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 or may depict similar models where a topic is identical.
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.

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Dealer Contact Information

Name: __________________________
Street: _________________________
City/State: _____________________
Telephone: ______________________
Email: _________________________
Dealer’s Customer No.: ____________

⚠️ WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov
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Important Safety Information

Look for Safety Symbol

The SAFETY ALERT SYMBOL indicates there is a potential hazard to personal safety involved and extra safety precaution must be taken. When you see this symbol, be alert and carefully read the message that follows it. In addition to design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence and proper training of personnel involved in the operation, transport, maintenance and storage of equipment.

Be Aware of Signal Words

Signal words designate a degree or level of hazard seriousness.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations, typically for machine components that, for functional purposes, cannot be guarded.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Prepare for Emergencies

▲ Be prepared if a fire starts
▲ Keep a first aid kit and fire extinguisher handy.
▲ Keep emergency numbers for doctor, ambulance, hospital and fire department near phone.

Be Familiar with Safety Decals

▲ Read and understand “Safety Decals” on page 6, thoroughly.
▲ Read all instructions noted on the decals.
▲ Keep decals clean. Replace damaged, faded and illegible decals.
Wear Protective Equipment

- Wear protective clothing and equipment.
- Wear clothing and equipment appropriate for the job. Avoid loose-fitting clothing.
- Because prolonged exposure to loud noise can cause hearing impairment or hearing loss, wear suitable hearing protection such as earmuffs or earplugs.
- Because operating equipment safely requires your full attention, avoid wearing entertainment headphones while operating machinery.

Handle Chemicals Properly

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

- Do not use liquid treatments with drill.
- Read and follow chemical manufacturer’s instructions.
- Wear protective clothing.
- Handle all chemicals with care.
- Avoid inhaling smoke from any type of chemical fire.
- Never drain, rinse or wash dispensers within 100 feet (30m) of a freshwater source, nor at a car wash.
- Store or dispose of unused chemicals as specified by chemical manufacturer.
- Dispose of empty chemical containers properly. Laws generally require power rinsing or rinsing three times, followed by perforation of the container to prevent re-use.

Avoid High Pressure Fluids

Escaping fluid under pressure can penetrate the skin, causing serious injury.

- Avoid the hazard by relieving pressure before disconnecting hydraulic lines.
- Use a piece of paper or cardboard, NOT BODY PARTS, to check for suspected leaks.
- Wear protective gloves and safety glasses or goggles when working with hydraulic systems.
- If an accident occurs, seek immediate medical attention from a physician familiar with this type of injury.
Use A Safety Chain

▲ Use a safety chain to help control drawn machinery should it separate from tractor drawbar.
▲ Use a chain with a strength rating equal to or greater than the gross weight of towed machinery.
▲ Attach chain to tractor drawbar support or other specified anchor location. Allow only enough slack in chain to permit turning.
▲ Replace chain if any links or end fittings are broken, stretched or damaged.
▲ Do not use safety chain for towing.

Check for Overhead Lines

Drill markers contacting overhead electrical lines can introduce lethal voltage levels on drill and tractor frames. A person touching almost any metal part can complete the circuit to ground, resulting in serious injury or death. At higher voltages, electrocution can occur without direct contact.
▲ Avoid overhead lines during seed loading and marker operations.

Keep Riders Off Machinery

Riders obstruct the operator’s view. Riders could be struck by foreign objects or thrown from the machine.
▲ Never allow children to operate equipment.
▲ Keep all bystanders away from machine when folding/unfolding, raising/lowering markers, raising/lowering openers, and transporting.

Use Safety Lights and Devices

Slow-moving tractors and towed implements can create a hazard when driven on public roads. They are difficult to see, especially at night.
▲ Use flashing warning lights and turn signals whenever driving on public roads.
▲ Use lights and devices provided with drill.
Transport Machinery Safely

Maximum transport speed for drill is 20 mph (32 kph). Some rough terrains require a slower speed. Sudden braking can cause a towed load to swerve and upset.

▲ Drill must be raised, locked-up, folded and locked for transport.

▲ Do not exceed 20 mph (32 kph). Never travel at a speed which does not allow adequate control of steering and stopping. Reduce speed if towed load is not equipped with brakes.

▲ Comply with national, regional and local laws.

▲ Do not tow a load that weighs more than 1.5x the weight of the tractor. See page 25 for details.

▲ Carry reflectors or flags to mark drill in case of breakdown on the road.

▲ Keep clear of overhead power lines and other obstructions when transporting. Refer to transport dimensions under “Specifications and Capacities” on page 124.

Shutdown and Storage

▲ Clean out and safely store or dispose of residual chemicals.

▲ Secure drill using blocks and transport locks. Lower openers if not locked up.

▲ Store in an area where children normally do not play.

Practice Safe Maintenance

▲ Understand procedure before doing work. Use proper tools and equipment. Refer to this manual on the Parts manual for additional information.

▲ Work in a clean, dry area.

▲ Put tractor in park, turn off engine, and remove key before performing maintenance.

▲ Make sure all moving parts have stopped and all system pressure is relieved.

▲ Disconnect battery ground cable (−) before servicing or adjusting electrical systems or before welding on drill.

▲ Inspect all parts. Make sure parts are in good condition and installed properly.

▲ Remove buildup of grease, oil or debris.

▲ Remove all tools and unused parts from drill before operation.
Tire Safety

Tire changing can be dangerous and should be performed by trained personnel using correct tools and equipment.

▲ When inflating tires, use a clip-on chuck and extension hose long enough for you to stand to one side—not in front of or over tire assembly. Use a safety cage if available.

▲ When removing and installing wheels, use wheel-handling equipment adequate for weight involved.

Safety At All Times

Thoroughly read and understand the instructions in this manual before operation. Read all instructions noted on the safety decals.

▲ Be familiar with all drill functions.

▲ Operate machinery from the driver’s seat only.

▲ Do not leave drill unattended with tractor engine running.

▲ Do not dismount a moving tractor. Dismounting a moving tractor could cause serious injury or death.

▲ Do not stand between the tractor and drill during hitching.

▲ Keep hands, feet and clothing away from power-driven parts.

▲ Wear snug-fitting clothing to avoid entanglement with moving parts.
Safety Decals

Safety Reflectors and Decals

Your drill comes equipped with all lights, safety reflectors and decals in place. They were designed to help you safely operate your drill.

▲ Read and follow decal directions.
▲ Keep lights in operating condition.
▲ Keep all safety decals clean and legible.
▲ Replace all damaged 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:
1. Clean the area on which the decal is to be placed.
2. Peel backing from decal. Press firmly on surface, being careful not to cause air bubbles under decal.

818-055C

Slow Moving Vehicle Reflector

Center rear of center box; 1 total

838-266C

Red Reflectors

On the outside edge of center walkboard each end; 4 total

838-265C

Amber Reflectors

On the ends and back edges of walkboards on both wings; 2 total
838-267C

Daytime Reflectors
On the outside edge of center walkboard each end;
2 total

848-512C

Danger: Read Manual
On tongue at hitch;
1 total

818-590C

Danger: Crushing Hazard
On tongue near hitch;
1 total

838-102C

Danger: Falling Hazard
Outside edge of wing walkboards;
2 total
818-045C

**WARNING**

**PINCH POINT OR CRUSHING HAZARD**

To prevent serious injury or death from pinching or crushing:
- Stand clear from implement while:
  - Folding
  - Raising
  - Lowering

**Warning: Pinch/Crush**

On transport wheel assembly; 4 total

818-188C

**WARNING**

**CESSIVE SPEED HAZARD**

Event Serious Injury or Death:

Not exceed 20 mph maximum transport speed; use of vehicle control and/or machine event Serious Injury or Death:

**Warning: Speed Hazard**

On tongue near hitch; 1 total

818-339C

**WARNING**

**HIGH PRESSURE FLUID HAZARD**

To Prevent Serious Injury or Death:
- Do not operate on system before inspecting, adjusting, or disconnecting.
- Wear proper hand and eye protection when servicing the fluid. Use wood or cardboard instead of hands.
- Keep all components in good repair.

**Warning: High Pressure Fluid Hazard**

On tongue near hitch; 1 total
818-579C (Option)

**WARNING**

**PINCH POINT HAZARD**

To Prevent Serious Injury or Death:
- Keep all persons and obstacles clear while any part of this machine is in motion.
- Keep hands, feet, hair, and clothing away.

**Warning: Pinch Point**

On marker, two with single, four with dual marker option; 2 or 4 total

818-580C (Option)

**WARNING**

**OVERHEAD HAZARD**

To Prevent Serious Injury or Death:
- Stay away from marker when it is in the raised position or being lowered.
- Keep others away.

**Warning: Overhead Hazard**

On marker, two with single, four with dual marker option; 2 or 4 total

818-398C

**CAUTION**

**To Avoid Injury From Dissecured Transport Tires:**
- Never ride on or use transport tires as a step.
- Tires not in contact with the ground will rotate easily.

**Caution: Tires Not A Step**

Above all sets of tires; 6 total
818-587C

**Caution: General**

On tongue near hitch; 1 total

838-426C

**Caution: Pressure/Torque**

On the rim of each tire; 12 total
Great Plains welcomes you to its growing family of new product owners. Your 3-Section 40-Foot No-Till Drill has been designed with care and built by skilled workers using quality materials. Proper setup, maintenance, and safe operating practices will help you get years of satisfactory use.

**Document Family**

- 196-359M  Operator Manual (this document)
- 196-359P  Parts Manual

**Description of Unit**

The 3N-4010F, 3N-4010HDF and 3N-4020F are pull-type seeding implements outfitted with hydraulic drive metering and no-till coulters for use in no-till or minimum-till conditions.

The 3N-4010F has 10 Series, parallel-arm openers.

The 3N-4010HDF has 10HD (Heavy Duty) openers.

The 3N-4020F has 20 Series, side-depth-control openers. All models fold for transport.

**Models Covered by this Manual**

- **10 Series Openers:**
  - 3N-4010F-481048 Rows, 10 inch/25cm
  - 3N-4010F-647564 Rows, 7.5 inch/19cm
- **10HD (Heavy Duty) Series Openers:**
  - 3N4010HDF-481048 Rows, 10 inch/25cm
  - 3N4010HDF-647564 Rows, 10 inch/19cm
- **20 Series Openers:**
  - 3N-4020F-481048 Rows, 10 inch/25cm
  - 3N-4020F-647564 Rows, 7.5 inch/19cm

**Intended Usage**

Use the drill to seed production-agriculture crops only. Do not modify the drill for use with attachments other than Great Plains options and accessories specified or recommended for use with the drill.

**Definitions**

The following terms are used throughout this manual.

Right-hand and left-hand as used in this manual are determined by facing the direction the machine will travel while in use unless otherwise stated.

---

**NOTICE**

*Paragraphs in this format present a crucial point of information related to the current topic.*

Read and follow the directions to:

- remain safe,
- avoid serious damage to equipment and
- ensure desired field results.

---

a. This manual also covers seeding rate. There is no separate Seed Rate manual.
Using This Manual

This manual will familiarize you with safety, assembly, operation, adjustments, troubleshooting, and maintenance. Read this manual and follow the recommendations to help ensure safe and efficient operation.

The information in this manual is current at printing. Some parts may change to assure top performance.

Owner Assistance

If you need customer service or repair parts, contact a Great Plains dealer. They have trained personnel, repair parts and equipment specially designed for Great Plains products.

Refer to Figure 3

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 Great Plains dealer. The serial number plate is located on the front of the left hand side of the center section as shown.

Record your drill model and serial number here for quick reference:

Model Number: __________________________
Serial Number: __________________________

Your Great Plains dealer wants you to be satisfied with your new machine. If you do not understand any part of this manual or are not satisfied with the service received, please take the following actions.

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

For further assistance write to:

Product Support
Great Plains Mfg. Inc., Service Department
PO Box 5060
Salina, KS 67402-5060

gp_web_cs@greatplainsmfg.com
785-823-3276
Preparation and Setup

This section will help you prepare your tractor and drill for use. Before using the drill in the field, you must hitch the drill to a suitable tractor and level the drill.

Pre-Setup Checklist

1. Read and understand "Important Safety Information" on page 1.
2. Check that all working parts are moving freely, bolts are tight, and cotter pins are spread.
3. Check that all grease fittings are in place and lubricated. See "Lubrication" on page 113.
4. Check that all safety decals and reflectors are correctly located and legible. Replace if damaged. See "Safety Decals" on page 6.
5. Inflate tires to pressure recommended and tighten wheel bolts as specified. "Appendix" on page 124.

Hitching

There are three hitch options (see page 118). Check that the tractor and drill are compatible before hitching.

**DANGER**

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 machines being hitched. Stop tractor engine and set park brake before installing hitch pins.

Refer to Figure 4

1. Use drill parking jack to raise or lower tongue as needed. Hitch drill to tractor using a hitch pin of adequate strength - minimum diameter $1\frac{1}{2}$in (38mm).
2. Install a retaining clip on the hitch pin to prevent it from working up.
3. Securely attach drill safety chain to tractor drawbar.
4. Lower tongue onto tractor drawbar with jack. Remove jack and store on tongue.

Make Electrical Connections

Make sure tractor is shut down with accessory power off before making connections. Connections include:

5. Lighting
6. Veris controller harness
7. Electric Clutch (Point Row) harness (2 connectors)
8. Shaft monitor (option)
Make Hydraulic Connections

**WARNING**

*High Pressure Fluid Hazard:*
Only trained personnel should work on system hydraulics! Escaping fluid under pressure can penetrate skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic lines. Use a piece of paper or cardboard, NOT BODY PARTS, to check for leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. If an accident occurs, seek immediate medical attention from a physician familiar with this type of injury.

**Hydraulic Circuit Connections**

*Refer to Figure 5*

Great Plains hydraulic hoses are color coded handle grips to help you hookup hoses to your tractor outlets. Hoses that go to the same remote valve are marked with the same color.

To distinguish hoses on the same hydraulic circuit, refer to the symbol molded into the handle grip. Hoses with an extended-cylinder symbol feed cylinder base ends. Hoses with a retracted-cylinder symbol feed cylinder rod ends.

The drill has three or four hydraulic circuits. The standard circuits power drive/locks, lift, and fold. If markers are present, they require a fourth circuit (or an additional selector valve sharing the fold circuit).

If the tractor has only one circuit rated for continuous flow, reserve it for the hydraulic drive.

1. Shut down tractor hydraulics.
2. Connect the hydraulic drive circuit.
3. Connect remaining circuits.
4. Check hose routing to ensure adequate slack for link arm movement, and clearance from pinching or abrading drill components.

*Refer to Figure 6*

5. If the drill is to be unfolded, set the selector valve to Locks (handle to drill center). Valve is located near rear end of left tongue tube.

**Current Style Color Coded Hose Handles**

<table>
<thead>
<tr>
<th>Hose Color</th>
<th>Hydraulic Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray</td>
<td>Fold</td>
</tr>
<tr>
<td>Blue</td>
<td>Lift</td>
</tr>
<tr>
<td>Green</td>
<td>Marker Cylinders (Option)</td>
</tr>
<tr>
<td>Yellow</td>
<td>Hydraulic Drive and Wing and Swivel Locks</td>
</tr>
</tbody>
</table>
Older Style Hoses with Color Ties

Refer to Figure 7

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

<table>
<thead>
<tr>
<th>Hose Color</th>
<th>Hydraulic Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Fold</td>
</tr>
<tr>
<td>Blue</td>
<td>Lift</td>
</tr>
<tr>
<td>Orange</td>
<td>Marker Cylinders (Option)</td>
</tr>
<tr>
<td>Yellow</td>
<td>Hydraulic Drive and Wing and Swivel Locks</td>
</tr>
</tbody>
</table>

NOTICE

The drive is compatible only with closed center, PC (pressure compensated) closed or LS (load sensing) hydraulic systems. Do not use an open center system.

Figure 7
Plastic Hose Label
Initial Setup

The following items need to be done for first use, and some need to be re-done if the tractor changes.

Initial Tractor Setup

Veris Controller

The standard Veris hydraulic drive, controller module and DICKEY-john radar are factory-installed on the drill. The Veris console needs to be installed in the tractor prior to first use. It includes suction cup feet that can support the console on glazing for extended periods.

Route the power lead to a +12Vdc source. Route the harness to the hitch, allowing enough slack for hitch movement and any tractor articulation.

Refer to Figure 8

Mount the console where the display is visible during planting, but does not obstruct vision of tractor or drill systems, and does not impair safe highway transport.

Installation instructions are found in an included Veris manual. Additional copies are available at: www.veristech.com

Expanded operating information from that manual is found in this manual, starting on page 34.

Once the console is installed, you can enter the initial setup data by stepping through the calibration sequence but not actually operating the motor. See page 38.

⚠️ DANGER

Moving Chain Hazard
Pinch/Crush Hazard
Shaft Entanglement Hazard:
Be careful when working around drill while tractor is running. Any movement detected by the radar gun (Figure 9) can activate the Veris hydraulic drive causing motion of chains, sprockets, shafts and seed meters.

⚠️ CAUTION

Vision Hazard:
The DICKEY-john RVS II radar speed sensor is an intentional radiator of RF energy. Although its radiated energy level is far below the limits set by EN 61010-1: 1993\A2: 1995 - Chapter 12.4, it is advisable not to look directly into the face of the unit.

The radar must radiate toward the ground and at least 20 cm (8 inches) away from a human during use to comply with the RF human exposure limits per FCC 47 CFR Sec. 2.1091. DO NOT mount or use the radar in a manner inconsistent with its defined use.
Point Row Switch Module

Refer to Figure 10

6. Choose a tractor cab location where the module does not obstruct vision, and the switches can be safely operated during planting passes.

7. Route the power leads to a source of +12 Vdc power capable of supplying 12.6A. Color code is red+, black-. Direct battery connection is acceptable; the controller module has its own master switch and fuse.

8. Use a tie to secure the power lead.

9. Route the controller harness to the tractor hitch. Use ties to secure the hitch lead.

Drill Setup Checks

Hydraulic Bleed

Bleeding the hydraulic system is not a routine daily setup item. If the system has not been charged since delivery, or any hydraulic work has been done (such as installing markers), see “Bleeding Hydraulics” on page 104.

Drill Level

Drill sections are aligned and leveled at the factory, and re-checked during dealer pre-delivery. Level normally does not require routine adjustment before use. Great Plains does recommend checking it once prior to first field use. See “Level Frame Side to Side” on page 101.

Drill Option Setup

Even if factory- or dealer-installed, some optional items may need checking or adjustment prior to first field use. Install any that were not pre-installed.

Scrapers (Option)

If scrapers were ordered, and not dealer-installed, install them now per the instructions in one of the following manuals, which are available on the Great Plains website if not ordered or included:

Kit: Manual
122-259K 122-262M (ordered separately)
198-960A 198-961M (included in kit)
Marker Setup (Option)

If markers are not installed, install them now per the instructions included with the markers.

Once installed, verify that they have been correctly bled (See “Bleeding Markers” on page 106).

Set initial marker extension - the distance to the mark on each side from the outside row unit on that side.

1. Move the hitched drill to a typical flat field.
2. Extend a marker on one side (see page 32). Pull forward a few feet or a meter or so to leave a mark.
3. Measure from the centerline of the outside row unit (whether that row unit is to be used or not) to the mark, along a line parallel to the wing.

Refer to Figure 175 through Figure 180 on pages 126 and 128

4. Check the measurement against the value recommended by Great Plains.

Refer to Figure 12

If the marker extensions need adjustment:

5. Loosen the nuts securing the U-bolt at the outer marker section.
6. Slide the inner tube in or out, and re-secure nuts.

See page 68 for further marker adjustments. Re-check marker extension when changing disk angle, or when inverting the disk, as both adjustments change the position of the centerline of the mark.

Shaft Monitor (Option)

1. Choose a tractor cab location where the module does not obstruct vision, and the shaft indicators can be easily seen if an alert sounds.

Refer to Figure 13

2. Route the power leads to a source of +12 Vdc power.
   Color code is red+, black-.
3. Use a tie to secure the power lead.
4. Route the monitor harness to the tractor hitch.
   Use ties to secure the hitch lead.

For operation, see: “Shaft Monitor Operation (Option)” on page 32.

For ordering information, see: “Shaft Monitor” on page 120.
Install Weight Brackets (Option)

If weight brackets were ordered, and were not dealer-installed, install them now. Two kits (4 brackets) are supported, accepting five standard 100 pound (45 kg) “suitcase” tractor weights each, for a maximum additional weight of 2000 pounds (907 kg). Weights are not included with kits.

If only one weight kit is to be installed, use the “Outer” position.

Once the brackets are installed, see “Frame Weight” on page 67 for operating information.

Install Outer Brackets

Start with the left wing.

Refer to Figure 15

1. Select two:
   19 806-172C U-BOLT 3/4-10 X 10 1/32X11 1/2

   From the front of the wing, insert the U-Bolts 19 through the holes in the outside lug 1.

2. Select one:
   11 196-291H 40P WEIGHT BRACKET WLDMNT
   and four sets:
   18 804-023C WASHER LOCK SPRING 3/4 PLT
   15 803-027C NUT HEX 3/4-10 PLT

   Mount the bracket weldment 11 on the U-Bolts 19, and secure with lock washers 18 and nuts 15.

3. Select one:
   12 197-062D WEIGHT BRACKET ADJ LEG
   and two sets:
   13 802-057C HHCS 5/8-11X2 1/4 GR5
   16 804-019C WASHER FLAT 5/8 USS PLT
   17 804-022C WASHER LOCK SPRING 5/8 PLT
   14 803-021C NUT HEX 5/8-11 PLT

   Orient the adjustment leg 12 toward the outside (end of wing), and secure with bolts 13, flat washers 16, lock washers 17 and nuts 14.

4. Repeat step 1 through step 3 for the right wing.
Install Mid-Wing Brackets  
Refer to Figure 16

5. Select two:
   (19) 806-172C U-BOLT 3/4-10 X 10 1/32X11 1/2

   From the centerline of the inside U-Bolt installed at step 1, measure toward drill center, approximately:
   2. 35 1/2 in (90cm)
   Insert a U-bolt (19) from drill front, under the hoses.
   Insert the second U-Bolt 7 1/2 in (19cm) further in.

6. Select one:
   (11) 196-291H 40P WEIGHT BRACKET WLDMNT
   and four sets:
   (18) 804-023C WASHER LOCK SPRING 3/4 PLT
   (15) 803-027C NUT HEX 3/4-10 PLT

   Position the bracket weldment (11) on the U-Bolts (19), and adjust the placement as necessary to clear tube
   weldments, web plates, grease banks, marker parts
   and secure with lock washers (18) and nuts (15).

7. Select one:
   (12) 197-062D WEIGHT BRACKET ADJ LEG
   and two sets:
   (13) 802-057C HHCS 5/8-11X2 1/4 GR5
   (16) 804-019C WASHER FLAT 5/8 USS PLT
   (17) 804-022C WASHER LOCK SPRING 5/8 PLT
   (14) 803-021C NUT HEX 5/8-11 PLT

   Orient the adjustment leg (12) toward the inside
   (center of drill), and secure with bolts (13), flat
   washers (16), lock washers (17) and nuts (14).

