attach the calibration bag to the scale. Make a record of the weight.

16. Go back to the terminal. Once the calibration button is released on the machine, you should have a new screen appear on the terminal.

17. Enter the weight in the box that appears after the calibration button is released. After this weight is entered, a speed range will appear at the bottom of the screen.

If this speed range includes your desired travel speed, tap ✔️ to confirm your calibration settings.

If the results are not what you need and/or you do not want to enter the values manually, tap ❌ to cancel the settings and start a new calibration run.

18. A speed range that falls outside of your desired drill speed range may indicate the need to:
   a. Check the calibration procedure again to verify the results.
   b. Change a metering shaft. See “Changing a Metering Shaft” on page 39.
   c. Exchange the gears on the side of the meter. See “Final Drive Ranges” on page 38.

19. Do the calibration test again after making any changes.

20. Once calibration is complete, return to the home screen by using the icon. When you are on the home screen, lower the drill’s hydraulics and turn on the fan.

Make sure the hopper lid is closed. Then tap ✔️ to turn on the drill.

21. If you see the screen below and all the outputs look correct, your machine is prepared to run.

22. Stop the engine. Take the key with you.

23. Close the calibration slide.

24. Empty the contents of the calibration bag into the hopper and close the hopper.

25. Return the scale and the calibration bag to the tool box.
### Planting Rate Information

#### Planting Rate Chart

<table>
<thead>
<tr>
<th>Kilograms per Hectare Range</th>
<th>Star Shaft</th>
<th>Gear Configuration</th>
<th>Calibration Factor (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small Seeds</td>
<td>Two Star</td>
<td>Four Star</td>
</tr>
<tr>
<td></td>
<td>8 kph</td>
<td>14 kph</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>30 - 170</td>
<td>17 - 98</td>
<td></td>
</tr>
<tr>
<td></td>
<td>37 - 220</td>
<td>20 - 125</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55 - 300</td>
<td>30 - 200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>160 - 300</td>
<td>90 - 300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>265 - 300</td>
<td>150 - 300</td>
<td></td>
</tr>
<tr>
<td>Oats</td>
<td>35 - 130</td>
<td>20 - 75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55 - 300</td>
<td>30 - 175</td>
<td></td>
</tr>
<tr>
<td></td>
<td>90 - 300</td>
<td>50 - 200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>175 - 300</td>
<td>100 - 300</td>
<td></td>
</tr>
<tr>
<td>Soybeans</td>
<td>20 - 40</td>
<td>10 - 50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 - 210</td>
<td>20 - 120</td>
<td></td>
</tr>
<tr>
<td></td>
<td>55 - 265</td>
<td>30 - 150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>125 - 300</td>
<td>70 - 300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>265 - 300</td>
<td>150 - 300</td>
<td></td>
</tr>
<tr>
<td>Milo</td>
<td>2 - 12</td>
<td>1 - 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 - 33</td>
<td>3 - 19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 - 105</td>
<td>10 - 60</td>
<td></td>
</tr>
<tr>
<td>Canola</td>
<td>3 - 12</td>
<td>2 - 5</td>
<td></td>
</tr>
<tr>
<td>Rye Grass</td>
<td>9 - 60</td>
<td>5 - 35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 - 80</td>
<td>10 - 65</td>
<td></td>
</tr>
<tr>
<td>Fertilizer</td>
<td>23 - 135</td>
<td>13 - 100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70 - 200</td>
<td>50 - 175</td>
<td></td>
</tr>
<tr>
<td></td>
<td>130 - 250</td>
<td>100 - 225</td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 - 300</td>
<td>200 - 300</td>
<td></td>
</tr>
</tbody>
</table>

Select a desired range of kilograms per hectare for your product, and use the corresponding star shaft, driving / driven gear configuration, and initial calibration factor for planting.
Air System Operation (S/N C1009F-)

Dual-Hopper (Double-Shoot) Air System

Single-Hopper Air System
1. **Hydraulic Fan** - The fan generates the air flow required to deliver material to the rows. Speed is adjusted using the tractor circuit. Output is monitored with rpm (2), pressure gauge (5) and pressure sensor (8).

2. **Fan RPM Sensor** - The terminal reports fan rpm based on this sensor. Although it is accurate for rate, it cannot detect a fan running in reverse.

3. **Manifold Gates** (page 53) - There are two gates only on dual-hopper drills. They control airflow balance between the meters. They may need adjustment with dissimilar material metering.

4. **Manifold Pressure Gauge(s)** (page 59) - There is one gauge per hopper, mounted for observation from the tractor cab. These report whether or not the air system is within recommended limits. On dual-hopper systems, the gauges assist in setting the manifold gates (3).

5. **Fan Manifold** (page 53) - Fan air is divided (or further divided) into equal flows for each meter inlet port (5).

6. **Hopper** (page 42) - Material (seed or fertilizer) flows into the top of the seed meter (9).

7. **Pressure Balance Lines** - Each hopper contains an internal pressure-balancing system to equalize pressure above and at the base of the material.

8. **Hopper Pressure Sensor** - This sensor signals the terminal, which can alarm if the hopper pressure goes out of limits. A dual hopper drill has two sensors.

9. **Seed Meter** - The meter combines material with air flow. It also has features for rate range, calibration and clean-out.

10. **Metering Shaft** - Four (optionally two or three) sets of flute stars control the flow of seed from the hopper into the air streams.

11. **Meter Outlet Ports** - Material falls from the meter flutes (10) into the air streams flowing from inlet manifold to outlet ports. Each port is a separate compartment.

12. **Diverter** - Seed is distributed evenly from the seed meter(s) through hoses to the towers.

13. **Primary Seed Hose** - Four (single-hopper) or eight (double-hopper) hoses deliver seed from the meters(9) to the distribution manifold (12).

14. **Distribution Tower** - The riser tube and distribution rings evenly divide the primary hose material flow into multiple secondary hose (15) flows. There are two towers on single-hopper and four towers on double-hopper drills.

15. **Secondary Seed Hose** - These hoses deliver material from a tower outlet port to a seed tube (17) or fertilizer tube (18).

16. **Tramline Diverters** (Option, page 104) - The tramline diverters are mounted on the under side of the towers.

17. **Opener Seed Tube** - Seed from hopper I and hopper II on single-shoot drills is delivered in-furrow ahead of the seed firmer.

18. **Opener Fertilizer Tube** (page 67) - On a dual-hopper double-shoot drill, the material from hopper II is delivered to this tube above the seed firmer and furrow.
Air System Operation (S/N C1010F+)

Dual-Hopper (Double-Shoot) Air System

Single-Hopper Air System
### Table of Contents

<table>
<thead>
<tr>
<th>No.</th>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Hydraulic Fan</strong></td>
<td>The fan generates the air flow required to deliver material to the rows. Speed is adjusted using the tractor circuit. Output is monitored with the fan rpm sensor (2), fan manifold sensor, and hopper sensor.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Fan RPM Sensor</strong></td>
<td>The terminal reports fan rpm based on this sensor. Although it is accurate for rate, it cannot detect a fan running in reverse.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Fan Manifold</strong></td>
<td>On dual hoppers, the fan manifold controls airflow balance to the meters. Fan air is divided into equal flows for each meter inlet port. They may need adjustment with dissimilar material metering.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Manifold Pressure Gauge(s)</strong></td>
<td>There is one gauge per hopper, mounted for ease of observation from the tractor cab. These report whether or not the air system is within recommended limits. On dual-hopper systems, the gauges assist in setting the fan manifold outlet.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Hopper</strong></td>
<td>Material (seed or fertilizer) flows into the top of the seed meter. Each hopper contains an internal pressure-balancing system to equalize pressure above and at the base of the material. A sensor signals the terminal if the hopper pressure goes out of limits. A dual hopper drill has two sensors.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Seed Meter</strong></td>
<td>The meter combines material with air flow. It also has features for rate range, calibration and clean-out.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Metering Shaft</strong></td>
<td>Sets of flute stars control the flow of seed from the hopper into the air streams.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Meter Outlet Ports</strong></td>
<td>Material falls from the meter flutes into the air streams flowing from inlet manifold to outlet ports. Each port is a separate compartment.</td>
</tr>
<tr>
<td>9</td>
<td><strong>Diverter/Transition</strong></td>
<td>Seed is distributed evenly from the seed meter(s) through hoses to the towers.</td>
</tr>
<tr>
<td>10</td>
<td><strong>Primary Seed Hose</strong></td>
<td>Four (single-hopper) or eight (double-hopper) hoses deliver seed from the meters to the distribution tower.</td>
</tr>
<tr>
<td>11</td>
<td><strong>Distribution Tower</strong></td>
<td>The riser tube and distribution rings evenly divide the primary hose material flow into multiple secondary hose flows. There are two towers on single-hopper and four towers on double-hopper drills.</td>
</tr>
<tr>
<td>12</td>
<td><strong>Secondary Seed Hose</strong></td>
<td>These hoses deliver material from a tower outlet port to a seed tube (14) or fertilizer tube (15).</td>
</tr>
<tr>
<td>13</td>
<td><strong>Tramline Diverter(s)</strong></td>
<td>(Option) - The tramline diverters are mounted on the under-side of the towers.</td>
</tr>
<tr>
<td>14</td>
<td><strong>Opener Seed Tube</strong></td>
<td>Seed from hopper I and hopper II on single-shoot drills is delivered in-furrow ahead of the seed firmer.</td>
</tr>
<tr>
<td>15</td>
<td><strong>Opener Fertilizer Tube</strong></td>
<td>On a dual-hopper double-shoot drill, the material from hopper II is delivered to this tube above the seed firmer and furrow.</td>
</tr>
</tbody>
</table>

#### Shoot Conversion for Dual-Hopper Double-Shoot to Single-Shoot

1. Park the tractor and the drill on a solid level surface.
2. Put the tractor in park and apply the tractor parking brake.
3. Make sure the meters are turned off. Operate the fan for 30 seconds to empty the primary seed hoses.
4. Stop the tractor engine and take the key with you.
5. Chock the wheels on the cart.
6. Open the cap (1) of the Y-fitting (2) mounted on the seed tube of the opener.
7. Disconnect the fertilizer hose (3) from the fertilizer tube (4).
8. Install the fertilizer hose on the Y-fitting. Make sure the hose clamp is seated and tight.

**Single-Shoot to Double-Shoot**

1. Park the tractor and the drill on a solid level surface.
2. Put the tractor in park and apply the tractor parking brake.
3. Make sure the meters are closed. Operate the fan for 30 seconds to empty the primary seed hoses.
4. Stop the tractor engine and take the key with you.
5. Chock the wheels on the cart.
6. Disconnect the fertilizer hose (1) from the Y-fitting (2).
7. Install the fertilizer hose on the fertilizer tube (3).
8. Install the cap (4) on the Y-fitting.

---

**Fan Operation**

**Rotating Fan Blade Hazard**

*Do not operate the fan with guard screen removed. The fan accelerates instantly and with high torque. Body parts and clothing can be drawn into fan, resulting in serious injury or death. Disconnect fan circuit at hitch when working on fan.*

**High Pressure Fluid Hazard**

*Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. Check all hydraulic lines and fittings before applying pressure. Use paper or cardboard, not body parts, and wear heavy gloves to check for suspected leaks. If injured, seek immediate medical attention from a physician familiar with this type of injury.*

The hydraulic fan supplies the air stream that carries materials from the meters, through the primary hoses to the towers, then to the secondary hoses to the rows.

The fan needs to be running in the correct direction, and within a narrow speed range, to reliably deliver material at your calibrated rates.

The fan circuit has three hoses. All must be correctly connected. Connect the sump line to a tractor port capable of accepting high volume low pressure return oil. Connect the case drain line to a low volume case drain return.

Avoid fan direction reversal. A fan running in reverse cannot generate sufficient airflow for planting. If the fan cannot reach target rpm, check for reversed circuit connections or improper drain connection.

Engage the fan circuit lever slowly, while observing the fan rpm on the terminal.

**Machine Damage Risk**

*Avoid sudden circuit changes. Motor seals may be damaged by rapid starts and stops, or by circuit reversals.*

Fan speed is monitored and reported by the terminal, but is manually controlled. See “Air System Adjustments” on page 52 for further information.

On dual-hopper drills, operating pressure at the meters is also affected by the adjustment of the manifold gate.
Fan Field Operation

Machine Damage Risk

Always engage the fan with the tractor at a low engine speed. Engaging the fan when the tractor is at high speed may cause fan damage. Do not reverse hydraulic flow with the fan running.

1. Unfold the implement (page 27).
2. Set the fan circuit lever to neutral.
3. With the tractor engine at low rpm, slowly extend the lever for the fan/fold circuit. Bring the fan up to recommended speed. Let the fan warm up for 15 minutes before planting.
4. Lower the drill a distance of 1.5 to 3m before planting is to begin. It takes a few seconds for seed to travel from the meters to the rows.
5. Leave the fan running during field turns. The meter drive is shut off when the openers are raised.
6. At the end of application, raise openers. Stop material flow before shutting off the fan.
7. Shut off the fan by carefully moving the fan circuit lever to float (preferred) or neutral. Avoid moving the lever into retract.

The fan does not stop instantly. A check valve in the fan circuit locally re-circulates oil until the blades coast to a stop.

Air System Adjustments

There are two adjustments for the air system:

1. Fan rpm, which controls manifold air pressure, hopper air pressure, and material delivery velocity.
2. On dual-hopper drills (either single- or double-shoot) there are gates in the manifold (page 53). The adjustments control the balance of air flow to each meter. This adjustment is not present on single-hopper drills.

There is no direct adjustment for hopper pressure. The table figures are included for setting alarm limits in the terminal. If a pressure alarm occurs, do not adjust the fan or manifold gates to compensate. The cause is usually a leak or a major blockage.

Air System Settings

<table>
<thead>
<tr>
<th>Fan rpm</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000 rpm to 4500 rpm</td>
<td></td>
</tr>
</tbody>
</table>

Typical Range

<table>
<thead>
<tr>
<th>Material</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milo</td>
<td>3250 rpm to 4000 rpm</td>
<td></td>
</tr>
<tr>
<td>Soybeans</td>
<td>2750 rpm to 3500 rpm</td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>2250 rpm to 3000 rpm</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>3250 rpm to 4000 rpm</td>
<td></td>
</tr>
</tbody>
</table>

Manifold Pressure

<table>
<thead>
<tr>
<th>Material</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milo</td>
<td>12 in H2O to 25 in H2O</td>
<td></td>
</tr>
<tr>
<td>Soybeans</td>
<td>30 cm H2O to 64 cm H2O</td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>30 kPa to 64 kPa</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>3050 bar to 6350 bar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.4 psi to 9.2 psi</td>
<td></td>
</tr>
</tbody>
</table>

Hopper Pressure Limits

<table>
<thead>
<tr>
<th>Material</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milo</td>
<td>1.3 kPa to 8.6 kPa</td>
<td></td>
</tr>
<tr>
<td>Soybeans</td>
<td>130 bar to 860 bar</td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>13 cm H2O to 88 cm H2O</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>0.19 psi to 1.25 psi</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 in H2O to 35 in H2O</td>
<td></td>
</tr>
</tbody>
</table>

Fan Speed

The specific fan rpm required varies considerably with drill configuration, material density, application rate, field speed and material properties. Develop and record settings that are suitable for your operations.

