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

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

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

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

| Model Number |  |
| Serial Number |  |
| Machine Height |  |
| Machine Length |  |
| Machine Width |  |
| Machine Weight |  |
| Year of Construction |  |
| Delivery Date |  |
| First Operation |  |
| Accessories |  |

Dealer Contact Information

Name: ___________________________
Street: ___________________________
City/State: _______________________
Telephone: _______________________
Email: ___________________________
Dealer’s Customer No.: ____________

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

- **Safety Decals**

# Introduction

- **Document Family**
- **Description of Unit**
- **Intended Usage**
- **Models Covered**
- **Using This Manual**
- **Definitions**
- **Owner Assistance**

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- **Axle Spacing**
- **Hydraulic Hookup**
- **Sprayer Control Hydraulic Hookup**
- **Hydraulic Pump Hookup**
- **Ace Pump Flow Limiter (Option)**
- **Setting Pump Rate**
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- **Operating Checklist**
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- **Tightening Tank Straps**
- **Shear Bolt Replacement**
- **Pump Maintenance and Repair**
- **Ace Hydraulic Pump Seal Replacement**
- **Elevator Slide Adjustment**
- **Quad-Jet Agitators**
- **Tank Entry**
- **Lubrication**

# Maintenance and Lubrication

- **SprayerBoom Maintenance**
- **Equipment Cleanup**
- **General Information**
- **Filter Maintenance**
- **Clean Out Solution Whirlfilter®**
- **Clean Out Tank Fill Filter**
- **Tightening Tank Straps**
- **Shear Bolt Replacement**
- **Pump Maintenance and Repair**
- **Ace Hydraulic Pump Seal Replacement**
- **Elevator Slide Adjustment**
- **Quad-Jet Agitators**
- **Tank Entry**
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- **Chemical Inductor**
- **Foam Marker**
- **Raven G1 Autoboom**
- **Pumps**
- **Ace Hydraulic Pump**
- **Gauge Protector**
- **Open Center Hydraulic Kit**
- **Speed Sensors**

# Appendix - Reference Information

- **Specifications and Capacities**
- **Tire Inflation Chart**
- **Torque Values**

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Printed in the United States of America
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.

Be Familiar with Safety Decals

▲ Read and understand “Safety Decals” starting on page 8, thoroughly.

▲ Read all instructions noted on the decals.

Avoid High Pressure Fluids

▲ Escaping fluid under pressure can penetrate the skin, causing serious injury. If hydraulic fluid penetrates the skin under pressure, immediate medical attention is required. See a physician familiar with this type of 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.
Wear Protective Equipment

Great Plains advises all users of chemical pesticides or herbicides to use the following personal safety equipment.

- Waterproof, wide-brimmed hat
- Waterproof apron.
- Face shield, goggles or full face respirator.
- Goggles with side shields or a full face respirator is required if handling or applying dusts, wettable powders, or granules or if being exposed to spray mist.
- Cartridge-type respirator approved for pesticide vapors unless label specifies another type of respirator.
- Waterproof, unlined gloves. Neoprene gloves are recommended.
- Cloth coveralls/outer clothing changed daily; waterproof items if there is a chance of becoming wet with spray
- Waterproof boots or foot coverings
- Do not wear contaminated clothing. Wash protective clothing and equipment with soap and water after each use. Personal clothing must be laundered separately from household articles.
- Clothing contaminated with certain pesticides must be destroyed according to state and local regulations. Read chemical label for specific instructions.
- Wear clothing and equipment appropriate for the job. Avoid loose-fitting clothing.
- Prolonged exposure to loud noise can cause hearing impairment or loss. Wear suitable hearing protection such as earmuffs or earplugs.
- Avoid wearing entertainment headphones while operating machinery. Operating equipment safely requires the full attention of the operator.
Handle Chemicals Properly

▲ Read and follow chemical manufacturer’s instructions.
▲ Wear protective clothing.
▲ Handle all chemicals with care.
▲ Agricultural chemicals can be dangerous. Improper use can seriously injure persons, animals, plants, soil and property.
▲ Inhaling smoke from any type of chemical fire is a serious health hazard.
▲ Store or dispose of unused chemicals as specified by the chemical manufacturer.
▲ Before adding chemical to the tank, make sure tank is at least half full. Do not pour concentrate into an empty tank.
▲ Never leave fill hose attached to the sprayer after filling tank. Chemicals in tank can siphon out of tank and contaminate freshwater source.
▲ Always keep handwash tank filled with clean water and have soap available in case of an emergency. Immediately and thoroughly flush any area of the body that is contaminated by chemicals.
▲ Do not touch sprayer components with mouth or lips.
▲ If chemical is swallowed, carefully follow the chemical manufacturer’s recommendations and consult with a doctor.
▲ If persons are exposed to a chemical in a way that could affect their health, consult a doctor immediately with the chemical label or container in hand. Any delay could cause serious illness or death.
▲ Dispose of empty chemical containers properly. By law rinsing of the used chemical container must be repeated three times. Puncture the container to prevent future use. An alternative is to jet-rinse or pressure rinse the container.
▲ Wash hands and face before eating after working with chemicals. Shower as soon as spraying is completed for the day.
▲ Spray only with acceptable wind conditions. Wind speed must be below 5 mph. Make sure wind drift of chemicals will not affect any surrounding land, people or animals.
▲ Never wash out the sprayer tank within 100 feet (30m) of any freshwater source or in a car wash.
▲ Rinse out the tank. Spray rinse water on last field sprayed.
Confined Space

Once used for hazardous fertilizers, or seeds with hazardous treatments, your tank may become a “permit-required confined space” under applicable statutes, regulations, insurance rules or business policy.

- When hazardous fumes are present, you can be quickly overcome even with the tank lid open.
- Do not enter a tank for material loading, material unloading, tank cleaning or valve maintenance.
- Clean tank by power washing from outside the tank top.
- Perform valve maintenance by removing meters from bottom of empty tank.
- If obstruction removal or repair requires tank entry, have the work performed by a team trained in confined space procedures.

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.

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 during operation.

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 tractor lights and lights provided with implement.
Check for Overhead Lines

**DANGER**

Sprayer booms contacting overhead electrical lines can introduce lethal voltage levels on sprayer 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 sprayer operations.

Transport Machinery Safely

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

▲ 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 state and local laws.

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

▲ Carry reflectors or flags to mark sprayer 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 64.

▲ Do not fold or unfold the sprayer while the tractor is moving.

Shutdown and Storage

▲ Fold sprayer, put tractor in park, turn off engine, and remove the key.

▲ Secure sprayer using blocks and supports provided.

▲ Detach and store sprayer 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 for additional information.
▲ Work in a clean, dry area.
▲ Fold the sprayer, 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.
▲ Allow sprayer to cool completely.
▲ Disconnect battery ground cable (-) before servicing or adjusting electrical systems or before welding on sprayer.
▲ 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 Front Fold Boom Sprayer before operation.

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.

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 sprayer functions.

▲ Operate machinery from the driver’s seat only.

▲ Do not leave sprayer 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 sprayer during hitching.

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

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

▲ Watch out for wires, trees, etc., when folding and raising sprayer. Make sure all persons are clear of working area.

▲ Do not turn tractor too tightly, causing sprayer to ride up on wheels. This could cause personal injury or equipment damage.

▲ Use only water without pesticides added to calibrate the sprayer. Do not exceed the calibrated sprayer speed and pressure when operating.

▲ When using a PTO pump, be sure that PTO shield is in place on the tractor, PTO coupler bolts are torqued to the correct specification, and torque bar is properly chained to tractor drawbar.

▲ Spray with the boom in the unfolded position only.

▲ The boom has many pinch points during field operation and folding. Keep all bystanders away.

▲ Never use tank for potable water.
Safety Decals

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

▲ Read and follow decal directions.
▲ 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.

Slow Moving Vehicle Reflector

818-055C

Middle rear of center section; 1 total

Red Reflectors (S/N A1179N-)

838-266C

On the rear outside corners of boom frame; 2 total
Red Reflectors (S/N A1180N+)

838-266C

On center section of boom, rear face of lower tube on each side of SMV;
On rear face of each light bracket;
4 total

Amber Reflectors (Trailer)

838-265C

Main frame, outside faces, front and rear corners;
4 total

Amber Reflectors (Boom) (S/N A1179N-)

838-265C

Front corner faces of rear center tool bar,
Front outside corners of boom frame;
4 total
Amber Reflectors (Boom) (S/N A1180N+)
838-265C

On front face and outside face of each light bracket; 4 total

Daytime Reflectors (S/N A1179N-)
838-267C

Near outside corners of rear center tool bar; 2 total

Daytime Reflectors (S/N A1180N+)
838-267C

On rear face of each light bracket; 2 total
Danger: Chemical Hazard
818-323C

Front face of mainframe left side;
On rear center boom frame;
2 total

Danger: Electrocution Hazard
818-367C

On rear of center section of boom;
1 total
Danger: Crushing Hazard
818-864C

On rear face of elevator base (1);

On rear center boom frame (1);

On front face of center section of boom (2);

4 total
Warning: Negative Tongue Weight

**818-019C**

**WARNING**

NEGATIVE TONGUE WEIGHT HAZARD

Negative tongue weight can cause immediate elevation of tongue when unhooking implement.

To prevent serious injury or death:
- Always be certain implement is hitched securely to tractor drawbar before reaising.
- Lower implement BEFORE unhitching.

Left side of tongue; 1 total

---

Warning: Excessive Speed

**818-188C**

**WARNING**

EXCESSIVE SPEED HAZARD

Do not exceed 20 mph maximum transport speed. Loss of vehicle control and/or machine can result.

Front left side of hitch; 1 total

---

Warning: Chemical Overflow Hazard

**818-303C**

**WARNING**

CHEMICAL OVERFLOW HAZARD

On the optional inductor; 1 total
Warning: High Pressure Fluid Hazard
818-339C

Front left side of hitch,
at rear of center section of boom;
2 total

Warning: Overhead Boom
818-467C

On front of each inner wing section of boom;
2 total

Warning: Axle Adjustment
818-548C

Left center side of main frame;
1 total
Warning: Water Contamination

**818-696C**

![Warning: Water Contamination](image)

Center left tank frame; 1 total

Warning: Pinch Point

**818-798C**

![Warning: Pinch Point](image)

Rear facing on each center section pivot tubes (2);

At front and rear of hinge on each inner wing section of boom (4);

On front and rear faces of each boom breakaway section, and inside faces of end plates at boom breakaway sections (8)

14 total
Caution: General Checklist
818-324C

**CAUTION**

To Avoid Injury or Machine Damage:
- Read and understand owner’s manual before operating sprayer.
- Fill sprayer to desired TSF660. Bring sprayer back.
- Do NOT transport sprayer with chemicals in solution tank. Add standard of the tank.
- MOTEK transporting truck appropriate bolt heads and holes.
- MOTEK fill or sprayer.
- Damage hydraulic. Pull out severe rusting when exposed to hydraulic components.

Front of tank, lower left; 1 total

Caution: Read Operator’s Manual
818-587C

**CAUTION**

On center frame; 1 total

Caution: Tire Pressure and Torque
818-365C (SN A1082N–)

**CAUTION**

13.6-38 wheel rims; 0 or 2 total

848-347C (SN A1083N+)

**CAUTION**

320/85R38 wheel rims; 0 or 2 total
Safety: Handwash Tank Location
818-304C

HANDWASH TANK

Top front of main tank; 1 total
Introduction

Great Plains welcomes you to its growing family of new product owners. This Front Fold Boom Sprayer 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 from the machine.