8. Repeat step 5 through step 7 for the right wing.

---

Figure 16
Weight Bracket, Mid-Wing
Operating Instructions

This section covers general operating procedures. It assumes that setup items have been completed. Experience, machine familiarity and this information leads to efficient operation and good working habits. Always operate farm machinery with safety in mind.

Pre-Start Checklist

- Review “Important Safety Information” on page 1.
- Lubricate the drill as indicated under Lubrication, “Maintenance and Lubrication” on page 99.
- Check the tires for proper inflation according to “Tire Inflation Chart” on page 124.
- Check for worn or damaged parts and repair or replace before going to the field.
- Check all nuts, bolts and screws. Tighten bolts as specified on “Torque Values Chart” on page 125
- Check hydraulic hoses, fittings and cylinders for leaks. Tighten, repair or replace before planting.

WARNING

High Pressure Fluid Hazard: Escaping fluid under pressure can penetrate skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic lines. Use a piece of paper or cardboard, NOT BODY PARTS, to check for leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. If an accident occurs, seek immediate medical attention from a physician familiar with this type of injury.

DANGER

Moving Chain Hazard
Pinch/ Crush Hazard
Shaft Entanglement Hazard:
Be careful when working around drill while tractor is running. Any movement detected by the radar gun (Figure 17) can activate the Veris hydraulic drive causing motion of chains, sprockets, shafts and seed meters.

CAUTION

Vision Hazard:
The DICKEY-john RVS II radar speed sensor is an intentional radiator of RF energy. Although its radiated energy level is far below the limits set by EN 61010-1: 1993\A2: 1995 - Chapter 12.4, it is advisable not to look directly into the face of the unit.

The radar must radiate toward the ground and at least 20 cm (8 inches) away from a human during use to comply with the RF human exposure limits per FCC 47 CFR Sec. 2.1091. DO NOT mount or use the radar in a manner inconsistent with its defined use.

Figure 17
DICKEY-john Radar

20310
Lift / Lower

**NOTICE**

**Machine Damage Risk:**
Lower only when the drill is unfolded. The drill must be raised and locked up for folding and unfolding.

The drill has six rephasing lift cylinders that raise and lower the opener frame.

Six (6) transport locks are provided, two for the rockshaft (center forward) cylinders, and one each for the rear and wing caster cylinders. These assure that the drill stays raised during folding/unfolding, transport, storage, lubrication, maintenance and some setup/adjustment tasks.

**Opener Operation Lowered**

The "lowered" position of the opener frame is regulated by an adjustable valve, factory set for 2in coulter depth. See "Frame Height" on page 59 for adjustment.

**Rephasing Lift System**

Over a period of normal use the cylinders may get out of phase. This causes some implement sections to run higher than others when lowered. To minimize this, or rephase the cylinders, make the following steps your normal raise sequence:

9. Raise drill completely and hold the hydraulic remote lever on for several seconds until all cylinders are fully extended. Do this every 3rd or 4th time you raise the drill out of the ground.

10. When all cylinders are fully extended, momentarily reverse the hydraulic remote lever to retract the system ½ inch (13mm) to maintain levelness.

If implement is still not level after re-phasing, see "Bleeding Lift Hydraulics" on page 104 and "Level Frame Side to Side" on page 101.
Folding the Drill

**NOTICE**

*Machine Damage Risk:*
Fold only when the drill is raised and locked up.

Fold the drill on level ground with the tractor in neutral. If your drill has markers, be certain they are folded and their control switches are off before folding.

**WARNING**

*Pinch Point and Crushing Hazard.*
To prevent serious injury or death:

- Always use transport lift locks when drill is folded.
- Fold only if hydraulics are bled free of air and fully charged with hydraulic oil.
- Stay away from frame sections when they are being raised or lowered.
- Keep away and keep others away when folding drill.

Refer to Figure 20

1. Set Drive/Lock selector valve to Lock.
2. Fold markers (Option). See page 32.
3. Raise drill with lift cylinders until cylinders are fully extended. Install lock channels over extended wheel-cylinder rods. Six cylinder rods total. See page 22.
4. Retract the Lock cylinder circuit lever to:
   - disengage the tool bar locks (2),
   - disengage swivel locks (2),
   - disengage caster locks (2), and
   - enable the self-latching transport lock (1).
   Set circuit to Neutral. Do not Extend.

There are two key points to remember when operating the lock cylinders.

a. All seven lock cylinders are plumbed together, and all move at the same time.

b. Operate the lock circuit lever (Retract/Neutral) only once to fold. As the cylinders move, they unlock 6 points then stop in a “ready to fold position.” When the drill is folded, the 7th lock, spring loaded, snaps shut, locking the drill.

5. Extend the Fold cylinder circuit lever to slowly fold wings forward. The transport lock automatically captures the right wing tool bar for transport.

It may be necessary to ease forward slightly with the tractor to assist wings in folding completely.
Unfolding the Drill

**NOTICE**

**Machine Damage Risk:**
Unfold only when the drill is raised and locked up.

Unfold the drill on level ground with the tractor transmission in neutral.

**WARNING**

**Crushing, Pinch-Point and Overhead Hazards:**
To prevent serious injury or death:

- Always use transport locks when drill is folded.
- Fold only if hydraulics are bled free of air and fully charged with hydraulic oil.
- Stay away from frame sections when they are being raised or lowered.
- Keep away and keep others away when unfolding drill.

When unfolding, operate the lock circuit exactly in reverse of folding. Operate the circuit once (Extend/Neutral). Remember that when the cylinders move, they release one lock, and enable six others, stopping in a “ready to unfold” position. As the drill is unfolded, the six spring loaded locks snap shut, locking the drill.

Refer to Figure 23
1. Check selector valve set to Locks.
2. Extend the Lock cylinder circuit lever to:
   - disengage the self-latching transport lock,
   - enable two tool bar locks,
   - enable two swivel locks, and
   - enable two caster locks.
   Set circuit to Neutral. Do not Retract.

Refer to Figure 18 and 19 on page 22
3. Raise the drill. Remove lock channels from all six wheel cylinders. Store lock channels.
4. Activate fold hydraulics and slowly unfold the drill until wings are fully unfolded and all spring loaded locks have snapped into position.
5. Lower drill.

Refer to Figure 23
6. Move selector valve handle from Locks to Drive.
Transport

DANGER

Electrocution Hazard:
To prevent serious injury or death from electric shock, keep clear of overhead power lines when transporting, folding, unfolding or operating drill components. Machine is not grounded. At higher voltages, electrocution can occur without direct contact.

Great Plains recommends transporting the drill without seed loaded. Although designed for highway movement with full seed boxes, the additional weight of seed may cause the drill to exceed the rated towing and stopping ability of the tractor, makes the drill more difficult to control and stop, and increases wear on tires and wheel bearings.

Make sure the tractor weighs at least $\frac{2}{3}$ (67%) of the drill, including any material load. Check the table at the bottom of this page for weights of various configurations.

WARNING

Loss of Control Hazard:
Towing the drill at high speeds or with a vehicle that is not heavy enough can lead to loss of vehicle control. Loss of vehicle control can lead to serious road accidents, injury and death. To reduce the hazard:

- Do not exceed 20 mph (32 kph).
- Do not tow a drill that weighs more than 1.5 times the weight of the towing vehicle.

Typicala Transport Weights

<table>
<thead>
<tr>
<th>Rows</th>
<th>3N-4010F</th>
<th>3N-4010HDF</th>
<th>3N-4020F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.5in</td>
<td>10in</td>
<td>7.5in</td>
</tr>
<tr>
<td>Empty, no markers, no weights</td>
<td>28260 lbs</td>
<td>26660 lbs</td>
<td>29640 lbs</td>
</tr>
<tr>
<td></td>
<td>12819 kg</td>
<td>12093 kg</td>
<td>13399 kg</td>
</tr>
<tr>
<td>Empty, w/markers and weights</td>
<td>32142 lbs</td>
<td>30542 lbs</td>
<td>33422 lbs</td>
</tr>
<tr>
<td></td>
<td>14579 kg</td>
<td>13854 kg</td>
<td>15160 kg</td>
</tr>
<tr>
<td>Full Seed Load, no markers, no weights</td>
<td>34404 lbs</td>
<td>32804 lbs</td>
<td>35684 lbs</td>
</tr>
<tr>
<td></td>
<td>15605 kg</td>
<td>14880 kg</td>
<td>15605 kg</td>
</tr>
<tr>
<td>Full Seed Load, w/markers and weights</td>
<td>38286 lbs</td>
<td>36686 lbs</td>
<td>39566 lbs</td>
</tr>
<tr>
<td></td>
<td>17366 kg</td>
<td>16640 kg</td>
<td>17366 kg</td>
</tr>
</tbody>
</table>

a. Weights do not include row unit accessories or other options. If table weight is near recommended limit for the tractor, obtain a precise weight for the empty drill at a scale.
Pre-Transport Checklist

Before transporting the drill, check and observe the following items.

- Make sure the weight of the tractor equals or exceeds the value specified for your drill configuration.
- **Marker Checklist Complete**
- Markers must be folded.
- **Master Switches Off**
- Check that the Veris and point row (if any) master switches are off while transporting.
- **Drill Raised and Locked**
- Lift transport locks installed.
- Wings folded and locked, with circuit lever in neutral.
- **Tires**
- Check that all tires are properly inflated as listed on “Tire Inflation Chart” on page 124.
- **Bystanders**
- Check that no one is in the way before moving. Do not allow any one to ride on the drill.
- **Warning Lights**
- Always use tractor and drill warning lights when transporting the drill.
- **Clearance**
- Know the maximum dimensions of the tractor and drill in transport position and follow a route that provides adequate clearance from all obstructions, including overhead lines. See “Specifications and Capacities” on page 124.
- **Stopping Distance**
- Allow sufficient stopping distance and reduce speed prior to any turns or maneuvers. If the drill is transported full, allow extra stopping distance.
- **Road Rules**
- Comply with all national, regional and local laws when transporting on public roads.
- **Watch Traffic**
- The drill boxes obstruct a portion of your rear view. Be prepared for sudden maneuvers from following vehicles.
Loading Seed
To unload seed, see “Seed Cleanout” on page 100.

**DANGER**

**Misstep Hazard:**
Watch your step when walking on drill ladder and walkboard. Falling from drill could cause severe injury or death.

Great Plains recommends loading materials after the drill has been transported to the planting ground.

Seed is heavy. A full load of dense seed adds over 6000 pounds (2780 kg) to the drill. Pre-loading substantially increases transport hazards:

- Stopping distance increases.
- Turns are more difficult to initiate and more difficult to stop, due to the inertia of the load.

To load materials:
1. Load only in dry conditions.
2. If the seed is treated, wear protective equipment recommended for the hazards.
3. Lower the drill.
4. Open the lids for the boxes.
5. Remove any debris or obstructions from the boxes. If other seed needs to be first removed, see “Seed Cleanout” on page 100.
6. If not planting all rows, shut off unused rows. See page 65.
7. Load seed. Load or spread materials evenly across all partitions. Use a tool or gloved hand. Do not overfill boxes.
8. Make a note of the quantity loaded, for later confirmation of population or application density desired.
9. Close and secure the box lids.

**No Seed Lubricants**
Fluted-feed materials do not require lubricants.
Planting
Seed Rate

Seed rate on this family of drills is controlled by:

- Seed rate handles.
- Seed cup door handles.
- Rate set by the hydraulic drive console.

Set Seed Rate Handle

Refer to Figure 27

There are main box seed rate handles for each section of the drill (3 handles total). All must be set identically.

The seed rate handle controls the percent engagement of the seed sprocket in the seed cups. The setting of the handle is given by the chart on page 39. These settings have been chosen based on the seed size, and a coarse rate that allows the hydraulic drive to provide optimal fine rate control. Once set, the handles are not adjusted.

To set a handle:

1. Loosen wing nut under handle.
2. Consult the chart on page 39 for your seed and rate range. Note the Rate Handle setting provided.
3. Move indicator to a scale value about 10 higher than the setting from the chart. Then move handle back to the chart setting.
4. Tighten wing nut.

Set Seed Cup Door

Refer to Figure 28, which depicts the seed cup door handle in position 3.

At each seed tube, adjust the seed cup door handle 5 for the seed size.

The handle has three normal operating position detents:

1. (top detent) is for the smallest seeds.
2. (middle detent) is for larger seeds.
3. (bottom detent) is for oversize or fragile seeds.

If you experience excessive cracking with setting 2, use setting 3.

Handle position 4 is used for clean-out (page 100), not planting. If set to this position with seed loaded, it may be difficult to reset it to a normal operating position.
About Hydraulic Drive Rate

Before it can control seed rate, the console must be:

- configured with information about your drill and intended planting speed,
- configured with a calibration number for the seed and rate range, and;
- calibrated to fine-tune the calibration number and speed.

This process is described starting on page 38.

Refer to Figure 29

With those steps completed, field seeding rate is controlled manually by adjusting the target “set=” rate using the ↑↓ arrow buttons. Field rate can also be controlled by a pre-loaded “recipe” or an external GPS controller.

In field operation, the hydraulic drive console displays:

- `set=` the currently active desired seeding rate
- `out=` the current system seeding rate
- `spd=` (over number), the current speed

Seeding Depth

Refer to Figure 29

Seeding depth ① is controlled by coulter depth ② in front, and press-wheel height ③ in back. Seed cannot be placed any deeper than coulter depth. Before adjusting row units, make sure coulters are performing as desired.

See “Level Frame Side to Side” on page 101.
See “Level Frame Front to Rear” on page 101.
See “Frame-Mounted Coulters” on page 62.
See “10 Series Opener Depth” on page 73.

Consistent seeding depth relies on appropriate down-pressure for conditions.

See “Frame Weight” on page 67.
See “10 Series Row Unit Down Pressure” on page 70.

For information on opener adjustments, see one of:

- “10 Series Row Unit Adjustments” on page 69
- “10HD Series Row Unit Adjustments” on page 74
- “20 Series Row-Unit Adjustments” on page 83

For information on troubleshooting opener problems, see “Troubleshooting” on page 89.
Point Row Switches

The hydraulic drive motor operates whenever the speed radar detects motion. The Point Row system determines whether or not that motion is coupled to the meter drives, by controlling the electric clutches. The implement lift switch is part of the Point Row system.

A Point Row troubleshooting chart is found on page 91.

Refer to Figure 31

The Pump (P) switch has no function on 3N-40 drills configured by Great Plains. Unless connected to field-installed equipment, leave it off.

When Not Planting or Calibrating

Set the Master switch (M) OFF when you do not intend to meter seed.

![Entanglement Hazard:]

If the hydraulic drive system is on, and the drill is lowered (or the Master switch is in CAL), unexpected motion of chains, sprockets, shafts and seed meters can occur if the speed radar detects motion, such as someone moving near the radar.

Normal Full Pass

1. Set Master switch (M) ON (up)
   - Set all sections (L C R) ON (up).
   - Check that corresponding lamps are on.
2. Height switch automatically energizes clutches when row units are lowered.

Point Row in Pass

3. Turn desired sections off as non-planting regions are reached.
4. Turn the sections back on before commencing next full-width pass.

Point Row CAL Mode

When the drill is raised, the lift switch normally causes the Point Row Monitor to disengage the clutches for each drill section. To keep one or more clutches engaged during hydraulic drive calibration, set the Master switch to CAL.

For a typical 3-row calibration, set the Left section switch (L) on, and the center and right section switches (C / R) off during calibration.

### Cab Switch Box

<table>
<thead>
<tr>
<th>Switch or Indicator</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASTER Switch</td>
<td>Up: ON: System enabled&lt;br&gt;Center: OFF System inactive&lt;br&gt;Down: CAL: Lift switch bypassed on</td>
</tr>
<tr>
<td>MASTER Lamp</td>
<td>On: System enabled&lt;br&gt;Off: System OFF</td>
</tr>
<tr>
<td>Section Lamps</td>
<td>On: Clutch enabled for that section.&lt;br&gt;Off: Clutch not energized&lt;br&gt;a.</td>
</tr>
<tr>
<td>LEFT CENTER RIGHT</td>
<td>Up: section enabled&lt;br&gt;Down: section disabled</td>
</tr>
<tr>
<td>PUMP</td>
<td>May control customer-provisioned equipment.</td>
</tr>
<tr>
<td>Fuse</td>
<td>Protects switch box, clutches and battery.</td>
</tr>
<tr>
<td>CAL Lamp</td>
<td>On: Lift switch overridden&lt;br&gt;Off: Lift switch active (or system off)</td>
</tr>
</tbody>
</table>

a. However, the section’s meters may still be coupled to the drive system, if lock-up bolts are installed in the clutch. See page 108.
b. If (m) lamp fails to illuminate with (M) set ON, check the fuse (F). If open, check for damaged cable / failed clutch.
Field Operations

This section presumes that all pre-operation checks have been made on drill, and drill is hitched and loaded with seed.

Final Field Checklist

- Drill unfolded and raised.
- Selector valve set to hydraulic drive.
- Hydraulic drive console set per seed rate calibration.
- Check all seed hoses secure.
- Check all row configurations identical (except where compensating for tire tracks, etc.).

If you desire to verify that all meters and seed tubes are working, you can run a Veris calibration for 4 seconds (the minimum time) and "KEEP OLD" when it presents a proposed new calibration number. See page 38.

Planting Sequence

1. All Clutch/Point Row switches up (except Pump). Check lamps illuminated.
2. Press Veris "ON/VR" button once. Check LED above button illuminated.
3. Pull forward to field.
4. Lower drill to field position.
5. Move lever for hydraulic drive circuit forward and lock it open.
6. Option: Extend marker side desired.
7. Option: Shaft Monitor ON
8. Press Veris "ENGAGE" button once. Check LED above button illuminated.
9. Accelerate to planting speed.
10. Raise drill for turns (drive stops automatically).
11. Option: Retract and extend markers at turns.

Stop early in the first pass to verify:
- Openers are at correct depth.
- Seed is flowing to furrows.
- Press wheels are covering furrows as desired.

Monitor the seed level indicators on the seed box. After a third or more of the first seed load has been planted, stop and check the seed boxes from above. Look for evidence of unexpected unevenness in the seed level. There may be mounds at any blocked rows.

Seed consumption is uneven, and end rows run out before mid-section rows. Re-load seed when the level indicators near Empty.

Figure 32
DICKEY-john Radar

Moving Chain Hazard
Pinch/Crush Hazard
Shaft Entanglement Hazard:
Be careful when working around drill while tractor is running. Any movement detected by the radar gun can activate the Veris hydraulic drive causing motion of chains, sprockets, shafts and seed meters.

Vision Hazard:
The DICKEY-john RVS II radar speed sensor is an intentional radiator of RF energy. Although its radiated energy level is far below the limits set by EN 61010-1: 1993/A2: 1995 - Chapter 12.4, it is advisable not to look directly into the face of the unit.

The radar must radiate toward the ground and at least 20 cm (8 inches) away from a human during use to comply with the RF human exposure limits per FCC 47 CFR Sec. 2.1091. DO NOT mount or use the radar in a manner inconsistent with its defined use.

Certain Machine Damage: Do not back up with openers in the ground. To do so will cause severe damage and opener plugging.
Marker Operation (Option)

Markers are on a separate hydraulic circuit on the drill. Before operating markers, make sure they are properly bled as described in “Bleeding Markers” on page 106.

Dual markers are equipped with a sequence valve to control lift sequence. Starting with both markers up, the sequence is:

1. Activate tractor hydraulic lever; right marker lowers while left marker stays up.
2. Reverse hydraulic lever; right marker raises while left marker stays up.
3. Activate hydraulic lever; left marker lowers while right marker stays up.
4. Reverse hydraulic lever; left marker raises while right marker stays up.
5. Pattern repeats.

Folding speed of dual markers is adjusted with adjustment screws on sequence valve body. Because excessive folding speed may damage markers, adjust markers to a safe folding speed according to “Marker Speed” on page 106.

To get both markers in the lowered position at the same time, activate hydraulic lever to lower one marker. After marker is lowered, move lever to opposite position then quickly reverse lever and hold until other marker is lowered.

Shaft Monitor Operation (Option)

Refer to Figure 33

To operate the optional shaft monitor, turn the system on via the ON-OFF ① switch.

During normal movement, the indicator lamps ② for each section are on steady, indicating that shaft rotation is detected.

If the seed-cup shaft stops for 30 seconds or more, an alarm ③ sounds and the lamp for the affected section flashes.

The 30-second delay is to prevent nuisance alarms when turning at the end of passes.

If a shaft failure does occur, remember that you have traveled for 30 seconds without planting under the affected section.

For installation, see: “Shaft Monitor (Option)” on page 18.

For ordering information, see: “Shaft Monitor” on page 120.

![Shaft Monitor Console](image-url)
Parking
Following these steps when parking the drill for periods of less than 36 hours. For longer periods, see Storage, the next topic.

1. Spot the drill on firm, level ground.
2. Raise the drill. Install transport locks.
3. Fold as necessary for the parking space available.
4. Securely block drill tires to prevent rolling.

**DANGER**

Roll-Away Hazard
Always block drill tires when unhitching. There is not enough weight on tongue to anchor drill using parking jack.

*Do NOT unhitch on a steep slope.*
*Always unhook safety chain LAST.*

Storage
Store the drill where children do not play. If possible, store inside for longer life, or cover with tarp.

5. Unload seed boxes. See page 100.
6. Lubricate the drill at all points listed under "Lubrication" on page 113.
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 before the next season.
9. Plug or cap seed delivery tubes to prevent pest entry.
10. Grease exposed cylinder rods to prevent rust. Be sure to completely de-grease before next use, to prevent seal damage.
11. Use touch-up paint to cover scratches, chips and worn areas to prevent rust.
Hydraulic Drive Operation

Drive Operational Requirements

Hydraulic System:
Closed Center, pressure compensated or load sensed systems only

**NOTICE**

Drive will not operate on Open-Center hydraulic systems

- Minimum Hydraulic Pressure: 2250 psi
- Maximum Hydraulic Pressure: 3000 psi
- Maximum Required Flow: 8.5 gpm

Electrical System:
- Voltage: 12 volts DC
- Current: 4 amperes

Tractor Hookup

Hydraulics:
1. Connect pressure hose (P) to retraction outlet
2. Connect motor return hose (T) to motor return port (if available) or to extension outlet.
3. Set flow rate at maximum required flow of 13 gpm.
4. If tractor is equipped with electro-hydraulic valves, set timer to "constant" flow.

Electrical:

Refer to Figure 35

Power must be connected directly to the battery. Make sure that eyelets are properly connected (red to positive, black to negative). Connect female socket to power port adapter.

**NOTICE**

Disconnect all cables and remove VER-21568 Ext. Control module before welding on drill. See page 99.

High Pressure Fluid Hazard: Escaping fluid under pressure can penetrate skin, causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic lines. Use a piece of paper or cardboard, NOT BODY PARTS, to check for leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. If an accident occurs, seek immediate medical attention from a physician familiar with this type of injury.