Machine Damage Risk

Always engage the fan with the tractor at a low engine speed. Engaging the fan when the tractor is at high speed may cause fan damage. Do not reverse hydraulic flow with the fan running.
At ideal fan speed:
- flow is more than high enough to avoid blockages (from both meters on dual-hopper drills),
- flow is even across all hoses from each meter, and
- flow is low enough to minimize seed cracking and bounce.

Fan speed is monitored and reported by the terminal, but is manually controlled.

If the fan cannot reach 3000 rpm, one or more hoses may not be connected correctly. Air moves toward the air box in either rotation direction, but reverse spinning airflow is too low to operate the system.

If the fan is operating properly, and at desired rpm, and the gate is correctly adjusted, but the pressure gauge is out of limits, see “Magnehelic® Gauge” on page 100.

Fan Speed Adjustments

Start with the rpm settings in the table on page 52. Adjust for your situation.

Start with flow on low setting (3 to 45 litres/min is average flow).

Run the fan for at least 15 minutes before seeding. Hydraulic fluid must be warm before the fan and wing pressure systems operate properly.

1. Check hopper lid(s) and meter-box seals for air leaks. Adjust the latch or replace the seals to prevent leakage.

   It only takes a very small air leak to cause large variations in the seeding rate and pattern.

2. Watch the manifold pressure gauge(s) and terminal. Adjust fan speed by increasing or decreasing hydraulic flow from the tractor. Use the guidelines and the fan speed chart to properly adjust fan speed.

Fan speed tips:
- Higher fan speeds improve seed distribution, but high fan speeds also increase the chance of seed damage and bounce.
- At first, adjust fan speed to the high end of the range suggested in the chart. Watch for excessive seed cracking and seed bounce from the furrow, then reduce fan speed if necessary.
- Actual fan speeds vary with implement width, row spacing, seeding rates, seed weights, and seed size. Increase fan speed for heavier seeding rates or seed. Reduce fan speed for lighter seeding rates and seed more prone to cracking.

Fan Manifold Gate Adjustments

On dual-hopper drills, where the material in each hopper may not be the same, the meters may require different air flows. Dual pressure gauges, and fan manifold gates are provided for setting unequal flows.

For S/N C1009F- drills, there are two gates and for S/N C1010F+ there is one gate. A fan manifold gate is not present on single-hopper drills.

An example of a situation likely to need unequal flow is:
- small light seeds in hopper I, and
- dense dry fertilizer in hopper II.

The need for unequal flows may be observed only during actual field operation, as material must be entering the airflow and generating air demand.

If applying a single material on a single-shoot drill, Great Plains recommends loading the material into both hoppers and using half rate. Set the manifold gate for equal pressures to each meter.

If applying a single material on a double-shoot drill, use a single hopper. Set the manifold gate to divert the maximum flow to the used side. This does not completely shut off air flow to the unused hopper, which needs some airflow to avoid nuisance alarms.
S/N C1009F-
The manifold gates inside the manifold (1) are controlled by the levers (2) on the front of the manifold. (The left-hand lever is shown.)

The factory setting for the handles is pointing all the way up, providing balanced flow to each meter. Decals on the manifold show the approximate angle of maximum effect.

To adjust a manifold gate:
- Loosen the nut (3).
- Rotate the handle to the horizontal position if reduced flow is desired and all the way up if increased flow is desired.
- Tighten the nut.

Manifold Gate Tuning
Start with:
- moderate fan speeds (see page 52)
- balanced manifold air flow.

1. Begin field operations. Watch for delivery issues that might be remedied by an uneven flow, such as blockage, pressure alarms, and seed cracking or bounce.

2. Adjust fan rpm up and down until you discover the upper and lower rpms that represent the best working range for each meter. Note the upper and lower manifold pressures for that operating range. The ideal pressures for each meter are likely to be different.

3. If there is no single fan speed that puts both meters comfortably within their ideal operating range, set the fan to an averaged rpm, and begin adjusting the manifold fan gate. The goal is to bring both pressure gauges to levels within their optimal range similar to those determined earlier.

4. After the final gate setting is made, some fan rpm adjustment may be needed to bring both gauges to the median readings in the optimal range.
Markers (Option)

Electrocution Hazard

Never fold implement with a marker extended. Never extend a marker with implement folded. Operate markers only with drill completely unfolded. A marker extended when folded is a major overhead electrocution hazard, overhead clearance hazard, and may damage drill systems.

Crushing Hazard

Do not allow anyone to stand near or beyond the end of the wings during marker operations. A folding marker can cause serious injury or death.

The illustration below shows the marker (1) in the folded position and resting on the cradle (2).

Dual markers are on a dedicated hydraulic circuit which contains an adjustable automatic sequence valve.

Marker circuits must be fully charged with oil and free of air before operation. Before first use or after maintenance, bleed the hydraulics. See “Marker Hydraulic Bleeding” on page 83.

Marker Unfold and Fold

1. Clear the area within 4m of marker arms on both sides of the drill.
2. Carefully move the circuit lever to extend and observe which marker side is extending.

3. If the marker extending is not on the desired side, reverse the lever (to retract) until the marker returns to the cradle (1). Set the control to neutral briefly, then to extend again. This cycles the sequence valve and extends the alternate marker.

4. When the marker is fully extended, set the circuit to neutral.
5. To fold the marker, set the circuit to retract until the marker is in the cradle.
6. To extend the other side, extend once more, as at step 3.

Which marker side extends at circuit activation is somewhat unpredictable, as it depends on the final state of the sequence valve at last use.

Special Dual-Marker Operations

Passes with same marker side:

- Retract (raise) the marker and make the turn.
- Begin to extend the opposite marker.
- Retract it, and extend the original marker.

Both markers unfolded:

- Fully extend one side.
- Momentarily retract, then extend to deploy the opposite side.
Marker Adjustments

**Crushing/Pinching Hazards**

Make all adjustments with tractor hydraulics shut down, and the marker circuit in float. To avoid serious injury or death, keep all persons clear of both markers when making adjustments. The marker that moves may not be the one expected.

**Sharp Object Hazard**

Marker disks may be sharp. Use caution when making adjustments in this area. If removed, always install guard above marker disk.

There are four operating adjustments for markers:

1. **Marker tension adjustment** - Adjust the spring tension to make sure the markers track uneven ground and do not drag excessively when folded.
2. **Marker extension adjustment** - Once set for a specific row spacing, this only needs periodic checking to make sure the clamp is secure.
3. **Marker speed adjustment** - Once initially set by your dealer, this rarely needs modification.
4. **Marker disk adjustment** - Even if your row spacing rarely changes, you may need to adjust disk angle for soil conditions and planting speed.

**Marker Tension Adjustment**

The strength of the mark is a function of marker arm weight at the disk. A spring (1) behind the pivot assembly acts against some of that weight. The spring is adjustable, and may be used to increase or decrease force at the marker disk.

The suggested initial marking force is 23 kg. For marking forces up to this value, use the weighing scale included with the drill to lift the extended marker disk.

To adjust the marking force:

1. Fold the markers. This minimizes spring tension for adjustment.
2. Set the marker hydraulic circuit to neutral. Shut off the tractor.
3. Loosen the eye bolt jam nut (2) on the top side of the bracket.
4. Turn the adjust nut (3) to change marking force:
   - Loosen this nut (relaxing the spring) to increase marking force.
   - Tighten this nut (tensioning the spring) to decrease marking force.
5. Tighten the jam nut to secure the new setting.

If the marker spring force is set too low, the marker may fail to return to its cradle when folded.

**Marker Extension Adjustment**

At delivery, marker extension is typically set for shipment (arm fully retracted), and needs to be reset for field. Marker extension needs to be checked periodically thereafter, and needs to be checked and adjusted when:

- tool bar height is changed,
- marker disk angle is changed, or;
- marker disk throw direction is changed.

Measure marker extension (A) in a representative field conditions, with the openers in the ground, after adjusting the tool bar height and wing weight transfer. If openers are not at planting depth when setting the extension, the gap will be too large during planting.

Marker extension is measured on the ground, from the centerline of the outside row unit to the disk mark.
For limited down-flex drills, the row spacing does not change at wing gaps. The marker extension is one half the span (distance between end rows) plus a gap of one row space.

For standard drills, with higher down-flex, marker extension is the same, but row spacing at the wing gap is 216 mm for all models. This increases the swath by one or two percent, or increases the swath-averaged row spacing of the drill.

The pass gap in the table below is set to the nominal row spacing for all models. It shows the actual swath for both wing types, and effective row spacing for higher down-flex drills. For most accurate seed monitoring, use the information below.

### Limited Down Flex Wing - Mark Extension

<table>
<thead>
<tr>
<th></th>
<th>3275</th>
<th>4006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass Gap</td>
<td>19.1 cm</td>
<td>15.2 cm</td>
</tr>
<tr>
<td>Extension</td>
<td>314.3 cm</td>
<td>312.4 cm</td>
</tr>
<tr>
<td>Swath</td>
<td>609.6 cm</td>
<td>609.6 cm</td>
</tr>
</tbody>
</table>

### Standard Wing - Mark Extension

<table>
<thead>
<tr>
<th></th>
<th>3275</th>
<th>4006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass Gap</td>
<td>19.1 cm</td>
<td>15.2 cm</td>
</tr>
<tr>
<td>Extensiona</td>
<td>316.9 cm</td>
<td>318.8 cm</td>
</tr>
<tr>
<td>Swath</td>
<td>614.7 cm</td>
<td>622.3 cm</td>
</tr>
<tr>
<td>Average spacing</td>
<td>19.2 cm</td>
<td>15.6 cm</td>
</tr>
</tbody>
</table>

a. Pass gap = row spacing

To change marker extension, on a lowered drill:

1. Fully extend a marker.
2. Pull forward approximately 2 m, to leave a mark and a furrow.
3. Loosen the jam nuts (1) and set screw bolts (2) securing the outer marker arm.
4. Slide the outer arm in or out until the disk is at the desired extension distance.
5. Secure the set screws and jam nuts.
6. Fold the marker.

### Marker Speed

There is one adjustment screw for unfolding speed (1) and one for folding speed (2). You can identify adjustment screws by markings stamped in the valve body. The screw marked Raise controls the folding speed. The screw marked Lower controls unfolding speed.

Turn the adjustment screws clockwise (S) to decrease folding/unfolding speed and counter-clockwise (F) to increase folding/unfolding speed.

With the tractor idling at a normal operating speed, adjust marker folding to a safe speed. Excessive folding/unfolding speed can damage markers and void the warranty.

After adjusting the folding speed, tighten the jam nuts on the hex adjustment screws to hold the settings.

### Marker Disk Adjustment

Adjustments for marks are as follow:

1. Loosen the nuts (1) securing the guard (2) and bracket (3). Change the angle of mark by shifting the bracket, which has slotted holes. Align the guard with the disk edge. Tighten the nuts. Check marker extension again.
2. For a larger change in mark angle, the bracket has a choice of small slotted holes on one side. Loosen both nuts. Remove the bolt on the two-hole side. Insert the bolt in the alternate hole. Align the guard with the disk edge. Tighten the nuts. Check the marker extension.
3. Mark visibility may be enhance by inverting the disk (4) on the disk axle. Remove the outer axle nuts (not shown). Invert the disk and depth gauge. Secure with nuts.

5. Coulter Depth (Option, page 62) - Coulters prepare the furrow ahead of the openers. If coulters are running too shallow or too deep, the openers may not operate at the desired depth.

6. Row Unit Spring Adjustment (page 65) - Several rows in tire tracks may need to be set to higher down-force in challenging conditions.

7. Opener Wear (page 65) - Over time, opener disk wear can cause T-handle settings to become too shallow.

---

3. Mark visibility may be enhance by inverting the disk (4) on the disk axle. Remove the outer axle nuts (not shown). Invert the disk and depth gauge. Secure with nuts.

---

Overlap or Excess Gap Risk
Check marker extension after adjusting. These adjustments may cause minor or major changes to marker extension, which could result in incorrect gaps between passes or pass overlaps.

### Planting Depth Adjustments

1. **Soil Conditions** - Changes in field conditions can require changes to several of the adjustments below.

2. **Row Unit Opener Depth** (page 66) - The T-handle directly controls opener depth by setting the press wheel height.

3. **Tool Bar Height** (page 58) - Spacers at the center section (master) lift cylinders control the center section tool bar height when the implement is lowered. Wings must also be level (page 62) for this adjustment to accurately set wing gauge wheel height.

   In more challenging conditions, increased cart weight transfer (page 59) may be required to prevent openers from lifting tool bar.

4. **Wing Weight Transfer** (page 59) - If the wings are not operating at desired planting depth, more center section weight may need to be transferred to wings.

---

Adjusting Tool Bar Height
See “Drill Height and Leveling” on page 23 for how to check tool bar height. To change the tool bar height, add or remove master lift cylinder rod spacers (1), in the combinations shown in the chart at the bottom of this page.
To change spacers:
1. Lift the drill (page 31).
2. Add or remove spacers. Unused spacers are stored on rod loops welded to the cart-implement link. If you store spacers on hoses, make sure they cannot slide into locations where they interfere with implement operation.

The cylinder has 5.7cm of exposed rod when fully retracted, for a minimum tool bar height of 58.4cm. All spacer combinations that increase tool bar height above the minimum must be a stack of at least 5.7cm in height.

Each full cm of spacer stack height modification changes the tool bar height by 2cm. Do not use a spacer stack taller than 10.2cm, or the furrow will be too shallow, or there will be no furrow at all.

Chart values are approximate. Press wheel settings, disk wear and manufacturing tolerances can cause actual heights and depths to vary from chart values. Choose spacer combinations based on actual field measurements.