Document Family

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500-644P</td>
<td>Owner's Manual (this document)</td>
</tr>
<tr>
<td>500-644P</td>
<td>Parts Manual</td>
</tr>
<tr>
<td>509-200M</td>
<td>Application Guide</td>
</tr>
<tr>
<td>832-038C</td>
<td>Nozzle Calculator (U.S. customary units)</td>
</tr>
<tr>
<td>832-058C</td>
<td>Nozzle Calculator (metric)</td>
</tr>
</tbody>
</table>

Description of Unit

The TSF660 sprayer is capable of spraying at 60 feet. The level float boom is fully suspended starting with vertical spring suspension in a 42-inch hydraulic elevator which provides a wide range of boom height adjustment along with gas shocks that provide side-to-side stability.

Intended Usage

Use these booms as part of a pressurized sprayer system to apply liquid pesticides, herbicides or fertilizers to production-agriculture crops only. Do not modify sprayer for use with attachments other than those approved by Great Plains.

Models Covered

TSF-660-2530  650 Gallon 60-foot 30-inch nozzle spacing  
TSF-660-3620  650 Gallon 60-foot 20-inch nozzle spacing

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.

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.

NOTE:

Paragraphs in this format provide useful information related to the current topic.

Manual Family QRC

The QR Code (Quick Response) to the left will take you to this machine’s family of manuals. Use your smart phone or tablet to scan the QR Code with an appropriate App to begin viewing.

Dealer QRC

The QR Code (Quick Response) to the left will take you to available dealers for Great Plains products. Refer to the Parts Manual QR Locator for detailed instructions.
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 Front Fold Boom Sprayer products.

Refer to Figure 1

Your machine’s parts were specially designed and should only be replaced with Front Fold Boom Sprayer 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 tank frame as shown.

Record your drill model and serial number here for quick reference:
Model Number:__________________________
Serial Number:__________________________

Further Assistance

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

1. Discuss the matter with your dealership service manager. Make sure 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.

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

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

Or go to www.greatplainsag.com and follow the contact information at the bottom of your screen for our service department.
Preparation and Setup

Before You Start

Read and understand the owners manual for your sprayer. A basic understanding of how the sprayer works will aid in the assembly, setup and operation of your sprayer.

Perform these checks before setting up your sprayer.

1. Read and understand “Important Safety Information” starting 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. Refer to “Lubrication” starting on page 58.
4. Check that all safety decals and reflectors are correctly located and legible. Replace if damaged. Refer to “Safety Decals” starting on page 8.

Hitching Tractor to Sprayer

⚠️ DANGER ⚠️
You may be severely injured or killed by being crushed between the tractor and Front Fold Boom Sprayer. Do not stand or place any part of your body between Front Fold Boom Sprayer and moving tractor. Stop tractor engine and set park brake before installing the hitch pin.

⚠️ DANGER ⚠️
Electrocution hazard. To prevent serious injury or death from electric shock, keep clear of overhead power lines when transporting, folding or unfolding boom. Boom is not grounded. Electrocution can occur without direct contact. Refer to transport dimensions under “Specifications and Capacities” on page 64. Do not fold or unfold boom while tractor is moving.

⚠️ WARNING ⚠️
Negative Tongue Weight Hazard:  
Do not unfold boom before hitching. When the tank is low or empty, unfolded booms can move the center of gravity aft of the wheels. This will cause the tongue to rise, with risk of personal injury and equipment damage.
A clevis hitch is used. Park the sprayer in an open, flat area with the jack in the park position.

**Refer to Figure 2**

1. Park the sprayer in an open, flat area with the jack in the park position.

**Refer to Figure 3**

2. Back the tractor up to the sprayer. Secure tractor to sprayer with bolt (1), flat washer (2), and hex nut (3).
3. Now that the sprayer is attached to the tractor, prepare to level the frame of the sprayer by securely supporting the front of the frame with a hoist.
4. Adjust the frame by moving the hitch up or down. Hitch may be turned over for further adjustment. The frame should be sloping to the front by about one degree. This will allow the fluid to drain into the sump.

**Axle Spacing**

The TSF sprayers have sliding axles allowing wheel center-lines to be in the range of 60 to 120 inches.

You can set them to match or complement tractor tire spacing.

This adjustment is most easily done when the sprayer is mechanically hitched with empty tanks. See “Axle Wheel Spacing Adjustment” on page 47 for detailed instructions.
Hydraulic Hookup

The standard sprayer has a single hydraulic connection at the hitch. Each cart hydraulic function is served by an electro-hydraulic control valve at boom center.

If an optional hydraulic pump is installed, there is a second hydraulic connection for the pump, which is located near the hitch.

Refer to Figure 4

Both hose sets have labels for flow conventions. These labels use cylinder Base/Extend and Rod/Retract icons. Be sure to connect these to the matching tractor remotes, so that when remote levers are activated as described in this manual:

a. booms move in the described directions, and
b. pump flow is forward and not reversed.

Sprayer Control Hydraulic Hookup

If the sprayer has a hydraulic pump, and the tractor has only one circuit capable of continuous flow or only one capable of adjustable continuous flow, reserve that circuit for the pump, and use another for the main sprayer functions.

1. Connect the main sprayer hydraulic hoses to suitable tractor remotes. They are easily identified, as they pass behind the pump.

Hydraulic Pump Hookup

The hydraulic motor used on all liquid pumps is a 7 gpm (23 liter/min.) motor. If the tractor used on the sprayer does not have the capabilities to adjust the remotes down to this flow, then a Hydraulic Flow Divider Kit must be installed so that flow can be controlled to prevent operating the pump at excessive speeds. See a Great Plains dealer for more information.

Refer to Figure 5

2. The pressure hose coming out of the tractor remotes must be connected to the motor inlet port (“I” on current pumps; “A” on older pumps, Base end on hose label), and the return line connected to the motor outlet (“O” on current pumps, “B” on older pumps, Rod end on hose label).

3. Before operating, place a stop in the neutral position for the tractor hydraulics so that the hydraulic lever can only be moved to the float and down positions. Refer to the tractor’s operator’s manual or tractor dealer on information for the neutral stop.

**NOTICE**

DO NOT move the hydraulic lever into the neutral position while the hydraulic pump is running. To do so may cause damage to the hydraulic pump.
Hydraulic Pump Setup

The hydraulic motor used on all liquid pumps is a 7 gpm (23 liter/min.) motor. If the tractor used on the sprayer does not have the capabilities to adjust the remotes down to this flow, then a Hydraulic Flow Divider Kit must be installed so that flow can be controlled to prevent operating the pump at excessive speeds. See a Great Plains dealer for more information.

1. Connect the hydraulic pump to the tractor remotes. See “Hydraulic Hookup” on page 22 for details. If no limiter is required, skip to step 7.

**NOTICE**

DO NOT move the hydraulic lever into the neutral position while the hydraulic pump is running. To do so may cause damage to the hydraulic pump.

Ace Pump Flow Limiter (Option)

The flow limiter (Great Plains part number 829-125C) is a hydraulic device designed to shut off the flow of hydraulic oil when a specified flow is exceeded. On tractors with load sensing closed center hydraulic systems, this device limits the flow of oil to the Ace motor and prevents failures due to misapplication.

Newer Case-IH, John Deere, New Holland, and CAT tractors, present a great potential to turn the motors beyond their rated speeds. Flows out of the hydraulic valves can exceed 20 gpm while the motors are rated at 4-11 gpm. The flow limiter protects the Ace motor by shutting off when hydraulic flows exceed the motor’s capacity.

The flow limiter should not be used on open center or pressure compensating closed center hydraulic systems. The flow limiter should not be used with a restrictor orifice.

Flow Limiter Installation

2. Install the flow limiter in the inlet port of the Ace motor.
3. Shut off boom and agitation valves on the sprayer to deadhead the sprayer pump flow.
4. Adjust the flow control on the tractor to the minimum flow setting (typically a turtle icon).
5. Move the hydraulic lever to the lower/retract position.
6. Adjust the flow control on the tractor until the sprayer system deadhead pressure is 80 psi.
   If the flow limiter stops the flow of oil to the motor:
   a. Move the hydraulic lever to the neutral position. This removes the oil pressure from the flow limiter and allows it to reset.
   b. Adjust the flow control to a lower flow position.
   c. Repeat step 5 and step 6.

Setting Pump Rate

7. To determine the correct setting of the flow rate, start out with the hydraulic flow control valve at minimum flow for the outlets that operate the pump.
8. With water in the sprayer tank and in the pump, place the hydraulic lever in the float position.
9. Open up the sprayer flow control valve to its maximum setting.
10. Start the tractor and engage the pump by placing the hydraulic lever in the down (forward) position.
11. Once the system builds pressure, close the agitation valve, shut off the boom section switches, and close the throttling valves (if applicable).
12. The pump is now at deadhead pressure and the hydraulic control valve must be adjusted so that the spray pressure reaches 80 psi maximum on the nozzle pressure gauge. This process should be done with the tractor throttle set at normal operating speed. Mark this setting on the hydraulic control valve for future reference.
13. Open up the agitation valve.
Electrical Connections

Lights

Refer to Figure 7

The lights and harness are standard, and pre-installed on the sprayer, but require the common SAE J560B 7-pin receptacle on the tractor. If your tractor does not have this connector, your dealer can assist you with the installation of one.

Raven SCS 440

The Raven SCS 440 (Sprayer Control System) is designed to improve the uniformity of spray applications. Its performance relies on the installation and preventative maintenance of the complete sprayer. An installation and service manual are provided with this sprayer. It is important to read and understand this manual before operating the system.

The SCS 440 system consists of a computer-based control console, a speed sensor, a turbine type flow meter and a motorized control valve. The console mounts directly in the cab of the tractor for easy operator use. The radar speed sensor is mounted to the frame of the tractor or sprayer (wheel drive and speedometer drive speed sensors are also available). The motorized control valve and flow meter mount to the framework supporting the boom valves. Appropriate cabling is furnished for field installation.

The controller module must be installed in the tractor cab prior to first use, and must be connected to one or more tractor systems, including:

- battery power (red:+, black:-)
- existing or new speed sensor, if tractor-mounted (and if new tractor mount, the sensor must be installed)

Your Great Plains dealer can assist with the installation. A Raven installation and service manual are provided.

Once installed and connected for the first time, setup and calibration steps are necessary prior to first field operations. See “Sprayer Calibration” on page 25.

The operator sets the target volume per area to be sprayed and the SCS 440 automatically maintains the flow regardless of vehicle speed or gear selection. A manual override switch allows the operator to manually control flow for system check-out and spot spraying. Actual volume per area being applied is displayed at all times. The SCS 440 additionally functions as an area monitor, speed monitor, and volume totalizer.
Spraying Setup

1. Securely hitch the sprayer to the tractor and fasten the safety chain. Make sure the hitch is adjusted so that the front of sprayer is 1 1/2 inch lower than the rear so that liquid in the tank will drain to the sump.