Moving Chain Hazard: Return hydraulic drive circuit lever to Neutral before exiting tractor cab. Unexpected drive rotation can cause serious injury.
Controller Menu

**PRESET RATES**

- **PRESET 1**
  - FUNCTION
- **PRESET 2**
  - FUNCTION
- **PRESET 3**
  - FUNCTION

**SPEED CALIBRATION**

- **UP: CALIBRATE**
  - FUNCTION
- **DN: RESTORE**
  - FUNCTION
- **CAL SETTINGS**
  - FUNCTION
- **PRESS ENGAGE AT 1ST FLAG**
  - FUNCTION
- **_if ENGAGE AT 2ND FLAG**
  - FUNCTION
- **DISTANCE ERROR</span> _%**
  - FUNCTION
- **UP: CALCULATE NEW**
  - FUNCTION
- **DN: KEEP CURRENT**
  - FUNCTION

**CALIBRATION NUMBER**

- **recipe format**
  - FUNCTION
- **VERIS V1</span> selected**
  - FUNCTION
- **RAWSON selected**
  - FUNCTION

**RATE CALIBRATION**

- **CAL SETTINGS**
  - FUNCTION
- **WIDTH**
  - FUNCTION
- **# ROWS**
  - FUNCTION
- **SPEED**
  - FUNCTION
- **ENTER TARGET AMOUNT**
  - FUNCTION
- **TIME TO RUN FOR CAL ____s**
  - FUNCTION

**CLEAR DRIVE AREA**

- **UP: CLEAR DN: EXIT**
  - FUNCTION
- **ENGAGE: RUN DRIVE**
  - FUNCTION
- **FUNCT: EXIT**
  - FUNCTION
- **____s out= _______**
  - FUNCTION

**ENTER TO STOP**

- **NEW CAL #: ____**
  - FUNCTION
- **OLD CAL #: ____**
  - FUNCTION

**UP: KEEP NEW**

- **DN: KEEP OLD**
  - FUNCTION

---

**KEY**

- set = * spd =
  - cab console LCD screen
- out =
  - Keys on cab console
- ( )
  - Condition for progressing to next screen
- *
  - Adjust number up/down or toggle between selections using the keys.
- **
  - Refer to the troubleshooting section of the manual for a description of error messages.
Console Functions

Refer to Figure 36 (depicting the console in Manual mode)

- **ON/VR button:**
  turns drive system on.
  Press twice for VR (Variable Rate) mode.

- **OFF button:**
  used to shut off Console.
  This also turns off power to the external controller module and ground speed radar.

- **FUNCTION button:**
  used in Calibration modes, and to programming Presets and downloading recipes.

- **Arrow buttons**
  used to change rates manually, enter setup data and select options.

- **ENGAGE button:**
  press to start drive.

Basic Operation

Power Up

Refer to Figure 36

To power-on the controller, press the ON/VR button once. This powers up the console in Manual mode, and also powers up the external module on the drill (if connected).

The green LED above the button illuminates, and a display appears showing:

- **set** = the currently active seeding rate
- **spd** = (over 0.0), the current speed, and
- **out** = 0.0, the current system operating rate.

Once the console is powered up, the ON/VR button toggles between Manual and VR (Variable Rate) mode.

It is possible to enter all setup information with the console connected to power, but disconnected from the drill. Operations requiring motion, such as calibrations, must be performed hitched (but generate harmless errors if undertaken with only the console powered).

Seed Rate

In Manual mode, use the \( \uparrow \downarrow \) arrow buttons to set the desired seed rate (in pounds/acre or kg/ha). Or use FUNCTION to select Preset mode, and the \( \uparrow \downarrow \) arrow buttons to alternate between preset rates (see page 53).
Hydraulic Drive Field Operations

Refer to Figure 37

1. Turn on Controller Console by pressing the ON/VR button. Green light above ON/VR button illuminates when power is on.

Pressing the ON/VR button twice puts the unit in VR mode. VR appears on the screen along with the Rate from the recipe or sent from your GPS. Press ON/VR button again to toggle back to manual mode. (Mode and rate changes take effect with the release of the button.)

2. To change rates manually whether in Manual or in VR mode, simply touch the \( \text{\textarrow{\uparrow}} \) arrow buttons. This changes the Controller to the rate you select manually. To return to VR, simply touch the ON/VR button to toggle back to VR mode.

3. Before planting, conduct a seed rate Calibration (page 38) and ground speed Calibration (page 50).

4. Engage the hydraulic flow by pushing FORWARD on the tractor remote hydraulic lever. The remote lever must be LOCKED OPEN in this position to provide constant flow to the drive motor.

   **John Deere tractors with Sound-Gard® body:** Use lever lock clip to lock lever forward. See your tractor dealer for lock purchase and installation.

   **John Deere 7000 Series tractors:** Rotate valve detent selector to motor position to lock lever in forward position.

   **John Deere 8000 Series tractors:** Set timer to continuous. Push lever forward until detent clicks.

   **Case-IH Magnum tractors:** Lock lever forward in detent position. You may need to turn up detent pressure to its maximum setting. Do not tie hydraulic lever past detent position with a strap. See your tractor dealer for details.

   **Other tractors:** Lock lever forward in detent position. You may need to turn detent pressure to maximum or use a mechanical detent holder to hold lever forward. See your tractor dealer for proper means of providing constant flow.

5. Press ENGAGE button to activate drive. Green light above ENGAGE button illuminates.

   If you do not move within 10 seconds, the automatic disengagement feature disengages the drive. To begin planting again, press ENGAGE.

6. The Console display shows two numbers while operating: “Set” rate is the rate you tell the system to plant, and the “Out” rate is the calculated rate based on the actual rotations of the drive. The “Out” reading is monitoring the drive system; it isn’t monitoring population. It verifies that the drive system is functioning properly.

   The “Out” readings normally fluctuates within 5% of the “Set” rates. This fluctuation is evidence of the drive system compensating for normal variations in ground speed.

7. If “Out” rate varies from the “Set” rate by more than 20%, an audible alarm sounds.

8. If Controller is powered directly from the battery or via unswitched power port, make sure to power Console off when tractor is shut down, in order to prevent tractor battery drain.

When calibrating, make sure that you choose a calibration speed that is representitive of your average planting speed.
Seed Rate Calibration

Seed rate calibration consists of:

a. Setting up to collect seed at one or more rows (typically 3), using an approximate calibration number.

b. Running the hydraulic drive (with drill stationary) for a short period of time, twice:
   - once to prime the seed cups, and
   - once to generate the sample.

c. Weighing the collected seed, and determining amount per row.

d. Entering that weight on the console. The controller uses it to calculate a more precise Cal. number.

Tools required:

- small container(s) to capture seed at one or more openers, and
- a scale with a capacity great enough to weigh the container(s)+seed, and precise enough to register the difference between that and the empty container(s).

Seed Rate Calibration Steps

In the steps which follow, the examples are based the configuration at right.

1. Unfold the drill.
   The wing drive shafts cannot turn with the drill folded. U-joint damage will occur if attempted.

2. Load an amount of seed, equal to about twice the expected sample size, over one or more rows near the end of the left wing seed box. The expected amount of seed is determined by you. The controller calculates the run-time necessary to generate that amount at a single row.

   Great Plains suggests sampling an amount that is at least $\frac{1}{4}$ lb (0.1 kg), and requires at least 100 seconds. At typical planting speeds, this is about one row for one acre (or one row for half a hectare). Divide your intended seed rate by your row count.

   \[
   \text{SampleSize (lbs)} = \frac{\text{SeedRate}}{\text{RowCount}}
   \]

   \[
   \text{SampleSize (kg)} = \frac{\text{SeedRate}}{\text{RowCount} \times 2}
   \]

3. Raise and lock-up the drill if capturing seed below openers.

   a. For short run times and/or small samples, increase the accuracy of the results by sampling multiple rows, and calculating the average. For adjacent rows, pull the seed hoses off at the opener, and route them to a common collection container.
## Hydraulic Drive Calibration

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<tr>
<th>Crop</th>
<th>Row Spacing</th>
<th>Rate Handle</th>
<th>Min Rate (pounds/acre)</th>
<th>Max Rate (kilograms/hectare)</th>
<th>Min Rate (kilograms/hectare)</th>
<th>Max Rate (kilograms/hectare)</th>
<th>Calibration Number</th>
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<td>6.37</td>
</tr>
<tr>
<td>Sunflowers</td>
<td>15in (50.8cm)</td>
<td>50</td>
<td>5</td>
<td>25</td>
<td>5.6</td>
<td>28</td>
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<tr>
<td>Sunflowers</td>
<td>30in (76.2cm)</td>
<td>50</td>
<td>5</td>
<td>25</td>
<td>5.6</td>
<td>28</td>
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<tr>
<td>Wheat</td>
<td>7.5in (19cm)</td>
<td>50</td>
<td>30</td>
<td>200</td>
<td>33.6</td>
<td>224.2</td>
<td>17.16</td>
</tr>
<tr>
<td>Wheat</td>
<td>10in (25.4cm)</td>
<td>50</td>
<td>30</td>
<td>200</td>
<td>33.6</td>
<td>224.2</td>
<td>12.87</td>
</tr>
<tr>
<td>Wheatgrass</td>
<td>7.5in (19cm)</td>
<td>25</td>
<td>5</td>
<td>20</td>
<td>5.6</td>
<td>22.4</td>
<td>1.78</td>
</tr>
<tr>
<td>Wheatgrass</td>
<td>10in (25.4cm)</td>
<td>25</td>
<td>5</td>
<td>20</td>
<td>5.6</td>
<td>22.4</td>
<td>1.33</td>
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</table>

* These extremely high rates may require a lower ground speed.

source: ./charts/veris40fc-cal.ods -> Export as .pdf -> convert to .eps in Illustrator.
Refer to Figure 39

4. Set the Point Row switch box for Calibration mode:
   • LEFT section switch on.
   • CENTER and RIGHT section switches off.
   • Master switch \( M \) to “CAL”
   Confirm CAL lamp \( \text{CAL} \) illuminated.

5. Take steps to capture and measure seed from the three outside rows of the left wing.
   If seed is loaded at more rows, take steps to recover seed from non-sampled rows on the left section.

6. Set the seed rate handles all sections to the chart value (page 39). See page 28 for handle operation.

7. Set the feeder cup doors, drill wide, per page 28.

Refer to Figure 40

8. Turn on Controller Console by pressing ON/VR button. Green light above ON/VR button illuminates.

9. Use \( \uparrow / \downarrow \) arrow buttons to set desired planting rate, the example, 50.0 pounds/acre\(^a\).

\( \text{Set the desired rate before performing a calibration, as this value is used by the controller to calculate sample run time. If the rate is not set, the sample run time will be incorrect, or you may get “TIME TOO LOW/HIGH” errors that cannot be cleared by adjusting the expected sample size.}\)

Refer to Figure 41

10. Press FUNCTION button until CALIBRATION NUMBER window appears.

11. Select drive calibration number based on row spacing and seed, from “Hydraulic Drive Calibration” on page 39. You may also use an initial value developed from a previous calibration of similar seed.

12. Use \( \uparrow / \downarrow \) arrow keys to set Calibration number.
   If no sample-based calibration is desired, press FUNCTION to cycle to initial screen.

\( \text{a. The controller ignores units of measure at step 9. If you change units at step 15, the numeric value entered at step 9 is unchanged.}\)
Refer to Figure 42
13. Press Function button until the Calibration window appears as shown.
14. Press \( \uparrow \) arrow button to enter calibration mode.

Refer to Figure 43
15. This is the first window that appears in Calibration mode. Press FUNCTION button to accept, or \( \uparrow \) button to change units of measure.

- ENGLISH (U.S. Customary) units are:
  - pounds/acre, pounds, feet and mph
- METRIC units are:
  - kg/hectare, kilograms, meters and kph

If you change units of measure for rate calibration, it also changes units for speed calibration.

Refer to Figure 44

When units of measure is changed, all previous and subsequent values entered or computed are assumed to be in the new units, but their numeric values are not converted.

For example, if you entered a rate of 50.0 (intending lbs/ac) at step 9, and switched to metric mode at step 15, the seed rate is left at 50.0 and taken to be 50.0 kg/ha during any calibration and planting.

Which changing units of measure, be sure to re-check all other settings, and convert any as required.
Refer to Figure 45

16. Enter drill width (swath), in feet (ENGLISH mode) or meters (METRIC mode), using ↑/↓ arrow buttons. Press FUNCTION button to advance to next window.

Swath values for various row spacings are found in the charts beginning on page 126. Your value may not be, for example, precisely 40.0 ft.

The controller uses this value to determine the calibrated motor rate-vs-ground speed needed to seed at your desired rate.

Refer to Figure 46

17. Enter number of rows here using ↑/↓ arrow buttons. Press FUNCTION button to advance to next window.

The controller uses this value in determining the sample run-time (which is based on 1 row).

Refer to Figure 47

18. Enter your planned planting speed using ↑/↓ arrow buttons. Calibration mode does not accept a speed higher than 10 mph or 16 kph. Press FUNCTION button to advance to next window.

Although the calibration sample is collected with the drill stationary, the controller operates the hydraulic drive at the same rpm that would be used in the field for this speed.
Prime Seed Meters
Before running an actual calibration, it is important that the seed cups be filled with seeds, and the flutes primed to deliver seed at first rotation. Step 19 through step 30 executes a short calibration to do this.

If the cups are already primed, skip to step 31.

Refer to Figure 48
19. Enter a small target amount.

Refer to Figure 49
20. It may take some experimenting to select a value that avoids "TIME TOO LOW" errors.

Press FUNCTION button to return to step 19.

If modest adjustments to the sample size continue to result in HIGH/LOW errors, chances are some other parameter is zero or incorrect by a large factor (such as decimal place error). To start over, press OFF, and then ON.

Refer to Figure 50
21. The minimum time is 4 seconds. Select a time just long enough to ensure that the meters are filled with seed, and seed is flowing to all seed tubes to be sampled.
Refer to Figure 51

22. Press FUNCTION. The console beeps and displays this screen, indicating that the drive is about to operate, and all personnel must be cleared from the area near the hydraulic drive, chains and shafts. There is a danger of entanglement if anyone is in the drive area.

**WARNING**

Moving Chain Entanglement Hazard:
Be sure to verify that no one is near the drive area before advancing to the next step.

Refer to Figure 52

23. Move the hydraulic motor circuit level lever forward to supply oil to motor.

24. Only after you have verified the drive area is clear, press the up arrow button to initiate calibration mode.
   The console beeps again.

   If drive area isn’t clear, press Down arrow button to abandon the calibration. This skips to the next item in the main FUNCTION menu rotation (speed calibration, page 50).

25. Continuing to verify that the drive area is clear, press the ENGAGE button to start drive rotation.

   To terminate priming, press ENGAGE.

Refer to Figure 53

26. While the drive is rotating, the display window shows the time remaining and the “Out” rate.

   The “out=” rate is the estimated area planting rate, based on motor performance, and is not related to the sample size. The example screen at right is halfway through the priming, and the actual motor rate is slightly high.

**CAUTION**

CONTINUE TO MONITOR DRIVE AREA DURING DRIVE ROTATION. PRESS THE ENGAGE BUTTON (OR OFF KEY) TO STOP DRIVE DURING CALIBRATION
Refer to Figure 54

27. When the sample run-time has expired, the motor stops, the indicator above the ENGAGE button goes out, and the console displays the estimated sample generated (based on actual motor performance, which may vary slightly from calculations).

The number display is normally very close to the sample size entered at step 19.

28. Press the OFF button on the console.

29. Return hydraulic motor circuit lever to Neutral.

30. Exit the tractor cab. Return metered seed to seed box.

Refer to Figure 56

If you see the screen at right, the console has detected an error. The most common problem is that motor rotation has not been detected. Check:

• all cables connected
• hydraulic fluid supply to motor

This screen is a normal and harmless condition if you are operating the console disconnected from the drill.
Full Calibration
Make sure the seed meter cups are full, and seed can flow at initial motor rotation. To prime the cups, see page 43.

Refer to Figure 56
31. Turn the console on with the ON/VR button. Check, and as necessary, repeat step 1 through step 18.
32. Enter the amount of seed you want to measure. This should be at least ¼ of a pound (0.1 kg). Press FUNCTION button to advance to next window.

The amount shown at right is from the example estimate at step 2.

Refer to Figure 57
33. Normally, the console display informs you of the length of time, in seconds, that the drive will be operating, in order to meter the amount of seed you have requested, at the calibration number, drill width, and number of rows you have selected. Press FUNCTION button to advance to next window.

Refer to Figure 58
34. If the screen reads instead:
TIME TOO LOW, or
TIME TOO HIGH,
change the amount of seed that you will count or measure. For calibration accuracy, the Controller firmware does not allow calibrating at settings that would result in the drive rotating for less than 4 seconds, or more than 255 seconds.

Press FUNCTION button to return to step 31.

If modest adjustments to the sample size continue to result in HIGH/LOW errors, chances are some other parameter is zero or incorrect by a large factor (such as decimal place error). To start over, press OFF, and then ON.
Refer to Figure 59

35. Press FUNCTION. The console beeps and displays the next screen indicating that the drive is about to operate, and all personnel must be cleared from the area near the hydraulic drive, chains and shafts. There is a danger of entanglement if anyone is in the drive area.

**WARNING**

Moving Chain Entanglement Hazard:
Be sure to verify that no one is near the drive area before advancing to the next step.

Refer to Figure 59

36. Only after you have verified the drive area is clear, press the up arrow button to initiate calibration mode. The console beeps again.

If drive area isn’t clear, press ↓ Down arrow button to abandon the calibration. This skips to the next item in the main FUNCTION rotation (speed calibration, page 50).

Refer to Figure 60

37. Continuing to verify that the drive area is clear, press the ENGAGE button to start drive rotation.

To terminate calibration mode, press the ENGAGE or OFF buttons.

Refer to Figure 61

38. While the drive is rotating, the display window shows the time remaining and the “Out” rate.

The “out=” rate is the estimated area planting rate, based on motor performance, and is not related to the sample size. The example screen at right is halfway through the sample collection, and the actual motor rate is slightly high.

**CAUTION**

CONTINUE TO MONITOR DRIVE AREA DURING DRIVE ROTATION. PRESS THE ENGAGE BUTTON (OR OFF KEY) TO STOP DRIVE DURING CALIBRATION.
Refer to Figure 62

39. When the sample run-time has expired, the motor stops, the indicator above the ENGAGE button goes out, and the console displays the estimated sample generated (based on actual motor performance, which may vary slightly from calculations).

The number display is normally very close to the sample size entered at step 31.

40. Exit the tractor cab and obtain the net weight of the samples. If multiple rows were sampled, divide the total seed weight by the number of row sampled.

\[
SampleWeight = GrossWeight - ContainerWeight
\]

\[
AmountCollected = \frac{SampleWeight}{RowsSampled}
\]

Refer to Figure 63

41. Enter the actual amount metered per row using the \( \uparrow/\downarrow \) arrow buttons.

Press FUNCTION button to advance to next window.

Example:

Three 4 oz. containers were used at 3 rows.

\[ContainerWeight = (4 \times 3 \div 16)\], or 0.75 lbs.

Weight of containers and metered seed was:

\[GrossWeight = 3.66 \text{ lbs.}\]

\[SampleWeight = 3.66 - 0.75\], or 2.91 lbs.

\[AmountedCollected = 2.91 / 3\], or 0.97 lbs.
Refer to Figure 64

42. A new calibration number is suggested, along with the old calibration number.

Refer to Figure 65

43. Press FUNCTION button to advance to the choice window.

If you wish to keep the old number, perhaps to re-run the calibration procedure, press the \( \Downarrow \) Down arrow button.

To accept the New calibration number, press the \( \Uparrow \) Up arrow button.

Refer to Figure 66

44. Console window displays the calibration number you have selected.

The console is once again at step 10. If the calibration just completed resulted in a Cal number change of more than a few percent, validate or further refine it by running a new calibration, skipping the Priming step 19 through step 30.

Rate calibration results, once accepted by you, are stored until changed, and are not lost when power is removed.

\( \text{Cautious practice includes a furrow inspection to ensure that actual seed placement and spacing is as expected. This can be done by setting one or more rows to shallow operation, tying up the press wheel (or locking up a 10HD row), for a short distance.} \)
Speed Calibration

In order to fine-tune the default speed calculation or to convert to radar speed signal, the controller may be calibrated as follows:

1. Set two flags 400ft apart (100 meters if in metric mode).

Refer to Figure 67

2. To calibrate the Controller for speed, press the FUNCTION button until the screen at right appears.

Refer to Figure 68

3. Press the † Up arrow button to initiate new speed calibration routine.

Press the ‡ Down arrow button to restore factory default setting.

Refer to Figure 69

4. This is the first window that appears in Speed Calibration mode. Press FUNCTION button to accept, or † button to change units of measure.

ENGLISH (U.S. Customary) speed units are:

mph (miles per hour)

METRIC speed units are:

kph (kilometers per hour)

If you change units of measure for speed calibration, it also changes units for seed rate. Numeric values entered or previously computed are not converted. Be sure to review all screens before planting.
Refer to Figure 70
5. Begin driving at a normal field speed; when the tractor passes the first flag, press ENGAGE.

Refer to Figure 71
6. While between flags, the display shows the distance traveled.

Refer to Figure 72
7. When the tractor passes the second flag, press ENGAGE again.
Refer to Figure 73

8. The display shows the error or difference between the traveled distance and the distance calculated by the Controller.

Refer to Figure 74

9. If this is the first time the unit has been calibrated, this error can be large. Accept the new speed calibration and re-run the course. Re-calibrate until the error is within 5%. The cab console gives you the option each time you calibrate of accepting the new settings, or keeping the previous setting.

Speed calibration results, once accepted by you, are stored until changed, and are not lost when power is removed.

10. When planting, check the speed displayed against the tractor speedometer or other reference. If they disagree by more than a few percent, perform another speed calibration.
Varying Rates with Pre-set Function

The Precision Population Controller allows you to pre-set three different rates, and then change rates on-the-go by toggling from one rate to another rate with the ↑/↓ arrow buttons.

Refer to Figure 75
11. To enter the three pre-set rates, press the FUNCTION button until Pre-set Menu screen appears: Use ↑/↓ arrow buttons to toggle from Manual mode to pre-set mode

Refer to Figure 76, Figure 77 and Figure 78
12. Press Function button to move to the next pre-set screen, and the Up-Down arrow keys to set the pre-set rates.

Refer to Figure 79
13. When in Pre-Set mode, the main operating screen shows the pre-set rate currently being applied.
   When you are in Pre-set mode, the ↑/↓ arrow buttons only toggle between pre-set rates.
GPS-Based Planting

Refer to Figure 80

Both the Farmworks SiteMate computer and the Ag Leader PF3000 GPS solutions require a 9-pin serial connection to the hydraulic drive console.

FarmWorks SiteMate

Settings for FarmWorks SiteMate used with Precision Population Controller

1. Create a .shp recipe file in FarmWorks Site Pro, SMS 2.0, SSToolbox, or other software that will create a .shp file, and transfer it to SiteMate.

SiteMate Settings: (version 8.12)

1. Select CONFIGURE Tab.
   Select SETTINGS.
   Select VARIABLE RATE SETUP.
   Select NEW.
   Type in GP PPC.
   Under CONTROLLER TYPE, select Rawson from the scroll-down list.
   Under COMM PORT select the port number for the serial card or flash jacket port.

