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

Illustrations may show optional equipment not supplied with standard unit, or may show NP30L, NP40L or NP3000 models where the topic function is identical.
Machine Identification

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

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

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<td><strong>Accessories</strong></td>
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Dealer Contact Information

Name: __________________________

Street: __________________________

City/State: __________________________

Telephone: __________________________

Email: __________________________

Dealer’s Customer No.: __________________________

⚠️ WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov
# Table of Contents

## Important Safety Information
- Anhydrous Ammonia Safety .............................................. 1
- Safety Decals ........................................................................ 8

## Introduction
- Description of Unit ................................................................. 18
- Document Family ....................................................................... 18
- Models Covered ......................................................................... 18
- Intended Usage ........................................................................... 18
- Using This Manual ..................................................................... 19
- Owner Assistance ....................................................................... 20
- Further Assistance ...................................................................... 20

## Metering Overview
- Anhydrous Flow Diagram ....................................................... 21
- Systems Overview ....................................................................... 22

## Preparation and Setup
- Initial Setup ............................................................................. 28
- Post-Delivery/Seasonal Setup ................................................... 28
- Get Expert Advice ..................................................................... 29
- Pre-Application Setup ............................................................... 29
- Hitching Tractor to Applicator .................................................. 30
  - Pull-Type Hitching .................................................................... 30
  - 2- and 3-Point Hitching ............................................................ 31
  - Emergency Shut-Off Rope ....................................................... 32
- Electrical Hookup ........................................................................ 34
- Hydraulic Hose Hookup ............................................................ 35
- Raise Parking Stands (2- and 3-Point Only) .............................. 36
- Leveling Applicator .................................................................... 38
  - Set Application Depth .............................................................. 38
  - 3-Point Leveling ........................................................................ 38
  - 2-Point Front-to-Back Level (Spacers) ........................................ 38
  - Pull-Type Hitch Leveling .......................................................... 39
- Meter Setup ................................................................................ 40
- Wash Water .................................................................................. 43
- Sealer Setup (Option) ................................................................. 43

## Applicator Operating Instructions
- Pre-Start Checklist ..................................................................... 44
  - Applicator Locks ...................................................................... 45
  - Lift-Assist Locks ....................................................................... 45
  - Front Caster Wheel Lock Channels .......................................... 46
  - Wing Lock Channels ................................................................. 47
  - Wing Lock Pins ......................................................................... 47
  - Outer Wing Fold Latches .......................................................... 48
  - Solenoid Valves ......................................................................... 48
  - 2013+ NP40A 2-Point Fold/Lift Circuit ....................................... 49
- FOLD / FIELD Switch ............................................................... 49
- Raising/Lowering Applicator ..................................................... 50
  - Weight-Transfer Shut-Off Valve ............................................... 50
  - Raise/Lower Pull-Type ............................................................. 51
  - Re-Phasing Pull-Type Lift System ............................................ 51
  - Raise/Lower 3-Point ............................................................... 51
  - Raise/Lower 3-Section and 2012- 2-Point ................................ 53
  - Raise/Lower 2013+ 5-Section .................................................. 55
- Unfolding and Folding .............................................................. 59
  - Unfolding and Folding Pull-Type ............................................ 59
  - Unfolding and Folding 3-Point ............................................... 60
  - Unfolding and Folding 3-Section and 2012- 2-Point .............. 61
  - 5-Section .................................................................................. 61
- Transport ..................................................................................... 66
- Final Applicator Setup .............................................................. 67
  - Nurse Tanks ............................................................................. 68
- Safing Applicator Before Cart Hitch .......................................... 68
  - Close Line Valves ..................................................................... 68
  - Check Hydrostatic Relief Valves .............................................. 69
  - Close Bleed Valves ................................................................... 69
  - Check Hose Discharged .......................................................... 69
- Hitching Tank .............................................................................. 70
- Mechanical Cart Hitching ........................................................ 70
- Making Nurse Tank Connections .............................................. 71
  - Connect Cart Hose ................................................................. 72
- Dry Run ....................................................................................... 72
- Pass Planning .............................................................................. 73
  - Start of Pass Planning ............................................................. 73
- Monitor Operation ....................................................................... 74
- Field Application ......................................................................... 74
  - Starting NH₃ Tank Flow ........................................................... 74
  - Starting Application ............................................................... 75
- Field Turns .................................................................................. 76
- Stopping Application ................................................................... 77
- Breakaway Event ........................................................................ 78
- Unhitching Nurse Tank .............................................................. 80
- Exchanging Nurse Tanks ........................................................... 80
- Final Nurse Tank Unhitch ........................................................... 80
- Field Set-Up Checklists ............................................................. 81
- Field Operation Checklists ........................................................ 82
- Short-Term Parking ..................................................................... 83
- Long-Term Storage .................................................................... 83