<table>
<thead>
<tr>
<th>Maximum Opener Depth</th>
<th>Maximum Disc Blade (Coulters) Depth</th>
<th>Tool Bar Height</th>
<th>Spacer Stack Height</th>
<th>Spacers Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.1 cm</td>
<td>3.8 cm</td>
</tr>
<tr>
<td>10.2 cm</td>
<td>11.4 cm</td>
<td>58.4 cm</td>
<td>5.7 cm</td>
<td>X</td>
</tr>
<tr>
<td>8.9 cm</td>
<td>10.2 cm</td>
<td>59.7 cm</td>
<td>6.4 cm</td>
<td>X</td>
</tr>
<tr>
<td>7.6 cm</td>
<td>8.9 cm</td>
<td>61.0 cm</td>
<td>7.0 cm</td>
<td>X</td>
</tr>
<tr>
<td>6.4 cm</td>
<td>7.6 cm</td>
<td>62.2 cm</td>
<td>7.6 cm</td>
<td>X</td>
</tr>
<tr>
<td>5.1 cm</td>
<td>6.4 cm</td>
<td>63.5 cm</td>
<td>8.3 cm</td>
<td>X</td>
</tr>
<tr>
<td>3.8 cm</td>
<td>5.1 cm</td>
<td>64.8 cm</td>
<td>8.9 cm</td>
<td>X</td>
</tr>
<tr>
<td>2.5 cm</td>
<td>3.8 cm</td>
<td>66.0 cm</td>
<td>9.5 cm</td>
<td>X</td>
</tr>
<tr>
<td>1.3 cm</td>
<td>2.5 cm</td>
<td>67.3 cm</td>
<td>10.2 cm</td>
<td>X</td>
</tr>
</tbody>
</table>

**Weight Transfer**

**Crushing Hazard**

This adjustment requires working near the unfolded and lowered drill with the hydraulic system active. Assign two people to this task, one in the tractor cab ready to shut down the tractor. Keep clear of wings and openers while adjusting. Keep all bystanders well away. Serious injury or death will result if you are caught between lowering openers and ground, or raising openers and drill frame.

**High Pressure Fluid Hazard:**

Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. Check all hydraulic lines and fittings before applying pressure. Use paper or cardboard, not body parts, and wear heavy gloves to check for suspected leaks. If injured, seek immediate medical attention from a physician familiar with this type of injury.

**Falling Hazard**

Do not use tires as steps or platforms. At higher transfers, cylinders can lift cart wheels sufficiently for them to spin.

**Weight Transfer Operation**

During field operations, the fold cylinders distribute center section weight to the wings. The wings are much lighter than the center section, so some weight needs to be transferred. The wing-transfer valve controls the amount of weight transferred.

The wing transfer valve needs an initial setting and possible later adjustment. If insufficient weight is transferred, the wings run higher than the center section. If excess weight is transferred, the center runs higher.

The center section lift lock and cart-transfer functions share a hydraulic circuit. There needs to be some circuit pressure for a pilot-operated check valve to switch between functions. Also, at higher row unit down-forces, there may be insufficient total...
implement weight. A pair of cylinders between the cart and implement allow some of the cart weight to be transferred to the implement. The cart-transfer valve controls the transfer.

The cart transfer valve may often be left at 100 psi value.

<table>
<thead>
<tr>
<th>Bypass Valve (S/N C1009F-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The weight transfer bypass valve must be adjusted before adjusting the weight transfer circuit.</td>
</tr>
<tr>
<td>A bypass valve is plumbed into the weight transfer circuit. Tractors with load-sensing, closed-center hydraulics require this bypass valve to protect the tractor hydraulic system.</td>
</tr>
<tr>
<td>If you are unsure what type of hydraulic system is on your tractor, contact your tractor manufacturer.</td>
</tr>
</tbody>
</table>

### Tractors with Pressure Compensating Closed Center Hydraulics (PC Closed)

Close the bypass valve for no oil flow by turning the knob on the valve clockwise completely. Always operate the drill with the bypass valve closed.

### Tractors with Load Sensing Closed Center Hydraulics (LS Closed) or Pressure Flow Compensating (PFC) Systems

The weight transfer bypass valve must be adjusted to protect the tractor. Do the following procedure.

**Equipment Damage Risk**

Failure to use the bypass valve on load-sensing tractors may cause major tractor damage.

1. Release the lock ring (1) on the bypass valve (2).
2. Turn the knob on the bypass valve (3) all the way clockwise to the closed position.

3. Tighten the lock ring.

4. On the tractor, turn the flow on this circuit down to no more than 45.5 litres/min.

5. Engage the tractor hydraulics to the weight transfer circuit. Lock the hydraulic lever on the tractor for continuous operation.

6. Adjust both weight transfer circuits so the gauges are at 1800 psi.

7. While watching the gauges on the drill, slowly turn the knob on the bypass valve counterclockwise. Adjust the bypass valve just until the needles on the gauges begin to move down from 1800 psi. Lock the bypass valve at this setting.

   As the pressure increases, the cart will raise off the ground.

8. Adjust the pressure-control valves on the drill to the desired weight transfer circuit pressure as explained under “Weight Transfer Operation” on page 59.
Set the bypass valve as low as possible while staying at least 300 psi above the weight transfer circuit setting.

**Tractor Damage Risk**
The higher the bypass pressure, the greater the potential for oil heating and tractor damage.

While 1800 psi is a good starting point for setting the bypass valve, if you consistently operate the drill with low weight transfer circuit pressure you can set the bypass valve below 1800 psi. If you consistently operate the drill with very high weight transfer circuit pressure, you may need a bypass-valve setting above 1800 psi.

**Weight Transfer Preparation**
A relief valve prevents operating the wing-transfer at over 1500 psi.

**Potential Planting Risk**
To avoid planting problems, do not exceed 1500 psi for wing-transfer, and 1000psi for cart-transfer.

1. Hitch the drill to a suitable tractor. Hydraulic power must be available for this adjustment.
2. Unfold the implement. The wing transfer adjustment cannot be made with the wings folded. Set the circuit to neutral.
3. Lower the drill in a level area of the field. Pull forward to put openers in the ground.

**Wing Weight Transfer Adjustment**
1. Release the lock ring (1) on the wing-transfer valve.
2. Adjust the knob (2) while watching the gauge (3).
   - Increase the weight transfer to wings by turning the knob clockwise.
   - Reduce the weight transfer to wings by turning the knob counterclockwise.
3. Set pressure to at least 250 psi.
4. Secure the setting with the lock ring.

**Cart Weight Transfer Adjustment**
1. Release the lock ring (4) on the cart-transfer valve.
2. Adjust the knob (5) while watching the gauge (6).
   - Increase the weight transfer to wings by turning the knob clockwise.
   - Reduce the weight transfer to wings by turning the knob counterclockwise.

3. Set pressure to at least 100psi.
4. Secure setting with lock ring.

**Testing Weight Transfer Adjustments**
1. Pull forward in the ground. Check the opener and coulter (option) penetration. Compare the wings to the center section.

   Wing operating height is also affected by a leveling eye bolt adjustment.

2. During field operations, monitor the coulter and opener depth of the wings and coulter section. Adjust the weight transfer as required for consistent depth across the drill.
Implement Leveling

When fully raised, the opener tool bars of all three sections should be at the same height. This measurement is most accurately made on a flat paved surface.

Implement operating height/level is controlled at several points:

- Center frame tool bar height is controlled by spacers on the lift cylinder rods.
- Front-to-back level is automatic. User adjustment of the lift link is not recommended. In the event of dismount during maintenance or repair, factory link length is 2020 mm center-to-center.
- Wing tip tool bar height is primarily controlled by gauge wheel cylinders.
- Wing tilt is controlled by wing weight transfer. The weight transfer adjustment necessary varies with field conditions.

Wing Leveling Eye Bolts

Wing tip tool bar height is normally set by the wing lift cylinders. These are rephasering cylinders operating as slaves to the center section (master) lift cylinders. The master cylinder lowering limit is set by spacers.

If wing tip tool bar height is not the same as the center section tool bar height, make these checks before considering any adjustment to the eye bolts:

1. Make sure the lift system is charged and bled. If there is any air in the system, the wing heights may not track the center height (or each other).
2. Make sure the lift system is rephasered. If the wing cylinders are not tracking the center cylinders, rephase the cylinders.
3. Check tire inflation.

4. Make sure weight transfer is properly set for conditions. If the wing gauge wheels are off the ground (or nearly so), there may be too little weight transfer. If the center section is running high, and the wing ends are low, there may be too much transfer.

5. Check the current eye bolt setting. Before any adjustment, make sure that it was at the factory-recommended setting. The distance (A) from the base of the cylinder lug tube (1) to the flat top of the eye bolt lug (2) is factory-set to 57 mm.

To adjust the gauge wheel height:

6. Unfold the implement on flat ground. Fully raise the implement.
7. Loosen the jam nut (3).
8. Set the gauge wheel height with the adjust nut (4). Adjust until the opener tool bar height at the wing tip is the same as center opener tool bar height.
9. Tighten the jam nut.

If the left and right wing cylinders are not operating identically, the problem is hydraulic, and not a mechanical adjustment.

Frame-Mounted Coulter

Frame-mounted coulter are used in-row and prepare the soil directly ahead of the seed furrow.

The factory suggested default setting with new coulter blades at 3.8 cm opener (planting) depth (A), is a coulter depth (B) of 5.1 cm, or 13 mm below opener depth.
Frame-Mounted Coulter Adjustments

There are several frame-mounted coulter adjustments:

1. Frame height directly controls the group coulter depth (B).
   If the center frame is not running at the correct height, coulter depth is also incorrect. See “Adjusting Tool Bar Height” on page 58.
   Wing frame height is controlled by the center frame height, and is affected by wing weight transfer. See “Wing Weight Transfer Adjustment” on page 61.

2. A few individual rows may be lowered by loosening the nuts (1) at the tool bar u-bolts, sliding the spring bar (2) down and tightening the nuts. Do not lower more than about 2.5 cm Keep the top edge of the spring bar at or above the top of the upper bolt holes.

3. Individual coulter down-force is a spring adjustment for rows in tracks, or all rows - in unusually light or heavy no-till conditions.

4. Coulters are factory aligned so that the coulter disk prepares the furrow directly ahead of the opener disks.
   After any coulter or row maintenance, check that these components are still aligned. Adjust at the coulter mounting clamp on the tool bar. Check coulter height again if any adjustments are made.
   In regular or heavy no-till conditions, adjust opener depth to set the coulter depth to about 13mm deeper than seeding depth.
   In addition to checking depths at setup, be sure to check actual seeding results while planting.
   Replace the 432mm coulter blades when the diameter is less than 400mm.

Frame-Mounted Coulter Force

In normal operation at target running depth, the spring is at full extension or only slightly compressed. It compresses briefly as obstructions and denser soil are encountered.

Coulter springs are set to 181 kg. In normal operation at target running depth, the spring is at full extension. It compresses briefly as obstructions are encountered.

- In heavy no-till conditions, the springs may be in compression most of the time. This means that the blades are not reaching the desired coulter depth. If drill weight is available, increase the spring down-force to compensate.
- In light, rocky conditions, the factory spring setting may be higher than needed. Extend blade life by reducing the force at which the blades ride up over obstructions.

To adjust the coulter spring:

1. Unfold the implement. Configure the implement for the maintenance lift lock (page 69).
2. Determine the new spring length (1) desired. See the table.
3. Measure the current length of the spring(s) to be changed. If a spring is already shorter than 24.8 cm or longer than 26.0 cm do not adjust.
4. Loosen the jam nut (2).
5. Rotate the adjuster nut (3) until the spring is at the new length. Tighten the jam nut.

<table>
<thead>
<tr>
<th>Spring Length</th>
<th>Force at Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.0 cm</td>
<td>136 kg</td>
</tr>
<tr>
<td>25.4 cm</td>
<td>181 kg</td>
</tr>
<tr>
<td>24.8 cm</td>
<td>238 kg</td>
</tr>
</tbody>
</table>

**Machine Damage Risk**

Do not use spring lengths shorter than 24.8 cm. It may contribute to premature parts failure not covered by warranty.

If all springs are continuously in compression, the coulters can lift the wing frames off the ground at the gauge wheels, resulting in uneven coulter depth and/or uneven seed depth. If the drill is already operating at maximum down-pressure, reduce the coulter depth.

**07 Series Row Unit**

A 07 Series row unit can include the following capabilities:

Frame-mounted coulter (1) - optional. See “Frame-Mounted Couler Adjustments” on page 63.

Down pressure spring (2) - standard. Each row unit is mounted on the implement with arms which allow the row unit to independently move up and down. The adjustable spring sets the force at which the opener rides up over obstructions. See “Row Unit Spring Adjustment” on page 65.

Disk blades (3) - standard, 2 per row unit. Double disk blades open a furrow, creating the seed bed. Spacers adjust the blades for a clean furrow. See “Disk Blade Adjustments” on page 65.

Seed delivery tube (4) - standard. This tube delivers material from hopper I on single-hopper or double-shoot drills. It delivers material from both hopper I and hopper II on single-shoot drills. No adjustments are necessary.


Seed firmer (6) - seed flap is standard. A seed flap requires no adjustment, other than replacement when worn. The Seed-Lok™ firming wheel option improves seed-soil contact. See “Seed-Lok™ Firming Wheel” on page 66.

Press wheels (7) - standard with a choice of type. The press wheel closes the seed trench. The press wheel also supports the free end of the row unit, and provides the primary control over seeding depth using the T-handle (8). See “Opener Depth - Press Wheel Height” on page 66.

Dry fertilizer tube (9) - optional. This tube delivers material from hopper II on double-shoot drills. The delivery angle is adjustable (page 67).
Row Unit Spring Adjustment
Row unit springs normally require no adjustment. The factory setting for the row unit springs is:

1. Spring length - 32.4 cm
2. Assembly length - 56.2 cm

In some unusual conditions, rows in tire tracks may need to be set heavier.

**Machine Damage Risk**

Do not use spring lengths shorter than 29.8 cm. It may contribute to premature parts failure not covered by warranty.

1. Make adjustments with the wings unfolded and the rows lifted off the ground, so that the springs are at full extension.
2. Loosen the jam nut (3). Rotate the adjuster nut (4). Shorten the spring to increase down-force, lengthen the spring to reduce down-force.
   For each turn of the adjuster nut, the down force at the opener disk changes by approximately 1.7 kg/turn
3. Tighten the jam nut after setting the force.

Disk Blade Adjustments

**Sharp Object Hazard**

_Coulter and disk blades are sharp. To avoid serious injury, wear gloves when working in this area._

Opener disk angle and stagger is not adjustable, but disk-to-disk spacing is, and may need attention as disks wear. Spacers will need to be reset when blades are replaced.

The ideal spacing causes the blades to be in contact for about 25 mm. If you insert two pieces of paper between the blades, the gap between them should be 0 to 44 mm (A).

If the contact region is significantly larger or smaller (or there is no contact at all), adjust by moving one or more spacer washers. If the contact region varies with blade rotation, one or both blades is likely bent and needs replacement.