2. Select MAP tab.
   Enter DEFAULT rate.
   This is the rate that SiteMate calls for if GPS signal is lost or you are outside the map area.

3. Note: if GPS signal is interrupted, or you are outside the map area, the Controller continues applying at the latest rate, until signal is regained, or another rate is set manually. If SiteMate power is interrupted, restart the recipe to return to VR.

4. In the CONVERSION window, enter the conversion rate as 1.

5. Under the APP tab,
   enter the Feed Delay as 3 seconds.
   Enter the Following Distance (the offset from the GPS to the seed tubes) based on:
   24 ft (7.32m) from hitch pin to seed tubes;
   Add the distance from the GPS to the hitch pin.
   Enter the total in the Following Distance window.

   Enter the Swath Width of the Great Plains unit.

6. Under the CTRL tab,
   enter the Nominal Rate as follows:
   Divide the highest rate on your recipe by 1.6.
   This is your Nominal rate.
   If your highest rate is 32, your nominal rate is 20.

   Enter the Step as 4%.

Exit VRA Controller Setup by clicking OK button to save the settings.

7. Under FILE,
   Open VRT and select the Rx Map (recipe) for the field.
   Press the SETUP button and select the PPC controller option you set up using these instructions.

8. Press GO.
   The Rx rate window shows the rate that is being sent to the GP Precision Population Controller. The APPLIED window shows the rate that the GP Controller is applying.
GP Precision Population Settings

1. Connect SiteMate computer to Console using 9-pin serial cable, as shown in Figure 80. Follow instructions on page 38 to set Calibration Number.
   Refer to Figure 81

2. Press FUNCTION button until a “recipe format” window appears. Use the \( \uparrow/\downarrow \) arrow buttons to select RAWSON mode.

Refer to Figure 82

3. Press FUNCTION button until the Nominal Rate appears on the display. Using the Up/Down arrow keys, set the Nominal Rate to the same number as you set the SiteMate. Once Nominal Rate is set, press Function button until the main operating screen appears, as shown in Figure 36 on page 36.

4. Press On/VR button again to toggle to VR mode. VR should appear on the screen along with the Rate that is being sent from the SiteMate computer. (See Figure 37 on page 37). Verify that the rate shown on the GP Controller Console is the same as the recipe sent from SiteMate. Press ENGAGE button to activate the Precision Population Controller.

5. To change rates manually when in VR mode, touch the \( \uparrow/\downarrow \) arrow buttons. This changes the Controller to the rate you select manually. To return to VR, touch the ON/VR button to toggle back to VR mode.
Ag Leader PF3000

Settings for Ag Leader PF3000 Monitors used with Precision Population Controller QUICK REFERENCE GUIDE.

1. Create a .tgt recipe file in SMS 2.0 or FarmWorks Site Pro, or other software that will create a .tgt file, and copy it to an SRAM or Flash card that is compatible with the PF 3000.

PF3000 Settings:

2. Press SETUP key. Press SWATH key. Set swath to that of your Great Plains Precision Seeding System.

3. Press SETUP key. Press VEHICLE key. Set Primary speed sensor to GPS.

4. Press SETUP key. Press CARD key. Set the following:
   - Log Device: None.

5. Press SETUP key. Press APP RATE key. Set the following:
   - Application Control: On
   - Look Ahead: On
   - Current target file: press Edit to view the files you have on the card; select the one you wish to use.

6. Press SETUP key. Press CONTROLLER key. Select controller as Rawson Accu-Rate. Press EDIT SETTINGS. Set the following:
   - Number of pulses/10 revolutions: 500
   - Nominal rate: Divide the highest rate on your recipe by 1.6. This is your Nominal rate. If your highest rate is 32, your nominal rate is 20.
   - Percent rate change: set to 4%
   - Area count: Set to Standard
   - Stop height: Set to 8
   - Act. rate recording method: Set to Sensor
   - Controller time delay: Set to 4 sec.
   - Application offset from GPS: 24 ft (7.32m) Add the distance from the hitch pin to your GPS location.
   - Serial Port: Port 3

7. Press SETUP key. Press PRODUCT key. Select product and press EDIT SETTINGS. Set the following:
   - Controller Device: Rawson Accu-Rate Cal. number for act. rate: set to 0
   - Actual Rate Scale Factor: Set to 1.000
   - Target Rate Units: Set to Seeds
   - Actual Rate Units: Set to Seeds
   - Target conversion Number: 1
   - Target Rate increment: Determines the increment value by which you can change the manual target rate with each press of the arrow keys.

8. Press FIELD key. Set Field. Set Product (press button to right of product)
**Precision Population Settings**

1. Connect PF3000 to Console using 9 pin serial cable per Figure 83 on page 56.
2. Set Calibration Number per page 38.

*Refer to Figure 84*

3. Press FUNCTION button until a “recipe” screen appears. Use the ↑/↓ arrow buttons to select RAWSON mode.

*Refer to Figure 82*

4. Press FUNCTION button until the Nominal Rate appears on the display.
   Using the ↑/↓ arrow buttons, set the Nominal Rate to the same number as you set the PF3000 in step 5 above. Once Nominal Rate is set, press FUNCTION key until main operating screen appears.

5. Press On/VR key again to toggle to VR mode. VR should appear on the screen along with the Rate that is being sent from the PF3000. Verify that the rate shown on the GP Controller Console is the same as the recipe sent from the PF3000.

   Press ENGAGE button to activate the Precision Population Controller.

6. To change rates manually when in VR mode, simply touch the ↑/↓ arrow buttons. This changes the Controller to the rate you select manually. To return to VR, touch the ON/VR button to toggle back to VR mode.
Adjustments

To get full performance from your drill, you need an understanding of all component operations, and many provide adjustments for optimal field results.

The 3N-4010F, 3N-4010HDF and 3N-4020F have double-disk parallel-arm openers with depth-controlling press wheels. This system provides accurate depth control and seed placement over uneven terrain. The following is an introduction to the basic seeding components and how they work.

Each opener is mounted on a floating opener frame, held parallel to the ground. Opener bodies are staggered for easy soil flow. A spring provides the down pressure necessary for opener double disks to open a seed furrow. The spring allows openers to float down into depressions and up over obstructions. Trailing press wheels close the furrow. Individual openers can be adjusted to account for tire tracks.

Even if your planting conditions rarely change, some of these adjustment items need periodic attention due to normal wear.

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Planting Depth

Setting nominal planting depth, and achieving it consistently, is affected by multiple adjustable drill functions, from greatest to least effect they are:

- Coulter Height;
- Opener Depth (Press Wheel and/or Side Wheel);
- Row Unit Down Pressure;
- Frame Weight;
- Disk Blade Adjustments (as blades wear).
Frame Level

When beginning planting, check frame level with row units in level ground.
If one or both wings are angled up or down, check and adjust the following items:
• "Level Frame Side to Side" on page 101
• coulter depth setting - see "Frame-Mounted Coulters" on page 62
• coulter mount adjustment - see "Individual Frame-Mounted Coulters Depth" on page 64
• coulter down-force spring setting - see "Frame Weight" on page 67
• row unit down-force spring setting - see:
  "10 Series Row Unit Down Pressure" on page 70
  "10HD Row Unit Down Pressure" on page 77
  "20 Series Row-Unit Down Pressure" on page 84
• press-wheel height setting - see:
  "10 Series Opener Depth" on page 73
  "10HD Press Wheel Adjustments" on page 81
  "20 Series Press Wheels" on page 88

Frame Height

Frame height is determined by an adjustable hydraulic depth control valve, and has a significant effect on planting depth.
Frame height adjustment methods depend on coulter configuration. Frame-mounted coulters (FMC) are standard on some 3N-40 models and optional on others. The 3N-4010HDF accepts either FMC or unit-mount coulters (UMC), although only one type of coulter can be installed simultaneously.
For adjustments:
Refer to Figure 86
1. Frame-Mounted Coulters (FMC)
   frame height information begins on page 62.
2. Unit-Mounted Coulters (UMC, 10HDF only)
   frame height information begins on page 75.
3. No Coulters
   use the same frame height setup as UMC, page 75.
Frame Height without Frame-Mounted Coulters

Use these instructions with a drill having no coulters, or having unit-mounted coulters (UMC). Adjustments to individual unit-mounted coulters themselves (10HD models only) are on page 75.

If the drill has frame-mounted coulters, use the height procedure on page 62.

Refer to Figure 87

Frame height ① is measured from the bottom of the opener tool bar (the largest of the tool bars), and is measured with the drill lowered.

The recommended height depends on your field conditions (see table below), and whether unit-mounted coulters are installed.

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<tbody>
<tr>
<td>Light no-till, or conventional tillage, with unit-mounted coulters or no coulters</td>
<td>3N-4010HDF</td>
<td>Above 26in (66cm)</td>
</tr>
<tr>
<td></td>
<td>3N-4010F</td>
<td>Above 24in (61cm)</td>
</tr>
<tr>
<td></td>
<td>3N-4020F</td>
<td>Above 24in (61cm)</td>
</tr>
<tr>
<td>Moderate to challenging no-till with unit-mounted coulters</td>
<td>3N-4010HDF</td>
<td>At 26in (66cm)</td>
</tr>
<tr>
<td></td>
<td>3N-4010F</td>
<td>At 24in (61cm)</td>
</tr>
<tr>
<td></td>
<td>3N-4020F</td>
<td>At 24in (61cm)</td>
</tr>
</tbody>
</table>

For no-till conditions, a 26in (66cm) height allows the opener parallel arms to run parallel to the ground giving the opener the maximum upward or downward flotation.

In loose or conventional planting conditions, a frame height above 26in (66cm) helps keep the no-till spring forces from burying the openers.

 직접 프레임 위의 해저: 위 26인치 (66cm) 높이를 설정하면 오픈을 하행 방향의 플로테이션을 제한합니다.

Running with the frame below 26in (66cm) limits opener upward flotation and could cause opener damage especially at center of the drill.

⚠️ DANGER

Crushing Hazard:
Make all down-stop adjustments with circuit in neutral and...
drill raised (actuator plunger not in contact with down-stop). Loosening the down-stop with circuit active and drill lowered results in rapid lowering of the frame.

**NOTICE**

**Height Mis-setting Risk:**
Make sure the drill is level and the lift system bled and re-phased before adjusting the tool bar height. If the center section does not consistently stop at the set height, or the wings do not run at the same height as the center, the lift system may have air or be out of phase (above), or the wings may not be level. See “Frame Alignment and Level” on page 100.

**Refer to Figure 88**

The lift system includes an adjustable stop valve 1 to fix the height of the opener frame when the drill is lowered.

To adjust the stop height:

1. Move to smooth level ground representative of field conditions.
2. Lower the drill and measure the present tool bar height. If the drill cannot be fully lowered due to row unit spring settings, temporarily move the cams to a lower setting, or out of notch entirely.
3. Raise the drill.
4. Loosen the knob 2 on the stop 3.
5. Adjust the stop 3 position on the tube 4. Adjust up (to raise) or down (to lower). Adjust by half the last difference. Secure the stop with the knob bolt 2.
6. Lower the drill and measure the tool bar height. If the error is more than about 1/8in (3mm), repeat the adjustment process from step 3.
7. Raise and lower several times and confirm that the drill stops consistently at the new height.

It is important that all tires remain in ground contact to maintain front to rear levelness. Setting the depth control too deep combined with high opener spring force can cause the drill to tip forward when planting, which may cause plugging.

Running with the front tires floating or skimming on the ground will cause uneven coulter depth and may cause uneven seed depth.
Frame-Mounted Coulters

The factory configuration of frame-mounted coulters (FMC) is that they run about 1 in (2.5 cm) deeper than the opener blades. Based on your conditions and experience, you can readjust the depth drill-wide, or just at some rows.

Frame-mounted coulters, as factory-installed, are used “in row” and not “zone”. They are intended to prepare the soil directly ahead of the seed furrow.

With frame-mounted coulters, the coulter depth controls opener depth and performance. Set the frame height to achieve the desired coulter depth.

There are three adjustments for frame-mounted coulters:

Refer to Figure 89

1. Frame height - the running depth of all coulters as a group. This is set by a hydraulic stop, the next topic.

2. Individual coulter depth - a mechanical adjustment for a few rows in tire tracks. See page 64.

3. Individual coulter down-force - this is a spring adjustment for rows in tracks, or all rows - in unusually light or heavy no-till conditions. See page 65.

Frame Height - Frame Mounted Coulters

Refer to Figure 90

In regular or heavy no-till conditions, set the coulter depth to about 1 in (2.5 cm) deeper than seeding depth.

For example, if the desired seeding depth is 1 in (2.5 cm), set the coulters to run at 2 in (5.1 cm) deep.

Setting coulters too deep for conditions can cause opener plugging and uneven or too-deep seed depth. In light no-till or conventional till conditions, it may be necessary to set coulter depth to less than 1 in (2.5 cm) below seeding depth, or even 1/4 in (6 mm) above seeding depth.

In addition to checking depths at setup, be sure to check actual seeding results while planting.
Crushing Hazard:
Make all down-stop adjustments with circuit in neutral and drill raised (actuator plunger not in contact with down-stop). Loosening the down-stop with circuit active and drill lowered results in rapid lowering of the frame.

Height Mis-setting Risk:
Make sure the drill is level and the lift system bled and re-phased before adjusting the tool bar height. If the center section does not consistently stop at the set height, or the wings do not run at the same height as the center, the lift system may have air or be out of phase (above), or the wings may not be level. See “Frame Alignment and Level” on page 100.

Refer to Figure 91

The change in coulter height is greater than the change in down-stop adjustment. Make adjustments in small amounts.

The lift system includes an adjustable stop valve 1 to fix the height of the opener frame when the drill is lowered.

To adjust the stop height (assuming a desired 1 1/4 in / 3.2 cm coulter depth):

1. Move to smooth level ground with soil as similar as possible to field conditions.
2. Lower the drill until the coulter blades just touch the ground. Hold that height by setting the lift circuit to neutral.
3. Loosen the knob 2 on the stop 3.
4. Adjust the stop 3 position on the tube 4 until it just touches the actuator 5.
5. Raise and then fully lower the drill.
6. Pull forward 10 feet (3m) and stop.

Figure 91: FMC: Opener Depth Stop
7. Measure the depth at which the coulters are running. Measure only in non-tire-track rows where the coulter springs are not in compression (arm is at full extension). If the coulters are at the desired depth, no further adjustment is necessary. Skip to step 11.

8. Raise the drill and set the lift circuit to neutral.

9. Adjust the stop up (to raise depth) or down (to lower depth). Adjust in small increments. Secure the stop with the knob on the bolt 2.

10. Check the new setting starting at step 5.

11. Raise and lower several times and confirm that the drill stops consistently at the new height.

Before making any adjustments to individual frame-mounted coulters, setup the seeding depth on the row units, and verify that the coulter tool bar height is set for your conditions.

**Individual Frame-Mounted Coulter Depth**

The running depth of all coulters is adjusted simultaneously by changing the tool bar height. Adjusting the height of a small number of coulters may be useful for rows in tire tracks.

Adjust individual coulters as follows.

1. On level ground, lower the drill until coulters just touch the ground.

2. Raise the drill by the extra amount you need to lower the rows in tracks.

3. At each frame-mounted coulter to be adjusted, slightly loosen all six bolts (1, 2) at the mount.

4. Using a rubber mallet, tap the spring bar 3 up or down until the bottom edge of the coulter disk is at ground level.

5. Tighten the two clamp bolts 1 until both U-bolts are firmly against the edge of the spring bar 3. It is normal for there to be a small gap between the clamps.

6. Tighten the four U-bolts 2.

7. Lower the drill to planting height and pull forward 30 feet (10m).

8. Check coulter blade to opener blade (furrow centerline) alignment.

---

*It is important that all of the tires remain in contact with the ground to maintain levelness of machine from front to rear. Setting the depth control too deep combined with high opener spring force can cause the drill to tip forward when planting, which may cause plugging.*

Running with the front tires floating or skimming on the ground will cause uneven coulter depth and may cause uneven seed depth.

---

*A gap of as much as 1/8in (3mm) between the clamp plates is normal.*
Frame-Mounted Coulter Force
Coulter springs are set to 400 lbs (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, you may observe the springs in compression most of the time. This means that the blades are not reaching the desired coulter depth. If adequate drill weight is available, you can increase the spring down-force to compensate.

- In light but rocky conditions, the factory spring setting may be higher than needed. You can extend blade life by reducing the force at which the blades ride up over obstructions.

To adjust the coulter spring:

Refer to Figure 93
1. Raise the drill and install transport locks. See “Lift / Lower” on page 22.
2. Determine the new spring length desired. See the table at right.
3. Measure the current length of the spring(s) to be changed. If already shorter than 9.75 in (24.8 cm), or longer than 10.25 in (26 cm), do not further adjust them.
4. Loosen the jam nut.
5. Rotate the adjuster nut until the spring is at the new length. Tighten the jam nut.

If all springs are continuously in compression, the coulters can lift the wing frames off the ground (at the wheels), resulting in uneven coulter depth and/or uneven seed depth. If high forces are required, frame weights are probably required.

Row Unit Shut-Off
To shut off seed flow to individual rows, such as to operate with an alternate row spacing, there are two or three steps involved:

Refer to Figure 94
1. Block the seed flow to the row with an optional seed tube plug. See page 120 for ordering.
2. Re-calculate the drill’s swath, and check for any changes needed to:
   - marker extension (see pages 18 and 126) and
   - calibration (step 16 on page 42).
3. On 10HD Series, reduce needless wear on the unused rows by locking them up. See page 79.

Notice
Equipment Damage Risk: Do not use spring lengths shorter than 9.75 in (24.8 cm). It may contribute to premature parts failure which will not be covered by warranty.
Implement Lift Switch Adjustment

Refer to Figure 95

A switch ① on the drill turns seed metering off (via the electric clutches) when the drill is raised. To adjust the height at which seed metering stops, follow these steps.

1. Do not place any part of body under implement while making adjustments.
2. Locate the lift switch on the left hand rockshaft.
3. Lower the implement until it is at a height where seeding should start (usually just above the ground). Securely support frame at this height with jack stands or blocks.
4. Turn off the tractor and remove the key.

Refer to Figure 96

5. Loosen the cam clamp ② on the rockshaft and turn until the switch roller is just starting to make contact with the ramp surface ③.

Refer to Figure 96

6. Raise the implement fully and check that the switch is compressed. If adjustments are made to hydraulic coulter depth, re-check switch engagement.

If coulter depth is adjusted, re-check lift switch operation.
Frame Weight

In challenging no-till conditions, some row-unit down-pressure settings (across all rows), and many frame-mounted coulter settings, may be high enough to lift the wing caster wheels off the ground. To avoid inconsistent results, add weight to the wings.

One or two pairs of (four total) weight brackets are optional. The weights required are common “suitcase” tractor weights, and are widely available, although not supplied by Great Plains.

Each bracket accepts up to five standard weights, about 500 lbs (227 kg) per wing, or 1000 lbs (454 kg) per kit.

Great Plains recommends loading no more than two sets of brackets, representing 2000 lbs (907 kg) total.

Do not add weight to the center section. It is always heavier than even a fully weighted wing, and never requires additional weights.

Available Down Force

Each Weight set assumed to be fully populated with five 100 pound weights.

<table>
<thead>
<tr>
<th>Wing Configuration</th>
<th>3N40-6475 7.5in (64 Rows)</th>
<th>3N40-4810 10in Rows (48 Rows)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Weight Kit (no markers)</td>
<td>48 lbs (22 kg)</td>
<td>63 lbs (28 kg)</td>
</tr>
<tr>
<td>Marker (no weight kits)</td>
<td>90 lbs (41 kg)</td>
<td>118 lbs (53 kg)</td>
</tr>
<tr>
<td>2 Weight Kits (no markers)</td>
<td>95 lbs (43 kg)</td>
<td>125 lbs (57 kg)</td>
</tr>
<tr>
<td>Marker and 1 Set</td>
<td>137 lbs (62 kg)</td>
<td>180 lbs (82 kg)</td>
</tr>
<tr>
<td>Marker and 2 Weight Sets</td>
<td>185 lbs (84 kg)</td>
<td>243 lbs (110 kg)</td>
</tr>
</tbody>
</table>

This table does not include the effect of adding frame-mounted coulters to the drill.

Although frame-mounted coulters add 61 lbs (28 kg) to each row, they also rely on the available weight per row, and can easily require more weight than they contribute.

Although this reduces the weight available to the openers, the opener workload is also reduced by having the furrow prepared by the coulters.
Marker Adjustments

This section covers marker items that may need adjustment for current conditions, and assumes that the markers are installed, set to the correct initial extension and in proper working order. See also:

- "Marker Setup (Option)" on page 18
- "Marker Maintenance" on page 106

Marker Disk Adjustment

**CAUTION**

*Sharp Object Hazard:*
Marker disks may be sharp. Use caution when making adjustments in this area.

**Adjusting Mark Width**

*Refer to Figure 99*

① is the direction of travel.

To change angle of cut, and the width of the mark, loosen 1/2-inch bolts ② holding the disk assembly.

For a wider mark ⑤, increase the angle of the marker with respect to the tube ①. For a narrower mark ⑥, reduce the angle.

Tighten bolts ②.

**Direction of Cut**

*Refer to Figure 100*

To have the marker throw dirt out, invert the disk on the spindle, and invert the disk assembly.
10 Series Row Unit Adjustments

Refer to Figure 101 (which depicts a row unit fully populated with all optional accessories supported for use with the 3N-4010F drill)

From front to back, a Great Plains 10 Series row unit can include the following capabilities (some optional):

1. **Dual Down Pressure Springs:** standard
   Each row unit is mounted on the planter via parallel arms which allow the row unit to independently move up and down while remaining parallel to the ground. The adjustable spring provides the force to get the row unit and attachments into the soil.

2. **Row Unit Spring Cam:** standard
   This adjustment sets the down-force used by the row unit. See “10 Series Row Unit Down Pressure” on page 70.

3. **Disc Blades:** standard, 2 per row unit
   Double disc blades open a furrow, creating the seed bed. Spacers adjust the blades for a clean furrow. See “10 Series Disk Blade Adjustments” on page 71.

4. **Seed delivery tube:** standard
   No adjustments are necessary.

5. **Disk Scraper:** optional
   In sticky soils, a scraper helps keep the opener disks operating freely. An optional carbide scraper is available. See page 122.

6. **Seed firmer:** seed flap (not shown) standard:
   - Keeton seed firmer (not shown)
     Improves seed-soil contact, and provides a stable arm for a low-rate liquid fertilizer delivery tube. See “10 Series Keeton Adjustment” on page 72.
   - Seed-Lok™ firming wheel (shown)
     Improves seed-soil contact. See “10 Series Seed-Lok™ Lock-Up” on page 73.

7. **Press wheels:** standard (choice of types)
   These close the seed trench. The wheels also support the free end of the row unit, and provide the primary control over seeding depth. See “10 Series Opener Depth” on page 73.

---

**NOTICE**

**Certain Machine Damage:**
Do not back up with row units in the ground. To do so will cause severe damage and row unit plugging.
10 Series Row Unit Down Pressure

Refer to Figure 102

The ideal amount of down-force causes the press wheels to compress any loose surface soil, but not press a trench into subsoil.