2. Fill sprayer 1/2 full with water for calibrating purposes.

3. Hook-up the pump to the tractor. Engage the pump slowly and check for any leaks.

4. Set the deadhead pressure of the pump at 80 psi depending on how the pump is driven.

Sprayer Calibration

Sprayer calibration

a. prepares your sprayer for operation, and

b. diagnoses nozzle wear.

This will give you optimum performance from your nozzles and ensure accuracy from your sprayer.

Equipment Needed:

- Calibration container
- Nozzle tip calculator
- Calculator
- Stopwatch or wristwatch with second hand.

Speed Calibration

Current sprayers include a Raven SCS 440 controller as standard equipment, and the SCS 440 requires a speed sensing input, a new or existing wheel sensor, or radar.

For a sprayer with the Raven SCS440 controller, perform the speed calibration procedure from the Raven SCS 440 manual, then resume at “Rate Calibration” on page 26 in this manual.

For a sprayer without a Raven controller, use the following steps.

1. Measure off a 200 foot course in the area to be sprayed or in an area with similar surface conditions.

2. Select the engine throttle setting and gear that will be used when spraying. The starting post should be far enough away to permit your tractor/sprayer to reach desired spraying speed.

3. Hold the speed as you approach the start marker, and check the time required to travel through the course to the end marker.

4. Repeat the above procedure, and average the times that were recorded. Use the following equation to determine the exact ground speed.

\[
\text{mph} = \frac{\text{Course Feet} \times 60}{\text{Elapsed Seconds} \times 88}
\]

Example:

27 seconds over a 200 ft course

\[
\frac{200 \times 60}{27 \times 88} = 5.05
\]

Speed: 5.05 mph
Rate Calibration

For a sprayer with the Raven SCS 440 controller, perform the rate calibration procedures from the Raven SCS 440 manual.

For a sprayer without the Raven controller, perform the following steps.

1. Determine the application rate at which your chemical should be sprayed. In determining which spray nozzles to use with your sprayer, you must know:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Your value</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nozzle spacing</td>
<td>inch</td>
<td>from sprayer configuration (page 64)</td>
<td></td>
</tr>
<tr>
<td>Target (gallons per acre)</td>
<td>gpa</td>
<td>from material container or supplier</td>
<td></td>
</tr>
<tr>
<td>Intended (miles per hour)</td>
<td>mph</td>
<td>from course trial above</td>
<td></td>
</tr>
<tr>
<td>Nominal application pressure</td>
<td>psi</td>
<td>from GP slide chart</td>
<td></td>
</tr>
</tbody>
</table>

2. Using this information, calculate the volume per minute, per nozzle as follows:

\[ \text{gpm} = \frac{\text{gpa} \times \text{mph} \times \text{NozzleSpacing}}{5940} \]

**Example:**

Nozzle Spacing: 20 inch
Speed: 5.05 mph
Pressure: 30 psi

\[
\frac{20 \times 5.05 \times 20}{5940} = 0.34
\]

Nozzle Rate = 0.34 gallons per minute

Using 0.34 gpm and 30 psi pressure, select a nozzle from your nozzle chart that comes closest to providing the desired output.

3. Turn on your sprayer and adjust the pressure.

4. Operate the sprayer at desired pressure and catch the discharge in the calibration container for one minute. Divide 128 into the number of ounces caught to determine gallons per minute (gpm) per nozzle. 128 fluid ounces equals one gallon.

\[ \text{gpm} = \frac{\text{OuncesPerMinute}}{128} \]

**Example:**

Sample: 44 U.S. fluid ounces in 1 minute

\[
\frac{44}{128} = 0.34
\]

Nozzle Rate = 0.34 gallons per minute

5. Check the area rate. You need the nozzle spacing from the sprayer, the intended field speed, and the nozzle gpm.

**Example:**

Nozzle rate: 0.34 gpm
Speed 5.05 mph
Spacing: 20 inch

\[
\frac{0.34 \times 5940}{5.05 \times 20} = 20
\]

Area Rate = 20 gallons per acre

The above information will assure you of a check for accurate application in the event there is an error in the gauge, nozzle spacing, nozzle height, tractor speed or nozzle wear. Since all tabulations are based on spraying water, conversion factors must be used when spraying solutions which are heavier or lighter than water.

If sprayer is equipped with a Raven 440 Automatic Rate Controller, this simple calibration procedure will also work for verifying speed and proper nozzle output.

All Raven 440 Control Systems require either wheel drive speed sensor magnets or a radar speed sensor. Calibration procedures for the speed sensor magnets can be found in the Raven 440 manual. Calculation procedures for radar speed sensors are included with each radar unit dependent on make and model. Make sure to follow initial programming instructions from the Raven manual to select either SP1-(wheel drive sensor), or SP2-(radar sensor).
Operating Instructions

General Notes For Field Operation

DANGEROUS

Read and follow chemical manufacturer’s instructions. Some chemicals can cause serious burns, lung damage and even death.

1. Securely hitch the sprayer to the tractor and fasten the safety chain. Make sure the hitch is adjusted so that the liquid in the tank will drain to the sump of the tank. Refer to “Hitching Tractor to Sprayer” on page 20.

2. Check the tire pressure in each tire. Refer to the “Tire Inflation Chart” on page 64.

3. Lubricate the sprayer as needed. Refer to “Lubrication” on page 58.

4. Hook up the pump to the tractor. Refer to “Hydraulic Pump Hookup” on page 22.

5. Fill the handwash tank with clean water. Have soap available to wash any exposed areas.

6. Check and clean, if necessary, pump, nozzles, and Whirlfilter®.

7. Check the sprayer initially and periodically for loose bolts, pins and hose clamps. Check the hoses, pumps, valves and fittings for leaks.

8. When transporting the sprayer, DO NOT exceed 20 mph and DO NOT transport with chemical in the tank.

9. NEVER allow anyone to ride on the sprayer.

At the Field

10. Make sure all tank shut off valves are turned on.

11. Calibrate sprayer with water only, not chemical and water. Calibrate with the sprayer tank half full of water. Refer to the calibration procedures in the Application Guide.

12. Adjust the boom height required for the nozzles and spacing to be used. Refer to nozzle tables in the Application Guide.

NOTICE

Make sure to read the label on the chemical compound that is to be applied. It is the law.

13. Consider how the chemical will be stored and how you will dispose of the chemical, according to the chemical label.

14. When calibrating, filling the tank, or working around chemicals, wear protective clothing that covers the body. Refer to “Wear Protective Equipment” on page 2. Have soap and clean water available to wash any exposed areas. Never open a container with your bare hands.

15. When filling the sprayer, it is better to mix the chemical in the field where it is to be applied. Position the sprayer 100 feet from any well or other water source before mixing the chemical.

16. Safely and carefully add the chemical to the sprayer tank. By law rinsing of the used chemical container must be repeated three times. The container should then be punctured to prevent future use. An alternative is to jet-rinse or pressure rinse the container. When adding chemical, remain at least 100 feet from any water well or fresh water source. Follow chemical manufacturer’s recommendations for safe handling of chemicals.

17. Take note of adjoining crops, houses, gardens, people, etc.

18. Apply spray when the wind is 5 mph or less. Minimize drift by using nozzle tips with the largest practical openings and by operating the sprayer boom at the lowest practical height and lowest practical pressure.

19. If possible work crosswise to the wind, starting from the downwind side of the field. Do this so you will not ever be heading directly into chemical fumes.

20. Drive at the same speed you used in your calibration. Refer to the Application Guide. Keep your sprayer calibrated.

21. When turning at the end of a field, make sure you are correct on the rows so that the boom will not overlap on crop previously sprayed.

22. Check the condition of hoses and connections frequently. Release system pressure before working on the sprayer by shutting off the pump and flipping the individual boom section switches on the control box. Always wear rubber gloves when making repairs or adjustments.

23. When you are finished spraying, empty the tank and flush the sprayer with water, including the pump, the nozzles and the bypass line from the throttling valves. Properly store the chemical emptied from the tank or dispose of it by the recommendations on its label.
Operating Checklist
Each time the sprayer is used, check the following:
- Check sprayer tire pressure, wear and overall condition.
- Check the tractor’s brakes to make sure they operate properly.
- Make sure all lights and turn signals are working properly.
- Lubricate sprayer as needed.
- Booms must be locked in place before transporting.
- Inspect tank. Make sure the hitch is adjusted so that the solution drains to the sump.
- Use safety equipment as listed on page 2.
- Fill with water and calibrate sprayer BEFORE adding chemical to the tank.
- Check the position of the ball valves in the plumbing to see if they are in the correct position.
- Check hoses, pumps and valves for any leaks.
- Check nozzle pattern for streaks and non-uniformity.
- Check the sprayer initially and periodically for loose bolts and pins.
- Follow “Important Safety Information” on page 1 of this Manual.
- Make sure the handwash tank is full of clean water.

Using Handwash Tank
In the event of an accidental spill of chemicals on skin or in eyes, use the handwash tank to flush away chemicals.

1. Make sure all persons working with or near the sprayer know where the tank is located and how to use it. In the event of a spraying accident, it may be necessary to find and operate the wash line with impaired vision.

2. Open the tank valve and use the hose to direct the clean water on all contaminated areas. Wash all contaminated areas of skin with soap and water. To flush chemicals from eyes, point the hose and water stream upward while lowering eyes into the stream of flowing water.

3. Close the tank valve and refill the handwash tank. See “Filling Handwash Tank” on page 32.

4. Periodically empty and refill the handwash tank with clean water.
Plumbing Operations

Refer to Figure 10 on page 30

A basic knowledge of how the sprayer is plumbed will help you to understand how to operate your Great Plains Sprayer. Throughout this manual, the components on this diagram will be described with the terminology labeling these components.

Five of the valves are labeled on the sprayer decals.

1. Agitator Selector Valve
2. Pump Inlet (Tank) Selector Valve
3. Fill/Spray Selector Valve
4. Product Valve (Tank Fill vs. Induct)
5. Inductor Valve (On/Off)

Other key components are:

10. Main Tank
11. Flush Tank
12. Main Tank Sump
13. Pump
14. Solution Whirlfilter®
15. Flow Meter
16. Bypass Control Butterfly Valve
17. 3-Way Boom Manifold Valves
18. Agitation Gauge
19. Inductor
20. Main Inlet Quick Connect
21. Main Inlet Filter
22. Flush Tank Inlet Quick Connect
23. Manual Throttle Valve
24. Agitator Inlet Shutoff Valves (Normally Open)
25. Main Inlet Shutoff (Normally Closed)
26. Flush Tank Inlet Shutoff (Normally Closed)
27. Main Tank Sump Shutoff (Normally Open)
28. Whirlfilter Cleanout Shutoff Valve (Normally Closed)
29. Inductor Outlet/Tank Inlet Shutoff Valve (N.Open)

Valves operate by moving their handles to point at the function on the decal, or toward the pipe desired on an otherwise unmarked selector valve. Shut-off valves are open when the handle is parallel to the piping, and closed when the handle is perpendicular.

Fluid is drawn out of the sump (12) in the tank and passes through the pump (13).

From the pump fluid passes through the solution Whirlfilter® (14) and filters out or grinds up all undissolved chemical and solid particles. The fluid then passes through both the flow meter (15) and the bypass control butterfly valve (16).