**Adjusting Disk Contact**

1. Unfold the implement. Configure the implement for maintenance lift lock (page 69).
2. Remove the bolt (1) keeping the opener disk on one side. Carefully remove the blade (2), noting how many spacers (3) are outside the disk and inside the disk. Do not lose the hub components and spacers.
3. To reduce the spacing between the disks, move one spacer washer from the inside to the outside of the disk.
   When installing new blades, it is generally necessary to move outside spacers back inside after both disks are mounted.
4. Assemble and check the disk contact.
Disk Scraper Adjustments

**Sharp Object Hazard**

Coulter and disk blades are sharp. To avoid serious injury, wear gloves when working in this area.

Slotted disk scrapers are standard. Spring-loaded carbide disk scrapers are optional.

To keep opener disks turning freely, dirt scrapers are mounted between disks to clean as disks rotate.

As field conditions vary, scrapers may need to be adjusted. In damp conditions, lower scrapers. If openers are not turning freely, raise scrapers. To adjust, loosen the bolt and move the scraper as needed.

Seed Firmer Adjustments

**Sharp Object Hazard**

Coulter and disk blades are sharp. To avoid serious injury, wear gloves when working in this area.

A row unit includes a seed flap (1), and accepts an optional seed firmer.

The seed flap requires no adjustment, but may need to be replaced if worn, or may need to be shortened if an optional seed firmer is added.

Seed-Lok™ Firming Wheel

An optional Seed-Lok™ firming wheel provides additional seed-to-soil contact. The wheels are spring loaded and do not require adjusting.

In some wet and sticky conditions the wheels may accumulate soil. To avoid problems associated with this, you can lock-up the Seed-Lok wheels:

1. Pull the catch wire aside (1).
2. Pull up on the arm (2).
3. Engage the wire.

Opener Depth - Press Wheel Height

Set opener seeding depth (A) by adjusting press wheel height.

To adjust, first raise the openers slightly, then lift and slide the T-handles (1). Adjust all press wheels to the same height.

- Each increment of the handle adjusts the seeding depth by approximately 3.2 mm. The range is approximately 0 to 89 mm seeding depth.
- For more shallow seeding, slide T-handles forward (2) toward the implement.
- For deeper seeding, slide the T-handles back (3) away from the implement.
If moving the T-handle back does not cause the opener to achieve the desired depth, lower the coulters by lowering the frame height, and increase weight transfer pressures if necessary.

If coulters are installed, set the coulter depth with the tool bar height. Adjust the opener depth to be 13 mm shallower.

If no coulters are installed, adjust the tool bar height so the opener frame runs level at the desired seeding depth.

**Fertilizer Tube Adjustment**

On a double-shoot drill, deeper dry fertilizer placement may be achieved by rotating the fertilizer tube (1) to face forward. This orientation is suggested only if the seed firmer is a seed flap (2).

If a Seed-Lok™ firming wheel is present, fertilizer falls on the firmer and may be scattered rather than placed deeper.

-- Image of the fertilizer tube adjustment.

---

**Speed (Radar) Calibration**

Refer to the DrillCommand User Guide for speed calibration.

**Tramline Motors (Option)**

Before installing motors, close all implement openers from your terminal. This will make sure that tramlines are formed uniformly.

Tramlines are controlled using the DrillCommand software. In addition to the software, you must fit your machine with tramline motors (1) that will shut off the flow of seed to the desired openers.

To make changes to tramline patterns, locate the desired opener numbers on the back of your machine. Follow the seed hose to the corresponding tower port. Attach a motor underneath each valve needed for tramline. Secure each motor using the four supplied bolts.

Remove any pre-existing motors from opener valves (2) and install motors to valves necessary to create the desired tramline patterns.

---

**Parking**

Follow these steps when parking the drill for periods of less than 36 hours. For longer periods, see “Storage” on page 68.

1. Park the drill on solid, level surface.
2. If the drill has air brakes:
   a. Stop the engine and apply the parking brake.
   b. Open the drain valve on the air reservoir and drain any water. Close the drain valve.
   c. Start the engine.
3. To reduce tongue weight, raise, fold, and lock the implement (page 30).
4. Put the tractor in park, apply tractor parking brake. Stop the engine and take the key with you.
5. If the drill is equipped with brakes, apply the parking brake on the drill.
6. Check that hopper lids are latched, and secure the hopper lids with security cable or padlock and chain to prevent entry by children. See “Hopper Lid Closing” on page 37.
7. Remove the jack (1) from storage position and pin securely to lifting stob on outside of drill tongue. See “Hitch Tractor to Drill” on page 18.

8. If the ground is soft, place a wide block or plate under the jack to increase contact area.

9. Securely chock tires to prevent the jack from digging or sliding off the plate.

10. If the drill has hydraulic brakes:
   a. Disconnect the hydraulic line from the tractor. Store the fitting of the hydraulic line in the holder on the tongue.
   b. Untie the rope for the emergency valve from the tractor. Coil the rope onto the emergency valve.
   c. Rotate the shaft in the emergency valve to clockwise to apply the brakes.

11. If the drill has air brakes:
   a. First, disconnect the red-coded (control) gladhand. This will cause the air reservoir to pressurize the brake system and apply the brakes.
   b. Next, disconnect the yellow-coded (supply) gladhand.
   c. Close the covers on the gladhands.
   d. Store the gladhands on the tongue.

12. Disconnect the electrical lines and protect with any plugs or caps provided.

13. Release pressure on the hydraulic system, then disconnect the hydraulic lines and pull all lines back onto the tongue of the drill. Store the hoses ends in keyholes of the hose holder bracket. The largest hole is reserved for the sump line.

14. If equipped, disconnect the safety chain.

15. Unhitch from the tractor.

### Storage

Store the drill where children do not play. If possible, store inside for longer life.

1. Unload all material in hoppers. See “Unloading Hopper Materials” on page 71.

2. Raise, fold and lock implement (page 30).

3. For unfolded storage:
   a. Raise and unfold the implement.
   b. Install the gauge wheel lock channels.
   c. Initiate a fold just until the center lock engages.
   d. Lower the implement onto the lock channels.
   e. Set all hydraulic remotes to float.

4. Unlatch the hopper lids so the seals are not in compression during storage. Route a chain or security cable through the hold-down u-bolt and the latch handle to prevent unauthorized entry, and prevent high winds from opening the lid.

5. Follow the steps in “Parking” on page 67, except for step 6.

6. Lubricate the drill at all points listed in “Maintenance” on page 69.

7. Check all bolts, pins, fittings and hoses. Tighten, repair or replace parts as needed.

8. Check all moving parts for wear or damage. Make notes of any parts needing repair or replacement before the next season.

9. Set meter doors to slightly open, but not wide enough for animals to enter the meters. Wire doors in place if needed. Do not store the drill with seals compressed.

10. Raise and latch the ladders, to discourage climbers.

11. Clean drill of mud, dirt, excess oil and grease.

12. Apply grease to exposed cylinder rods to prevent rust.

13. Use touch-up paint to cover scratches, chips, and worn areas to prevent rust.
Maintenance

Proper servicing and maintenance is the key to long implement life. With careful inspection, you can avoid costly maintenance, downtime and repair.

Always turn off the tractor and remove the tractor key before making any adjustments or performing any maintenance.

**Crushing Hazard**

Always use center section and gauge wheel lift locks when working near or under a raised implement. A falling implement can result in severe injury or death.

**High Pressure Fluid Hazard:**

Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. Check all hydraulic lines and fittings before applying pressure. Use paper or cardboard, not body parts, and wear heavy gloves to check for suspected leaks. If injured, seek immediate medical attention from a physician familiar with this type of injury.

| Maintenance Schedule |
|----------------------|-----------------|----------------|
| **Maintenance Point** | **Type of Maintenance** | **Frequency**          |
| Wheel hardware (page 102) | Check torque | Daily          |
| Hopper straps (page 70) | Inspect tension | Frequently on new drill, then periodically |
| Marker tilt bearings (page 83) | Lubricate grease fittings | Every 8 hours |
| Coulter grease bank (page 84) | Lubricate grease fittings | Every 10 hours |
| Coulter hub bearings (page 84) | Lubricate grease fittings | Every 100 hours |
| Air brake air reservoir (page 79) | Drain | Before storage and daily when humid |
| Air brake filter (page 79) | Clean | Seasonal or more often in dusty conditions |
| Hopper lid seal (page 71) | Inspect and replace as needed | Seasonal or if air leaks detected |
| Meter door seals (page 71) | Inspect and replace as needed | Seasonal or if air leaks detected |
| Cart brakes (page 80) | Check for wear or damage | Seasonal or every 9600 km |
| Hopper straps (page 70) | Check for wear and damage | Seasonal |
| Hopper lid (page 71) | Multi-purpose oil | Seasonal |
| Caster brakes (page 82) | Inspect UHMW piston | Seasonal |
| Caster lock pin (page 82) | Lubricate with silicon spray | Seasonal |
| Parking brake (page 84) | Lubricate grease fittings | Seasonal |
| Cart wheel bearings (page 84) | Clean and pack bearings | Seasonal |
| Implement wheel bearings (page 84) | Clean and pack bearings | Seasonal |
| Brake actuating shaft (page 84) | Lubricate grease fittings | Seasonal |

**Crush and Pinch Hazards**

Do not rely on hydraulics to hold the implement at lift. Use the maintenance lift locks provided. Unlocked lift cylinders settle over time and may result in serious injury or death to anyone working underneath.

Do not rely on the transport lift lock to hold the wings at raised. Use the gauge wheel lock channels provided. Unlocked gauge wheel cylinders settle over time and may result in serious injury or death for anyone working underneath. Openers at wing gaps can pinch anyone working between them. Opener damage is also possible.
Regular Maintenance

After using the drill for several hours, check all bolts to be sure they are tight.

- Securely lock up drill before working on it.
- Lubricate areas listed under “Lubrication” on page 83.
- Check for air leaks at lids, doors, seals, caps and hose connections.
- Inflate tires as specified in the “Tire and Wheel Information” on page 102.
- Replace any worn, damaged or illegible safety decals. Order new decals from your Great Plains dealer. See “Safety Decals” on page 5.

Maintenance Lift Lock

Locks, including gauge wheel cylinder locks, are provided to hold all implement sections at raised for maintenance, and for raised unfolded storage. The gauge wheel lock channels are not used in routine operations (field or transport).

Before engaging the maintenance lift lock, unfold the implement.

1. Raise the unfolded implement.
2. Install the gauge wheel lock channels. Remove the channels (1) from the wing lugs (2) and pin to the cylinder rods (3).
3. With the implement still fully raised, begin folding (page 28) just long enough for the center lock cylinder (4) to extend and engage the center lock lug (5).
4. Lower the implement.

Maintenance Lift Unlock

1. Raise the implement.
2. Remove the gauge wheel lock channels. Return them to storage.
3. Lower the implement just long enough to disengage the center lock.

To fold, leave the center lock engaged, and fold the implement (page 28).

Hopper/Meter Maintenance

Hopper Straps

On a new drill, as the hopper seat, check the hopper straps frequently. Periodic inspection is further required due to continued hopper seating and strap stretching.

Check the hopper strap tension before and after filling a hopper, and at the end of each day. Seasonally inspect the straps for wear and damage. Replace any that are frayed or torn.

Tighten the nuts on the tensioning bolts (1) until the straps cannot slide side to side on the hopper face (2). Then tighten the nuts two additional turns.
Hopper Lid
There are four pivot points and one swivel point on each hopper lid that requires a multi-purpose oil lubricant seasonally. Coat each point thoroughly.

Seasonally inspect each hopper lid seal. Inspect if air leaks are detected. Replace if missing, torn, permanently compressed, or otherwise damaged. Do not tightly close lids for extended periods.

Meter Door Seals
Inspect each meter door seal seasonally. Inspect if air leaks are detected. Replace if missing, torn, permanently compressed, or otherwise damaged. Do not tightly close meter doors all the way for extended periods.

Unloading Hopper Materials
Unloading materials has the same risks as loading material. Review the instructions on page 41.

Entrapment and Rapid Suffocation Hazard
Never enter a hopper for loading or unloading.

Possible Chemical Hazard
Agricultural chemicals can be dangerous, including treatments on seeds, and components of fertilizers. Improper use can seriously injure persons, animals, plants, soil and property.

Unloading Procedure
1. Unless using an auger for unloading, position the drill on a clear flat surface. Put the tractor in park. If using an auger, unloading is a two-person operation.
2. Shut off the tractor unless using the tractor hydraulics for auger operations.
3. Place a tarp or the auger inlet under the metering hoses (1) at the rear of the drill.
4. Locate the calibration diverters (2) for the metering hoses. Slide the calibration diverters to the open position. Seed will exit out the metering hoses.
5. Start the tractor engine. Operate the fan and put the terminal in calibration mode.
6. If using an auger, have everyone stand clear, and test the auger controls.
7. Locate the yellow button (3) on the left-hand side of the machine near the ladder (4). Squeeze the yellow button and the collar under the yellow button and pull them out approximately 16 mm. The yellow button is now in the ON position. Expect material to flow in significant volume until the hopper is empty. Inspect the hopper from the lid to confirm that it is empty.

8. When the hoppers are empty, press the yellow button to the OFF position.

9. Stop the fan. Stop the tractor engine and take the key with you.

10. Slide the calibration diverters to the closed position.

11. Raise the latch for the chute (5). Pull the outside end of the chute to the outside and down. The chute must be down for the levers to open the doors in the seed meter.

12. Rotate the front handle (6) all the way down to open the front meter door. A small amount of material may fall out when the meter doors are opened.

13. Blow out the meters with air to remove all material.

14. If the drill will not be used again for an extended period, complete the steps at “Material Clean-Out” starting on page 73.

15. Move the drill from the collection area and recover materials.

16. Wipe down the meter doors and the bottom of the meter.

17. Close both meter doors. For temporary parking or transport, fully close the meter doors. For storage, close the meter doors only until elastomer seals begin to touch the meter housing, so that condensation can drain. Do not leave the meter doors open wide enough for pest entry.

18. Raise the chute. Push the chute toward the middle of the cart. Engage the chute latch. If the chute door is down, this is an indication that the doors in the seed meter could be open. Close the doors and raise the chute before operating the drill.
Material Clean-Out

Confined Space and Suffocation Hazard

Do not enter hopper for routine cleaning or meter maintenance. You can be overcome by hazardous fumes very quickly, even in an empty hopper with the lid open. A partially full hopper, even with no bridging present, is a suffocation risk. Oxygen levels may be insufficient and/or dust levels may be too high for breathing.

Regulations and Policies

These steps apply when there are no specific clean-up requirements provided by national, regional or local regulation, nor by the seed and/or fertilizer supplier. Review any legal requirements, instructions on the material containers, and any material safety data sheets.

For normal unloading of materials after planting, see “Unloading Procedure” on page 71.

This section covers completely cleaning out hopper and air system when residue needs to be minimized.