To assess down-force, operate the drill for a short distance on typical ground (with or without seeding), and stop. Leave the drill lowered (row units in ground).

At several row units, inspect the furrow created by the opener discs and closed by the press wheels.

Be sure to inspect rows both in and out of tire tracks.

Refer to Figure 103

1. If the press wheels are leaving no tracks, or light tracks, increase down-force.

2. If the wheels are compressing trash and loose soil, and leaving clear tracks right at the top of the subsoil, down-force is probably correct and needs no adjustment.

3. If the wheels are creating a trench into the subsoil, down-force is too high and needs to be reduced.

Adjusting 10 Series Down Force

The springs allow the row units to float down into depressions and up over obstructions.

On 10 Series row units, the seed trench is primarily opened by the coulters. Row unit springs provide only additional assistance needed to make a furrow “V” shaped and ensure furrow closure by the press wheels.

Often, the rows may be run at the minimum spring setting, other than in tire tracks, which commonly need some adjustment.

If trench depth is not being achieved across all rows, adjust the force and/or depth of the coulters before making row unit spring adjustments.

If you cannot achieve enough down force, adding a weight kit may help. See "Dual Weight Kit" on page 119.
Adjusting 10 Series Down-Force

Refer to Figure 104

An adjuster cam sets row unit spring down pressure individually for each row unit. This is useful for penetrating hard soil and planting in tire tracks.

<table>
<thead>
<tr>
<th>Cam Notch</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero (out of notch)</td>
<td>Maintenance Only</td>
</tr>
<tr>
<td>one</td>
<td>100 lbs (445 N)</td>
</tr>
<tr>
<td>two</td>
<td>116 lbs (516 N)</td>
</tr>
<tr>
<td>three</td>
<td>140 lbs (623 N)</td>
</tr>
<tr>
<td>tip</td>
<td>Do Not Use</td>
</tr>
</tbody>
</table>

Refer to Figure 105

To adjust down pressure, use the spring adjustment tool (part 198-126H) stored behind the tool bar at the Slow-Moving-Vehicle placard.

1. Raise the drill. Although this adjustment can be made with the drill lowered, the springs will be in tension, and will require more effort. The extra force required may also damage tools.
2. Put tractor in Park and shut it off.
3. Position tool in the holes.
4. Pull upper spring link back.
5. Move the adjustment cam to the new setting on the spring adjust bar.

Do not set all rows higher than notch two. Using high settings across all rows causes uneven planting. Individual rows may be set higher if running in tire tracks.

10 Series Disk Blade Adjustments

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

Refer to Figure 106

The ideal spacing causes the blades to be in contact for about one inch. If you insert two pieces of paper between the blades, the gap between them should be 0.5 to 1.75in (13 to 44mm).

If the contact region is significantly larger or smaller (or there is no contact at all), it needs to be adjusted by moving one or more spacer washers. If the contact region varies with blade rotation, one or both blades is likely bent and in need of replacement.
Adjusting 10 Series Disc Contact

**CAUTION**

*Sharp Object Hazard:*
Row unit disk blades may be sharp. Use caution when making adjustments in this area.

Refer to Figure 107

1. Raise the drill and install the transport locks.
2. Remove the bolt retaining the opener disc on one side. Carefully remove the disc, noting how many spacers are outside the disk and inside the disk. Do not lose the hub components and spacer washers.
3. To reduce the spacing between the discs (the normal case), move one spacer washer from the inside to the outside of the disc.
4. Re-assemble and check disc contact.

10 Series Seed Firmer Adjustments

10 Series row units include a seed flap, and accept one of two optional seed firmers.

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

**CAUTION**

*Sharp Object Hazard:*
Row unit disk blades may be sharp. Use caution when making adjustments in this area.

To adjust the Keeton Seed Firmer, lower the planter until the disks of the row units are resting on the ground.

10 Series Keeton Adjustment

The optional Keeton Seed Firmer is an engineered polymer shape that slides down the seed trench. It traps seeds as they exit the seed tube and firms them into the bottom of the “V”.

Refer to Figure 108

The Firmer is provided with a preset tension which is recommended for using the first year. The tension screw can be tightened in subsequent years according to your needs. Firmers should provide just enough tension to push seeds to the bottom of the trench.
10 Series Seed-Lok™ Lock-Up
Optional Seed-Lok firming wheels provide 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 firmers.

Refer to Figure 109 (which depicts a row unit with the opener blades removed for clarity)

To lock up Seed-Lock wheels:
1. Hook one end of chain in opener-body hole just above wheel arm ①.
2. Pull firming-wheel arm ② up as high as possible and wrap chain around arm ③.
3. Hook other end of chain in a link. Leave no slack in chain; secure wheel arm in its highest position.

10 Series Opener Depth
(Press Wheel Height)
Seeding depth on 3N-4010F, 3N-4010HDF and 3N-4020F is set by coulter depth and row unit depth. Set coulter depth before making row unit depth adjustments. 10 Series press wheel height is a stop adjustment and not a spring adjustment. It establishes a fixed relationship between opener depth and closed-furrow surface at the press wheel.

Refer to Figure 110
Set opener seeding depth by adjusting press-wheel height ①. To adjust, first raise openers slightly, then lift and slide T handles ② on top of openers. Adjust all press wheels to the same height.

- For more shallow seeding, slide T handles forward ③ toward implement.
- For deeper seeding, slide T handles backward ④ away from implement.

If press wheels are lifting off ground, check front-to-back level, and increase row unit spring down force.
If press wheels are digging into ground, reduce spring down force at the row units.
10HD Series Row Unit Adjustments

Refer to Figure 101
(which depicts a row unit fully populated with all optional accessories supported for use with the 3N-4010HDF drill)

From front to back, a Great Plains 10HD Series row unit can include the following capabilities (some optional):

1. Unit-Mounted Coulters (UMC): optional
   UMCs are used instead of frame-mounted coulters and are often preferred where soils are not rocky.

2. Dual Down Pressure Springs: standard
   Each row unit is mounted on the drill via parallel arms which allow the row unit to independently move up and down while remaining parallel to the ground. The adjustable spring provides the force to get the row unit and attachments into the soil.

3. Row Unit Spring Cam: standard
   This adjustment sets the down-force used by the row unit. See “10 Series Row Unit Down Pressure” on page 70.

4. Row-Unit Lock-Up: hole standard, pin optional
   If rows are shut off with seed tube plugs, row unit wear can be reduced by locking them up. 10HD Row Unit Lock-Up.

5. Disc Blades: standard, 2 per row unit
   Double disc blades open a furrow, creating the seed bed. Spacers adjust the blades for a clean furrow. See “10 Series Disk Blade Adjustments” on page 71.

6. Scraper Separator: standard
   No adjustments are necessary.

7. Seed delivery tube: standard
   No adjustments are necessary.

8. Seed firmer:
   reduces seed bounce and aids emergence by pressing seed gently into the furrow.
   A seed flap (not shown) is standard.

   Keeton seed firmer (not shown)
   improves seed-soil contact, and provides a stable arm for a low-rate liquid fertilizer delivery tube. See “10 Series Keeton Adjustment” on page 72.

   Seed-Lok™ firming wheel (shown)
   improves seed-soil contact. See “10 Series Seed-Lok™ Lock-Up” on page 73.

9. Press wheels: standard (choice of types)
   These close the seed trench. The wheels also support the free end of the row unit, and provide the primary control over seeding depth. See “10 Series Opener Depth” on page 73.

**NOTICE**

Certain Machine Damage:
Do not back up with row units in the ground. To do so will cause severe damage and row unit plugging.
Unit-Mounted Coulter Adjustments

Unit-mounted coulters (UMC) are an optional alternative to frame-mounted coulters. Only one type of coulter may be installed. See page 121 for ordering information.

Unit-Mounted Coulters are not factory-installed. Check alignment and depth prior to first use.

10HD Coulter Depth Adjustment

Check frame height before making any UMC adjustments. See “Frame Height without Frame-Mounted Coulters” on page 60.

The ideal operating depth for unit-mounted coulters is 1\(\frac{1}{4}\)in above opener depth. Although they may have originally been set to this depth, coulter (and opener) blades wear with time, and may need adjusting.

Adjusting the coulter depth is accomplished by re-mounting the coulter blade in one of the six mounting holes arranged in a staggered pattern in the coulter bracket.

Refer to Figure 112 and Figure 113

Raise drill and install cylinder locks before working on coulters. Row unit may be fully lowered or locked up. Do not attempt to move blade when the current or new position causes it to contact the ground during the adjustment. Be careful around the front end of row units. Coulter blades may be sharp.

To adjust coulter depth:
1. Determine the present opener and coulter depths.
2. Note which bracket hole the coulter is presently using.
3. Determine which new hole will position the coulter closer to the 1\(\frac{1}{4}\)in-above depth. See the table below.
4. Remove the 5\(\frac{3}{8}\)-11 x 4in bolt, lock washer and nut (7 in Figure 112).
5. Move the blade to the new position. Insert the bolt, and tighten on the lock washer and nut.

<table>
<thead>
<tr>
<th>Hole No.</th>
<th>Depth of (new) coulter blade relative to (new) opener blades</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1in above</td>
</tr>
<tr>
<td>3</td>
<td>5(\frac{3}{8})in above</td>
</tr>
<tr>
<td>5</td>
<td>1(\frac{1}{4})in above</td>
</tr>
<tr>
<td>1</td>
<td>0 (factory standard hole)</td>
</tr>
<tr>
<td>4</td>
<td>3(\frac{1}{8})in below</td>
</tr>
<tr>
<td>6</td>
<td>3(\frac{1}{4})in below</td>
</tr>
</tbody>
</table>

If a worn coulter cannot be adjusted to satisfactory operating depth, replace the coulter blade.
10HD Coulter Row Alignment

Refer to Figure 114

For both frame- and unit-mounted coulters, the ideal alignment is for the blade to prepare a furrow directly ahead of the opener discs.

As a check on coarse alignment, sight along the coulter blade centerline ①, the gap between the opener blades ②, and the centerline between the press wheels ③. If they are clearly out of alignment, either the coulter or the press wheels (or both) may be in need of adjustment.

The exacting test of correct alignment is field results. Operate the drill on some test ground (no seed required), and verify that the opener blades are in the groove opened by the coulter.

Refer to Figure 115

To adjust unit-mounted coulter alignment, loosen the four bolts ④ that attach its bracket to the row unit. The holes on the row unit are slotted, side-to-side, and allow the coulter bracket sideways and rotational adjustment.

Keep the coulter blade vertical while adjusting.

If the blade cannot be brought into alignment, check that the blade spindle itself is using the same hole location on each side of the bracket.
10HD Row Unit Down Pressure

Refer to Figure 102

The ideal amount of down-force causes the press wheels to compress any loose surface soil, but not press a trench into subsoil.

To assess down-force, operate the drill for a short distance on typical ground (with or without seeding), and stop. Leave the drill lowered (row units in ground).

At several row units, inspect the furrow created by the opener discs and closed by the press wheels.

Be sure to inspect rows both in and out of tire tracks.

Refer to Figure 103

1. If the press wheels are leaving no tracks, or light tracks, increase down-force.
2. If the wheels are compressing trash and loose soil, and leaving clear tracks right at the top of the subsoil, down-force is probably correct and needs no adjustment.
3. If the wheels are creating a trench into the subsoil, down-force is too high and needs to be reduced.

Adjusting 10HD Row Unit Down Force

The springs allow the row units to float down into depressions and up over obstructions.

With Frame-Mounted Coulters

With frame-mounted coulters, the seed trench is primarily opened by the coulters. Row unit springs provide only additional assistance needed to make a furrow “V” shaped and ensure furrow closure by the press wheels.

Often, the rows may be run at the minimum spring setting, other than in tire tracks, which commonly need some adjustment.

If trench depth is not being achieved across all rows, adjust the force and/or depth of the coulters before making row unit spring adjustments.

With Unit-Mounted Coulters (or no coulters)

Without frame-mounted coulters, the row unit springs provide the primary down force for cutting through residue and opening the seed trench.
Row Unit Down Pressure
10HDP Series Down-Pressure

Refer to Figure 118
An adjuster cam sets row unit spring down pressure individually for each row unit. This is useful for penetrating hard soil and planting in tire tracks.

The notes in the left table below are based on a drill without coulters. About 120 pounds (54 kg) of the down-force is the weight of the row unit itself. The additional force is due to the springs lifting against the mass of the drill.

Test, without seeding, in your conditions, to determine optimal down-force settings.

To adjust down pressure, use an adjustable or open-end 1 1/8 inch (29 mm) wrench.

1. Raise the drill. Although this adjustment can be made with the drill lowered, the springs will be in tension, and will require more effort. The extra force required may also damage tools.
2. Put tractor in Park and shut it off.
3. Position wrench on hex nut weldment.
4. Pull upper spring link back.
5. Move the adjustment cam to the new setting on the spring adjust bar.

2-Spring 10HD Cam Down-Force Settings
These settings apply to 2009+ drills, or updated older drills, that have two parallel arm springs per row.

<table>
<thead>
<tr>
<th>Cam Notch</th>
<th>Pounds</th>
<th>Kilograms</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero (out of notch)</td>
<td>Lock-Up &amp; Maintenance</td>
<td></td>
</tr>
<tr>
<td>one</td>
<td>125</td>
<td>55</td>
</tr>
<tr>
<td>two</td>
<td>140</td>
<td>60</td>
</tr>
<tr>
<td>three</td>
<td>155</td>
<td>70</td>
</tr>
<tr>
<td>four</td>
<td>185</td>
<td>85</td>
</tr>
<tr>
<td>five</td>
<td>215</td>
<td>100</td>
</tr>
<tr>
<td>six</td>
<td>245</td>
<td>110</td>
</tr>
<tr>
<td>tip</td>
<td>Do Not Use</td>
<td></td>
</tr>
</tbody>
</table>

4-Spring 10HD Cam Down-Force Settings
These settings apply to older drills, not yet updated, that have four parallel arm springs per row.

<table>
<thead>
<tr>
<th>Cam Notch</th>
<th>Pounds</th>
<th>Kilograms</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero (out of notch)</td>
<td>Lock-Up &amp; Maintenance</td>
<td></td>
</tr>
<tr>
<td>one</td>
<td>250</td>
<td>115</td>
</tr>
<tr>
<td>two</td>
<td>275</td>
<td>125</td>
</tr>
<tr>
<td>three</td>
<td>310</td>
<td>140</td>
</tr>
<tr>
<td>four</td>
<td>370</td>
<td>170</td>
</tr>
<tr>
<td>five</td>
<td>430</td>
<td>195</td>
</tr>
<tr>
<td>six</td>
<td>490</td>
<td>220</td>
</tr>
<tr>
<td>tip</td>
<td>Do Not Use</td>
<td></td>
</tr>
</tbody>
</table>

With 4-spring rows, do not set all rows so high that planting becomes uneven or gauge wheels lift off ground.

a. Contact your Great Plains dealer for update kit information.
10HD Row Unit Lock-Up

When seeding is shut off, individual row 10HD Series row units can be locked up to reduce wear. The opener shank has a hole 2 in the opener shank that accepts an optional pin 3 to block parallel arm movement. See page 121 for pin ordering information.

1. Raise the drill. Although this adjustment can be made with the drill lowered, the springs will be in tension, and will require more effort. The extra force may also damage tools.
2. Set the down pressure springs to the minimum cam setting, per the instructions on page 70.

- **DANGER**

**Crushing and Sharp Object Hazard:** Do not attempt to lift the row unit by hand. The weight of the unit, plus the force of the springs (even at minimum) is too great (plus, a free hand is needed for pin insertion). Even with multiple people lifting, hand-lifting is unsafe - there are numerous sharp edges, and the row unit will snap down violently if a grip is lost.

3. Raise the row unit high enough that the hole  for the pin is above the lower parallel arm. This can be done in several ways, including:
   a. use a hoist at the rear of the shank 5
   b. use a jack under the shank extension
   c. place a block under the row, and lower drill

4. Remove the pin from the storage hole 1. Insert it in the lock-up hole 3. Secure it with the cotter pin 6.
5. Lower row unit until lower parallel arm rests on lock-up pin.
6. Repeat for all rows needing lock-up.

10HD Disk Blade Adjustments

See also “10HD Opener Maintenance” on page 111.

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

Refer to Figure 106

The ideal spacing causes the blades to be in contact for about one inch. If you insert two pieces of notebook paper between the blades, the gap between them should be 0.5 to 1.75in (13 to 44mm).

If the contact region is significantly larger or smaller (or there is no contact at all), it needs to be adjusted by moving one or more spacer washers. If the contact region varies with blade rotation, one or both blades is likely bent and in need of replacement.
Adjusting 10HD Disc Contact

**CAUTION**

*Sharp Object Hazard:*
Row unit disk blades may be sharp. Use caution when making adjustments in this area.

Refer to Figure 107

1. Raise the drill and install the transport locks.
2. Remove the bolt retaining the opener disc on one side. Carefully remove the disc, noting how many spacers are outside the disk and inside the disk. Do not lose the hub components and spacer washers.
3. To reduce the spacing between the discs (the normal case), move one spacer washer from the inside to the outside of the disc.
4. Re-assemble and check disc contact.

10HD Seed Firmer Adjustments

10HD Series row units include a seed flap, or one of two optional seed firmers.

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

**CAUTION**

*Sharp Object Hazard:*
Row unit disk blades may be sharp. Use caution when making adjustments in this area. To adjust the Keeton Seed Firmer, lower the drill until the disks of the row units are resting on the ground.

10HD Keeton Adjustment

The optional Keeton Seed Firmer is an engineered polymer shape that slides down the seed trench. It traps seeds as they exit the seed tube and firms them into the bottom of the "V".

Refer to Figure 108

The Firmer is provided with a preset tension which is recommended for using the first year. The tension screw can be tightened in subsequent years according to your needs. Firmers should provide just enough tension to push seeds to the bottom of the trench.
10HD Seed-Lok™ Lock-Up

Optional Seed-Lok firming wheels provide 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 firmers.

Refer to Figure 109 (which depicts a row unit with the opener blades removed for clarity)

To lock up Seed-Lock wheels:
1. Pull firming-wheel arm ② up as high as possible.
2. Flip the lock tip ② to hold the arm up.

10HD Press Wheel Adjustments

Opener Depth (Press Wheel Height)

Seeding depth on 3N-4010F, 3N-4010HDF and 3N-4020F is set by frame-mounted coulter depth (if installed) and row unit depth. Set frame height (page 62) before making row unit depth adjustments.

10HD Series press wheel height is a stop adjustment and not a spring adjustment. It establishes a fixed relationship between opener depth and the closed-furrow surface at the press wheel

Refer to Figure 110

Set opener seeding depth by adjusting press-wheel height ①. To adjust, first raise openers slightly, then lift and slide T handles ② on top of openers. Initially adjust all press wheels to the same height. Individual rows running in tire tracks may need to be set deeper. 
- For more shallow seeding, slide T handles forward ④ toward drill.
- For deeper seeding, slide T handles backward ⑤ away from drill.

If press wheels are lifting off ground, check front-to-back level, and increase row unit spring down force.
If press wheels are digging into ground, reduce spring down force at the row units.

---

a. If frame-mounted coulters are installed, adjust them for tire tracks before adjust T-handles. The coulter depth adjustment may be all that’s required to compensate for tracks.
10HD Press Wheel Spacing
Double V Press Wheel Adjustment

Refer to Figure 125

The double-V closing wheels ① can be moved inward and outward to alter how they close the seed trench and press soil over the seed.
To move the wheels in toward the center of the trench, remove one of the 1/4 in (6.4mm) spacer bushings ② next to the press wheel arm and position it under the head of the hex head cap screw ③.
On wider row spacings the closing wheels can be moved outward by relocating the spacers to the inside, next to the press wheel arm ④.

Figure 125: 10HD Series Double-V Press Wheels
20 Series Row-Unit Adjustments

Refer to Figure 126, which depicts a 20 Series row unit fully populated with all features supported on 3N-4020F drill (excepting Seed-Lok). From front to back, they are:

1. Dual Down-Pressure Springs & Cam (standard)
   See “20 Series Row-Unit Down Pressure” on page 84. Each row-unit is mounted on the planter with parallel arms. This parallel-action mounting allows the row-unit to move up and down while staying horizontal. A cam ① adjusts the force between 100 and 225 pounds.

2. Double Disk Openers (standard)
   A pair of canted opener disk blades ② open a furrow and keep it clear for the seed tube. These disks are adjustable for contact. See “20 Series Row-Unit Down Pressure” on page 84.

3. Side Depth Gauge Wheels (standard)
   These wheels ③ are the primary control of seeding depth (set by the T-handle). They also have adjustments for angle and disk contact. See “Side Gauge Wheel Adjustments” on page 85.

4. Seed Tube (standard)
   A seed tube mounted between the disks (not shown) delivers seed to the trench. It is fed by the seed meter, and has a seed flap ④, shown here cut back for clearance from the seed firmer. See “20 Series Seed Firmer Adjustments” on page 87.

5. T-Handle (standard)
   This handle ⑤ sets the height of the side depth gauge wheels. See “20 Series Row-Unit Planting Depth” on page 84.

6. Seed Firmer (optional)
   An optional seed firmer (Keeton shown) minimizes seed bounce and improves soil contact. See “20 Series Seed Firmer Adjustments” on page 87.

7. Press Wheels (standard)
   The press wheels close the furrow, gently pressing the soil over the seed to ensure good seed to soil contact for even emergence. They have adjustments for down-pressure, stagger and angles. See “20 Series Press Wheels” on page 88.

**NOTICE**

Certain Machine Damage:
Do not back up with row-units in the ground. This will cause severe damage and row-unit plugging.
**20 Series Row-Unit Down Pressure**

Refer to Figure 127

An adjuster cam sets row unit spring down pressure individually for each row unit. This is useful for penetrating hard soil and planting in tire tracks.

<table>
<thead>
<tr>
<th>Cam Notch</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>zero (out of notch)</td>
<td>Maintenance Only</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>165</td>
</tr>
<tr>
<td>3</td>
<td>225</td>
</tr>
</tbody>
</table>

To adjust down pressure, use a tool to lift and rotate the adjustment cam.

1. Raise the drill. Although this adjustment can be made with the drill lowered, the springs will be in tension, and will require more effort. The extra force required may also damage tools.
2. Put tractor in Park and shut it off.
3. Position tool under upper spring link, and pull it back and up.
4. Move the adjustment cam to the new setting on the spring adjust bar ⑧.

Do not set all rows higher than notch two. Using high settings across all rows causes uneven planting. Individual rows may be set higher if running in tire tracks.

**20 Series Row-Unit Planting Depth**

Refer to Figure 129

Side depth wheels ① outside the row-unit disks ② control row-unit planting depth. The position of an adjustable stop, using the T-handle ③, determines planting depth.

Set planting depth by adjusting handle ③. To adjust, first raise row-units slightly, then lift and slide handle on top of row-units. Adjust all handles to the same setting.

For shallower planting, slide handle forward toward planter.

For deeper planting, slide handle back away from planter.
20 Series Disk Adjustments
See also “20 Series Opener Maintenance” on page 111.