## Adjustments
- Frame Height Adjustments ....................................................... 84

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Registered Trademarks of Great Plains Manufacturing, Inc. include: Air-Pro, Clear-Shot, Discovator, Great Plains, Land Pride, MeterCone, Nutri-Pro, Seed-Lok, Solid Stand, Terra-Guard, Turbo-Chisel, Turbo-Chopper, Turbo-Max, Turbo-Till, Ultra-Till, Whirlfilter, and Yield-Pro. Brand and Product Names that appear and are owned by others are trademarks of their respective owners.
Important Safety Information

Anhydrous Ammonia Safety

Your Nutri-Pro® applicator includes several manuals in addition to this Operator manual that contain crucial safety information:

- 407-551M Using Anhydrous Ammonia Safely
- 016-0159-403 Raven AccuFlow™ Operator manual
- 016-0159-831 Raven SCS 450 Installation, Operation and Service manual
- FVC062 Squibb-Taylor Flo-Max™ manual

Read all of these manuals. If you do not have the current edition of one or more, contact Great Plains for a replacement copy.

**EPA EHS (Extremely Hazardous Substance):**

Despite the common odor, anhydrous ammonia properties are dramatically different from those of household ammonia (dilute ammonium hydroxide) cleaning solutions. An uncontrolled release of NH₃ anhydrous ammonia can easily be fatal or cause permanent disabling injury.

If you are new to NH₃ operations, study everything you can about this chemical and how to use it safely.

**Suffocation, Blinding, Burning, Freezing, Disabling and Disfigurement Hazards:**

Your life and health, the lives and health of your workers and community, the continued commercial availability of anhydrous ammonia, and continuation of agricultural NH₃ transport exceptions depend on you conducting meticulously careful operations.

Read All Manuals

The Anhydrous Safety manual (407-551M), this manual, the meter manual and the breakaway coupler manual are required reading for safe operations. All operators of this equipment must read these manuals.

Even if you are an experienced anhydrous ammonia operator, read the "Using Anhydrous Ammonia Safely" manual (407-551M).

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a. AccuFlow™ is a trademark of Raven Industries.

b. Flo-Max™ is a trademark of Squibb-Taylor, Inc.
Look for Safety Symbol

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

Be Aware of Signal Words

Signal words designate a degree or level of hazard seriousness.

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

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

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

Prepare for Emergencies

▲ Be prepared if a fire starts.
▲ Keep a first aid kit and fire extinguisher handy.
▲ Keep emergency numbers for doctor, ambulance, hospital and fire department near phone. Know the reporting requirement for spills or releases of the chemicals you are using. Have contact numbers available.
▲ For anhydrous ammonia operations, have additional contact information for:
  • national response center
  • regional (state) response center
  • local response center
▲ If a fire threatens an anhydrous ammonia tank, evacuate the area. The tank may heat up faster than the relief valve can vent the rising pressure, resulting in a catastrophic gas release and possibly an explosion.

Be Familiar with Safety Decals

▲ Read and understand “Safety Decals” on page 8, thoroughly.
▲ Read all instructions noted on the decals.
▲ Keep decals clean. Replace damaged, faded and illegible decals.
Wear Protective Equipment (PPE)

▲ Wear clothing and equipment appropriate for the job. Avoid loose-fitting clothing.
▲ Waterproof, wide-brimmed hat
▲ Face shield, goggles or full face respirator.
▲ 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.
▲ See manual 407-551M for specific requirements and recommendations for NH₃ PPE.
▲ Goggles with side shields or a full face respirator are 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 conventional liquid fertilize label specifies another type of respirator.
▲ Waterproof, unlined gloves. Neoprene is recommended.
▲ Cloth coveralls/outer clothing changed daily; waterproof items if there is a chance of becoming wet with spray.
▲ Waterproof apron
▲ 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.
Use Safety Chains
(For all nurse tanks and drawn fertilizer applicators)

▲ Use safety chains to help control drawn machinery should it separate from tractor draw-bar.
▲ Use chain with a strength rating equal to or greater than the gross weight of towed machinery.
▲ Attach applicator chain to tractor draw-bar support or specified anchor location. Attach nurse tank chain(s) to anchors provided on applicator. Allow only enough slack in chain for turns.
▲ Replace chain if any links or end fittings are broken, stretched or damaged.
▲ Do not use safety chain for towing.
▲ Current regulations require two chains on anhydrous ammonia nurse tank carts.