1. Perform normal material unloading, then fold and lock the drill to prepare for moving to a site suitable for wash-out.
2. Reposition the drill to a suitable site with rinse water and hose available. This may be two different sites if each hopper contained different materials.
   If no otherwise suitable location is available, perform a fertilizer or treated seed clean-out on an up-hill portion of the field last planted or treated.
3. Leave the tractor hitched and in park with the parking brake set. If the tractor cannot be left hitched, block the drill tires with chocks.
4. Deploy a ladder.
5. Remove and clean the strainer. While the strainer is removed, inspect the hopper for signs of problems that may prevent normal clean-out, such as objects or congealed masses too large to exit through the meter (see “Problem Clean-Outs”).
6. Power wash the interior of the hopper.
7. Install the strainer. Do not leave the strainer out after wash-out. Close the lid tight and secure the handle.
8. After cleaning out the last hopper, close all doors. Run the air system for 10 minutes to blow moisture out of the meters and lines.
9. Open all meter doors. Run air for 5 minutes.
10. Shut off air. Clean the meter door seals and meter box faces.
11. Close meter doors as for parking or storage.
12. Move the drill to a parking or storage site. Follow normal parking or storage instructions.

Problem Clean-Outs

If parking and storage recommendations have not been followed or material is defective, it is possible to have hard-to-remove material present.

If the material fails to pass through the meter doors, take the following steps to remove it. Do not consider entering the hopper until first completing these tasks.

1. Open both meter doors.
2. Remove the strainer and evaluate the problem. For example:
   - If the problem is a single movable large object, such as a dead animal, fishing out from above may be the solution.
   - If the problem is congealed materials, scoop out a sample from above and see if the mass dissolves in water. If so, and there is a small amount of material involved, rinsing, or rinsing and pumping the hopper from above may be the solution.
3. For small amounts of residual materials, poking with a long pole may push it through the clean-out.
   If poking does not produce results, and you intend to try wash-out, poke at least one hole down to the meter clean-out, so that water can flow out.
   If wash-out is attempted, start with a small amount of water, and make sure that it appears at the clean-out within 15 minutes. If not, you will just be adding water to the problem. The hopper is not designed to hold water at full capacity. Do not add any more water.
Hopper Entry

Entrapment and Suffocation Hazard

Never enter a hopper for any reason unless you fully comply with applicable laws, regulations, rules, agreements and the instructions in this section. Where applicable laws, regulations, rules, and agreements contradict an instruction below, do no follow that instruction.

Normal use of the hopper and routine maintenance do not require entry.

The hopper vent tube structure includes features to aid emergency egress. It is not intended for routine entry.

Do not remove the vent tube structure, as it is required for pressure-balancing the air space above the material.

Depending on their use, the material hoppers may be or become “permit-required confined spaces” under U.S. OSHA regulations (29 CFR 1910.146) and similar regulations, statutes, insurance agreements and local business policy. A written policy and permitting process may be required for any hopper entry.

Hopper entry may be necessary in some unusual circumstances, such as:

- hopper level or pressure sensor replacement, or
- removal of obstructions too difficult to pull out with the meter box removed and not susceptible to fishing or pumping out from the open lid.

Should such a situation arise, observe the following precautions:

1. **Evaluate the hazards** - Review the materials safety data sheets (MSDS) for any treatments and/or fertilizers used in the hopper since it was last thoroughly cleaned, and the most recent materials even if the hopper was cleaned. Retain the MSDS information for any medical treatment that might be required.

2. **Designate or engage a team** - Hopper entry is never a single-person activity. At least one attendant/observer is necessary. Give priority to individuals already trained in confined space operations. Designate a leader (who will not be the entrant) with authority to terminate the activity.

3. **Protect the team** - Obtain the necessary safety equipment specified for confined space exposure to those materials, paying particular attention to safety harness/line, and respiratory support and protection. This may include contaminant detection equipment and positive ventilation to refresh air in the hopper.

4. **Equip the team** - At least one attendant must be equipped with communications capability, to summon outside aid in the event that the hopper worker is overcome. Equip the entrant with a safety harness and safety line.

5. **Train the team** - Review the hazards. Review the procedures. Understand the use of the protective equipment. Know the steps to take in emergencies. Practice them. Train the observer to summon aid, and not attempt hopper entry if the entrant is overcome.

6. **Secure the drill** - Set brakes or block the wheels of drill to prevent movement.

7. **Disrupt crusting or bridging** - From outside the hopper, break up any hard surfacing on top of the material, or forming layers within the material.

8. **Empty the hopper** - Follow the steps at “Unloading Procedure” on page 71. If a blockage makes this impossible, use an external pump line to remove as much material as possible without performing a hopper entry. Pump until at least some material is exiting the meter doors. Leave the meter doors open.

9. **Clean the hopper** - From the outside at the walkboard, power-wash the inside of the hopper. Use a mild detergent sprayer. Rinse thoroughly.

10. **Air the hopper** - Leave the hopper lid and meter doors open, and do not begin work until the rinse water has completely evaporated.

11. **Plan the work** - Postpone the work if any team members, equipment or other resources are missing, or weather/lighting conditions are not favorable. Terminate and evacuate if any unexpected situations arise.
Fan Speed Switch Adjustment
A fan speed switch is located in the fan. The fan speed switch counts the revolutions of the three mounting screws inside the fan.

1. Park the drill on a solid, level surface. Apply the tractor park brake. Stop the engine and take the key with you.
2. Remove the end cover from the fan shroud (1).
3. Slowly rotate the fan (2) to check the alignment of the fan switch (3) with the three fan screws (4). If the alignment is not correct, loosen the hardware (5) at both ends of the switch mounting bracket (6). Adjust the position of the fan speed switch and tighten the hardware.
4. Check the distance (A) between the end of the fan speed switch and the head of one of the three fan screws. The distance must be 0 to 4 mm. (Approximately the thickness of one wire tie.) If the distance is not correct, use the adjusting nuts on the fan speed switch to get the correct distance.
5. Install the end cover on the fan shroud.

Implement Lift Switch Adjustment

Crush and Pinch Hazard
Do not place any part of body under implement or near moving parts while checking adjustments. Have another person make sure the tractor is not started and the tractor controls are not moved during the adjustment procedure.

An implement lift switch (1) on the drill turns seed metering off when the implement is raised. To adjust the switch activation height, first locate the implement lift switch on the implement (center section, upper parallel arm at right rear).

Adjust the implement lift switch for activation height if:
- Any changes have been made to tool bar height (page 23).
- The implement lift switch was removed for any reason.

1. Park the drill on a solid, level surface. Fold the wings to prevent the lift lock from engaging.
2. Lower the openers until at a height where seeding should start (usually just above the ground).
3. Turn off the tractor and remove the key.
4. Securely support the center section tool bar at this height with jack stands or blocks.
5. Check the distance between the end of the implement lift switch (1) and the face of the lift arm (2). The distance must be 0 to 8 mm. (Approximately the thickness of two wire ties.) If the distance is not correct, use the adjusting nuts on the implement lift switch to get the correct distance.
6. Put the tractor key in the ON position to supply current to the implement lift switch. Do not start the tractor.
7. Loosen the bracket bolts (3). Slide the switch mounting bracket (4) up and down until the lamp in the implement lift switch just illuminates. Tighten the bracket bolts.

8. Turn the tractor key to OFF, then remove the tractor key.

## Hydraulic Maintenance

### High Pressure Fluid Hazard

Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. Check all hydraulic lines and fittings before applying pressure. Use paper or cardboard, not body parts, and wear heavy gloves to check for suspected leaks. If injured, seek immediate medical attention from a physician familiar with this type of injury.

Do not loosen fittings with a circuit engaged. With a circuit in neutral or float, crack hydraulic lines carefully. There may still be pressure in lines even with the circuit in float or neutral. Crack fittings slowly. Supply fluid slowly. When the circuit is energized, watch for fluid emergence at a safe distance.

To function properly, the hydraulic systems must be free of contaminants, free of air and fully charged with oil.

### Bleeding Hydraulics

#### Fitting Damage Risk

![Warning symbol]

Bleed only at JIC or NPT fittings. Avoid bleeding at ORB fittings. Never bleed at QD fittings.

Reasons to bleed the hydraulics:

- If hydraulics operate with jerky, uneven motions and the wings drop rapidly during unfold.
- During initial implement setup or if you replace a part in hydraulic system.

Check the hydraulic fluid level in the tractor reservoir and fill to the proper level. Add fluid to the system as needed. System capacity for the entire drill is about 38 litres.

#### Bleeding Lift Hydraulics

Move the drill to a hard surface area, so that the implement cannot fully lower.

If the systems have sufficient fluid for safe operation, before bleeding, unfold the implement (page 27). Leave the implement raised.

A complete lift system charging requires approximately 10 litres of oil.

1. Record the number of spacers (1) on the rods of each master cylinder (2). Remove and save the spacers (to prevent the cylinders from resting on the spacers).

2. Lower the implement.

   If the lift cylinders bottom-out on the rod ends, it will be necessary to use jacks or stands under the tool bar. Raise the implement. Lower it on the supports.

3. Set the lift circuit to float. Shut off the tractor. Remove the key.
4. Unpin the rod ends of both center section lift cylinders (2), and both wing gauge wheel lift cylinders (3).

5. Position the lift cylinder rod ends so they are pointing up (at least slightly above horizontal) and cannot strike drill parts at full extension. Fully extend the lift cylinders. Hold for several seconds.

6. Retract the cylinders to their starting position. Set the circuit to float. Connect the rod ends. Install the spacers.

---

**Bleeding Fold/Lock/Down-Pressure Hydraulics**

If the systems have sufficient fluid for safe operation, before bleeding, unfold and lower the drill.

A complete fold system charging requires about 20 litres of oil.

1. Set the fold circuit to float.
2. Set both weight-transfer pressure control valves (1) three turns from fully open. Release lock rings. Turn knobs fully counter-clockwise. Reverse 3 full turns.
3. Unpin the wing fold rod ends (2). Unpin the cart-transfer cylinder rod ends (3). Unpin the lock cylinder base end (4). Block up or wire the cylinders so that the free ends may extend without striking drill parts.

4. If extended, completely retract the fold and cart-transfer cylinders. Fully extend the center lock cylinder rod.

5. Loosen the JIC fittings at the base end (5) of both fold cylinders, the base end (6) of both cart-transfer cylinders, and at the rod end (7) of the lock cylinder.

6. Slowly extend the circuit until fluid appears at each loosened fitting. Set the circuit to neutral and secure each fitting in turn. Repeat until all five fittings are secured.

7. Continue to extend the circuit until the fold and cart-transfer cylinders are fully extended, and the lock cylinder is fully retracted. Set the circuit to neutral.

8. Loosen the JIC fittings at the rod end (3) of both cart-transfer cylinders, the base end (4) of the lock cylinder, and Port 2 on the lower side of the valve (8) connected to the rod end of both fold cylinders.
9. Slowly retract the circuit until fluid appears at a fitting. Set the circuit to neutral and secure the fitting. Repeat until all five fittings are secured.

10. Cycle the cylinders full stroke several times.

11. Use the tractor circuit to position the rod ends and pin.

12. If no other bleeding is required, adjust the transfer control valves back to their most recent settings (or to the suggested default settings).

**In-Line Hydraulic Filter**

If folding/unfolding time slows noticeably, check the in-line hydraulic filter and clean if needed. The hydraulic filter is located at the inlet port of each pressure valve.

1. Move the drill to typical field conditions. Unfold the drill. Lower the openers. Turn on the fan and bring up to normal field rpm.

2. Set fold circuit to float.

3. Shut down the tractor and remove the key.

4. Slowly loosen the hydraulic filter and relieve any residual pressure in the line. When disconnecting the hose, support the end to minimize fluid loss.

5. To disassemble, unscrew the end cap of the hydraulic filter. Remove the top retaining washer and screen.

6. Clean the filter screen with solvent and compressed air, or replace if needed.

7. When reassembling put the screen into the hydraulic filter. Place the retaining washer on top of the hydraulic filter and screw on the end cap.

8. Install the hydraulic filter.

9. Activate the fold circuit. Cycle the lift and fold systems several times. Check for leaks.

10. If there is any sign of air in the system, bleed the system (page 77).

---

**Brake Maintenance**

*Possible Asbestos Hazard*

If you are unable to confirm that you are removing and installing ADR approved parts, you may have linings that contain asbestos. Some after-market brake shoes may contain asbestos, and require strict, complex and costly safety procedures not covered in this manual.

*Equipment Malfunction Risks*

If brake shoe replacement is indicated, use only parts supplied or recommended by ADR. Unapproved parts may appear to fit, but will not function correctly.

Inspecting the brakes may show a need to refinish the drums and/or replace other brake parts. Although not strictly part of brake maintenance, you may need to repack the bearings (generally the outer), and it may be necessary to replace a worn or damaged inner seal and pack the inner bearing with fresh grease.

For service of internal brake components, refer to ADR parts and service information.

- General Information: [http://www.adraxles.com/download](http://www.adraxles.com/download)

**Hydraulic Brakes Bleeding**

1. Park the drill on a solid, level surface. Unfold and lower the drill. Put the tractor in park, stop the tractor engine, and take the key with you.

2. Chock both cart tires and both caster wheels to prevent movement.

3. Block both gauge wheels to prevent movement.

4. Make sure the tractor transmission is in park. Release the tractor parking brake.

5. Make sure the hydraulic line (1) for the brakes is connected to the trailer brake port on the tractor.

6. Start the tractor engine. Apply the trailer brakes for five seconds to charge the emergency brake accumulator. Stop the tractor engine.

7. Use the hairpin in the emergency valve (2) to rotate the shaft clockwise. The shaft will close off the brake system and then cause the accumulator to pressurize the brake system.
8. There are three fittings in the brake system that must be bled. Open each fitting one at a time in the order shown below. Open each fitting just enough to allow air to escape while the system is pressurized, but not enough to allow air to enter. When the fluid at each fitting is free of air, close the fitting.
   a. Inlet fitting (3) on the accumulator (4).
   b. Inlet fitting on the left brake chamber (5).
   c. Inlet fitting on the right brake chamber (6).

9. Use the hairpin in the emergency valve to rotate the shaft counterclockwise to the working position. This will open the brake system to pressure from the tractor.

10. Start the tractor engine. Apply the trailer brakes for five seconds to charge the emergency brake accumulator. Stop the tractor engine.

---

Air Brake Reservoir Draining

Before storage, or daily in humid operations, drain water from the air reservoir tank (1). Draining the air reservoir can prevent rust inside the tank and rust contamination of the brake valve system.

1. Chock the cart tires.
2. Pull the ring (2) to open the drain valve. Hold the drain valve open until no water flows.
3. Release the drain valve.