Opener Disc Contact Region
Refer to Figure 130

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

The ideal spacing causes the blades to be in contact for about one inch ①. If you insert two pieces of paper between the blades, they should slide to 0.5 to 1.75 in (13 to 44 mm) of each other.

If the contact region is significantly larger or smaller (or there is no contact at all), it needs to be adjusted by moving one or more spacer washers.

Adjusting Disc Contact
Refer to Figure 130 and Figure 131

1. Raise the drill.
2. Remove the side gauge wheels ② on the row unit in need of adjustment.
3. Remove the bolt ③ retaining the opener disc ④ on one side. Carefully remove the disc. Do not lose the hub components and spacer washers ⑤, ⑥.
4. To reduce the spacing between the discs (the normal case), move one spacer washer from the inside ⑤ to the outside ⑥ of the disc.
5. Re-assemble and check disc contact.

Side Gauge Wheel Adjustments
Refer to Figure 132

The side gauge wheels have two, interrelated adjustments:
• angle of side gauge wheel, and
• distance between side gauge wheels and disks.

Refer to Figure 133

Adjust side-gauge-wheel angle so wheels contact row-unit disks at the bottom of wheel at 2 in planting depth and gaps open 3/8 in to 3/8 in at top. Check with row-units in soil so wheels are held up.

At the same time, keep side gauge wheels close to opener disks so openers do not plug with soil or trash. However, wheels should be out far enough so disks and wheels turn freely.
Refer to Figure 134

To adjust side gauge wheels:
1. Raise planter slightly removing weight from side gauge wheels.
2. Loosen hex-head bolt ①. Move wheel and arm out on O-ring bushing.
3. Loosen pivot bolt ②. Turn hex adjuster ③ so indicator notch ④ is at 5 o’clock to 7 o’clock.
   - Use this as the starting point for adjustment.
4. Move wheel arm in so side gauge wheel contacts row unit disk. Tighten hex-head bolt ① to clamp arm around bushing and shank.
5. Check wheel-to-disk contact at 2 in planting depth. Lift wheel 2 in and release. When let go, wheel should fall freely.
   - If wheel does not contact disk at bottom to area where blade leaves contact with soil, move hex adjuster until wheel is angled for proper contact with disk.
   - If wheel does not fall freely, loosen hex-head bolt ① and slide wheel arm out just until wheel and arm move freely. Tighten hex-head bolt ① per grade:
     - 1/2 in Grade 5 bolt, 75 ft-lbs.
     - 1/2 in Grade 8 bolt, 110 ft-lbs.
6. Keep turning hex adjuster and moving wheel arm until the wheel is adjusted properly. When satisfied, tighten pivot bolt ② to 110 ft-lbs.
   - Use “Torque Values Chart” on page 125 for reference.
20 Series Seed Firmer Adjustments

20 Series row units include a seed flap, and accept one of two optional firmers.

**CAUTION**

*Sharp Object Hazard:*
Row unit disk blades may be sharp. Use caution when making adjustments. To adjust the Keeton Firmer, lower the planter until the disks of the row units are resting on the ground.

**20 Series Keeton Adjustment**

The optional Keeton Seed Firmer is an engineered polymer shape that slides down the seed trench. It traps seeds as they exit the seed tube and firms them into the bottom of the furrow.

*Refer to Figure 108*

The Firmer is provided with a preset tension which is recommended for using the first year. The tension screw can be tightened in subsequent years according to your needs. Firmers should provide just enough tension to push seeds to the bottom of the trench.

Measure the distance from the ground to the head of the tension screw. This distance should be 4 to 4 1/2 in. If not, loosen the bolts in the mounting bracket and select different holes until the proper measurement is attained.

**20 Series Seed-Lok™ Lock-Up**

Optional Seed-Lok™ firming wheels provide 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 firmers.

*Refer to Figure 109*

To lock up Seed-Lok wheels:
1. Raise planter. Insert lift assist cylinder locks.
2. Rotate Seed-Lok™ lock-up handle 1 90 degrees down on top of row unit body.
3. Push up on Seed-Lok™ wheel 2 until wheel arm latches up.
4. To return to normal operation, turn release 3 down.
20 Series Press Wheels

Attached to the rear of each row-unit is one of several press wheel options.

To provide consistent seed firming, the press wheels are free to move downward from their normal operating position. This system maintains pressing action even if the row-unit arm is lifted when the disks encounter obstructions.

Refer to Figure 137

Press wheels are attached to each row-unit body. The press wheels close the seed trench and gently press soil over seed.

An adjustable spring in the press wheel mechanism creates the down pressure needed to close the seed trench. The amount of force needed will vary with field conditions.

To adjust, move adjustment handle.

- For less down pressure, move handle forward toward planter.
- For more down pressure, move handle back away from planter.

Increased press wheel spring force may require increased row-unit down force to maintain depth.

The factory setting on the press wheel is staggered to achieve optimum residue flow.

Refer to Figure 138

To adjust press wheels between staggered to even, remove 5/8 in nut 1 and inside lock washer 2. Remove press wheel, keeping spacer 3, outside lock washer 2 and bolt 4 with wheel. Move wheel to other mounting hole and re-secure.

If one press wheel is running in the seed trench or the wheels are not centered over the seed trench, adjust the press wheels by adding or removing spacers 3.

Figure 137: 20 Series: Press Wheel Adjustment

Figure 138: 20F: 20 Series: Press Wheel Stagger
## General Drill Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting too much</td>
<td>Incorrect seed rate.</td>
<td>Check seed rate setup and calibration, page 28.</td>
</tr>
<tr>
<td></td>
<td>Seed cup door not correctly set for seed size.</td>
<td>Adjust seed cup doors, page 28.</td>
</tr>
<tr>
<td></td>
<td>Actual field size is different.</td>
<td>Verify field size.</td>
</tr>
<tr>
<td>Planting too little</td>
<td>Incorrect seed rate.</td>
<td>Check seed rate setup and calibration, page 28.</td>
</tr>
<tr>
<td></td>
<td>Excessive field speed.</td>
<td>Reduce field speed.</td>
</tr>
<tr>
<td></td>
<td>Seed cup door not correctly set for seed size.</td>
<td>Adjust seed cup doors, page 28.</td>
</tr>
<tr>
<td></td>
<td>Oil in electric clutch causing slippage</td>
<td>Disassemble and degrease clutch.</td>
</tr>
<tr>
<td></td>
<td>Check seed level in seed box.</td>
<td>Fill seed box.</td>
</tr>
<tr>
<td></td>
<td>Actual field size is different.</td>
<td>Verify field size.</td>
</tr>
<tr>
<td></td>
<td>Excessive gaps between drill passes.</td>
<td>Adjust marker, page 18.</td>
</tr>
<tr>
<td></td>
<td>Build up of seed treatment in seed cups.</td>
<td>Clean out seed cups.</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>Obstruction in seed cup from foreign matter or unclean seed.</td>
<td>Clean seed cup.</td>
</tr>
<tr>
<td></td>
<td>Thrown or worn drive chains</td>
<td>Check drive chains.</td>
</tr>
<tr>
<td></td>
<td>Worn sprockets and/or chain idlers.</td>
<td>Replace sprockets and/or chain idlers.</td>
</tr>
<tr>
<td>Uneven seed spacing</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>Build up of seed treatment in seed cup.</td>
<td>Clean out seed cup.</td>
</tr>
<tr>
<td></td>
<td>Seed-Lok plugging.</td>
<td>Lock up Seed-Lok, pages 73, 81, 87.</td>
</tr>
<tr>
<td></td>
<td>Damaged or missing seed flap.</td>
<td>Replace seed flap.</td>
</tr>
<tr>
<td></td>
<td>Opener disks not turning.</td>
<td>See “Opener disks not turning freely” in this Troubleshooting chart.</td>
</tr>
<tr>
<td></td>
<td>Plugged opener seed tube.</td>
<td>Lift up drill, expose bottom of seed tube and clean out.</td>
</tr>
<tr>
<td></td>
<td>Worn/rusted sprockets and/or chain idler.</td>
<td>Check and replace any worn/rusted sprockets or chain idlers.</td>
</tr>
<tr>
<td></td>
<td>Opener not penetrating low spots.</td>
<td>Adjust opener, pages 70, 77, 84.</td>
</tr>
<tr>
<td></td>
<td>Drive type too slow.</td>
<td>Use faster drive type and readjust seed rate handle.</td>
</tr>
<tr>
<td></td>
<td>Seed cup door setting too open.</td>
<td>Close flutes to a more narrow position.</td>
</tr>
<tr>
<td>Problem</td>
<td>Cause</td>
<td>Solution</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Uneven seed depth</td>
<td>Excessive field speed.</td>
<td>Reduce field speed.</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, pages 73, 81, 87.</td>
</tr>
<tr>
<td></td>
<td>Damaged or missing seed flaps.</td>
<td>Replace seed flaps.</td>
</tr>
<tr>
<td></td>
<td>Drill not level</td>
<td>See page 100.</td>
</tr>
<tr>
<td></td>
<td>Row down-force too light for conditions</td>
<td>Increase force, pages 70, 77, 84.</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></td>
<td>Low tire pressure</td>
<td>Check tires</td>
</tr>
<tr>
<td>Opener disks not turning freely</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, pages 73, 81, 87.</td>
</tr>
<tr>
<td></td>
<td>Failed disk bearings.</td>
<td>Replace disk 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>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>Incorrect press wheel depth.</td>
<td>Reset press wheel depth, pages 73, 81, 88.</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>Seed cup door handle not open enough.</td>
<td>See page 28.</td>
</tr>
<tr>
<td>Drill boxes do not empty evenly</td>
<td>Opener seed tube plugged.</td>
<td>Lift up drill, expose bottom of seed tube and clean out with wire.</td>
</tr>
<tr>
<td></td>
<td>Drive chains missing or damaged.</td>
<td>Replace drive chains.</td>
</tr>
<tr>
<td></td>
<td>Planting around fields vs. back-and-forth.</td>
<td>Correct planting operation.</td>
</tr>
<tr>
<td></td>
<td>Rough field conditions may move seed in the box.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seed cup(s) are shut off.</td>
<td>Open seed cup(s).</td>
</tr>
<tr>
<td></td>
<td>Some models do not have the same number of seed cups between each bulkhead divider. The section with more seed cups will empty sooner.</td>
<td>Verify number of seed cups in each box.</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>Coulters set too deep, bring up excess dirt and moisture.</td>
<td>Check coulter adjustment.</td>
</tr>
<tr>
<td></td>
<td>Drill not set to run level from front to rear, carrying enough weight on wheels to prevent &quot;nosing over&quot;, or set too low on rear caster eyebolts allowing it to run &quot;nose high&quot;.</td>
<td>Check Leveling Frame Front-to-Rear, page 101.</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 disk bearings.</td>
<td>Replace disk bearings.</td>
</tr>
<tr>
<td></td>
<td>Disk blades worn.</td>
<td>Replace disk blades.</td>
</tr>
<tr>
<td></td>
<td>Scraper worn or damaged.</td>
<td>Replace scraper.</td>
</tr>
</tbody>
</table>
Point Row Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed cup sprockets locked up or</td>
<td>Foreign matter lodged in seed cup sprockets.</td>
<td>Clean out seed cup sprockets.</td>
</tr>
<tr>
<td>seed drive shaft twisted</td>
<td>Build-up of dried liquid insecticide in seed cups.</td>
<td>Remove build-up by disassembling each seed cup and scraping the foreign substance from turning surfaces.</td>
</tr>
</tbody>
</table>

Hydraulic Drive Troubleshooting

Drive will not rotate:
(see Troubleshooting Flow Chart and Electronics Overview, page 95 and page 96)

1. Check cab console:
   a. No power to cab console - check with voltmeter.
   b. Upper line (set) is visible but no lower line (out rate and speed) on display: move to Communication troubleshooting below.
   c. 1 or 10 amp fuse on power cable may be blown.
   d. Engage button is not on - check to see if green indicator light is on.
   e. Use Cab Console Power Tester (p/n 27857) to check power out of cab console. Install tester on round 7-pin power/comm cable from cab console. Turn drive on. Green LED shows power to external controller. Red LED shows power to solenoid. If LED lights are not lit, double-check power and connections; replace cab console if needed.

2. Check communication between cab console and drive:
   a. Check to see if power and communication cable (main harness) is properly connected.
   b. If no lower line on cab console appears (speed and output rate), and drive will not rotate in calibration mode, use Cable Continuity Tester (p/n 27859) to test power and communication to external controller.

   NOTICE

   TO PREVENT DAMAGE TO COMPONENTS, DISCONNECT POWER/COM CABLE FROM CAB CONSOLE AND EXTERNAL CONTROLLER BEFORE INSTALLING THIS TESTER.

   Install 4-pin test plug on end of 4-pin power/comm cable before powering the Cable Continuity Tester - remove before reattaching power/comm cable directly to cab console.

   c. If Cable Continuity Tester shows power is getting to external controller, turn power off and remove Cable Continuity Tester and 4-pin test plug from ends of power/comm cable. Reattach...
power/comm cable to cab console and external controller.

d. If power/comm cable tester shows power and communication is reaching external controller from cab console, and no lower line appears on cab console, replace chip or external controller. Call Service Department.

e. If Cable Continuity Tester (p/n 27859) isn’t available, check cable with voltmeter at connection at control module.

3. Test Relay inside external controller:
   a. Use Relay Output Tester (p/n 27860) to test relay inside external controller. Install tester to weather-pak solenoid connector from external controller. With tractor engine off, start drive calibration function. Auditory alarm should buzz for 1.5 seconds when drive is engaged in calibration mode. If no alarm, relay or external controller may need replacing. Call Service Department.

4. Check hydraulics:
   a. Check hydraulic lever is in detent position.
   b. Hydraulic lever is in wrong detent direction - a check valve at outlet of motor prevents reverse rotation.
   c. Make sure that both hoses are properly connected to tractor remotes.
   d. Inadequate system pressure. Gauge pressure at filter and check reading. If system pressure is below tractor specifications, check system.
   e. Power solenoid directly:

Rapid drive rotation may occur causing serious injury.

   i. Disengage hydraulics.
   ii. Reduce flow to 30-50%.
   iii. Power solenoid directly by connecting power weather-pak connector to solenoid weather-pak connector. If drive doesn’t rotate, Proportional Coil (p/n 19799) may be defective. Check continuity with meter, or energize with 12v power and check for magnetic pull with small screwdriver. Double-check connections on solenoid cable. If solenoid energizes but drive does not rotate when powered directly, tractor hydraulics are not properly engaged.

f. Excessive torque in drive system. Disconnect main drive chain to check for rotation under zero load. Check for a problem with the mechanical portion of drive, such as foreign material or swelled grain wedged in meters, frozen bearings, misaligned chains. Install pressure gauge at motor inlet. Pressure should be 1000-1500 psi. If pressure is above 2000 psi, significant torque problems are present.

5. Check Speed signal (if drive rotates in calibration mode but not when planting)

Rapid drive rotation may occur causing serious injury.

   a. No signal from speed sensor - check connection at sensor and at drive controller.
   b. Use Speed Simulator (p/n 27858) to troubleshoot speed loop. Leave tractor stationary and drive hydraulics do not need to be engaged.
   c. Test speed sensor and hall effect sensor; replace sensor if simulated speed appears on cab console.
   d. Test speed cable between speed sensor and hall effect module; replace cable if simulated speed appears on cab console.
   e. Test hall effect module and cable to external controller; replace module and cable if simulated speed appears on cab console. If speed does not appear, external controller or chip may need replacement. Call Service Department.

Drive rotates but not at desired speed:

6. Drive (out rate) fluctuating erratically:
   a. If indicated field speed on drive is also fluctuating erratically, troubleshoot speed signal loop.
   b. If field speed is steady, check for loose set screws on motor encoder, contamination of proportional valve, or mechanical binding of chains.

7. Indicated speed fluctuating erratically:
   a. Use speed simulator to troubleshoot speed loop. Leave tractor stationary and drive hydraulics do not need to be engaged. If steady speed between 4-10 mph appears on cab console using speed simulator, troubleshoot radar and hall effect module. If steady speed does not appear, external controller may need replacement. Call Service Department.
b. Check radar gun angle.

c. Check power to system. Less than 12 Vdc power will cause drive to behave erratically - often problem manifests itself in speed loop.

8. Drive shuts off while planting:
   a. If it occurs after 20 seconds of not planting, such as turning on headlands, operation is normal safety shutoff (on units with radar speed signal).
   b. Check setting of speed signal interrupter switch - reposition as necessary to keep actuator from disengaging while planting.
   c. 1.5 second delay shutting off drive - causes: chain binding, inadequate hydraulics.

9. Drive will not achieve desired rate:
   a. Recheck calibration number and rerun calibration procedure if necessary.
   b. Check to make sure that your desired rate is within the range of the meter that is installed.
   c. Inadequate hydraulic flow. Adjust flow control to higher position. Check with flow meter if flow is suspect.
   d. Field speed too high. Check maximum planting rate in seed chart for rate that you are planting.
   e. Check speed shown on cab console against other speedometer - tractor, planter monitor. If drive speed is significantly lower, recalibrate speed on drive.

10. Drive plants significantly higher than desired rate:
   a. Recheck calibration number and re-run calibration procedure if necessary.
   b. Check speed shown on cab console against other speedometer. If drive speed is significantly higher, recalibrate speed on drive.

11. Drive continues to rotate after tractor has stopped:
   a. Contamination or wear in proportional valve (p/n 19798). Remove and inspect. Blow out with compressed air. Check o-rings and reinstall. Replace if necessary.

12. Fluid weeping from motor shaft seal:
   a. Excessive back pressure in return hose. Check quick coupler connection. Use motor control port for return if available.
Calibration Troubleshooting:

If the time to run for calibration is less than 4 seconds, the cab console will display TIME TOO LOW.

Pressing the FUNCTION button will bring up the ENTER TARGET AMOUNT screen. The target should be raised to increase the calibration time. If the time is greater than 255 seconds, the cab console will display TIME TOO HIGH. Pressing the FUNCTION button will bring up the ENTER TARGET AMOUNT screen. The target should be lowered to decrease the calibration time.

If modest adjustments to the sample size continue to result in HIGH/LOW errors, chances are some other parameter is zero or incorrect by a large factor (such as decimal place error). To start over, press OFF, and then ON.

While rate calibration is running, one of four error messages may be displayed:

<table>
<thead>
<tr>
<th>Message</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMM TIMEOUT</td>
<td>Power to or communication with the external controller was interrupted during calibration.</td>
<td>Check power and communication connections from the cab console to the external controller and rerun calibration.</td>
</tr>
<tr>
<td>TIME OVER LIMIT</td>
<td>The external controller module ran too long in calibration.</td>
<td>Rerun calibration. If the same message appears, call technical support.</td>
</tr>
<tr>
<td>USER TERMINATED</td>
<td>The ENGAGE button was pressed during calibration.</td>
<td>Rerun calibration.</td>
</tr>
<tr>
<td>CALIBRATE ERROR</td>
<td>The drive did not turn when calibration began.</td>
<td>Check encoder cable and connection, solenoid cable and connection, and hydraulic lever position.</td>
</tr>
</tbody>
</table>
Hydraulic Drive Troubleshooting Flow Chart

Problem: Drive will not rotate.

NO

Make sure cab console is on.

Check 1A and 10A fuses.

Replace cab console.

Use diagnostic kit part #27857 to check power from cab console.

NO

NO

Replace power/comm cable.

Replace external controller chip (Dealer Service)

If new chip doesn’t fix problem, replace external controller (Dealer Service).

YES

NO

Power from cab console ok?

YES

Lower line on cab console’s LCD?

NO

Upper line on cab console’s LCD?

Use diagnostic kit part #27857 to check continuity through power/comm cable (FOLLOW INSTRUCTIONS TO PREVENT DAMAGE).

NO

Replace power/comm cable.

Check solenoid coil, cable, and connections.

Check for excessive torque.

Drive rotates when solenoid powered directly?

YES

Use diagnostic kit part #27857 to check output from relay inside external controller. Replace external controller if test fails.

NO

Check tractor hydraulics.

Drive rotates during calibration?

YES

Disconnected Hall effect sensor and replace with diagnostic kit part #27857 (speed simulator). Depress speed cutoff switch. Replace sensor if speed appears on LCD.

NO

T speed doesn’t appear on LCD, disconnect speed sensor harness from Hall effect module and replace with speed simulator. Remove speed jumper wire located between Hall effect module and external controller. Replace speed sensor harness if speed appears on LCD.

If speed never appears on the LCD with the simulator, replace chip in external controller and repeat speed simulator test (Dealer Service).

If replacing the chip does not fix problem, replace external controller and repeat speed simulator test (Dealer Service).
Hydraulic Drive Electronics Troubleshooting

KEY:
SOLID LINES -- DRIVE ELECTRONICS CABLES
DASHED LINES -- TROUBLESHOOTING ITEMS

[Diagram of hydraulic drive electronics]

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GPS Troubleshooting

Troubleshooting GPS with SiteMate

1. No Rx rate appears on SiteMate
   - Has field been selected? Select VRT file (see SiteMate Settings, step 7, page 56)
   - Check recipe to verify that it is valid by viewing Attributes for each zone in SiteMate
   - If recipe calls for zero rate as the default, do you have GPS signal, or are you outside of field?
2. Rx rate appears on SiteMate, but no Applied Rate.
   - Make sure “Go” button on SiteMate is pressed. (button should read “Stop” when recipe is being sent to GP Console)
   - You must be planting in order for Applied Rate to appear.
3. Rx rate appears on SiteMate but not on GP Controller Console.
   - Make sure GP Controller Console is set to VR Mode (see Figure 37 on page 37).
   - Double-check all cable connections
   - Check Nominal rates on both the SiteMate (SiteMate Settings, step 6, page 56), and on the GP Controller Console (GP Settings, step 3, page 55) These must be set to the same number.
4. Rates on GP Controller Console and on SiteMate do not match.
   - Check Nominal rates on both the SiteMate (SiteMate Settings, step 6, page 56), and on the GP Controller Console (GP Settings, step 3, page 55) These must be set to the same number.
   - Re-check GP calibration number, with metering wheel and row spacing.
   - The recipe rates from SiteMate are in 4% increments. If the two rates are within this 4% range, the units are operating normally.
   - Check the Conversion number (SiteMate Settings, Step 2). If the recipe requires a target conversion number, i.e. the recipe is for 25 which means 25,000 seeds/acre, the target conversion number will be 1000. In this case the Nominal Rate in SiteMate and the GP Console should be near 25,000. See SiteMate Settings, step 6, page 56 for calculating Nominal Rate.
5. Population Monitor rate does not match GP Controller Console.
   - Make certain that SiteMate and GP Controller Console agree. If not, see Troubleshooting step 4.
   - Re-check GP calibration number, with metering wheel and row spacing.

   • Re-check planter monitor settings: calibration number, row spacing, number of rows, swath width, seed, etc.
   • GPS signal is not being received by SiteMate:
     - Verify that GPS serial port (which is also the docking port) is not set to PC connection only (Start/Settings/Communications/PC Connections-check GPS settings in Configure/Settings/GPS settings/COM (typically COM1, 4800 Baud, 8 data bits, Parity None, and Stop Bits 1)
     - Click Data tab to view GPS details
Troubleshooting GPS with PF3000

1. No Target Rate appears on the PF3000
   • Has field been selected? Select target file (see PF3000 Settings, step 5, page 56)
   • Check recipe to verify that it is valid
   • If recipe calls for zero rate as the default, do you have GPS signal, or are you outside of field?