Avoid High Pressure Fluids
Escaping fluid under pressure can penetrate the skin, causing serious injury. This fertilizer applicator requires a Power-Beyond port, which is always under pressure when the tractor is running.

▲ Avoid the hazard by relieving pressure at other remotes, and shutting down tractor before connecting, disconnecting or inspecting hydraulic lines.
▲ Use a piece of paper or cardboard, NOT BODY PARTS, to check for suspected leaks.
▲ Wear protective gloves and safety glasses or goggles when working with hydraulic systems.
▲ If an accident occurs, seek immediate medical assistance from a physician familiar with this type of injury.

Minimize Radiation Exposure
The optional DICKEY-john® RVS II and RVS III Radars are intentional radiators of RF energy. Although its radiated energy level is far below the limits set by EN 61010-1:1993 A2:1995-Chapter 12.4, it is advisable not to look directly into the face of the unit.

The radar must radiate toward the ground and at least 20 cm (8 inches) away from a human during use to comply with the RF human exposure limits as called out in FCC 47 CFR Sec.2.1091. DO NOT RE-MOUNT OR USE THE RADAR IN A MANNER INCONSISTENT WITH ITS DEFINED USE.

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 applicators can create a hazard when driven on public roads. They are difficult to see, especially at night.

- Use flashing warning lights and turn signals whenever driving on public roads.
- Use lights and devices provided with applicator.

Transport Machinery Safely
Maximum transport speed for applicator is 20 mph (32 kph), 13 mph (22 kph) in turns. Some rough terrains require a slower speed. Sudden braking can cause a towed load to swerve and upset.

- Tow nurse tank separately. Do not tow a nurse tank in train with the applicator on public roads.
- Never park an anhydrous ammonia tank on public roads or anywhere near sites with high occupancy or high-risk populations, such as shopping areas, events, schools, hospitals, retirement communities, etc.
- Avoid transporting an anhydrous ammonia tank through populated areas.
- Do not tow a pull-type or 2-point applicator or nurse tank that, when fully loaded, weighs more than 1.5 times the weight of towing vehicle.
- Do not transport a 3-point applicator that exceeds the capacity or ballasting of the tractor. There may not be enough front wheel traction for safe steering.
- Carry reflectors or flags to mark fertilizer applicator 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 136.
- Do not exceed 20 mph. 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.
- Reduce speed on rough roads.
- Comply with national, regional and local laws.
- Do not fold or unfold the fertilizer applicator while the tractor is moving.
Remain Clear of Overhead Lines

▲ If the fertilizer applicator contacts a power line, lethal voltage may be present on all metal parts. At higher voltage, the applicator does not need to be in line contact for the hazard to exist. Maintain at least 10 foot (3 m) clearance.

▲ Electrocution can occur without direct contact between the energized fertilizer applicator and a person near the fertilizer applicator.

▲ Watch for sagging, damaged or low electrical lines. The folded fertilizer applicator could contact lines lower than 13 foot (4 m). Overhead lines at farm structures are a particular hazard. An incorrectly folded applicator is at risk from lines lower than 22 foot (7 m).

▲ Watch for all electrical lines during folding and unfolding operations. Use a spotter during folding and unfolding. Know the location and height of all lines during transport and in fields.

▲ If an electrical hazard is observed while on the ground near the applicator, hop at least 100 feet (30 m) away with both feet together and summon professional help. At higher voltage, lethal voltage gradients can also be present at the soil surface.

▲ Consult your tractor manual for advice on how to respond to an electrical hazard event while in the cab.

Tires Not a Step

Do not use front caster tires, gauge wheel tires, or lift-assist tires as steps. A tire could spin underfoot, resulting in a fall onto the applicator or ground, possibly causing serious injury.

▲ The front caster wheels can be in poor ground contact at any time, even with the fertilizer applicator lowered in the field. They can appear to be in ground contact, and spin easily, in multiple conditions.

▲ The lift-assist tires can be in poor ground contact, or out of ground contact, whenever the fertilizer applicator is lowered.

Shutdown and Storage

▲ Lower fertilizer applicator, put tractor in park, turn off engine, and remove the key.

▲ Secure fertilizer applicator using locks and supports provided.