The bypass control butterfly valve (16) controls how much fluid goes to the boom. This is regulated by the Raven SCS 440 controller. The fluid passes through the flow meter (15) and proceeds to the 3-way boom manifold valves (17). If a boom valve is on, the fluid passes to its perspective boom section and is sprayed out the individual nozzles. Refer to page 30 for a layout of the boom plumbing.

The agitation can be set by adjusting the agitation pressure valve (1) while the pump is at operating speed. Refer to the Application Guide to adjust the agitation.

The optional inductor (19) provides convenient pump-driven loading of concentrates into the main tank.

There are tank shut off valves (30-35) at each outlet from the tank so that if there is a leak, the source can be shut off and the chemical spill reduced. These valves need to be wide open when the sprayer is in use.

To operate the hydraulic pump, first make sure that the hydraulic hoses are routed correctly so that the pump turns in the correct direction. See "Hydraulic Hookup" on page 22 for more details. To run the pump, push the hydraulic lever in the down position. When you want to stop the pump, push the hydraulic lever in the float position.

**NOTICE**

Do not move the hydraulic lever to the neutral position while the hydraulic pump is running. To do so may cause damage to the hydraulic pump.
Figure 10
Sprayer Tank Plumbing
Figure 11
Boom Plumbing System
Filling Tanks
Always fill the handwash tank first.

Filling Handwash Tank

**NOTICE**

Use only potable or distilled water in the handwash tank. In the event of a chemical accident, it may be necessary to spray this water into your eyes.

*Keep the handwash tank clean, and free of mold and fungus. After a period of storage, scrub the inside using a mild detergent. Rinse thoroughly.*

*Plug or cap the hose when parked or stored, to prevent pests from entering, nesting and plugging the hose. Test the valve and hose when filling.*

To fill the handwash tank:

**Refer to Figure 12**

1. Open the filler cap (1) and inspect the condition of the tank interior. If any debris, sediments, deposits or growths are seen, scrub and rinse the tank before use.

2. Unplug/uncap the hose and open the valve (2).

3. Begin adding clean water at the filler.
   - If water flows freely out the hose, close the valve.
   - If water does not flow freely out the hose, stop adding water, and clear the obstruction.

4. Close the valve and complete filling the tank.
Filling the Flush Tank

The rinse/flush tank fills from the bottom of the tank and uses a Cam-Lock coupler (22), located on the valve control panel, to connect to the freshwater hose. The flush tank fill line is not connected to the sprayer pump. A supply pump or pressurized water source is required to fill the flush tank.

The tank lid is vented and does not need to be opened for any tank operations other than inspection and cleaning.

To fill the flush tank:

Refer to Figure 10 on page 30 and Figure 13

1. Check that the handwash tank is full.
2. Check that all shutoff and cleanout valves are in their normal positions for field operations.
3. Close the inlet valve (32) at the flush tank inlet.
4. Set pump inlet selector valve (2) to MAIN TANK.
5. Connect the supply hose to the quick-fill Cam-Lock coupler.

**NOTE:** If using a positive-displacement pump, open the inlet valve (32) before starting the pump.

6. Turn on the water supply.
7. Open the inlet valve (32).
8. Stop filling by first stopping the pump, then closing the inlet valve (32).

Filling the Main Tank

Inspect Main Tank Quad Jets

The quad-jet agitators are the two agitators in the sprayer tank. Each agitator has four holes that shoot jets of water out at a high velocity. The agitator head is oriented at 45 degrees, with reference to the tank ends, so that the water jets are aimed at the corners of the tank.

If the nozzles are not correctly aligned, see “Quad-Jet Agitators” on page 56 for adjustment instructions. Follow the instructions carefully, as tank entry may be required, and can be extremely hazardous.
Adding Water to Main Tank

⚠️ CAUTION ⚠️
When filling the sprayer tank, use a check valve or anti-siphon device to prevent the solution in the tank from infiltrating into the fresh water source and contaminating it.

⚠️ NOTICE ⚠️
Never add chemicals to an empty tank. Add chemicals at the field. See page 36.

⚠️ NOTICE ⚠️
The tank straps that wrap around the sprayer tank may become loose after the first few hours of operation. This occurs when the tank settles in the saddle. Polyethylene tanks are especially susceptible to this. Retighten the tank straps to secure the tank.

Your Great Plains Sprayer fills the tank from the bottom of the tank and uses a standard 2-inch Cam-Lock coupler to connect to the freshwater hose. The sprayer must be hitched to the tractor for this operation.

>Note:
A 1 1/2-inch Cam-Lock coupler is also available. Refer to the parts manual.

1. To fill the tank, hook up the freshwater hose to the quick-fill Cam-Lock coupler with the quick-fill ball valve in the closed position.

2. Turn the water on and open the quick-fill ball valve for the freshwater to enter the tank. When using a positive displacement pump to fill the tank, open the quick fill ball valve first and then pump water into the tank.
Tank Fill Using Existing Pump (2006-)

The Tank Fill can be used to fill the main sprayer tank using the existing sprayer pump. To do so refer to the following instructions:

**WARNING**

Make sure the supply tank is higher than the sprayer tank. Failure to do so can cause back-flow from the sprayer tank causing sickness, serious injury or death from water contamination.

**NOTE:**
Use of the sprayer’s own pump to fill the tank is possible only when the optional inductor is installed. Tank Fill relies on valves and plumbing supplied with the inductor.

1. Make sure sprayer pump is off and insert supply tank hose into the main quick-fill coupler. Leave quick-fill valve off.

Refer to Figure 15 and Figure 16

2. Turn agitation valve (1) to OFF.
3. Turn tank valve (2) to MAIN TANK.
4. Open supply tank valve making sure that positive head pressure is maintained at the quick-fill to prevent back-flow from the sprayer tank.
5. Open quick-fill valve under the main frame.
6. Turn product valve on the inductor from OFF to TANK FILL.
7. Make sure the boom section valve switches are all off, start the pump and fill the tank.
8. When finished, follow this order:
   a. Turn off pump.
   b. Rotate product valve (4) on the inductor from TANK to OFF.
   c. Shut quick fill valve under walkboard.
   d. Shut off supply tank valve.
   e. Rotate operation valve (3) to “SPRAY”.

**NOTE:**
Make sure there is positive head pressure from supply tank during this procedure.
Adding Chemicals

**CAUTION**

*Do not add the chemical until you are at the field, just prior to spraying. When you add the chemical, follow the manufacturer’s instructions for mixing the spray solution in order to achieve the desired application rate.*

**CAUTION**

*Read the manufacturer’s label carefully before handling chemicals.*

Chemicals may be added at the tank top, or by using the optional inductor.

1. Check that the handwash tank is full of fresh potable or distilled water.

2. Before you add the chemical to the tank, make sure the tank is at least one half full of water. Never add chemicals to an empty tank. Do not add water after adding chemicals. Make sure the freshwater hose is disconnected and the inlet shutoff closed.

3. Check that all shutoff and cleanout valves are set to their normal field positions. Set all boom switches to OFF.

4. Park the sprayer so that you will be facing downwind when adding chemicals at the lid or at the inductor.

5. Keep the spray solution away from all skin. Wear protective clothing and goggles. If the solutions comes in contact with the body, wash off the contaminated area with soap and water.

6. *Do not* smoke while handling chemicals.

7. Store or dispose of unused chemicals as specified by the chemical manufacturer.

8. Dispose of empty chemical containers properly. By law rinsing of the used chemical container must be repeated three times. Puncture the container to prevent future use. An alternative is to jet-rinse or pressure rinse the container.
Inductor (Option)

The inductor option is used to induct chemical into the main sprayer tank so that the operator does not have to climb up the walkboard to do so.

To induct chemical into the tank refer to the following instructions:

Refer to Figure 17

1. Fill the main sprayer tank with the carrier needed and transport the sprayer to the field where the sprayer will be used.
2. Make sure the boom section switches are all off and operate the pump.
3. At the inductor, set valves:
   inductor valve (5) to OFF and product valve (4) from OFF to INDUCT.
4. At the valve panel, set valves:
   (1) to AGITATE,
   (2) to MAIN TANK, and
   (3) to SPRAY.
5. Be sure the valve to the tank is open.
6. Open the inductor lid.

NOTE:
The inductor lid is vented, and the inductor may be operated with the lid on or off.
7. Open the inductor shutoff valve (5) and inspect to ensure that there is no back-flow of water from the tank into the inductor.
8. Add the chemical to the inductor tank.
9. When the required amount of chemical has been added, and the inductor tank is empty, close the inductor shutoff valve (5).
10. Secure the lid on the inductor tank.
11. Turn off the pump.
12. Set the product valve (4) to OFF.
Agitation

**CAUTION**

If using liquid fertilizer or any other chemical that will corrode brass, install a gauge protector under the brass agitation gauge. Failure to do so will eventually cause the gauge to fail and chemical to be expelled from the gauge.

*Refer to Figure 19*

The agitator system bleeds off some of the material flow and recirculates it through quad jet orifices at the bottom of the tank. It helps maintain constant concentration with materials.

The agitation valve (1) adjusts the pressure to the agitation nozzles in the tank when set to positions in between OFF and AGITATION.

Refer to the agitation gauge (18), and adjust the pressure to a desired rate. Different chemicals require different agitation pressures to keep the chemical in suspension (see chemical label).

**Foam Marker Tank Fill**

Consult the separate manual provided with the marker system for information on selecting, mixing, loading and applying marker foam.

**Unloading Materials**

**CAUTION**

*Do not attempt to drain the main tank by removing the main sump cap. Potentially hazardous materials will spray in random directions as the clamp is being removed.*

Sprayed chemicals are normally diluted in water for application, and cannot be recaptured and stored for re-use.

*Refer to Figure 20*

If a small amount of material remains in the main tank at completion of spraying, one method of disposing of it is to apply it to the same fields. To avoid an overdose of material, reduce the rate or further dilute the tank contents with water (but do not use the flush tank water for this. Reserve it for final tank flush and clean-out).

If material must be drained from the tank, rather than applied via boom, drain at the Whirlfilter sump (1).
Boom Operations

2007+ Sprayer Hydraulics

On newer sprayers, the hydraulics use a live system. The tractor hydraulic pump may be left on during sprayer operations. This requires 5-to-8 gpm flow.

The console toggle switches move up and down from center off, and are auto-return. They must be held up or down until an operation is complete.

2006- Sprayer Hydraulics

The tractor circuit is engaged only during the operation, and the tractor lever determines the direction of cylinder movement.

The console switches move only up, are detented, and remain in the selected position until moved. The switch may be operated before or after lever movement.

Refer to Figure 21

The live hydraulic controls come standard to operate with closed center tractor hydraulics. To be used with an open center system a conversion kit must be purchased (part number 833-427C). To install the conversion kit, remove the plug from the end of the valve block (14) located on the top of the center boom section. Install the conversion valve and coil into this location. Plug the electrical cable into the open plug on the valve harness and the conversion is complete.

Figure 21
Fasse Valve Block
Elevator Raising/Lowering

The elevator lifts and lowers the center section of the boom, which raises and lowers the entire boom.

Refer to Figure 22

Lifting is performed by a hydraulic cylinder controlled by a solenoid valve, which in turn is controlled by an up-down/center-stop switch (1) on the boom control panel in the tractor cab.

The elevator is fully raised for folding.

Lowering is by gravity retraction of the cylinder. When the switch is toggled down, the hydraulic circuit is put in float. Lifting and lowering speeds may differ.