2. No Actual Rate appears on the PF3000.
   • Actual rate cannot be logged using the PF3000 with the Great Plains Precision Population Controller.

3. Target Rate appears on PF3000 but not on GP Controller Console.
   • Make sure GP Controller Console is set to VR Mode (see Figure 37 on page 37).
   • Double-check all cable connections
   • Check Nominal rates on both the PF3000 (PF3000 Settings, step 6, page 56), and on the GP Controller Console (GP Settings, step 4, page 57) These must be set to the same number.

4. Rates on GP Controller Console and on PF3000 do not match.
   • Check Nominal rates on both the PF3000 (PF3000 Settings, step 6, page 56), and on the GP Controller Console (GP Settings, step 4, page 57) These must be set to the same number.
   • Re-check GP calibration number, with metering wheel and row spacing.
   • The recipe rates from the PF3000 are in 4% increments. If the two rates are within this 4% range, the units are operating normally.
   • Check the target conversion number (PF3000 Settings, Step 6). If the recipe requires a target conversion number, i.e. the recipe is for 25 which means 25,000 seeds/acre, the target conversion number will be 1000. In this case the Nominal Rate on the PF3000 and on the GP Console should be near 25,000. See PF 3000 Settings, step 6, page 56 for calculating Nominal Rate.

5. Population Monitor rate does not match GP Controller Console.
   • Make certain that PF3000 and GP Controller Console agree. If not, see Troubleshooting step 4 above.
   • Re-check GP calibration number, with metering wheel and row spacing.
   • Re-check planter monitor settings: calibration number, row spacing, number of rows, swath width, seed, etc.
Maintenance and Lubrication

Proper servicing and maintenance is the key to long implement life. With careful and systematic inspection, you can avoid costly maintenance, downtime and repair. Always turn off and remove the tractor key before making any adjustments or performing any maintenance.

1. After initially running the drill for several hours, check all bolts for tightness as specified in "Torque Values Chart" on page 125.
2. Lubricate point at "Lubrication" on page 113.
3. Inflate tires per "Tire Inflation Chart" on page 124.
5. Clean or replace any fittings that will not take grease.
6. Periodically check and secure all bolts, pins, and fasteners. Tighten as specified on the "Torque Values Chart" on page 125.

Welding

If electrical welding on the drill is ever necessary, take these steps:
1. Disconnect all cables and harnesses at the hitch.

Refer to Figure 139

2. At the hydraulic drive motor mount, disconnect all four leads at the VER-21568 Ext. Controller, and remove this module from the drill.

WARNING

You may be severely injured or killed by crushing under a falling drill. Always use transport locks or have frame sufficiently blocked up when working on, and particularly under drill.

WARNING

Coulter and opener disk edges are very sharp. You may injure

WARNING

Escaping fluid under pressure can have sufficient pressure to penetrate the skin. Check all hydraulic lines and fittings before applying pressure. Fluid escaping from a very small hole can be almost invisible. Use paper or cardboard, not body parts, and wear heavy gloves to check for suspected leaks. If an accident occurs, seek immediate medical attention from a physician familiar with this type of injury.
Seed Cleanout

Refer to Figure 140, which depicts the seed cup door handle ① in a normal operating position.

1. For large quantities of remaining seed, use a bucket to scoop out from above, as this may be easier than collecting under row units.
2. Set all Seed Rate Handles to zero (0). This moves the seed cup sprockets out of the seed path.
3. Position a tarp or bucket under each row or set of rows to be cleaned out.
4. At the seed cup for each row, pull the door handle ① out of the operating detent range, and swing it down to position ②.
5. Open the main seed box and use a small brush to sweep seed toward seed cups set to clean-out. If seed does not flow freely, inspect seed cup, hose and seed tubes for obstructions.
6. Wash out the seed box with high pressure water.

It is not necessary to operate the seed meter drive shaft for clean-out. With the Seed Rate set to zero, nothing moves inside the seed cups; however, an inspection of the flutes for excess wear and damage does require shaft rotation.

Set the Seed Rate Handle to 100. Use an open-end wrench to turn the seed meter jackshaft, while another person inspects the flutes from the open seed boxes.

Frame Alignment and Level

Adjusting Fold Cylinders

If the drill does not fold or unfold fully it may be necessary to add or remove shims from the base of the wing fold cylinder.

Refer to Figure 141

1. With the drill in the folded or unfolded position make sure drill is on level ground and all safety locks are in place.
2. Place tractor in park, turn off ignition and remove ignition key.
3. Remove bolts ① from cylinder base plate ② and add or remove shims ③ as necessary.
4. Tighten fold cylinder base bolts and activate fold cylinders to make sure wings travel to full open and full closed position. If not repeat above steps until full open and full closed are achieved.
Level Frame Side to Side
All frame sections must be level to maintain even seeding depth. Before using the drill in the field, follow these steps to make sure the drill is level side-to-side.
Periodic frame-leveling adjustments should not be necessary, but if you are having problems with uneven depth, check drill levelness and follow these procedures.
Complete the steps at "Bleeding Fold Hydraulics" on page 105, before proceeding.

Refer to Figure 142
1. Locate the threaded eye bolt ④ at the base end of the wing caster wheel cylinders. The eye bolt is locked in place by jam nuts ⑤. Observe the amount of thread exposed above the upper nut and below the lower nut. If the exposed threads are roughly equal, no initial adjustment is needed. Go to step 3.
2. If the exposed threads above and below the nuts are not equal, loosen and adjust the jam nuts until the amount of exposed thread is about the same above and below. Repeat for other end of drill.
3. Move the drill to a level area. With the drill unfolded, raise the drill to its highest position with the lift cylinders. With the tractor idling, rephase the cylinders by holding the hydraulic lever on for an additional 30 seconds. Immediately lower the boxes until the coulters and openers are just ready to touch the ground.
4. Move the eye bolts until the openers on the outside end of the drill are the same height as the center openers.
   Eye-bolt adjustments are easier if the drill is first lowered to the ground to remove some of the force on the cylinders.
5. Repeat the steps above until the drill is level end-to-end when drilling in actual seeding conditions.

Level Frame Front to Rear
Level the drill front-to-rear with eye bolts located on the rear axle only.
6. Repeat the steps “Level Frame Side to Side” on page 101 using only the rear cylinders, until the drill is level front-to-rear when drilling in actual seeding conditions.
   When drill is level, opener bodies are at level or slightly higher at rear.
   Drill must be level front to rear in actual planting use or row plugging will occur. Adjusting wheel depth stop too low or excess opener spring force can cause the front of drill to roll forward when planting. Conventional till ground can also cause drill to run low in the front if wheel depth is set too low.
7. Have an assistant check front to rear level while planting by observing the drill from a safe distance. Drill should run with box and frame level or slightly lower in the front.
Box Alignment

To check and adjust box alignment:

1. Unfold drill (see “Unfolding the Drill” on page 24) and place a block ahead of each wing caster wheel. Pull drill forward against blocks to rock frames back. Pull forward until stop bolts are firmly against toolbars.

Refer to Figure 144

2. Check for proper alignment by running a string line across back of drill toward outer ends of wings. For proper alignment, outside ends of boxes (dimension ⑤) should be 0 to 3/4 in (0 to 6mm) ahead of inside ends (dimension ⑥).

Refer to Figure 143

3. To adjust box alignment, shorten or lengthen stop bolts to change the contact point with the toolbars. Adjust stop bolts ① in or out until dimension ⑥ is 0 to 3/4 in (0 to 6mm) greater than dimension ⑤.

If you have trouble getting box aligned it may be necessary to adjust fold cylinders (see “Adjusting Fold Cylinders” on page 100). Do not over-adjust or you may cause fold latching problems.

Box alignment, fold cylinder and tongue spacer shim adjustments are closely interrelated and may have to be adjusted in tandem. Adjust fold cylinders to enable complete 90 degrees of travel to latch wings and to unfold for box alignment. Then adjust tongue shims to remove as much play as possible in transport without preventing proper latch operation. Lack of proper fold cylinder adjustment will cause difficulties with wheels by not allowing full rotation of caster wheel assemblies.
Tongue Spacer Block

If the folded drill does not pull straight, wanders back and forth while being towed, or fails to latch during folding, it may be necessary to replace or adjust one or more tongue spacer block assemblies.

Refer to Figure 145 (which depicts right tongue tube)

There are four of these block assemblies on the drill tongue. Two ① are on the inside, and contact each other when folding. Two ② are on the outside, and contact the wing main frames when folded.

The amount of contact should be just enough to prevent sway, but not so much that it prevents reliable transport latching during fold.

If the skid blocks (③, ④) are worn or deformed, replace them.

If the skid blocks are serviceable, and there is a gap when folded, add a shim ⑤. Consult the latest Parts manual for the current shim part number.

When re-installing:

- The inside blocks ① must be exactly opposite each other, and are located 122in (3.1m) from the forward end of the tongue tube wall (dimension ⑥).
- The outside blocks ② are located 155in (3.74m) from the forward end of the tongue tube wall (dimension ⑦).

It is normal for the tongue assembly to rotate slightly when the wings move up and down independently. Adjusting tongue shims does not eliminate this.
Bleeding Hydraulics

To function properly, the hydraulics must be free of air. If hydraulics have not been bled, they will operate with jerky, uneven motions and could cause wings to drop rapidly during folding or unfolding.

**WARNING**

**Crushing Hazard:**
You may be severely injured or killed by being crushed from a falling implement. Always have transport locks in place and frame sufficiently blocked up when working on implement.

**NOTICE**

Bleed only at a
- JIC (Joint Industry Conference, 37° flare) or
- NPT (National Pipe Thread, tapered thread) fittings, and never at
- ORB (O-Ring Boss) or
- QD (Quick Disconnect) fittings.

Bleeding Lift Hydraulics

The lift system is equipped with rephasing hydraulic cylinders that require a special procedure for bleeding air from the system. Follow the procedure carefully.

1. Check hydraulic fluid level in tractor reservoir and fill to proper level. Add fluid to system as needed while cycling new cylinders.
2. Lower drill to ground.
3. With frame blocked and supported, unpin rod ends of wheel cylinders. Pivot cylinders up and wire or otherwise safely support rod ends higher than base ends. You may need to remove the cylinders from the rockshaft so you can orient them with rod ends higher than base ends.
4. With the tractor engine at idle speed, energize the lift hydraulics. When the wheel cylinders on wings have extended completely, hold the remote lever on for one minute. Check all hydraulic hoses, cylinders and fittings for leaks.
5. Retract the cylinder rods. Extend the rods again and hold the remote lever on for one more minute. Repeat this step two more times.
6. Again, check all hydraulic hoses, cylinders and fittings for leaks. Recheck the tractor hydraulic reservoir. Fill to the proper level.
7. Re-pin all cylinders.

During initial implement setup (which may have been done by your dealer) or if you replace a hydraulic component, complete the following procedures.

**WARNING**

**High Pressure Fluid Hazard:** Escaping fluid under pressure can penetrate skin, causing serious injury. Use a piece of paper or cardboard, NOT BODY PARTS, to check for leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. If an accident occurs, seek immediate medical attention from a physician familiar with this type of injury.

**NOTICE**

**Machine Damage Risk:** JIC fittings do not require high torque. JIC and O-ring fittings do not require sealant. Always use liquid pipe sealant when adding or replacing (NPT) pipe-thread fittings. To avoid cracking hydraulic fittings from over tightening, and to keep tape fragments from clogging filters, do not use plastic sealant tape.
Bleeding Fold Hydraulics

Review hydraulic bleeding warnings and advisories on page 104.

1. Check hydraulic fluid level in tractor reservoir and fill to proper level. Add fluid to system as needed while cycling new cylinders.

Lock Cylinders

Refer to Figure 147

2. The lock cylinders share a tractor remote circuit with the Veris Drive system. To bleed the lock cylinders, the selector valve handle must be rotated towards the lock cylinder hoses to direct flow to that circuit.

3. Crack fittings at both the rod end and base end of the small lock cylinders out on the LH wing and RH wing wheel casters. See Hydraulic Diagram on page 129.

4. Activate the tractor lever for this circuit. When oil appears at one fitting, stop and tighten that fitting. Activate the same lever in the same direction until oil appears on the other side of the drill. Tighten that fitting.

5. Activate the tractor lever in the opposite direction until oil appears at a fitting. Stop and tighten that fitting. Activate the same lever in the same direction until oil appears on the other side of the drill. Tighten that fitting.

Fold Cylinders

Unfolding drill retracts fold cylinders.

6. Unpin rod ends of wheel cylinders. Pivot cylinders up and wire or otherwise safely support rod ends higher than base ends. You may need to remove the fold cylinders from the drill so you can orient them with rod ends higher than base ends.

7. With the tractor engine at idle speed, energize the fold hydraulics. When the cylinders have extended completely, hold the remote lever on for one minute. Check all hydraulic hoses, cylinders and fittings for leaks.

8. Retract the cylinder rods. Extend the rods again and hold the remote lever on for one more minute. Repeat this step two more times.

9. Again, check all hydraulic hoses, cylinders and fittings for leaks. Recheck the tractor hydraulic reservoir. Fill to the proper level.

10. Re-pin all cylinders.
Marker Maintenance

**CAUTION**

Overhead Hazard:
You may be injured if hit by a folding or unfolding marker. Markers may fall quickly and unexpectedly if the hydraulics fail. Never allow anyone near the drill when folding or unfolding the markers.

See also:
"Marker Setup (Option)" on page 18 and
"Marker Adjustments" on page 68.

If grease-seal cap for marker-disk-hub bearings is damaged or missing, disassemble and clean hub. Repack with grease and install a new seal or grease cap.

**Bleeding Markers**

Review hydraulic bleeding warnings and advisories on page 104.

To fold properly, the marker hydraulics must be free of air. If the markers fold in jerky, uneven motions, follow these steps.

1. Check that tractor hydraulic reservoir is full.
2. With both markers lowered into field position, loosen hydraulic-hose fittings at rod and base ends of marker cylinders. If applicable, loosen fittings on back side of sequence valve.
3. With tractor idling, activate tractor hydraulic valve until oil seeps out around a loosened fitting. Tighten that fitting.
4. Reactivate tractor hydraulic valve until oil seeps out around another loosened fitting. Tighten that fitting. Repeat process until all loosened fittings have been bled and tightened.

**Marker Speed**

The procedure for adjusting marker speed is different for single marker with needle valve and dual markers with sequence valve.

**Single Marker/Needle Valve Speed**

Refer to Figure 149

A needle valve controls the folding speed. The needle valve is near the rod end of the marker cylinder.

With tractor idling at a normal operating speed, adjust marker folding to a safe speed. Turn adjustment knob clockwise to reduce folding speed or counterclockwise to increase folding speed. Excessive folding speed could damage markers and void the warranty.
Dual-Marker/Sequence Valve 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 valve body.

Turn adjustment screws clockwise (S: slower) to decrease unfolding/folding speed and counterclockwise (F: faster) to increase unfolding/folding speed.

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

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

Marker Shear Bolt Replacement

Refer to Figure 151

The marker arm is attached to marker body with a pivot bolt ① and a shear bolt ②. A third clamp bolt ③ acts as a hold-down for the top of the marker shear base.

The shear bolt ② is designed to fail if the marker tip gets hung up on an obstacle. This prevents damage to the marker.

If the shear bolt fails, replace it with a bolt of identical size and grade, or one of similar strength.

The supplied bolt ② is Great Plains part: 802-589C HHCS 7/16-14X2 GR5

This is a 7/16-14 x 2in Grade 5 bolt. If an exact replacement is not immediately available, temporarily substitute a metric bolt, M10x0.75 Class 8.8.

NOTICE

Machine Damage Risk:

*Do not replace the shear bolt with a higher grade bolt, or the next obstruction may result in marker damage.*

Do not replace the shear bolt with a lower grade bolt, or smaller bolt, or you may experience nuisance shears.

If conditions are causing frequent shears, keep spare bolts in the storage holes of the marker shear base.

Before installing a new shear bolt, tighten the 5/8-11x5in pivot and clamp bolts (①, ③) just enough so the marker shear arm moves with some resistance when pushed by hand.

Repeat the above bolt adjustment step at the beginning of each season.
Marker Chain Length

Refer to Figure 152

With marker unfolded, adjust chain length ①.
Slowly fold marker while observing disk. If marker disk slides across the ground more than a foot (30 cm) before chain and linkage lifts it up, the chain is too long.

Remove bolt ② and shorten chain one or two links. Check adjustment by repeating folding process.

If chain is too short when marker is unfolded, it will prevent the marker blade from dropping into field depressions, causing skips in the mark line. Correct this condition by lengthening chain one or two links.

Electric Clutch Lockup

Refer to Figure 153

In case of clutch failure, clutches can be temporarily bolted together.

1. Align cutouts at bolt holes ①.
2. Insert three M8-1.25x14mm long metric bolts ②.
3. Lock-up bolts ② are not supplied with the drill. They are separately available from Great Plains. Order quantity 9 of part: 802-782C HHCS M8X1.25X14 GR8.8

Use only 14mm length bolts or machine damage will occur. Longer bolts will damage the clutch. Shorter bolts may not effect a lock-up.

4. Unbolt torque tab of field coil housing ③ and make sure it is allowed to move freely.

If you observe half the hole obstructed by a metal disc ④, you are not at a cutout.

If the entire hole is obstructed by a metal disc ④, you are not at a cutout.

When at a cutout, the bolt will screw in with minimal resistance until the bolt head reaches the clutch face.

5. On the point row switch box, tag the switch or lamp for this section to alert the operator that the section cannot be shut off from the tractor cab.

NOTICE

Equipment Damage/Material Loss Risk:
When lubricating the drill, do not allow lubricant to enter the clutch, or clutch slippage, and low seed metering, will result.
Hydraulic Drive Maintenance

As with any hydraulic system, contamination is the most common cause of performance problems and pre-mature wear. Make a special effort to properly clean quick couplers prior to attaching the hoses to tractor.

Filter: All fluid is filtered through the high pressure filter (p/n 18574) and it provides protection to the hydraulic components of your drive if properly maintained. It is equipped with a pop-out indicator to alert that the replaceable element is clogged, and should be changed immediately if this situation occurs. Normal service life of the element will vary based on the precautions that you take to minimize contamination at the couplers and routine service of the tractor filtration.

To change the element:

Refer to Figure 155
1. Un-screw lower canister from filter, catching and disposing of used fluid.
2. Remove and discard element.
3. Install new element (p/n 19856)
4. Clean canister threads and lube o-ring with hydraulic fluid, then re-install.

Refer to Figure 156
5. Re-set pop-out indicator if necessary.

It is a good idea to keep a filter element on hand, and we recommend changing at a minimum on an annual basis.

7. Avoid direct spray from high pressure washers on the motor encoder and the external controller box. These units are sealed from normal moisture, but high pressure could inject water into the housing.
8. Keep electrical connects free from dirt and grease. It’s a good idea to occasionally spray the terminals with contact cleaner to ensure proper connection.
Row Unit Maintenance

Seed Flap Replacement (s/n 1066TT-)

Refer to Figure 157

To replace a seed flap ① use a needle nose or similar tool and squeeze the tabs ② together. Pull plastic seed flap ① down out of metal bracket ③.

If replacing with 817-349C:
Push new seed flap ① up through metal bracket ③ until tabs ② on seed flap snap in place.

If replacing with 816-302C:
See seed flap replacement instructions below.

Seed Flap Replacement (s/n 1067TT+)

Refer to Figure 158

To replace an 816-302C seed flap ④ use a needle nose pliers or similar tool to grasp "T" top of flap. Pull upward to pull flap up out of metal bracket ⑤.

Push new seed flap ④ down through metal bracket ⑤ until flap snaps into place with "T" top resting on top of bracket.
10HD Opener Maintenance

10HD Disk Spreader-Scraper

Refer to Figure 159

To perform this inspection (and replacement), it may be necessary to remove one or both opener disk blades.

1. With unit raised, remove bolt 1 holding on one or both blades.

☐ Keep the spacer washers 2 on the outside of the disk on the bolt. Do not misplace the spacers 3 on the inside of the disk. They control disk-to-disk contact.

2. Check blade spreader 4 for wear. Replace spreader assembly if the lower section 5 ahead of the seed tube bracket is \( \frac{1}{2} \) in (13mm) thick or narrower.

3. To replace, remove seed tube 6, drive out roll pins 7 and install new spreader.

4. When reinstalling disk blades, put spacers back on in same order as removed.

☐ It is normal for blade spreader to have some looseness in the holder and between the blades. Some looseness is required for proper operation.

20 Series Opener Maintenance

20 Series Side Gauge Wheels

Refer to Figure 160

1. Lift opener side wheel 1 off the ground. Move tire in and out to check for end play. Check for roughness in bearing by rotating wheel. If the bearings are rough, inspect and replace if necessary.

2. Check for the correct number of flat washers 2 and machine washer 3 between the side gauge wheel 1 and the wheel arm 4. There must be three flat washers 2 and one machine washer 3 between the wheel bearing and arm with the machine washer 3 next to the arm. There should be three flat washers 2 and one lock washer 5 on the outside of the wheel. When installed, the wheel should turn freely and not hit the arm at the curve. Do not add any more washers than necessary.

3. Disassemble side-gauge-wheel arm from unit. Remove bushing 6 from sleeve 7 and check bushing for wear. Replace bushing if necessary.

4. When reinstalling side gauge wheels, align tab on hex adjustment 8 with notch in bushing. Replace bolt and tighten.
5. To prevent plugging loosen clamp bolt \( \circ \) and slide arm inward to take up gap between side wheel and disk blade.


**20 Series Opener Disk Spreader**

Refer to Figure 160 and Figure 161

1. Remove side gauge wheel arm and wheel assembly by removing \( \frac{5}{6}-\text{11x2}\frac{1}{2} \) bolt \( \circ \) to access opener disks and spreaders.

2. With the unit raised, check blade spread \( \circ \) for wear. Replace spreader if it is \( \frac{7}{16} \text{in (11 mm)} \) wide or narrower, or if opener is plugging with dirt. To replace, remove disk blade \( \circ \). Drive out roll pins \( \circ \) and install a new spreader.

- Disk spreaders are loose to move freely.
Lubrication

Grease Bank (Option)

Up to 14 zerk(s) each bank, 2 banks each of 3 sections; 6 banks total; 1 zerk per opener; 48 or 64 zerk(s) total
Type of Lubrication: Grease
Quantity: 5 pumps

These zerks are only present if the drill has frame-mounted coulters. These zerks only serve the coulter arm pivots. Coulter hub zerks must be serviced at the hubs.