---

Air Brake Filter Cleaning

Filtered air is supplied from the tractor. Additional air filtering is obtained through two air filters on the drill. There is an air filter (1) in both the supply line and the service line. The filters trap any debris introduced during connection and disconnection.

1. Move the drill to a sheltered area, to prevent unfiltered dust from entering the opened air system.

---
2. Stop the tractor engine, apply the tractor parking brake, and take the key with you.

3. Apply the parking brake on the drill.

4. Locate the button for the shunt valve (2) on the left-hand side of the machine near the ladder (3). Push the button all the way in to empty the air reservoir. This will release the air from the air brake system.

5. Carefully remove the retainer ring (4) from the housing. Components are under spring pressure. Be careful not to lose any of the components. Individual parts are not available.

6. Remove the cap (5) and O-ring (6).

7. Remove the outer spring (7).

8. Remove the brass washer (8).

9. Remove the screen (9).

10. Remove the inner spring (10).

11. Using gentle compressed air, or a soft brush and compatible cleaning fluid, remove debris from the screen. Dry thoroughly.

12. Wipe the inside of the housing with a clean lint-free cloth.

13. The cap is a debris sump. Clean with air, or water and mild detergent. Dry the cap if wet. Inspect the O-ring and replace as necessary.

14. Install the inner (light) spring in the housing.

15. Install the screen in the housing closed-end first.

16. Install the brass collar with the flange away from the filter.

17. Install the outer (heavy) spring.

18. Install the O-ring on the cap and install the cap.

19. Push the cap into the bore and install the retainer ring.

### Cart Brake Maintenance

#### Possible Asbestos Hazard

*If you are unable to confirm that you are removing and installing ADR approved parts, you may have linings that contain asbestos. Some after-market brake shoes may contain asbestos, and require strict, complex and costly safety procedures not covered in this manual.*

#### Equipment Malfunction Risks

If brake shoe replacement is indicated, use only parts supplied or recommended by ADR. Unapproved parts may appear to fit, but will not function correctly.

Inspecting the brakes may show a need to refinish the drums and/or replace other brake parts. Although not strictly part of brake maintenance, you may need to repack the bearings (generally the outer), and it may be necessary to replace a worn or damaged inner seal (and pack the inner bearing with fresh grease).

Check brakes for wear, contamination and damage seasonally or every 9600 km.

Review the entire procedure. Great Plains suggests performing a complete operation on one wheel at a time, so that there is a fully-assembled wheel to use as an assembly reference.

1. Park the drill on a solid, level surface. Unfold and lower the drill. Stop the tractor engine and take the key with you.

2. Chock both cart tires, both caster wheels, and both gauge wheels to prevent movement.

3. Put the tractor transmission in park. Release tractor service brake and tractor parking brake.

   a. If the drill has hydraulic brakes:

      Rotate the shaft in the emergency valve (1) to release the pressure in the accumulator (2). Releasing the pressure in the accumulator releases the brakes.
Disconnect the hydraulic line (3) from the port for the trailer brakes on the tractor. Apply the tractor parking brake only after trailer brake disconnection.

4. Loosen the wheel hardware on the cart wheel to be removed. It is recommended that only one cart wheel be removed at a time.

5. Put the correct lifting equipment under the crossbeam that is below the axle. Raise the drill until the cart tire is just off the ground. Put support stands under the crossbeam.

6. Rotate the tire to check for evidence of excess run-out at the braking surface of the drums. Repair or replace the drum as necessary.

7. Use correct wheel handling equipment to hold the cart wheel.

8. Remove the wheel hardware.

9. Use the wheel handling equipment to remove the cart wheel.

**Cart Wheel Installation**

1. Use the wheel handling equipment to put the cart wheel in position on the hub.

2. Install the wheel hardware and tighten just until the cart wheel is seated on the hub.

3. Remove the wheel handling equipment.

4. Use the lifting equipment to lower the drill. Remove the lifting equipment.

5. Tighten the wheel hardware in the correct staging and sequence.

### Wheel Hardware Torque

Check the torque of the wheel hardware daily. Using the following staging and order of tightening will ensure proper seating of the wheel against the hug.

**Gauge and Caster Wheels**

Make a mark (A) on the wheel as a starting point. Tighten the wheel hardware in stages to the specified torque in the order shown below.

- Stage 1 - 175 to 195 N·m
- Stage 2 - 250 to 290 N·m
Caster Wheel
Make a mark (A) on the wheel as a starting point. Tighten the wheel hardware in stages to the specified torque in the order shown below.
- Stage 1 - 190 to 210 N-m
- Stage 2 - 330 to 370 N-m
- Stage 3 - 500 to 560 N-m

Caster Maintenance

Caster Brakes
Inspect the caster brakes seasonally. Replace the UHMW piston (1) if its length is less than 32 mm. Also replace the piston if missing, damaged, tilted, or top of piston is visible.

Set bolt reveal (2) (brake spring tension) to 54 mm for a new piston, as measured from beneath the bolt head to the top of the weldment. Use more tension as needed to eliminate caster vibration during highway transport.

Caster Lock Pin
Lubricate each caster lock pin with silicone spray seasonally.

Marker Maintenance (Option)

Crush and Pinch Hazard
Never allow anyone near the drill when folding or unfolding markers. Being trapped or hit by a folding or unfolding marker may result in serious injury.

Marker Shear Bolt
The marker arm is attached to the pivot sleeve with a shear bolt (1), which is intended to fail if the marker hits an obstruction, allowing the marker to swing back around a normally stationary pivot (2).

If the shear bolt breaks, replace it with an equivalent 5/16-16x4 inch Grade 5 bolt (Great Plains part 802-223C). If that size is not immediately available in your area, temporarily substitute an M10x10.0 Class 8.8 metric bolt. Use two nuts (3) on the shear bolt.

Machine Damage Risk
Replacing the bolt with a higher grade can result in marker damage.

Replacing the bolt with a lower grade, or smaller size, or using a single nut, can result in nuisance shears.
Marker Hydraulic Bleeding

Do not allow anyone near the drill when markers are in motion. Sudden and irregular motion due to air in the system may result in serious injury or death.

Hydraulic Hose Damage Risk

Be careful when folding and unfolding markers for the first time. Check for pinching and kinking of hoses.

1. Clear all objects from the area.
2. With markers unfolded in field position, crack the hydraulic-hose JIC fittings at the base (1) and rod ends (2) of each marker cylinder.

3. With the tractor at idle speed, activate the tractor hydraulic valve forward until oil appears at a fitting. When oil begins to seep out around a fitting, tighten that fitting. Reverse the tractor hydraulic valve until oil appears at the opposite hose fitting. Tighten that fitting.
4. Activate the tractor hydraulic valve forward again until oil seeps out around a fitting on the other marker cylinder. Tighten that fitting. Reverse the tractor hydraulic valve until oil seeps out around the remaining hose fitting and tighten the fitting.
5. Fold and unfold markers slowly to work out all air.

Seed Flap Replacement

To replace a seed flap (1), use a needle nose pliers or similar tool to grasp the T at the top of the flap. Pull up to pull the flap up out of the metal bracket (2).

Push a new seed flap down through the metal bracket until the flap snaps into place with the T top resting on top of the bracket.

If a seed firmer is also installed, it may be necessary to shorten the flap.

Lubrication

If any movable parts such as levers, pivots, and clamps are not moving smoothly due to rust or hindering material, do not attempt to force parts into motion. Instead, remove the rust or unwanted material and apply oil or grease on the relevant spot. Otherwise, machine may become damaged through impaired usage.

Apply a small amount of grease to the following areas at the hourly intervals indicated. If you operate the machine in extremely wet and/or muddy conditions, lubricate grease fittings more frequently.

Grease Fittings

Lubricate with grease at the hourly interval indicated in the arrow.

Marker Tilt Bearings
Coulter Grease Bank

Clean and pack bearings with bearing grease.

Coulter Hub Bearings

These hubs also have a grease fitting. If grease is added using the grease fitting, pump gently and only until resistance is felt. Excess pressure or grease volume can damage seals.

Parking Brake

Implement Wheel Bearings

Clean and pack bearings with bearing grease.

Cart Wheel Bearings

Clean and pack bearings with bearing grease.
Hydraulic Diagrams
Fold/Weight Transfer Hydraulics (S/N C1010F+)
Lock/Lift Hydraulics (S/N C1010F+)
Dual Hopper Hydraulics (S/N C1010F+)

Single Hopper Hydraulics (S/N C1010F+)
Center/Right Wing Hydraulics (S/N C1009F-)

<table>
<thead>
<tr>
<th>Port</th>
<th>Functions</th>
<th>Port</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Implement Lower</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Implement Lift</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>G</td>
<td>Markers (Option)</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>H</td>
<td>Markers (Option)</td>
</tr>
</tbody>
</table>
Left Wing Hydraulics (S/N C1009F-)
Dual Hopper Hydraulics (S/N C1009F-)
Single Hopper Hydraulics (S/N C1009F-)
Marker Hydraulics (Option)
Air Brakes