Boom Height

After calibrating the sprayer for the specific nozzle to be used at a desired pressure and tractor speed, the main field adjustment is the boom height.

Depending on which type of nozzle is being used, set the boom height so that the correct overlap for that specific nozzle is achieved. If the crop canopy is taller in some fields than others, adjust the boom height accordingly. Refer to the nozzle charts in the Application Guide to determine the height of the boom.

In center-off, the elevator stays at the current position. In normal field operations, the elevator is set to the desired height, and left there for the field. Typically this is about 20 inches (51cm) above the crop canopy.

As necessary, wings are raised and lowered at turns by the operator, and adjusted to accommodate uneven terrain.

Boom Folding Procedure

The front folding boom is hydraulically operated, and is controlled by a single valve block. There are controls for the vertical elevation, left and right boom tilt, left and right inner fold and left and right outer fold.

Boom Folding

Refer to Figure 23

The following procedure should be used to fold the boom.

1. Raise elevator to top position.
2. Fold left and right outer booms 180°. Make sure outer booms snap into locks.
3. Raise left and right tilt to uppermost position. Make sure lock plunger moves up, locking boom in place.
4. Fold left and right inner booms 90°.
5. Lower left and right tilt so the booms rest on the transport supports.

\(\text{NOTE:}\)

Outer booms will not lock if booms are tilted.
Boom Unfolding

⚠️ WARNING ⚠️

Negative Tongue Weight:
Do Not unfold the booms if the sprayer is unhooked from tractor with the sprayer tank empty or low.

Refer to Figure 24

The following procedure should be used to unfold the boom:

1. Raise left and right tilt to uppermost position.
2. Unfold left and right inner booms 90°.
3. Lower left and right tilt to lowest position. Make sure lock plunger lowers out of the way.
4. Unfold left and right outer booms 180°.
5. Lower elevator to proper spraying height.

Normal boom use may shift the outer boom support locks along the inner section. When properly adjusted, the outer arm plate will snap into the gap between the lock plates, and the holes line up. Loosen the U-bolts and reposition brackets as necessary. Adjust cable tension so the plunger is out of the way when boom is unfolded.

Make sure outer boom cylinder pressure is released and lock plunger is free to move up and down before unfolding boom.

Leveling Boom

⚠️ WARNING ⚠️

Pinch Point Hazard:
Your fingers, hands or arms could be seriously injured or severed if caught in the folding boom sections. Shut off tractor and remove key before adjusting shims.

📝 NOTE:
The boom sections must be level across the span for even spraying.

Refer to Figure 25

To adjust the inner arm:

1. Unfold the boom.
2. Place supports under boom.
3. Loosen bolts holding the plates at the top of the pivots, located between the center section and the inner boom arms.
4. Add or remove shims as necessary. Additional shims are available from Great Plains (part number 506-826D).
5. Retighten bolts.
Locking System

*Refer to Figure 26*

The sprayer has a locking system for automatic boom locking during folding and transport. For proper folding, the boom-lock cable must be tight enough that the lock arms just clear their stops when unfolded and rest secure against the stop when folded.

*Refer to Figure 27*

To adjust the tension on the boom-lock cable, loosen jam nut and turn clevis. Re-tighten jam nut.

**Raven G1 Autoboom (Option)**

The Raven Autoboom is a system that helps automatically adjust the height of the boom to changing terrain. Although this option will allow the sprayer to be driven faster most of the time, take care to avoid large obstacles and large terraces as the autoboom will only sense terrain changes at the point of the wheel sensor.

For information on installation, calibration, and operation of the system, refer to the Raven manuals supplied.
Tank and Boom Flush

The tank rinse and flush uses the fresh water in the 50 gallon flush tank to rinse out the main sprayer tank in the field.

Refer to Figure 28

Before operation make sure the flush tank is filled with fresh, clean water.

1. Completely empty the chemical in the main sprayer tank by turning the agitation off the last pass and spraying it out in the field.
2. Make sure all boom valves and pump are turned off.
3. Turn the agitation valve (1) to FLUSH, and rotate the tank valve (2) from MAIN TANK to FLUSH TANK.
4. Operate the pump with the sprayer stationary, and rinse the tank until 1/3 of the flush tank volume (17 gallons) is consumed and then stop the pump.
5. With the sprayer pump off, turn the agitation valve (1) from FLUSH to OFF.

Refer to Figure 29

6. Rotate the tank valve (2) from FLUSH TANK to MAIN TANK
7. Operate the pump and spray out the full volume of liquid (deposited into the main sprayer tank from the Flush Tank) in the field just finished.
8. Repeat step 2 through step 7 twice more until the flush tank is empty and the main sprayer tank has been rinsed completely three times.
9. Reset the agitation pressure before filling the main sprayer tank again.
Transporting

**DANGER**

*Contact with electrical power lines can cause death by electrocution.*

1. Park your sprayer in an open area where you will not hit power lines, buildings, etc. when the boom is folded.

2. Make sure the tractor is capable of towing the sprayer. The sprayer must weigh no more than 150% of the tractor weight. The tractor must be rated for the load.

3. Make sure the safety chain is securely fastened to the tractor draw bar and the retaining clip is fastened to the hitch pin.

4. **Never** allow riders when transporting the sprayer.

5. When transporting your sprayer, be sure to watch the height clearances of your folded boom to prevent damage to the boom and possible injury.

6. **Do not** exceed 20 mph transporting your sprayer.

7. **Do not** transport sprayer while filled with chemical mixture.

**NOTE:**

If a suitable water source exists at the field, transport the sprayer with main tank empty. The weight of the sprayer more than doubles when the main tank is full.

Parking

**WARNING**

*Negative tongue weight. Do Not unhook the sprayer from tractor with the sprayer tank empty or low with the booms unfolded.*

The following list should be conducted when you want to unhitch your sprayer. See “Storage” on page 45, for more information on long term storage of your sprayer.

**Refer to Figure 30 and Figure 31**

1. Fold the booms.

2. If field operations are complete, drain the sprayer tank of any excess water left from flushing. Dispose of or store chemical properly by instructions on the chemical label.

3. Park the sprayer on a flat, level area, preferably where it is sheltered from direct sunlight.

4. Remove the jack from the transport position and move to the park position.

5. If the ground is soft, place a board or plate under the jack to widen the ground contact area.

6. Extend the jack until the weight of the tongue is off the tractor drawbar and is supported by the jack.
7. Disconnect the electrical lines.
8. Set all tractor circuits to float.
9. Shut off tractor.
10. Unplug the hydraulic lines.
11. Remove the hitch pin and disconnect the safety chain from the tractor drawbar.

**Storage**

**DANGER**

Read and follow chemical manufacturer's instructions. Some chemicals and cause serious burns, lung damage and even death.

1. Empty solution from the tank, clean the chemical inductor (option), and store or dispose of the chemical as recommended by the manufacturer’s chemical label.
2. Flush the entire sprayer system with clean water.
4. Circulate 3 to 5 gallons of antifreeze (Great Plains strongly recommends the use of non-toxic recreational vehicle antifreeze) through the system including the pump, hoses and nozzles.
5. A cast iron pump must be either full of RV antifreeze or completely empty of all liquid to avoid corrosion. If the content of the pump is unclear it is advisable to drain the pump, remove it, and place it in a warm dry environment during the winter.

**NOTICE**

Regular antifreeze is harmful or fatal to animals and humans. Use carefully according to the label’s instructions. We strongly recommend the use of recreational vehicle (RV) antifreeze which does not exhibit these harmful side effects.

6. Wash off the exterior of the sprayer thoroughly using a safe solvent or soap and water.
7. Unhitch sprayer. See “Parking” on page 44.
8. Remove nozzles, disconnect the control box, and place them indoors with the pump.
9. Change filters in the tractor cab after finished.
10. Apply grease to exposed cylinder rods to prevent rust. Be sure to remove grease prior to next use, to avoid damaging seals.
11. Inspect all parts of the sprayer for wear and rust. Repair and paint parts as necessary.
12. Store the sprayer in a dry area away from direct sunlight.
Adjustments

Boom Height

After calibrating your sprayer for the specific nozzle you will use at a desired pressure, and tractor speed, the main field adjustment is the boom height. Depending on which type of nozzle you are using, you need to set your boom height so that you achieve the correct overlap for that specific nozzle. If the crop canopy is taller in some fields than others, you will need to adjust the boom height accordingly. Refer to the nozzle charts located in this manual to determine the height of the boom needed. Use the elevator gauge as a height reference.

EXAMPLE: A 2.5 MeterCone nozzle at 20 inch spacing is being used. From the nozzle chart (refer to section 4 of this manual or the Application Guide), a height of 19 to 21 inches above the top of the crop is required. If the crop is 6 inches off the ground, the boom height should be set to 25 to 27 inches off the ground.

Nozzle Pressure

Another area that will need some field adjustments is the nozzle pressure. As your tank level decreases, you may have to adjust the boom pressure to keep the pressure at the same magnitude for what the sprayer was calibrated for if your sprayer is not equipped with a monitor. Watch your pressure gauge and be aware of changes in the pressure.

Break-Away Spring

Refer to Figure 32

If an outer boom arm strikes an obstruction, a pair of spring-load rollers ride up and out of a detent, allowing the arm to pivot back and upward.

The arm usually re-seats itself automatically. If it does not:

1. Stop the tractor and set the parking brake.
2. Set hydraulic pump circuit to float or shut down PTO.
3. Wear gloves and swing the arm forward until the rollers are back in detent.

Periodically check that break-away springs are compressed to $5\frac{1}{2}$ inches.

Adjust spring by turning mounting nut under spring.

More serious obstructions may fail a shear bolt at the inner arm pivot. See page 53 for replacing this shear bolt.
Axle Wheel Spacing Adjustment

Refer to Figure 33

Axle extension can be adjusted for differing row spacings.

**CAUTION**

Do not change the fore/aft position of the axle mount. Moving it forward may result in negative tongue weight even when folded. Moving it aft increases positive tongue weight and risks tire contact with boom.

1. Hitch the sprayer on level ground.
2. Measure the current wheel spacing (span) between tread center-lines.

   **NOTE:**
   Also measure the distance from the outer end of each axle to the mount. Keep these equal, or the sprayer will pull skewed.

3. Compute the difference between the current and desired spans. Divide it by two. This is the amount to extend or retract each axle.
4. Use a hoist or jacks at the left rear corner of the mainframe to raise the sprayer until the tire on that side (only) is slightly elevated off the ground.

   **CAUTION**

   Leave the other tire firmly on the ground to provide resistance to lateral frame movement when adjusting an axle.

5. Loosen the bolts joining the upper and lower axle mounts, starting with the bolts nearest the wheel being adjusted. Loosen only enough bolts to allow movement of the axle to be adjusted.
6. Slide the axle in or out to the new setting.

   **CAUTION**

   Do not adjust the wheel spacing wider than 120 inches at tire tread center lines. To do so may cause a falling axle hazard while the sprayer is in service.

7. Secure the four bolts nearest the tire.
8. Lower the adjusted side.
9. Elevate the right corner, and repeat step 5 through step 8.
10. Tighten all the bolts to “Torque Values” on page 65.
Manual Pressure Adjustment Valve

**CAUTION**

If equipped with a boom control valve without a bypass (Raven Monitor Unit) adjust the boom flow throttle valve when the sprayer is full of clean water (no chemical added). Never adjust the valve when you would be exposed to chemical coming out of the boom.