Parallel Arm Pivots

1 zerk each end of each arm, two arms per assembly, four arms per drill; 16 zerks total
Type of Lubrication: Grease
Quantity: Until grease emerges

Wing Caster Wheel Pivot

1 zerk each of 2 pivots; 2 total
Type of Lubrication: Grease
Quantity: Until grease emerges
Rockshaft

1 zerk each of 3 pivots,
1 zerk each lower cylinder pin;
5 total
Type of Lubrication: Grease
Quantity: Until grease emerges

Lift Cylinder Pins

1 zerk each rod-end cylinder pin,
1 cylinder each parallel arms set,
2 cylinders at rockshaft;
6 total
Type of Lubrication: Grease
Quantity: Until grease emerges
Wing Flex Pivots

1 zerk each of 2 pivots; 2 total
Type of Lubrication: Grease
Quantity: Until grease emerges

Rear Axle Pivot

1 zerk
Type of Lubrication: Grease
Quantity: Until grease emerges

Transfer Drive Shafts

1 zerk each of 2 shafts; 2 total
Type of Lubrication: Grease
Quantity: Until grease emerges
Wing Frame Vertical Pivots

1 zerk each of 2 pivots; 2 total
Type of Lubrication: Grease
Quantity: Until grease emerges

Marker(s) (Option)

3 zerk per marker; 3 or 6 total
Type of Lubrication: Grease
Quantity: Until grease emerges

20 Series Side Gauge Wheel Bushings

2 zerk per row; 96 or 128 total
Type of Lubrication: Grease
Quantity: Until grease emerges

Rear Wheel Caster Spindles

1 zerk each of 2 casters; 2 total
Type of Lubrication: Grease
Quantity: Until grease emerges at top and bottom
**Drive Chains**

1 chain per section; 3 total  
Type of Lubrication: Chain Lube  
Quantity: Coat thoroughly

**Coulter Hub Bearings**

1 zerk each hub; 48 or 64 total  
Type of Lubrication: Grease  
Quantity: Until resistance is felt

**Marker Disk Bearings (Option)**

2 races each marker; 2 or 4 total  
Type of Lubrication: Grease  
Quantity: Repack

**Wheel Bearings**

2 races each of 6 wheels; 12 total  
Type of Lubrication: Grease  
Quantity: Repack
Hitch Options

One hitch is selected upon initial order of an 3N-4010F, 3N-4010HDF and 3N-4020F Drill, and includes the spring wire loop, safety chain, and all fasteners. Additional hitches may be ordered for conversion in the field, and include extra hitch mounting bolts, lock washers and nuts.

<table>
<thead>
<tr>
<th>Hitch Description</th>
<th>Option</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Strap</td>
<td>(61)</td>
<td>170-038A</td>
</tr>
<tr>
<td>Clevis</td>
<td>(62)</td>
<td>170-039A</td>
</tr>
<tr>
<td>Small Strap</td>
<td>(63)</td>
<td>170-059A</td>
</tr>
</tbody>
</table>

Flat Fold Markers

Hydraulically-operated markers leave a visible groove to use as centerline for the next pass.

The single marker mounts on the left side of the drill. The dual markers mount on both sides, and include an automatic sequence valve for operating alternate sides on each pass.

Both marker include speed adjustments.

If ordered with a new drill, markers are factory-installed. They may also be ordered later for field installation. Each kit equips one drill.

<table>
<thead>
<tr>
<th>Marker Kit</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>113-769A</td>
</tr>
<tr>
<td>Dual</td>
<td>113-760A</td>
</tr>
</tbody>
</table>

Markers add weight to the drill, but only to the wing section(s), and the full weight is on the wing only when folded. The dual kit adds 1860 lbs (844 kg). The single kit adds 930 lbs (422 kg).
Dual Weight Kit

If unusual soil conditions require more weight for coulter penetration, one or two weight bracket kits are available, each kit containing tow brackets (one for each wing). The brackets attach to the wing mainframe, and accept up to five standard “suitcase” tractor weights, approximately 500 lbs (227 kg) per bracket or 1000 lbs (454 kg) per kit. The empty weight of the kit itself is 121 lbs (55 kg), or 61 lbs (28 kg) per bracket.

The weight kit is field-installed, and does not include weights. See also: “Install Weight Brackets (Option)” on page 19, and “Frame Weight” on page 67.

Frame-Mounted Coulters

All 3N-40 drills support frame-mounted coulters. The 3N-4010HDF alternatively supports unit-mounted coulters (page 121). It is not possible to install both types on the same drill.

Frame-mounted coulters are recommended for heavier no-till conditions and rocky soil. They are independent of row-unit down-force and may be set to different (usually higher) force levels.

Because the weight of the drill is used to deliver both frame-mounted coulter and row-unit opener/press-wheel down-force, extra weights may be required with frame-mounted coulters. Each coulter itself adds 61 lbs (28 kg) to the drill. See page 25 for weights of various drill configurations.

When ordered with a new drill, frame-mounted coulters are factory-installed. They may also be ordered for field installation. Each kit equips an entire drill.

<table>
<thead>
<tr>
<th>17x5/8 in Fluted Blade</th>
<th>17x5/8 in Wavy Blade</th>
<th>17x3/4 in Wavy Blade</th>
<th>17x5/8 in Turbo Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option</td>
<td>Part</td>
<td>Option</td>
<td>Part</td>
</tr>
<tr>
<td>3N-4010F-4810</td>
<td>(31) 249-081A</td>
<td>(32) 249-082A</td>
<td>(33) 249-083A</td>
</tr>
<tr>
<td>3N-4010F-6475</td>
<td>(31) 249-085A</td>
<td>(32) 249-086A</td>
<td>(33) 249-087A</td>
</tr>
<tr>
<td>3N-4010HDF-4810</td>
<td>249-141A</td>
<td></td>
<td>249-142A</td>
</tr>
<tr>
<td>3N-4010HDF-6475</td>
<td>249-139A</td>
<td></td>
<td>249-140A</td>
</tr>
<tr>
<td>3N-4020F-4810</td>
<td>(31) 249-081A</td>
<td>(32) 249-082A</td>
<td>(33) 249-083A</td>
</tr>
<tr>
<td>3N-4020F-6475</td>
<td>(31) 249-085A</td>
<td>(32) 249-086A</td>
<td>(33) 249-087A</td>
</tr>
<tr>
<td>Blades (1 per part)</td>
<td>820-018C</td>
<td>820-116C</td>
<td>820-082C</td>
</tr>
</tbody>
</table>

See “Frame-Mounted Coulters” on page 62 for adjustments.
Coulter Tines
Frame-mounted coulters on your implement can be equipped with optional trash tines. The tines help guide the residue under the coulters and openers to prevent plugging.
Order one kit per row.

<table>
<thead>
<tr>
<th>Row Spacing</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5-Inch Rows, Coulter Tine Update Kit</td>
<td>149-925A</td>
</tr>
<tr>
<td>10-Inch Rows, Coulter Tine Update Kit</td>
<td>149-926A</td>
</tr>
</tbody>
</table>

Shaft Monitor
Via sensors at each meter shaft, the shaft monitor displays and sounds an alert if shaft rotation stops for more than 30 seconds.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 CHANNEL SHAFT MONITOR</td>
<td>823-060C</td>
</tr>
</tbody>
</table>

For installation, see: "Shaft Monitor (Option)" on page 18.
For operation, see: "Shaft Monitor Operation (Option)" on page 32.

Row Unit Options
Seed Tube Plug
This plug stops seed flow from the seed box at the top of a seed tube. Order one per row to set inactive.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed tube plug</td>
<td>817-087C</td>
</tr>
</tbody>
</table>
10HD Unit-Mounted Coulters

Unit-mount coulters (UMCs) are available only for models 3N-4010HDF, and are an alternative to frame-mounted coulters (page 119). Only one type of coulter at a time can be installed. UMCs attach directly to the 10HD row unit, and the coulter blade maintains a precise relationship to the opener disk (seeding) depth.

UMCs are suitable for lighter no-till and conventional tillage conditions. Their down-force is limited to what the 10HD row unit can provide. In challenging conditions, weight kits may be required.

UMCs are dealer-installed. Order one kit part number per row. Weight is 40 lbs (18kg) per row.

<table>
<thead>
<tr>
<th>Coulter Kit</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP25S UMC 15” FLUTED BLD</td>
<td>204-616L</td>
</tr>
<tr>
<td>GP25S UMC 15” TURBO BLD</td>
<td>204-617L</td>
</tr>
</tbody>
</table>

For operation, see “Unit-Mounted Coulter Adjustments” on page 75.

15in Coulter Blades

<table>
<thead>
<tr>
<th>Blade</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>COULTER BLADE (FLUTED) 15” OD</td>
<td>820-331C</td>
</tr>
<tr>
<td>COULTER BLADE (TURBO) 15” OD</td>
<td>820-327C</td>
</tr>
</tbody>
</table>

10HD Lock-Up Pin

If rows are shut off with seed tube plugs (page 120), you can reduce unnecessary wear on the unused row units by locking them up. One one per row unit locked-up.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIN HITCH 1 X 6 W/HAIRPIN</td>
<td>805-033C</td>
</tr>
</tbody>
</table>
Inside Carbide Scrapers

When planting in moist or sticky soils, these scrapers are useful in preventing build-up that might otherwise impair opener disc performance. The scrapers are spring-loaded, and require no adjustment. Order one per row. The 122-259K kit is not compatible with Seed-Lok.

<table>
<thead>
<tr>
<th>Description</th>
<th>Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Series Scraper</td>
<td>122-259K</td>
</tr>
<tr>
<td>20 Series Scraper</td>
<td>122-259K</td>
</tr>
</tbody>
</table>

20 Series Depth Wheel Scraper

These scrapers help keep the depth gauge wheels free of sticky soils, assuring more consistent seeding depth. Order one kit per row.

<table>
<thead>
<tr>
<th>Description</th>
<th>Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>20P SIDE WHEEL SCRAPER ROW KIT</td>
<td>198-960A</td>
</tr>
</tbody>
</table>

Seed Firmers

A standard 3N-4010F, 3N-4010HDF and 3N-4020F drill includes seed flaps. A choice of firmers is an option in the product bundles, or may be field-installed as kits. Only one type of seed firmer may be installed at the same time.

<table>
<thead>
<tr>
<th>Description</th>
<th>Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/10HD/20 Series Seed-Lok</td>
<td>28315</td>
</tr>
</tbody>
</table>
Seed-Lok® Seed Firmer

Factory-installed Seed-Lok firmers are included in numerous drill opener bundles.

For post-delivery installation, order one kit per row.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Series Seed-Lok</td>
<td>122-252K</td>
</tr>
<tr>
<td>10HD Series Seed-Lok</td>
<td>122-151K</td>
</tr>
<tr>
<td>20 Series Seed-Lok</td>
<td>122-193K</td>
</tr>
</tbody>
</table>

For operations, see:
“10 Series Seed-Lok™ Lock-Up” on page 73
“10HD Seed-Lok™ Lock-Up” on page 81
“20 Series Seed-Lok™ Lock-Up” on page 87

Keeton Seed Firmer

The Keeton seed former is an engineered polymer shape that glides down the seed furrow. It is adjustable, and can support customer-provisioned liquid treatment applications.

Factory-installed Keetons are included in numerous drill opener bundles.

For post-delivery installation, order one kit per row.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 and 20 Series Keeton</td>
<td>890-796C</td>
</tr>
<tr>
<td>10HD Series Keeton</td>
<td>890-840C</td>
</tr>
</tbody>
</table>

For operations, see:
“10 Series Keeton Adjustment” on page 72
“10HD Keeton Adjustment” on page 80
“20 Series Keeton Adjustment” on page 87

Press Wheels

A variety of single and dual press wheels are available, as bundle options at the time of initial drill order. Kits are not presently available to convert these in the field. Parts may be ordered to do so.

---

a. The seed flap may be installed at the same as a Seed-Lok or Keeton, but if the optional firmer is dealer- or customer-installed, the seed flap usually needs to be shortened.
Appendix

Specifications and Capacities

<table>
<thead>
<tr>
<th></th>
<th>3N-4010F-4810</th>
<th>3N-4010F-6475</th>
<th>3N-4010HDF-4810</th>
<th>3N-4010HDF-6475</th>
<th>3N-4020F-4810</th>
<th>3N-4020F-6475</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Width</td>
<td>40 ft (12.2m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swath</td>
<td>480in (1219cm)</td>
<td>484in (1229cm)</td>
<td>480in (1219cm)</td>
<td>484in (1229cm)</td>
<td>480in (1219cm)</td>
<td>484in (1229cm)</td>
</tr>
<tr>
<td>Number of Rows</td>
<td>48</td>
<td>64</td>
<td>48</td>
<td>64</td>
<td>48</td>
<td>64</td>
</tr>
<tr>
<td>Row Spacing</td>
<td>10in (25.4cm)</td>
<td>7.5in (19.1cm)</td>
<td>10in (25.4cm)</td>
<td>7.5in (19.1cm)</td>
<td>10in (25.4cm)</td>
<td>7.5in (19.1cm)</td>
</tr>
<tr>
<td>Nominal Swath Averaged</td>
<td></td>
<td>7.56in (19.2cm)</td>
<td>7.56in (19.2cm)</td>
<td>7.56in (19.2cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor Requirements</td>
<td></td>
<td>275-400 hp (205-300 kW)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seed Capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drill Weight</td>
<td>26660 lbs (12093 kg)</td>
<td>28260 lbs (12819 kg)</td>
<td>27620 lbs (12528 kg)</td>
<td>29540 lbs (13399 kg)</td>
<td>29204 lbs (13247 kg)</td>
<td>31652 lbs (14357 kg)</td>
</tr>
<tr>
<td>Max. Additional</td>
<td>2000 lbs (907 kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic Circuits</td>
<td>3 or 4 circuits required: load-sensitive or closed-center 15 to 30 gpm at 2250 psi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport Width</td>
<td>14 ft 10½in (4.5 m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport Height</td>
<td>8 ft (2.43 m) without markers, 12 ft 8 in (3.86 m) with markers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport Clearance</td>
<td>13½in (34.3 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Height</td>
<td>6ft 6 in (1.98 m) without markers, 11ft 2 in (3.40 m) with markers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>44 ft 4 in (13.51 m) folded, 32 ft 6 in (9.91 m) unfolded</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tire Size</td>
<td>395/55B16.5 NHS 12-Ply Skid Steer, on 8-Bolt rims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. All rows operating; for modified spacings, see “Row Spacing Data” on page 126.

b. 7.5in row spacing, coulters, frame weights and markers increase power requirements over minimum.

c. Does not include markers, optional weights or seed. See “Typical Transport Weights” on page 25 and “Frame Weight” on page 67.

Tire Inflation Chart

<table>
<thead>
<tr>
<th>Tire Size</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>395/55B16.5 NHS</td>
<td>60 psi 414 kPa</td>
</tr>
</tbody>
</table>

Tire Warranty Information

All tires are warranted by the original manufacturer of the tire. Tire warranty information is found online at the manufacturer’s websites listed below. For assistance or information, contact your nearest Authorized Farm Tire Retailer.

Manufacturer/Website
- Firestone [www.firestoneag.com](http://www.firestoneag.com)
- Gleason [www.gleasonwheel.com](http://www.gleasonwheel.com)
- Titan [www.titan-intl.com](http://www.titan-intl.com)
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<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Bolt Head Identification</th>
<th>Grade 2</th>
<th>Grade 5</th>
<th>Grade 8</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>N-m</td>
<td>ft-lb</td>
<td>N-m</td>
</tr>
<tr>
<td>1/4-20</td>
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<td>7.4</td>
<td>5.6</td>
<td>11</td>
</tr>
<tr>
<td>1/4-28</td>
<td></td>
<td>8.5</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>5/32-18</td>
<td></td>
<td>15</td>
<td>11</td>
<td>24</td>
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<tr>
<td>5/32-24</td>
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<td>17</td>
<td>13</td>
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<td>27</td>
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<td>150</td>
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<td>5/32-11</td>
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<td>205</td>
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<td>230</td>
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<td>360</td>
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<td>3/4-16</td>
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<td>405</td>
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<td>5/32-9</td>
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<td>225</td>
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<td>585</td>
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<td>250</td>
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<td>1080</td>
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<td></td>
<td>1010</td>
<td>745</td>
<td>2270</td>
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<td>870</td>
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<td>980</td>
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<th>Class 10.9</th>
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<td></td>
<td></td>
<td>N-m</td>
<td>ft-lb</td>
<td>N-m</td>
</tr>
<tr>
<td>M 5 X 0.8</td>
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<td>4</td>
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<td>6</td>
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<tr>
<td>M 6 X 1</td>
<td></td>
<td>7</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>M 8 X 1.25</td>
<td></td>
<td>17</td>
<td>12</td>
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<tr>
<td>M 8 X 1</td>
<td></td>
<td>18</td>
<td>13</td>
<td>28</td>
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<tr>
<td>M 10 X 1.5</td>
<td></td>
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<td>M 14 X 2</td>
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<td>92</td>
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<td>99</td>
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<td>M 16 X 2</td>
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<td>145</td>
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<td>155</td>
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<td>240</td>
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<td>280</td>
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<td>650</td>
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<td>760</td>
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<td>960</td>
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<td>1730</td>
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<td>1880</td>
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<table>
<thead>
<tr>
<th>mm x pitch</th>
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<th>ft-lb</th>
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<tr>
<td>M 5 X 0.8</td>
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<td></td>
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<tr>
<td>M 10 X 0.75</td>
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<tr>
<td>M 12 X 1.75</td>
<td></td>
<td></td>
</tr>
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<td>M 14 X 2</td>
<td></td>
<td></td>
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<tr>
<td>M 14 X 1.5</td>
<td></td>
<td></td>
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<tr>
<td>M 16 X 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 16 X 1.5</td>
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<td></td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>M 30 X 2</td>
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<td>M 36 X 3.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M 36 X 2</td>
<td></td>
<td></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.
Row Spacing Data

The diagrams in this section show useful measures that vary between machine models, row spacings, and modified row spacings.

Example Row Spacing

-6475 as "-1630" (1)

Baseline Span: 476.5in (1210cm) (3)
Active Span: 454in (1153cm)
Swath: 484in/40.3ft (1229cm/12.3m) (4)
Swath-Averaged Row Spacing: 7.56in (19.2cm) (5)
Active Nominal Row Spacing: 30in (76.2cm)

Use this data for calibration (page 38), setting marker extension (page 18), and shutting off rows for modified spacings (page 65).

Row Spacing Data Legend

Refer to Figure 175

Find the chart for your drill's row spacing. Row spacings are identical across 3N-4010F, -4010HDF and -4020F.

1, 2: The heading and title block identify the drill opener configuration, default row count, default row spacing, and whether the diagram applies to a standard or modified row spacing.

3: Span is the dimension between the center-lines of the left and right outside row units. If all are active, only a single "Span" value is given. If some are inactive, a "Baseline Span" for all rows is given, as well as an "Active Span" for just the rows in use. You may need this data for modified row spacings not shown.

4: Swath is the average width of successive planted passes. Swath is at least one row spacing wider than the [Active] Span, and is wider on 7.5in models, as there is an extra 2in at each wing-center tool bar gap.

5: Row Spacing Shows standard or "Active" row spacing.

6: Each illustration shows three drills, their tool bars represented by the horizontal lines.

7: The large top arrow shows drill centerline the direction of travel. This is always drill centerline, and not necessarily the center of the presently active row units.

8: Solid lines with arrows across the tool bar show active row units.

9: Dashed lines without arrows across the tool bar show inactive row units.

10, 11: Marker Extension values are shown separately for left and right side opposing passes. They may not be the same, and can be substantially unequal, particularly for modified spacings.

For setting marker extension, measure from the mark to the centerline of the outside opener on each side, whether that opener row is active or not.

Opposing passes are presumed for these extension values. For concentric passes, only one marker side is used. Measure from drill centerline to the mark, and set the extension to the Swath value 4 for your configuration.
-4810 Models Row Spacings

-4810 Standard Spacing
Span: 470in (1194cm)
Swath: 480in (1219cm)
Rows: 48 openers (all used)
Row Spacing: 10in (25.4cm)

![Figure 176: -4810 Standard Spacing](image)

-4810 as “-2420”
Baseline Span: 470in (1194cm)
Active Span: 460in (1168cm)
Swath: 480in (1219cm)
Rows: 48 openers; 24 used; 24 unused
Row Spacing: 20in (50.8cm)

![Figure 177: -4810 as -2420](image)

-4810 as “-1630”
Baseline Span: 470in (1194cm)
Active Span: 450in (1143cm)
Swath: 480in (1219cm)
Rows: 48 openers; 16 used; 32 unused
Row Spacing: 30in (76.2cm)

![Figure 178: -4810 as -1630](image)
-6475 Models Row Spacings

-6475 Standard Spacing
Span: 476.5in (1210cm)
Swath: 484in (1229cm)
Rows: 64 openers (all used)
Nominal Row Spacing: 7.5in (19.1cm)
Swath-Averaged Row Spacing: 7.56in (19.2cm)

Figure 179: -6475
Standard Spacing: 64 single 7.5in Rows; all rows used

-6475 as “-3215”
Baseline Span: 476.5in (1210cm)
Active Span: 469in (1191cm)
Swath: 484in (1229cm)
Rows: 64 openers; 32 used; 32 unused
Nominal Row Spacing: 15in (38.1cm)
Swath-Averaged Row Spacing: 15.1in (38.4cm)

Figure 180: -6475 as -3215
Non-Standard Spacing: 24 single 20in Rows; 24 rows unused

-6475 as “-1630”
Baseline Span: 476.5in (1210cm)
Active Span: 454in (1153cm)
Swath: 484in (1229cm)
Rows: 64 openers; 16 used; 48 unused
Nominal Row Spacing: 30in (76.2cm)
Swath-Averaged Row Spacing: 30.3in (76.8cm)

Figure 181: -6475 as -1630
Non-Standard Spacing: 16 single 30in Rows; 48 rows unused
Hydraulic Diagram
Warranty

Great Plains Manufacturing, Incorporated warrants to the original purchaser that this seeding equipment will be free from defects in material and workmanship for a period of one year from the date of original purchase when used as intended and under normal service and conditions for personal use; 90 days for commercial or rental purposes. This Warranty is limited to the replacement of any defective part by Great Plains Manufacturing, Incorporated and the installation by the dealer of any such replacement part. Great Plains reserves the right to inspect any equipment or part which are claimed to have been defective in material or workmanship.

This Warranty does not apply to any part or product which in Great Plains’ judgement shall have been misused or damaged by accident or lack of normal maintenance or care, or which has been repaired or altered in a way which adversely affects its performance or reliability, or which has been used for a purpose for which the product is not designed. This Warranty shall not apply if the product is towed at a speed in excess of 20 miles per hour.

Claims under this Warranty must be made to the dealer which originally sold the product and all warranty adjustments must by made through such dealer. Great Plains reserves the right to make changes in materials or design of the product at any time without notice.

This Warranty shall not be interpreted to render Great Plains liable for damages of any kind, direct, consequential, or contingent, to property. Furthermore, Great Plains shall not be liable for damages resulting from any cause beyond its reasonable control. This Warranty does not extend to loss of crops, losses caused by harvest delays or any expense or loss for labor, supplies, rental machinery or for any other reason.

No other warranty of any kind whatsoever, express or implied, is made with respect to this sale; and all implied warranties of merchantability and fitness for a particular purpose which exceed the obligations set forth in this written warranty are hereby disclaimed and excluded from this sale.

This Warranty is not valid unless registered with Great Plains Manufacturing, Incorporated within 10 days from the date of original purchase.
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