Hydraulic Brakes (S/N C1010F+)
## Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No material flow - all rows</strong></td>
<td>Empty hopper</td>
<td>Load material.</td>
</tr>
<tr>
<td></td>
<td>Meter in use clogged</td>
<td>Clean-out meter (page 73).</td>
</tr>
<tr>
<td></td>
<td>Fan not operating</td>
<td>Check hydraulic and electrical connections for fan.</td>
</tr>
<tr>
<td></td>
<td>Fan speed too low</td>
<td>Check pulses-per-rev setting for fan in terminal. Increase fan speed to recommended range. See operator manual for terminal.</td>
</tr>
<tr>
<td></td>
<td>Fan running backward</td>
<td>Reverse fan circuit hoses at hitch.</td>
</tr>
<tr>
<td><strong>No material flow - multiple rows</strong></td>
<td>Primary seed hose blocked</td>
<td>Check seed hoses for kinks, congealed materials at low spots, nests and pests.</td>
</tr>
<tr>
<td></td>
<td>Tower inlet or turret blocked</td>
<td>Clear blockage.</td>
</tr>
<tr>
<td><strong>No material flow - one or two rows</strong></td>
<td>Seed tube blocked at row</td>
<td>Inspect and clear seed tube.</td>
</tr>
<tr>
<td></td>
<td>Tower port blocked for affected row</td>
<td>Disassemble distribution ring and clear blockage.</td>
</tr>
<tr>
<td></td>
<td>False alarm - blockage sensor disconnected or failed</td>
<td>Run terminal self-test. Swap sensor with a working row to verify failure. Replace sensor.</td>
</tr>
<tr>
<td><strong>Material is flowing, but is not detected by terminal</strong></td>
<td>This is normal during the first few meters of planting, as it takes some time for material to reach rows.</td>
<td>Lower openers 3m before planting is to begin. Terminal does not check for blockage during first 5 seconds.</td>
</tr>
<tr>
<td></td>
<td>Lift switch not adjusted correctly, failed, or not wired correctly.</td>
<td>Check, adjust or replace switch (page 75).</td>
</tr>
<tr>
<td></td>
<td>Terminal disconnected at hitch</td>
<td>Connect terminal.</td>
</tr>
<tr>
<td><strong>Planting too little - some rows</strong></td>
<td>Partial blockage in meter chamber, seed hoses, towers, seed tubes</td>
<td>Treat as blockage. See “No material flow - multiple rows” and “No material flow - one or two rows”.</td>
</tr>
<tr>
<td><strong>Planting too little - all rows</strong></td>
<td>Incorrect seed rate, meter flutes, or rate range setting.</td>
<td>Check seed rate information beginning on page 37.</td>
</tr>
<tr>
<td></td>
<td>Air system leaks retarding material flow above meters</td>
<td>Check hopper lids, meter seals, manifold caps and seed hose connections. Adjust latch and/or replace seals as needed.</td>
</tr>
<tr>
<td></td>
<td>Seed size and weight or fertilizer density and granularity vary.</td>
<td>Calibrate. Adjust rate to compensate.</td>
</tr>
<tr>
<td></td>
<td>Seed or fertilizer density and granularity may vary from season to season, batch to batch and between different suppliers.</td>
<td>Calibrate again if materials might have changed since last calibration.</td>
</tr>
<tr>
<td></td>
<td>Low material level in hopper</td>
<td>Fill hopper.</td>
</tr>
<tr>
<td></td>
<td>Fan speed too low</td>
<td>Increase fan speed (page 52).</td>
</tr>
<tr>
<td></td>
<td>Fan will not run fast enough</td>
<td>Tractor must be able to supply 68 litres/min at 14 bar.</td>
</tr>
<tr>
<td>Problem</td>
<td>Causes</td>
<td>Solutions</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>Planting too little - all rows (cont’d)</td>
<td>Fan will not run fast enough</td>
<td>Check that hydraulic fan check valve is not installed backward.</td>
</tr>
<tr>
<td></td>
<td>Actual field size is different.</td>
<td>Verify field size.</td>
</tr>
<tr>
<td></td>
<td>Excessive pass gaps. Irregular shaped field.</td>
<td>Adjust marker (page 55).</td>
</tr>
<tr>
<td></td>
<td>Build-up of treatment or debris in seed meter.</td>
<td>Clean out seed meter (page 73).</td>
</tr>
<tr>
<td></td>
<td>Plugged opener seed tube.</td>
<td>Lift drill, expose bottom of seed tube, and clean out.</td>
</tr>
<tr>
<td></td>
<td>Meter sprocket damaged</td>
<td>Replace worn or damaged stars on metering shaft</td>
</tr>
<tr>
<td>Planting too much - all rows</td>
<td>Incorrect seed rate, meter flutes, or rate range setting.</td>
<td>Check material rate information beginning on page 37.</td>
</tr>
<tr>
<td></td>
<td>Seed size and weight or fertilizer density and granularity change</td>
<td>Calibrate. Adjust rate to compensate.</td>
</tr>
<tr>
<td></td>
<td>Seed or fertilizer density and granularity may vary from season to season, batch to batch and between different suppliers.</td>
<td>Calibrate again if materials might have changed since last calibration (page 43).</td>
</tr>
<tr>
<td></td>
<td>Actual field size is different.</td>
<td>Verify field size.</td>
</tr>
<tr>
<td></td>
<td>Excessive pass overlap. Irregular shaped field.</td>
<td>Adjust marker (page 55).</td>
</tr>
<tr>
<td>Planting too much - some rows</td>
<td>Dividers damaged or missing in towers.</td>
<td>Disassemble tower turrets. Replace damaged or worn parts.</td>
</tr>
<tr>
<td></td>
<td>Worn/damaged flute stars in meter.</td>
<td>Inspect empty meter from above. Remove meter from below and repair.</td>
</tr>
<tr>
<td>Uneven seed depth</td>
<td>Excessive field speed</td>
<td>Slow down. Check terminal for correct maximum field speed.</td>
</tr>
<tr>
<td></td>
<td>Implement not level</td>
<td>Check leveling instructions (page 62).</td>
</tr>
<tr>
<td></td>
<td>Planting conditions too wet</td>
<td>Wait until drier weather.</td>
</tr>
<tr>
<td>Uneven seed spacing</td>
<td>Excessive field speed.</td>
<td>Reduce field speed.</td>
</tr>
<tr>
<td></td>
<td>Drill not level</td>
<td>Check level (page 62) and weight transfer (page 59).</td>
</tr>
<tr>
<td></td>
<td>Planting conditions too wet.</td>
<td>Wait until drier weather.</td>
</tr>
<tr>
<td></td>
<td>Seed-Lok™ building up with dirt.</td>
<td>Lock up Seed-Lok™ (page 66).</td>
</tr>
<tr>
<td></td>
<td>Damaged or missing seed flaps.</td>
<td>Replace seed flaps.</td>
</tr>
<tr>
<td></td>
<td>Partially plugged opener seed tube.</td>
<td>Expose bottom of seed tube and clean out.</td>
</tr>
<tr>
<td>Opener discs not turning free</td>
<td>Opener plugged with dirt.</td>
<td>Clean opener.</td>
</tr>
<tr>
<td></td>
<td>Planting conditions too wet.</td>
<td>Wait until drier weather.</td>
</tr>
<tr>
<td></td>
<td>Seed-Lok™ is plugging opener.</td>
<td>Lock up Seed-Lok™ (page 66).</td>
</tr>
<tr>
<td></td>
<td>Failed disc bearings.</td>
<td>Replace disc bearings.</td>
</tr>
<tr>
<td></td>
<td>Bent or twisted opener frame.</td>
<td>Replace opener frame.</td>
</tr>
<tr>
<td></td>
<td>Partially plugged opener seed tube.</td>
<td>Lift up drill, expose bottom of seed tube, and clean out.</td>
</tr>
<tr>
<td>Problem</td>
<td>Causes</td>
<td>Solutions</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td>Hectares or acres planted not correctly reported - Area tally is most accurate when seeding back and forth with markers with few headlands and curves</td>
<td>Excessive overlap or gaps between passes.</td>
<td>Avoid overlap or gaps. Adjust marker.</td>
</tr>
<tr>
<td></td>
<td>Soil conditions.</td>
<td>Loose soil and slippage will cause variations in acres registered.</td>
</tr>
<tr>
<td></td>
<td>Actual field size different.</td>
<td>Verify field size.</td>
</tr>
<tr>
<td>Press wheels not compacting the soil as desired</td>
<td>Too wet or cloddy.</td>
<td>Wait until drier weather or rework ground.</td>
</tr>
<tr>
<td></td>
<td>Inadequate or incorrect weight transfer adjustment</td>
<td>Adjust weight transfer (page 59)</td>
</tr>
<tr>
<td></td>
<td>Incorrect press wheel depth.</td>
<td>Reset press wheel depth (page 66).</td>
</tr>
<tr>
<td>Excessive seed cracking</td>
<td>Excessive field speed.</td>
<td>Reduce field speed.</td>
</tr>
<tr>
<td></td>
<td>Unclean seed.</td>
<td>Use clean seed.</td>
</tr>
<tr>
<td></td>
<td>Damaged, old or dry seed.</td>
<td>Use clean, new seed.</td>
</tr>
<tr>
<td></td>
<td>Fan speed too high</td>
<td>Use only enough speed for accurate delivery to all rows.</td>
</tr>
<tr>
<td>Press wheel or openers plugging</td>
<td>Planting conditions too wet.</td>
<td>Wait until drier weather.</td>
</tr>
<tr>
<td></td>
<td>Backed up with drill in the ground.</td>
<td>Clean out and check for damage.</td>
</tr>
<tr>
<td></td>
<td>Failed disc bearings.</td>
<td>Replace disc bearings.</td>
</tr>
<tr>
<td></td>
<td>Disc blades worn.</td>
<td>Replace disc blades.</td>
</tr>
<tr>
<td></td>
<td>Scraper worn or damaged.</td>
<td>Replace scraper.</td>
</tr>
<tr>
<td>Openers product too deep - Bulldozing</td>
<td>Coulters set too deep</td>
<td>Raise opener frame (page 58).</td>
</tr>
<tr>
<td>Front of openers dropping too low in hard or minimum-till conditions</td>
<td>Coulters set too deep</td>
<td>Raise opener frame (page 58).</td>
</tr>
<tr>
<td>Pressure gauges show pressure when openers are raised</td>
<td>Hydraulic hoses not routed correctly between pressure control valves and opener lift cylinders.</td>
<td>See hose routing diagrams beginning on page 85.</td>
</tr>
<tr>
<td>Hydraulic marker functioning improperly</td>
<td>Air or oil leaks in hose fittings or connections.</td>
<td>Check all hose fittings and connections for air or oil leaks.</td>
</tr>
<tr>
<td></td>
<td>Low tractor hydraulic oil level.</td>
<td>Check tractor hydraulic oil level.</td>
</tr>
<tr>
<td></td>
<td>Loose or missing bolts or fasteners.</td>
<td>Check all bolts and fasteners.</td>
</tr>
<tr>
<td>Marker disc does not mark</td>
<td>Marker counterbalance spring set too high, and not allowing disc to drop into field depressions (or mark on flat ground at extreme spring settings)</td>
<td>Reduce counterbalance spring force.</td>
</tr>
<tr>
<td></td>
<td>Disc orientation not ideal for conditions</td>
<td>Reverse marker disc to pull or throw dirt.</td>
</tr>
</tbody>
</table>
## Lift Lock Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pawl engaged after unfold</td>
<td>Lock cylinder not retracted.</td>
<td>Unfold the implement (page 27) to retract lock cylinder.</td>
</tr>
<tr>
<td></td>
<td>Pawl held by lift lug.</td>
<td>Perform a lift operation (page 31) to move lug and free pawl.</td>
</tr>
<tr>
<td></td>
<td>Pilot-operated check valve not activated.</td>
<td>Extend lift circuit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extend fold circuit.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temporarily increase pressure in both down-pressure and weight transfer circuits.</td>
</tr>
<tr>
<td>Implement lowered after folding - pawl not engaged</td>
<td>Implement was not fully raised before lowering</td>
<td></td>
</tr>
</tbody>
</table>

## Brake Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke or odd burning odor from axle area</td>
<td>Overheated brakes, typically on long steep hills</td>
<td>Stop immediately. Wait for brakes to cool completely. Moderate downhill speed by using lower gear and frequent full stops. Check brake components for heat distortion.</td>
</tr>
<tr>
<td></td>
<td>New brakes may exhibit slight smoking or odors until linings seat on drums.</td>
<td>Check brakes if problem persists, or braking action is insufficient.</td>
</tr>
<tr>
<td>Braking insufficient - one wheel</td>
<td>Tire under-inflated.</td>
<td>Inflate all tires to specification.</td>
</tr>
<tr>
<td></td>
<td>Worn brake linings and/or drum</td>
<td>Service the brakes.</td>
</tr>
<tr>
<td></td>
<td>Worn or leaking brake chamber</td>
<td>Rebuild or replace brake chamber.</td>
</tr>
<tr>
<td></td>
<td>Grease or oil on linings</td>
<td>Correct problem causing contamination. Service brakes.</td>
</tr>
<tr>
<td></td>
<td>Brake adjusting rod too short</td>
<td>Lengthen brake adjusting rod.</td>
</tr>
<tr>
<td>Braking insufficient - both wheels</td>
<td>Hydraulic brake system - air in brake line from tractor</td>
<td>Check for loose fittings. Check for damaged fittings and lines. Check for damage or worn operating components. Correct source of leak. Bleed and recharge system.</td>
</tr>
<tr>
<td></td>
<td>Air brakes - leaks in air system</td>
<td>Repair leaks.</td>
</tr>
<tr>
<td></td>
<td>Air brakes - clogged filters</td>
<td>Clean filters (page 79).</td>
</tr>
<tr>
<td></td>
<td>Air brakes - valve open</td>
<td>Close shunt valve (page 21). Make sure drain valve on air reservoir is closed (page 79).</td>
</tr>
<tr>
<td></td>
<td>Hydraulic brakes - air in brake lines</td>
<td>Bleed brake lines (page 78).</td>
</tr>
<tr>
<td></td>
<td>Brake linings and/or drums worn</td>
<td>Service brakes.</td>
</tr>
<tr>
<td></td>
<td>Brake linings replaced with unapproved parts having inadequate friction rating</td>
<td>Replace shoes with approved parts.</td>
</tr>
<tr>
<td></td>
<td>Air brakes - pressure supplied by tractor insufficient</td>
<td>Minimum required pressure for air system is 55 kPa.</td>
</tr>
<tr>
<td></td>
<td>Both brake adjusting rods too short</td>
<td>Lengthen both brake adjusting rods.</td>
</tr>
<tr>
<td>Problem</td>
<td>Causes</td>
<td>Solutions</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td>No braking - one wheel</td>
<td>Brake lining worn or missing</td>
<td>Inspect and repair as needed.</td>
</tr>
<tr>
<td></td>
<td>Brake chamber frozen</td>
<td>Inspect and repair as needed.</td>
</tr>
<tr>
<td></td>
<td>Air/hydraulic brakes - damaged diaphragm in brake chamber</td>
<td>Replace brake chamber.</td>
</tr>
<tr>
<td></td>
<td>Brake parts broken or missing</td>
<td>Inspect and repair as needed.</td>
</tr>
<tr>
<td></td>
<td>Brake adjusting rod too short</td>
<td>Lengthen brake adjusting rod</td>
</tr>
<tr>
<td>No braking, both wheels</td>
<td>Loss of fluid in brake lines</td>
<td>Check for fluid loss at all fittings and bleed ports. Close/repair, recharge and bleed.</td>
</tr>
<tr>
<td></td>
<td>Line(s) to tractor improperly connected</td>
<td>Check connections.</td>
</tr>
<tr>
<td></td>
<td>Trailer brake system disabled or malfunctioning in tractor</td>
<td>Check function with another trailer.</td>
</tr>
<tr>
<td></td>
<td>Tractor line pressure insufficient</td>
<td>Have dealer check pressure at port.</td>
</tr>
<tr>
<td></td>
<td>Brake adjusting rods too short</td>
<td>Lengthen brake adjusting rods</td>
</tr>
<tr>
<td>Drill pulling to one side</td>
<td>See “Dragging brake”.</td>
<td>Check dragging brake causes before flat spots develop on tires.</td>
</tr>
<tr>
<td></td>
<td>Brakes always engaged - both wheels</td>
<td>Brakes adjusted too tight</td>
</tr>
<tr>
<td></td>
<td>Hydraulic brakes - supply line is causing brakes to be always on.</td>
<td>Reverse air line connections at hitch.</td>
</tr>
<tr>
<td></td>
<td>Air brakes - tractor air brake lines reversed.</td>
<td>Connect drill brake line to correct remote.</td>
</tr>
<tr>
<td></td>
<td>Hydraulic brakes - Drill brake line connected to incorrect always-on remote.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydraulic brakes - Pressure supplied by tractor brake line is always too high.</td>
<td>Maximum allowed hydraulic pressure is 150 bar</td>
</tr>
<tr>
<td>Dragging brake</td>
<td></td>
<td>Minimum required air pressure is 550 kPa</td>
</tr>
<tr>
<td></td>
<td>One brake adjusted too tight</td>
<td>Shorten brake adjusting rod.</td>
</tr>
<tr>
<td></td>
<td>Debris in brakes</td>
<td>Remove brake shoes. Clean and dry.</td>
</tr>
<tr>
<td></td>
<td>Distorted brake parts scraping</td>
<td>Replace damaged parts.</td>
</tr>
<tr>
<td></td>
<td>Hydraulic brakes - weak return spring</td>
<td>Replace all springs.</td>
</tr>
<tr>
<td>Brakes grab, chatter or rattle</td>
<td>Hydraulic brakes - seized in brake chamber</td>
<td>Rebuild or replace brake chamber.</td>
</tr>
<tr>
<td></td>
<td>Hydraulic brakes - weak return springs</td>
<td>Replace all springs.</td>
</tr>
<tr>
<td></td>
<td>Drum worn, distorted or out of round</td>
<td>Re-surface drum if run-out is within specification, otherwise replace.</td>
</tr>
<tr>
<td></td>
<td>Under-inflated or undersized tire in pair</td>
<td>Replace tire if inflation to specification does not solve unequal contact problem.</td>
</tr>
<tr>
<td></td>
<td>Loose, worn, damaged or missing brake components in hub</td>
<td>Inspect brakes.</td>
</tr>
<tr>
<td></td>
<td>Loose or worn wheel bearings</td>
<td>Replace bearings.</td>
</tr>
<tr>
<td>Flat spots on tires</td>
<td>See “Brakes always engaged - both wheels”</td>
<td></td>
</tr>
<tr>
<td>Squealing from brakes</td>
<td>Worn brake linings</td>
<td>Check brakes. Replace worn linings.</td>
</tr>
<tr>
<td></td>
<td>Distorted brake parts scraping</td>
<td>Check brakes. Replace damaged parts.</td>
</tr>
</tbody>
</table>
### Magnehelic® Gauge

If a Magnehelic® gauge does not read zero with the fan off, inspect the gauge, and zero the gauge as needed.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-zero with fan off</td>
<td>Zero drift</td>
<td>Zero per instructions below</td>
</tr>
<tr>
<td>Gauge reading lower than expected</td>
<td>Relief port plug missing/damaged</td>
<td>Replace plug</td>
</tr>
<tr>
<td></td>
<td>Breather line blocked or kinked</td>
<td>Clear breather line</td>
</tr>
<tr>
<td></td>
<td>Leak in sensing line</td>
<td>Check line to chamber</td>
</tr>
<tr>
<td></td>
<td>Gauge damaged</td>
<td>Check for loose cover, damaged O-ring</td>
</tr>
</tbody>
</table>

Check for chamber and breather line problems before setting gauge to zero. Setting the gauge to zero cannot accurately compensate for leaks and blockages.

Zero the Magnehelic® gauge on level ground with the fan off, and if possible, under no-wind conditions. Turn the set screw (1) on the meter face until it reads zero from the tractor driver’s viewing position.

Port ID for troubleshooting:

1. Over-pressure relief port (with plug in place)
2. Low-pressure port (breather or atmospheric pressure)
3. High-pressure port (from manifold chamber)

Alternate high/low ports are plugged.