**Refer to Figure 34**

The manual pressure adjustment valve allows the operator to choke down the amount of fluid flowing to the boom. When the valve is wide open and the application is at a low rate, a small amount of adjustment on the butterfly valve makes a large difference in the flow rate. To dampen the sensitivity of the system, adjust manual pressure adjustment valve so that the pressure of the system is 20 psi greater than the maximum flow you want to achieve.

To adjust the manual pressure adjustment valve, open the butterfly valve until it is completely open. Operate the pump at the same rpm you would when spraying, and adjust the manual pressure adjustment valve until the system pressure is reading 20 psi greater than the maximum application pressure.

On the Raven Monitor control system, you will have to adjust the manual pressure adjustment valve with clean water coming out of the nozzles. Operate the pump at the same rpm you would when spraying, and adjust the manual pressure adjustment valve until the system pressure is reading 20 psi greater than the maximum application pressure.

A good time to do this would be during calibration of the sprayer.

With the manual pressure adjustment valve set correctly, the system pressure will be able to be adjusted without large fluctuations in the pressure.

**NOTE:**

When the pressure is increased at a later date, the manual pressure adjustment valve will need to be opened, and re-calibrated.
## Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Problem Area</th>
<th>Specific Checks</th>
<th>Solutions</th>
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<tr>
<td>Pressure decreasing</td>
<td>Between gauge and liquid supply</td>
<td>Pump wearing</td>
<td>Rebuild or replace pump</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plugged suction or pump to pressure head hose</td>
<td>Clean hose and reduce cause of clogging</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plugged Whirlfilter</td>
<td>See “Clean Out Solution Whirlfilter®” on page 52.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plugged gauge</td>
<td>Remove the quick disconnect fitting and flush gauge protector</td>
</tr>
<tr>
<td>Pressure fluctuating</td>
<td>Between pump outlet and liquid</td>
<td>Check suction hose &amp; fittings for air leaks. Air in system is indicated by buffs of air at nozzles</td>
<td>Remove obstruction from clogged area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vortex in tank suction</td>
<td>Align agitators properly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cracked pump housing</td>
<td>Replace pump housing</td>
</tr>
<tr>
<td>Pressure increasing</td>
<td>Between gauge and nozzle</td>
<td>Nozzle screens clogged</td>
<td>Clean screens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nozzle orifices plugged</td>
<td>Remove material with soft brush or air</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boom hoses becoming clogged</td>
<td>Remove obstruction from clogged area</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Boom hoses pinched</td>
<td>Use cable ties to position hose so it will not kink</td>
</tr>
<tr>
<td>Pressure cannot increase</td>
<td>Pump or electric ball valve</td>
<td>From nozzle charts check liquid demand against pump capacity (nozzle requirement + agitation requirement)</td>
<td>Reduce swath width by nozzle reduction; install smaller nozzles and drive at a lower rate of speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electric ball valve or gauge not functional</td>
<td>Replace or repair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pressure adjust switch faulty</td>
<td>Test switch &amp; replace if faulty</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fuse is out in control box</td>
<td>Replace fuse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manual pressure adjustment valve not all the way open</td>
<td>Open the manual pressure valve all the way and allow the electric ball valve to govern the pressure</td>
</tr>
<tr>
<td>No pressure</td>
<td>Plumbing</td>
<td>Tank shut-off valves off</td>
<td>Make sure all tank shut-off valves are open</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose fittings</td>
<td>Tighten fittings so pump can prime</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collapsed suction hose to pump</td>
<td>Replace hose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Obstruction in suction hose or tank</td>
<td>Remove obstruction</td>
</tr>
<tr>
<td>No pressure</td>
<td>Pump</td>
<td>Hydraulic pump running in the wrong direction</td>
<td>Switch hydraulic hoses in the tractor outlet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PTO pump coupler loose</td>
<td>Tighten PTO coupler</td>
</tr>
<tr>
<td>Pressure cannot decrease</td>
<td>Pump or electric ball valve</td>
<td>Tank agitation restricted</td>
<td>Check that the agitator valve is open and that the liquid is being agitated</td>
</tr>
<tr>
<td>Liquid will not induct</td>
<td>Chemical Inductor</td>
<td>Make sure the valve below the inductor tank is open</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure the pump is in operation and has prime</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make sure the venturi bypass valve is open</td>
<td></td>
</tr>
<tr>
<td>Inductor overflow</td>
<td>Chemical Inductor</td>
<td>Close valve below inductor tank until pump is running, has pressure and venturi valve is open</td>
<td></td>
</tr>
</tbody>
</table>
## Troubleshooting

### Boom will not fold

- **Problem Area**: Hydraulic block assembly
- **Specific Checks**
  - Check electrical connections
  - Check for leakage at the valve and at the cylinders
  - Check solenoid valves at the block

---

### Firing Diagram for Fasse 700-0807-4208  Great Plains 833-423C

<table>
<thead>
<tr>
<th>Switch No.</th>
<th>Boot Color</th>
<th>Switch Position</th>
<th>Hot Wires</th>
<th>Pin Out Location</th>
<th>Pressure Ports</th>
<th>Tank Ports</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Long</td>
<td>White</td>
<td>Left Foam (stat)</td>
<td>Red &amp; Wht Cond</td>
<td>D-4WP, A-4WP</td>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Center (off)</td>
<td>Red &amp; Wht Cond</td>
<td>D-4WP, A-4WP</td>
<td>Off</td>
<td></td>
<td>Left Foam Marker</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Right Foam (stat)</td>
<td>Red &amp; Grn 4 Cond</td>
<td>D-4WP, C-4WP</td>
<td>Left Foam Marker</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 2 Long     | Red        | Up (mom)       | Red/Blk & Grn | 5-12P, 10-12P | C5 | Left Tilt Up |
|            |            | Center (off)   | Red/Blk & Grn | 5-12P, 10-12P | C5 | Off |
|            |            | Down (mom)     | Red/Blk & Grn & Blk/Wht | 5-12P, 10-12P, 9-12P | C5 | Left Tilt Down |

| 3 Long     | White      | Up (mom)       | Org/Blk & Grn | 6-12P, 10-12P | C4 | Center Up |
|            |            | Center (off)   | Org/Blk & Grn | 6-12P, 10-12P | C4 | Off |
|            |            | Down (mom)     | Org/Blk & Grn & Blk/Wht | 6-12P, 10-12P, 9-12P | C4 | Center Down |

| 4 Long     | Blue       | Up (mom)       | Wht/Blk & Grn | 7-12P, 10-12P | C3 | Right Tilt Up |
|            |            | Center (off)   | Wht/Blk & Grn | 7-12P, 10-12P | C3 | Off |
|            |            | Down (mom)     | Wht/Blk & Grn & Blk/Wht | 7-12P, 10-12P, 9-12P | C3 | Right Tilt Down |

| 5 Short    | Green      | Up (mom)       | Grn/Wht & Blu/Wht & Grn | A-3P, B-3P, 10-12P | C7 | C14 | Left Outer Fold |
|            |            | Center (off)   | Grn/Wht & Blu/Wht & Grn | A-3P, B-3P, 10-12P | C7 | C14 | Off |
|            |            | Down (mom)     | Grn/Wht & Blu/Wht & Grn & Blk/Wht | A-3P, B-3P, 10-12P, 9-12P | C14 | C7 | Left Outer Unfold |

| 6 Short    | Yellow     | Up (mom)       | Grn/Blk & Red/Wht & Grn | 12-12P, C-3P, 10-12P | C6 | C13 | Left Inner Fold |
|            |            | Center (off)   | Grn/Blk & Red/Wht & Grn | 12-12P, C-3P, 10-12P | C6 | C13 | Off |
|            |            | Down (mom)     | Grn/Blk & Red/Wht & Grn & Blk/Wht | 12-12P, C-3P, 10-12P, 9-12P | C6 | C13 | Left Inner Unfold |

| 7 Short    | Grey       | Up (mom)       | Wht & Blu & Grn | 3-12P, 8-12P, 10-12P | C2 | C9 | Right Inner Fold |
|            |            | Center (off)   | Wht & Blu & Grn | 3-12P, 8-12P, 10-12P | C2 | C9 | Off |
|            |            | Down (mom)     | Wht & Blu & Grn & Blk/Wht | 3-12P, 8-12P, 10-12P, 9-12P | C2 | C9 | Right Inner Unfold |

| 8 Short    | Red        | Up (mom)       | Red & Org & Grn | 1-12P, 2-12P, 10-12P | C1 | C8 | Right Outer Fold |
|            |            | Center (off)   | Red & Org & Grn | 1-12P, 2-12P, 10-12P | C1 | C8 | Off |
|            |            | Down (mom)     | Red & Org & Grn & Blk/Wht | 1-12P, 2-12P, 10-12P, 9-12P | C1 | C8 | Right Outer Unfold |

|            |            | Blk (zip)      |             |                  |              |              | Ground |
|            |            | Blk            |             |                  |              |              | Ground |
|            |            | Blu/Blk        |             |                  |              |              | Ground |
|            |            | Blk            |             |                  |              |              | Ground |
Maintenance and Lubrication

Proper servicing and adjustment is the key to the long life of any farm implement. With careful and systematic inspection, you can avoid costly maintenance, time and repair.

⚠️ WARNING ⚠️

Before working on, servicing or making adjustments on sprayer, always disengage power, shut off tractor engine, make sure all moving parts have stopped, and all pressure in the system is relieved.

▲ Always wear rubber gloves when making repairs or adjustments.
▲ Make sure all safety equipment mentioned in the safety section of this manual, are stored in an easily accessible place but protected from potential contamination from dust or chemicals.

Sprayer/Boom Maintenance

Proper servicing and maintenance is the key to the long life of all farm equipment. With careful and systematic inspection of your sprayer, you can avoid costly maintenance, downtime and repair.

1. After several hours of operation, check sprayer for loose bolts, pins and hose clamps.
2. Check hoses, pumps, valves and fittings for leaks. Always wear rubber gloves when making repairs and adjustments.
3. Clean nozzles with an air hose with less than 30 psi. Periodically replace nozzles.
4. Keep elevator slide pads properly adjusted. Lubricating slide pads with grease may cause dirt accumulation that jams elevator. If necessary, use silicone spray on slide pads.
5. For lubrication points and intervals refer to "Lubrication" on page 58.
6. Check for proper air pressure in the sprayer tires. See "Tire Inflation Chart" on page 64.
7. Wash sprayer and boom daily using a safe solvent, or soap and water.
8. If equipped with a foam marker, clean the air filter on the air pump no less than once a week, even more often in extreme conditions.
9. Once a season lubricate multiple nozzle bodies with silicone spray. Remove nozzle and spray into opening to lubricate nozzle body so it will turn. DO NOT use petroleum based lubricant as this will cause the seals to swell and make it impossible to rotate the nozzle body.

Equipment Cleanup

⚠️ DANGER ⚠️

Read and follow chemical manufacturer’s instructions. Some chemicals and cause serious burns, lung damage and even death.

Nozzles should be cleaned with a low pressure {less than 30 psi} air hose, and periodically replaced. Haul a supply tank of water so you can clean the spray tank and applicator out in the field. Never wash tank out in the yard or at a car wash.