**Winter testing/maintenance advisory**

Gauge readings may be inaccurate or sluggish below -7°C.
## Specifications

<table>
<thead>
<tr>
<th>Model Information</th>
<th>NTA 607-2-3275</th>
<th>NTA 607-2-4006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Row Spacing</strong></td>
<td>19.1 cm</td>
<td>15.2 cm</td>
</tr>
<tr>
<td><strong>Number of Openers</strong></td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td><strong>Tractor Requirements</strong></td>
<td>130 kw</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>10 200 to 15 200 kg</td>
<td>10 800 to 15 800 kg</td>
</tr>
<tr>
<td><strong>Wing Flex</strong></td>
<td>Full Flex - 10° down, unlimited up</td>
<td>Limited Flex - 2.5° down, unlimited up</td>
</tr>
<tr>
<td><strong>Spacing at Wing Hinges</strong></td>
<td>Full Flex - 21.6 cm, Limited Flex - 19.1 cm</td>
<td>Full Flex - 21.1 cm, Limited Flex - 15.2 cm</td>
</tr>
<tr>
<td><strong>Swath Width</strong></td>
<td>Full Flex - 6.08 m, Limited Flex - 6.0 m</td>
<td>Full Flex - 6.13 m, Limited Flex - 6.0 m</td>
</tr>
<tr>
<td><strong>Cart Tires</strong></td>
<td>600/55-26.5 16 ply</td>
<td></td>
</tr>
<tr>
<td><strong>Implement Tires</strong></td>
<td>10.0/75-15 14 ply</td>
<td></td>
</tr>
<tr>
<td><strong>Hitch Load in Transport</strong></td>
<td>500 to 1590 kg</td>
<td></td>
</tr>
<tr>
<td><strong>Hitch to Opener Distance</strong></td>
<td>7.1 m</td>
<td></td>
</tr>
<tr>
<td><strong>Hydraulic circuits</strong></td>
<td>3 Closed-Center, 155 bar, 95 liters/min</td>
<td></td>
</tr>
</tbody>
</table>

### Dimensions

| **Field Width** | 6.1 m |
| **Field Length** | 9.6 m |
| **Field Height** | 3.2 m |
| **Transport Width** | 3.0 m |
| **Transport Length** | 9.1 m |
| **Transport Height** | 4.0 m |
| **Transport Clearance** | 19.1 cm |

### Capacities

| **Single Hopper** | 5280 litre (150 bu) |
| **Dual Hopper** | 2885 litre (82 bu) each |

### Openers

| **Opener Series** | 07 Series |
| **Opener Down Pressure** | 30 to 110 kg |
| **Coulter Down Pressure** | 180 to 250 k |
### Transport Weights

<table>
<thead>
<tr>
<th>Drill Information&lt;sup&gt;a&lt;/sup&gt;</th>
<th>NTA607-2-3275</th>
<th>NTA607-2-4006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Hopper Empty</td>
<td>10 000 kg</td>
<td>10 700 kg</td>
</tr>
<tr>
<td>Single Hopper Full Seed</td>
<td>14 100</td>
<td>14 700</td>
</tr>
<tr>
<td>Dual Hopper Empty</td>
<td>10 200</td>
<td>10 800</td>
</tr>
<tr>
<td>Dual Hopper Full Seed and Dry Fertilizer</td>
<td>15 100</td>
<td>15 800</td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes markers, coulters, standard flex, single-shoot, 2x13 openers, three sets of ballast weights.

### Tire and Wheel Information

<table>
<thead>
<tr>
<th>Tire</th>
<th>Size</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cart Tires</td>
<td>600/55-26.5</td>
<td>2.76 bar</td>
</tr>
<tr>
<td></td>
<td>16 ply</td>
<td></td>
</tr>
<tr>
<td>Implement Tires -</td>
<td>10.0/75-15</td>
<td>7.10 bar</td>
</tr>
<tr>
<td>with brakes</td>
<td>14 ply</td>
<td></td>
</tr>
<tr>
<td>Implement Tires -</td>
<td>11Lx15 Load F</td>
<td>6.2 bar</td>
</tr>
<tr>
<td>without brakes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Connector Identification

1. JIC - Joint Industry Conference (SAE J514)
2. straight threads
3. 37° cone on “M” fittings (or 37° flare on “F”).
4. ORB - O-Ring Boss (SAE J514)
5. straight threads
6. elastomer O-Ring

Fittings needing orientation, such as the ell above, also have a washer (7) and jam nut (8) (adjustable thread port stud)

<table>
<thead>
<tr>
<th>Fittings Torque Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitting</td>
</tr>
<tr>
<td>9/16 JIC</td>
</tr>
<tr>
<td>9/16 ORB w/jam nut</td>
</tr>
<tr>
<td>9/16 ORB straight</td>
</tr>
<tr>
<td>3/4 JIC</td>
</tr>
<tr>
<td>3/4 ORB w/jam nut</td>
</tr>
<tr>
<td>3/4 ORB straight</td>
</tr>
</tbody>
</table>
## Torque Values Chart

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Bolt Head Identification</th>
<th>mm x pitch&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade 2</td>
<td>Grade 5</td>
</tr>
<tr>
<td></td>
<td>N·m&lt;sup&gt;b&lt;/sup&gt; ft-lb&lt;sup&gt;d&lt;/sup&gt;</td>
<td>N·m ft-lb</td>
</tr>
<tr>
<td>1/4-20</td>
<td>7.4 5.6</td>
<td>11 8</td>
</tr>
<tr>
<td>1/4-28</td>
<td>8.5 6.5</td>
<td>13 10</td>
</tr>
<tr>
<td>5/32-18</td>
<td>9.5 6.2</td>
<td>14 9</td>
</tr>
<tr>
<td>5/32-24</td>
<td>17 13</td>
<td>26 19</td>
</tr>
<tr>
<td>3/16-16</td>
<td>27 20</td>
<td>42 31</td>
</tr>
<tr>
<td>1/8-24</td>
<td>31 22</td>
<td>47 35</td>
</tr>
<tr>
<td>1/8-14</td>
<td>43 32</td>
<td>67 49</td>
</tr>
<tr>
<td>5/32-20</td>
<td>49 36</td>
<td>75 55</td>
</tr>
<tr>
<td>1/8-13</td>
<td>66 49</td>
<td>105 76</td>
</tr>
<tr>
<td>5/32-20</td>
<td>75 55</td>
<td>115 85</td>
</tr>
<tr>
<td>5/32-12</td>
<td>95 70</td>
<td>150 110</td>
</tr>
<tr>
<td>5/32-18</td>
<td>105 79</td>
<td>165 120</td>
</tr>
<tr>
<td>5/32-11</td>
<td>130 97</td>
<td>205 150</td>
</tr>
<tr>
<td>5/32-18</td>
<td>150 110</td>
<td>230 170</td>
</tr>
<tr>
<td>3/16-10</td>
<td>235 170</td>
<td>360 265</td>
</tr>
<tr>
<td>3/16-16</td>
<td>260 190</td>
<td>405 295</td>
</tr>
<tr>
<td>3/16-9</td>
<td>225 165</td>
<td>585 430</td>
</tr>
<tr>
<td>3/16-14</td>
<td>250 185</td>
<td>640 475</td>
</tr>
<tr>
<td>1-8</td>
<td>340 250</td>
<td>875 645</td>
</tr>
<tr>
<td>1-12</td>
<td>370 275</td>
<td>955 705</td>
</tr>
<tr>
<td>1/8-7</td>
<td>480 355</td>
<td>1080 795</td>
</tr>
<tr>
<td>1/8-12</td>
<td>540 395</td>
<td>1210 890</td>
</tr>
<tr>
<td>1/8-7</td>
<td>680 500</td>
<td>1520 1120</td>
</tr>
<tr>
<td>1/8-12</td>
<td>750 555</td>
<td>1680 1240</td>
</tr>
<tr>
<td>5/32-6</td>
<td>890 655</td>
<td>1990 1470</td>
</tr>
<tr>
<td>5/32-12</td>
<td>1010 745</td>
<td>2270 1670</td>
</tr>
<tr>
<td>5/32-6</td>
<td>1180 870</td>
<td>2640 1950</td>
</tr>
<tr>
<td>1/2-12</td>
<td>1330 980</td>
<td>2970 2190</td>
</tr>
</tbody>
</table>

a. in-tpi = nominal thread diameter in inches-threads per inch  
b. N·m = newton-meters  
c. mm x pitch = nominal thread diameter in mm x thread pitch  
d. ft-lb = foot pounds

Torque tolerance + 0%, -15% of torquing values. Unless otherwise specified use torque values listed above.
Options

**Metering Shafts (S/N C1009F- only)**

From the factory, the drill is equipped with a 4-star metering shaft (1). Alternate metering shafts, 3-star (1) and 2-star (3), are available for lower seed rates. A small seed metering shaft (4) is available for small seeds.

Order one kit per meter (two per drill if changing both meters on a dual-hopper drill).

Determine the number of tramline kits needed by dividing the width of a single sprayer tire by the width of drill row spacing.

<table>
<thead>
<tr>
<th>Stars per Outlet</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Standard Stars - 4 per outlet</td>
<td>168-496S</td>
</tr>
<tr>
<td>(2) Standard Stars - 3 per outlet</td>
<td>168-510S</td>
</tr>
<tr>
<td>(3) Standard Stars - 2 per outlet</td>
<td>168-511S</td>
</tr>
<tr>
<td>(4) Small Seeds Stars</td>
<td>168-512S</td>
</tr>
</tbody>
</table>

All metering shafts are standard on S/N C1010F+ drills.

**Markers**

Hydraulically-operated swing-arm markers leave a visible groove to use as a centerline for the next pass.

These dual markers mount on both sides, and include an automatic sequence valve for operating alternate sides on each pass. The kit includes an installation manual.

Each kit equips one drill.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTA607 Marker Kit</td>
<td>113-849A</td>
</tr>
</tbody>
</table>

**Tramline**

Tramline kits configure one or more row units to cease seeding during specific passes, creating unplanted rows for transit of equipment post-emergence.

Each kit provides components to control one row on each side. The control solenoids are located in the towers. Pre-defined and user-programmable patterns are available.
**Row Options**

430 mm (17 in) Coulter Blades.
Part ordering number includes one blade.

<table>
<thead>
<tr>
<th>Blade</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>17x5/16 inch fluted blade</td>
<td>820-018C</td>
</tr>
<tr>
<td>17x3/4 inch wavy blade</td>
<td>820-082C</td>
</tr>
<tr>
<td>17x5/8 inch turbo blade</td>
<td>820-156C</td>
</tr>
</tbody>
</table>

**Seed Firmers**

The standard drill includes seed flaps. The Seed-Lok™ firmer is an option in the main drill product bundles and may be field-installed as a kit. Only one type of seed firmer may be installed at the same time (seed flaps are usually shortened but left in place). Order one firmer kit per opener.

**Scraper Installation**

Start with row 1 (left-most row unit):

1. Remove one or both disk blades for access to the mount (1). Note the position of bushings and spacers for correct re-assembly.
2. Remove the existing slotted scraper.
3. Place a 3/8 inch flat washer (2) on the 3/8 x 1-1/4 inch bolt (3).

   If a Seed-Lok® is present, place a 3/8 inch lock washer (4), then the 3/8 inch flat washer (2) on the 3/8 x 1-1/4 inch bolt (3).

4. If the scraper blades are not pre-assembled, position a left-hand side scraper (5) behind a right-hand side scraper (6). Connect the spring (7) between the scraper blades using the small top holes. Insert the spacer (8) into the large blade holes as shown.

5. Insert the bolt through the scraper blades and spacer.
6. Secure the scraper assembly to the scraper mount (1) using the lock washer (4) and hex nut (9).

   If a Seed-Lok® is present, secure the scraper assembly to the Seed-Lok® using the threaded hole in the Seed-Lok®. The hex nut (9) is not used.
7. Re-install the disk blades.

**Carbide Disk Scraper**

Optional carbide disc scrapers are spring-loaded and require no periodic adjustment. Scrapers are compatible with the standard seed flap and Seed-Lok™. Carbide disc scrapers are not factory installed. Each kit equips one opener row.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Scraper Assembly</td>
<td>121-781A</td>
</tr>
</tbody>
</table>
### Wheel Scraper

Optional wheel scrapers are used to help clean the caster wheels. The wheel scrapers mount on the caster wheel forks. The wheel scrapers require no periodic adjustment.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel Scraper Assembly</td>
<td>160-466A</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Topic</td>
</tr>
<tr>
<td>------------------------------</td>
</tr>
<tr>
<td>secondary seed hose</td>
</tr>
<tr>
<td>seed delivery tube</td>
</tr>
<tr>
<td>seed depth</td>
</tr>
<tr>
<td>seed firmer</td>
</tr>
<tr>
<td>seed firmers</td>
</tr>
<tr>
<td>seed flap</td>
</tr>
<tr>
<td>seed meter</td>
</tr>
<tr>
<td>seed tube</td>
</tr>
<tr>
<td>Seed-Lok</td>
</tr>
<tr>
<td>sequence valve</td>
</tr>
<tr>
<td>service locks</td>
</tr>
<tr>
<td>shoot conversion</td>
</tr>
<tr>
<td>shunt valve</td>
</tr>
<tr>
<td>shutdown</td>
</tr>
<tr>
<td>single-hopper</td>
</tr>
<tr>
<td>speed calibration</td>
</tr>
<tr>
<td>storage</td>
</tr>
<tr>
<td>strainer</td>
</tr>
<tr>
<td>T</td>
</tr>
<tr>
<td>T handle</td>
</tr>
<tr>
<td>terminal</td>
</tr>
<tr>
<td>tire safety</td>
</tr>
<tr>
<td>tongue height</td>
</tr>
<tr>
<td>tool bar height</td>
</tr>
<tr>
<td>tramline</td>
</tr>
<tr>
<td>tramline diverter</td>
</tr>
<tr>
<td>tramlines</td>
</tr>
<tr>
<td>transition</td>
</tr>
<tr>
<td>transport</td>
</tr>
<tr>
<td>transport speed</td>
</tr>
<tr>
<td>U</td>
</tr>
<tr>
<td>UHMW piston</td>
</tr>
<tr>
<td>unfolding</td>
</tr>
<tr>
<td>unloading hopper</td>
</tr>
<tr>
<td>W</td>
</tr>
<tr>
<td>wash-out</td>
</tr>
<tr>
<td>waste disposal</td>
</tr>
<tr>
<td>weight transfer</td>
</tr>
<tr>
<td>wheel chocks</td>
</tr>
<tr>
<td>wheel scraper</td>
</tr>
<tr>
<td>wing tip height</td>
</tr>
<tr>
<td>wing weight transfer</td>
</tr>
<tr>
<td>wing-transfer valve</td>
</tr>
<tr>
<td>Y</td>
</tr>
<tr>
<td>yellow button</td>
</tr>
<tr>
<td>Z</td>
</tr>
<tr>
<td>zero gauge</td>
</tr>
</tbody>
</table>