Dispose of leftover chemical in the same manner described on the manufacturer’s label of the chemical last used in the sprayer. Rinse out the tank and spray the rinse water on the last field that was sprayed. Flush the sprayer with fresh water and spray the water in the field that was last sprayed. While the sprayer is being flushed at the field, turn the boom section switches on to flush the nozzles, then turn them off to flush out the throttling valves and bypass lines (if equipped). Repeat this procedure several times.

General Information

If equipment is to be used in freezing or near freezing conditions, protect pump and plumbing system by thoroughly draining liquid and pumping antifreeze (Great Plains strongly recommends the use of recreational vehicle antifreeze) solution through the plumbing system.

⚠️ NOTICE ⚠️

Regular antifreeze is harmful or fatal to animals and humans. Use carefully according to the label’s instructions. We strongly recommend the use of recreational vehicle (RV) antifreeze which does not exhibit these harmful side effects.

Check the conditions of hoses and connections frequently. Release the system pressure before working on the sprayer. To release the pressure flip the boom section switches on and off without the pump running. Always wear rubber gloves when making repairs or adjustments. Make sure all personal safety equipment (gloves, goggles, etc.) listed on page 2, are stored in an easily accessible place but protected from potential contamination from dust or chemicals.
Filter Maintenance

There are two filters on the sprayer. One is a canister type that filters the water entering the tank and the other is a Whirlfilter® that filters the chemical solution being sprayed.

These need to be cleaned seasonally, or sooner if flow restriction is observed.

**Clean Out Solution Whirlfilter®**

*Refer to Figure 35*

There is one Whirlfilter® on your Great Plains Sprayer. The Whirlfilter® filters the chemical solution being sprayed.

These need to be cleaned seasonally or sooner if flow restriction is observed.

1. Fill the sprayer tank with water and turn the pump on.
2. With the pump running, slowly open the clean-out valve and allow the grit to flow out into a bucket.
   Clean out the solution Whirlfilter® only when the sprayer tank is filled with water and no chemical has been added.
3. Close the clean-out valve and turn off the pump.
4. Dispose of the grit and water in the same manner described on the manufacturer's label of the latest chemical used in the sprayer.

**Clean Out Tank Fill Filter**

![](warning_icon.png)

*CAUTION*

Wear chemical gloves and protective clothing. Although used for adding clean water, the chemical mix in the main tank can back-wash into this assembly.

*Refer to Figure 36*

1. Start with an empty sprayer tank.
2. Position a bucket under the plug (1) in the sump cap (2) of the filter. Remove the plug and allow the grit to fall out.
3. Screw the plug back in using pipe thread sealant to seal the plug.
4. Dispose of the grit and water in the same manner described on the manufacturer's label of the latest chemical used in the sprayer.

If draining the filter does not improve flow:

5. Unscrew the entire sump cap (2). Remove it slowly and save the gasket (3).
6. Remove the filter element (4). Clean or replace it.
7. Re-assemble the filter. No thread sealant is required on the main cap threads.
**Tightening Tank Straps**

*Refer to Figure 37*

The tank straps that wrap around the sprayer tank may become loose after the first few hours of operation. This occurs when the tank settles in the saddle. Polyethylene tanks are especially susceptible to this. Tighten the tank straps to secure the tank.

---

**Shear Bolt Replacement**

*Refer to Figure 38*

Your Great Plains sprayer is equipped with four shear bolts (1), two each side, to help prevent damage to the booms. These are located at the inner boom pivot posts at the ends of the center section. When the boom encounters an obstruction, both bolts on that side fail, allowing the boom to swing back.

If a pair of shear bolts breaks, replace them with a pair of 1/2 x 3-inch Grade 5 bolts. Using a lower grade/class bolt causes nuisance shears. Using a higher grade/class bolt may result in serious equipment damage.

Inspect these bolts at the start of the spraying season to insure the bolts have not been weakened through use or rusting.

Stock a spare nut for each spare shear bolt, as the nut end of the sheared bolt commonly falls away and is difficult to locate.
Pump Maintenance and Repair

The centrifugal pump is designed for long life and service. Through the years, there may be a need to replace the mechanical seal or service some component of the pump. A mechanical seal may weep slightly, but if it starts to drip, the pump will have to be disassembled. Before disassembling the pump, be sure to wash it out with fresh water.

If the pump is leaking, before removing it from the sprayer, run the pump with adequate water in the tank to diagnose the actual pump problem.

Ace Hydraulic Pump Seal Replacement

Refer to Figure 39

Disassembly
1. Remove four 5/16-inch hex head cap screws (19) from rear of motor. Remove motor and coupler.
2. Remove rear internal bearing snap ring (11).
3. Remove four 3/8 x 3/4-inch hex head cap screws (9) from mounting frame (8). Remove volute (2).
4. Remove 3/8-inch lock nut (3) from shaft (16). Insert flat file into impeller vane to hold stationary.

**NOTICE**

Excess torque may cause damage to plastic impellers.

5. Press shaft (16) out of impeller (5) using one 5/16-inch hex head cap screw from step 1. Remove impeller (5), key (15), and rotating seal member (6).
6. Press shaft/bearing assembly out of frame.
7. Remove stationary seal member (17) by prying out with screwdriver or pressing out from motor end of pump housing.
8. Remove O-ring (20) from shaft groove.
   If only replacing the pump seal:
   a. Press the shaft/bearing assembly into frame.
   b. Reinstall rear internal bearing snap ring.
   c. Skip to Assembly step 8.
4. Press bearings off of shaft.
5. Remove forward internal bearing snap ring (11).
Assembly

Refer to Figure 40

1. Install forward internal bearing snap ring (11) in mounting frame (8).
2. Press in forward bearing (12) from rear side of mounting frame (8) to snap ring (11).
3. Install two external shaft retainer rings (13) with spacer (14) between on shaft (16).
4. Press shaft assembly through forward bearing (12) until forward shaft snap ring (13) rests against inner face of forward bearing (12).
5. Press rear bearing (12) over shaft (16).
6. Insert rear internal bearing snap ring (11).
7. Slide rubber slinger (10) over shaft (16) and push back to front bearing (12).
8. Clean old sealant from mounting frame seal bore.
9. Install O-ring (20) in shaft groove.
10. Apply non-hardening Type 2 Permatex or similar under stationary seal flange.
11. Place stationary portion of seal (17) over shaft (16) and press into seal bore cavity. Use 1-3/8-inch ID pipe or PTO adapter to press seal flange evenly on all sides.
12. Install rotating portion of seal (6) over shaft (16) and O-ring (20) by hand. The two polished seal faces should face each other. Avoid contacting polished seal faces.
13. Insert key (15) in keyway. Install impeller (5) on shaft (16).
14. Place lock washer (4) and 3/8-inch lock nut (3) on shaft (16) and tighten nut (3).
15. Replace volute O-ring or gasket (7), volute (2), and four 3/8 x 3/4-inch cap screws (9).
16. Position coupler in pump shaft slot and fill cavity surrounding coupler with grease.
17. Install motor (18) by aligning motor tang and coupler slot. Rotate motor (18) until nameplate faces up.
18. Install four 5/16-inch cap screws (19).
Elevator Slide Adjustment

Refer to Figure 41

The polyethylene slides on the elevator can be adjusted to take out any side-to-side play. Periodically check the slide pads (A) for wear. As the pads wear, tighten 1/2-inch bolts (B) on both sides of elevator frame (C) until pads just touch frame.

Tighten the slides so that there is a minimal amount of play in the elevator.

**NOTICE**

When tightening the slides be sure to keep the elevator slide centered in the elevator mount. If the elevator is adjusted to one side there can be an interference.

Cycle the elevator a few times to ensure there is no binding and that the slides are sufficiently tightened.

---

Quad-Jet Agitators

**DANGER**

Confined space, chemical fume and low oxygen hazards. Review and implement the recommendations of “Tank Entry” on page 57 before performing any work inside the tank.

Refer to Figure 42

The quad-jet agitators are two 4-port nozzle heads in the sprayer tank. A portion of the tank outflow may be recirculated to the quad jets to maintain a constant concentration of materials.

The agitator head is oriented at 45 degrees, with reference to the tank ends, so that the water jets are aimed at the corners of the tank. After tank flushing is completed, check that the ports are pointing to the corners.

If the ports have shifted, re-adjust them. If they require frequent adjustment, remove the assemblies and check for loose fittings.
Tank Entry

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

**DANGER**

*Confined Space Hazard:*

You can be overcome by hazardous fumes very quickly even in an empty tank with the lid open. Oxygen levels may be insufficient. Do not enter a tank for loading or unloading material or for routine cleaning. Never enter a tank without at least one trained and equipped attendant present.

Never enter a tank for any reason unless you fully comply with applicable laws, regulations, rules, agreements, and the instructions in this section. Where applicable laws, regulations, rules, agreements contradict an instruction below, do not follow that instruction.

Depending on use, the sprayer tank may be or become a "permit-required confined space" under U.S. OSHA regulations (29 CFR 1910.146) and similar regulations, statutes, insurance agreements and local business policy. A written policy and permitting process may be required for any tank entry.

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

- agitator nozzle alignment;
- clean-out nozzle repair/replacement; or,
- removal of obstructions not susceptible to fishing or pumping out from the open lid.

Should such a situation arise, observe the following precautions:

1. **Evaluate the hazards**
   Review the material safety data sheets (MSDS) for any chemicals used in the tank since it was last thoroughly cleaned, and the most recent materials even if the tank was subsequently cleaned. Retain the MSDS information for any medical treatment that might be required.

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

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

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

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

6. **Secure the cart**
   Block the cart wheels to prevent movement.

7. **Empty the tank**
   Follow the steps at “Unloading Materials” on page 38. If a blockage makes this impossible, use an external pump line to remove as much material as possible without performing a tank entry. Pump until at least some material is exiting the clean-out port. Leave the clean-out port open.

8. **Clean the tank**
   Perform normal tank flushing, per “Tank and Boom Flush” on page 43. From the outside at the walkboard, power-wash the inside of the tank. Use a mild detergent sprayer. Rinse thoroughly.

9. **Air the tank**
   Leave the tank lid and clean-out door open, and do not commence work until the rinse water has completely evaporated.

10. **Plan the work. Work the plan.**
    Postpone the work if any team members, equipment or other resources are missing, or weather/lighting conditions are not favorable. Terminate and evacuate if any unexpected situations arise.
Lubrication

Elevator Slide

Pads and exposed vertical tube bearing surfaces
Type of Lubrication: Dry graphite or NLGI grade 2 grease
Quantity: coat surface lightly

Swing Arm Weldment

2 grease fittings each side; 4 total
Type of Lubrication: Grease
Quantity: Until resistance is felt

Inner Pivot Tube

2 grease fittings each side (top and bottom); 4 total
Type of Lubrication: Grease
Quantity: Until resistance is felt
Inner Fold Section Base Pivot

1 grease fitting each side; 2 total
Type of Lubrication: Grease
Quantity: Until resistance is felt

Outer Fold Section Base Pivot

2 grease fittings each side; 4 total
Type of Lubrication: Grease
Quantity = Until resistance is felt

Breakaway Base Pivot

2 grease fittings each side; 4 total
Type of Lubrication: Grease
Quantity = Until resistance is felt
End Wing Weldment and Breakaway Boom

2 grease fittings each side; 4 total
Type of Lubrication: Grease
Quantity: Until resistance is felt

Transport Wheel Bearings

Seasonally

2 bearings each axle; 4 total
Type of Lubrication: Grease
Quantity: repack
Options

Chemical Inductor

The chemical inductor provides a safe and easy way to put chemical into the tank, which keeps an operator from having to climb up on the walkboard and dispense the chemical into the tank from the tank lid. Placing the chemical into the inductor tank allows it to transfer the chemical into the sprayer tank.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Inductor Assembly</td>
<td>502-158A</td>
</tr>
</tbody>
</table>

Foam Marker

The High Volume Foam Marker is specifically for extreme residue conditions. It can be adjusted to produce a continuous stream of foam.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foam Marker Kit 90 ft.</td>
<td>502-147A</td>
</tr>
</tbody>
</table>
Raven G1 Autoboom

The Raven Autoboom is a system that helps automatically adjust the height of the boom to changing terrain.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1 Autoboom with Cylinders (2006-)</td>
<td>510-038A</td>
</tr>
<tr>
<td>Open Center Conversion Kit</td>
<td>833-422C</td>
</tr>
</tbody>
</table>

Pumps

The standard TSF660 does not include a pump. Optional hydraulic pump is available.

Ace Hydraulic Pump

If ordered with a new TSF660 (Option 35), the pump is pre-installed prior to delivery.

<table>
<thead>
<tr>
<th>Description</th>
<th>Option</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUMP - TS HIGH VOL HYD</td>
<td>35</td>
<td>507-106A</td>
</tr>
</tbody>
</table>

Pump kit weight: 40 lbs (18 kg)

Ace Flow Limiter

On tractors with load sensing closed center hydraulic systems, this device limits the flow of oil to the Ace motor and prevents failures due to misapplication. Your Great Plains dealer can assist with installation of the flow limiter.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOW LIMITER VALVE - ACE PUMP</td>
<td>829-125C (2006-)</td>
</tr>
<tr>
<td>FLOW LIMITER VALVE - ACE PUMP</td>
<td>829-131C (2007+)</td>
</tr>
</tbody>
</table>

Gauge Protector

This fitting protects the control panel pressure gauge from corrosive chemicals added to the main tank.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAUGE PROTECTOR ASSY</td>
<td>507-034V</td>
</tr>
</tbody>
</table>
Open Center Hydraulic Kit

2007+ sprayers require a tractor with closed center hydraulics. Use this kit to convert the sprayer for use with an open center tractor.

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FASSE LIVE HYD OPEN CTR KIT</td>
<td>833-427C</td>
</tr>
</tbody>
</table>

Speed Sensors

The standard TSF660 does not include a speed sensor, which is required by the Auto-Control system to regulate material rate based on current speed. Optional sensors kits detect speed via wheel rotation or radar ground speed.

If the tractor already has a speed sensor, a “Y” cable is available to share its signal with the Raven SCS 440 controller. Otherwise, order one of the following:

<table>
<thead>
<tr>
<th>Description</th>
<th>Option</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSF RADAR KIT</td>
<td>43</td>
<td>509-289A</td>
</tr>
<tr>
<td>TSF WHEEL SENSOR MNT KIT</td>
<td>42</td>
<td>509-288A</td>
</tr>
</tbody>
</table>

Your Great Plains dealer can assist you with installation
Appendix - Reference Information

Specifications and Capacities

<table>
<thead>
<tr>
<th>Model</th>
<th>TSF660</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom Width</td>
<td>60 fee</td>
</tr>
<tr>
<td>Nozzle Spacing</td>
<td></td>
</tr>
<tr>
<td>20 inches</td>
<td>30 inches</td>
</tr>
<tr>
<td>Number of Nozzles</td>
<td></td>
</tr>
<tr>
<td>36 (20 inch spacing)</td>
<td></td>
</tr>
<tr>
<td>25 (30 inch spacing)</td>
<td></td>
</tr>
<tr>
<td>Wheel Spacing</td>
<td>60 inches to 120 inches</td>
</tr>
<tr>
<td>Transport Height</td>
<td>12 feet 3 inches</td>
</tr>
<tr>
<td>Transport Width</td>
<td>9 feet (wheels in)</td>
</tr>
<tr>
<td>11 feet 3 inches (wheels out)</td>
<td></td>
</tr>
<tr>
<td>Working Width</td>
<td>63 feet</td>
</tr>
<tr>
<td>Length</td>
<td>19 feet 10 inches</td>
</tr>
<tr>
<td>Ground Clearance</td>
<td>28 inches</td>
</tr>
<tr>
<td>Approximate Empty Weight</td>
<td>6950 pounds</td>
</tr>
<tr>
<td>Approximate Full Weight (Full)</td>
<td>12,400 pounds</td>
</tr>
<tr>
<td>Wheel/Tire Size</td>
<td>320/85R38</td>
</tr>
<tr>
<td>Main Tank Capacity</td>
<td>650 gallons</td>
</tr>
<tr>
<td>Pump Capacity</td>
<td>90 gpm @30psi</td>
</tr>
<tr>
<td>Flush and Rinse Capacity</td>
<td>50 gallons</td>
</tr>
<tr>
<td>Foam Marker Capacity (Option)</td>
<td>25 gallons</td>
</tr>
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</table>

Tire Inflation Chart

<table>
<thead>
<tr>
<th>Tire Size</th>
<th>Inflation psi</th>
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<tbody>
<tr>
<td>13.6 x 38 6 ply tractor tread</td>
<td>22</td>
</tr>
<tr>
<td>320/85R 38 Radial</td>
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</tr>
</tbody>
</table>

Tire Warranty Information

All tires are warranted by the original manufacturer of the tire. Tire warranty information is found in the brochures included with your Operator's and Parts Manuals or online at the manufacturer's websites listed below. For assistance or information, contact your nearest Authorized Farm Tire Retailer.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firestone</td>
<td><a href="http://www.firestoneag.com">www.firestoneag.com</a></td>
</tr>
<tr>
<td>Gleason</td>
<td><a href="http://www.gleasonwheel.com">www.gleasonwheel.com</a></td>
</tr>
<tr>
<td>Titan</td>
<td><a href="http://www.titan-intl.com">www.titan-intl.com</a></td>
</tr>
</tbody>
</table>
## Torque Values

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Bolt Head Identification</th>
<th>Bolt Size</th>
<th>Bolt Head Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>in-tpi(^a)</td>
<td>Grade 2</td>
<td>Grade 5</td>
<td>Grade 8</td>
</tr>
<tr>
<td></td>
<td>N-m(^b)</td>
<td>ft-lb(^d)</td>
<td>N-m</td>
</tr>
<tr>
<td>5/8-20</td>
<td>7.4</td>
<td>5.6</td>
<td>11</td>
</tr>
<tr>
<td>5/8-28</td>
<td>8.5</td>
<td>6.5</td>
<td>13</td>
</tr>
<tr>
<td>5/16-18</td>
<td>15</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>5/16-24</td>
<td>17</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>3/16-16</td>
<td>27</td>
<td>20</td>
<td>42</td>
</tr>
<tr>
<td>3/16-24</td>
<td>31</td>
<td>22</td>
<td>47</td>
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<td>105</td>
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<td>70</td>
<td>150</td>
</tr>
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<td>79</td>
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<td>275</td>
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<td>1-1/8-12</td>
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<td>1-1/4-7</td>
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<td>500</td>
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<td>655</td>
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<td>745</td>
<td>2270</td>
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<tr>
<td>1-1/2-12</td>
<td>1330</td>
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<td>2970</td>
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<table>
<thead>
<tr>
<th>M 5 X 0.8</th>
<th>N-m</th>
<th>ft-lb</th>
<th>N-m</th>
<th>ft-lb</th>
<th>N-m</th>
<th>ft-lb</th>
</tr>
</thead>
<tbody>
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<td>15</td>
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<td>12</td>
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<td>19</td>
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<td>13</td>
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<td>93</td>
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<td>M12 X 1.5</td>
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<td>44</td>
<td>95</td>
<td>70</td>
<td>130</td>
<td>97</td>
</tr>
<tr>
<td>M12 X 1</td>
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<td>66</td>
<td>105</td>
<td>77</td>
<td>145</td>
<td>105</td>
</tr>
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<td>M14 X 2</td>
<td>92</td>
<td>68</td>
<td>145</td>
<td>105</td>
<td>200</td>
<td>150</td>
</tr>
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<td>M14 X 1.5</td>
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<td>73</td>
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<td>160</td>
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<tr>
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<td>105</td>
<td>225</td>
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<td>315</td>
<td>230</td>
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<td>115</td>
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<tr>
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<td>195</td>
<td>145</td>
<td>310</td>
<td>230</td>
<td>405</td>
<td>300</td>
</tr>
<tr>
<td>M18 X 1.5</td>
<td>220</td>
<td>165</td>
<td>350</td>
<td>260</td>
<td>485</td>
<td>355</td>
</tr>
<tr>
<td>M20 X 2.5</td>
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<td>205</td>
<td>440</td>
<td>325</td>
<td>610</td>
<td>450</td>
</tr>
<tr>
<td>M20 X 1.5</td>
<td>310</td>
<td>230</td>
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<td>480</td>
<td>900</td>
<td>665</td>
</tr>
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<td>M24 X 3</td>
<td>480</td>
<td>355</td>
<td>760</td>
<td>560</td>
<td>1050</td>
<td>780</td>
</tr>
<tr>
<td>M24 X 2</td>
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<td>390</td>
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<td>610</td>
<td>1150</td>
<td>845</td>
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<td>M30 X 3.5</td>
<td>960</td>
<td>705</td>
<td>1510</td>
<td>1120</td>
<td>2100</td>
<td>1550</td>
</tr>
<tr>
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<td>1950</td>
<td>3660</td>
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<td>M36 X 2</td>
<td>1880</td>
<td>1380</td>
<td>2960</td>
<td>2190</td>
<td>4100</td>
<td>3220</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.
Warranty

Great Plains (a division of Great Plains Manufacturing, Inc.) warrants to the original purchaser that this Great Plains unit will be free from defects in material and workmanship for a period of one year from the first use date when used as intended and under normal service and conditions for personal use; ninety days for custom/commercial or rental use. This Warranty is limited to the replacement of any defective part by Great Plains 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.

The following items and/or conditions are **not covered under warranty**: failures resulting from abuse or misuse of the equipment, failures occurring as a result of accidental damage or acts of God, failures resulting from alterations or modifications, failures caused by lack of normal maintenance as outlined in the operator’s manual, repairs made by non-authorized personnel, items replaced or repaired due to normal wear (such as wear items and ground engaging components), repeat repair due to improper diagnosis or repair by the dealer, temporary repairs, service calls and/or mileage to and from customer location, overtime premium, or unit hauling expenses. The warranty may be voided if the unit is towed at speeds in excess of 20 miles per hour (32 kilometers per hour), or is used in soils with rocks, stumps, or other obstructions.

Great Plains reserves the right to make changes in materials or design of the product at any time without notice. The warranty shall not be interpreted to render Great Plains liable for damages of any kind, direct or consequential or contingent to property. Furthermore, Great Plains shall not be liable for damages resulting from any cause beyond its control. This warranty does not extend to crop loss, losses caused by planting or harvest delays or any expense or loss of 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 the unit is registered with Great Plains within 10 days from the date of the original purchase.
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