▲ Detach and store fertilizer applicator in an area where children normally do not play.

▲ Park an anhydrous ammonia applicator downwind of occupied areas until it is purged of NH₃ residues.

▲ Do not leave an NH₃ nurse tank unattended.
Tire Safety

Tire changing can be dangerous. Employ 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 fertilizer applicator functions.

▲ Operate machinery from the driver’s seat only.

▲ Do not leave fertilizer applicator unattended with tractor engine running.

▲ Do not stand between tractor and applicator, or applicator and nurse tank, 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 fertilizer applicator. Make sure all persons are clear of working area.
Safety Decals

Safety Reflectors and Decals

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

- 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.

818-055C
Slow Moving Vehicle Reflector
On a mount attached to the transport rest assembly; 1 total

838-266C
Red Reflectors
On each light bracket, and back face, outside ends of the top transport rest tube; 4 total
838-265C  
**Amber Reflectors**

On front face of front tool bar near wing hinge;  
Pull-Type (shown):  
On outside face of lift-assist brackets;  
2-Point:  
On the outside faces of casters;  
3-Point Models:  
on the outside faces of lift assist brace weldments;  
4 or 6 total  

---

838-267C  
**Daytime Reflectors**

On each light bracket,  
Back face, outside ends of the top transport rest tube;  
4 total  

---

**Raven 039-0159-034**  
**Danger: Ammonia**

On front or back side of Raven AccuFlow™;  
2 or 4 total  

Order replacement from Raven Industries.
115527-01
Danger: Bleed System
On top of CDS-John Blue Impellicone® flow divider; 1 total

818-323C
Danger: Possible Chemical Hazard
On decal mount near Flo-Max™ coupler: 1 total

818-557C
Danger: Peligro: Ingles
(in Spanish, warning users to seek translation assistance if they do not speak English)
Pull-Type: On top of left tongue tube near hitch, 2-Point/3-Point: On front face of frame tube, left of hitch; 1 total
818-590C
Danger: Hitch Crush
On front of frame tube; 2 total

838-599C
Danger: Electrocution
On frame tube near wing hinges; 2 total

848-534C
(Squibb-Taylor FM125-2000)
Danger: Safety Coupler
On decal mount near Flo-Max™ coupler; 1 total
This decal summarizes the mechanical procedure for coupler re-connection after a breakaway event. Rely on these instructions only if the Squibb-Taylor Flo-Max™ manual is not available. See "Breakaway Event" on page 78.
**WARNING**

**EXCESSIVE SPEED HAZARD**

To Prevent Serious Injury or Death:

- Do not exceed 25 mph maximum transport speed.
- Each vehicle to control and for machine damage can result.

---

**818-337C**  
**Warning: Speed**  
On front face of front tool bar, right of center;  
1 total

---

**818-339C**  
**Warning: High Pressure Fluid Hazard**  
Pull-Type: On top of left tongue tube near hitch;  
1 total

---

**818-437C**  
**Warning: High Pressure Fluid Hazard**  
On front face of front tool bar, left of center,  
Pull-Type: On mount of each front caster wheel,  
Pull-Type (shown) and 2-point: on each lift-assist mount;  
1, 3 or 7 total
848-551C
Warning: Towing
On decal mount near Flo-Max™ coupler:
1 total
See “Transport” on page 66 and “Hitching Nurse Tank” on page 70 for further information.

**WARNING: HAZARDOUS FLUID CAN BECOME TRAPPED IN VALVE BALL. BEFORE DIS-ASSEMBLING OR SERVICING, BALL VALVE MUST BE IN OPEN POSITION.**

Raven: (no part number)
Warning: Ball Valve
On the handle of each emergency shut-off ball valve of applicators manufactured prior to 2011;
1 or 2 total
Unvented ball valves can trap fluid inside the ball if closed with the line fully charged. Ball valves shipped in 2011 and later have a bleed orifice on the downstream side of the valve ball and do not require this decal.
See “Avoid Ball Traps” on page 114.

**CAUTION**

Raven 039-0159-035
Caution: Ammonia
On front or back side of Raven AccuFlow™;
2 or 4 total
Order replacement from Raven Industries.
818-398C
Caution: Tires Not a Step
2-/3-Point: outside faces of manual gauge wheel arms; 2 total

818-587C
Caution: Read Operator’s Manual
On front face of front tool bar, right of center; 1 total

818-719C
Caution: Read Operator’s Manual
On front face of front tool bar, left of center; 1 total
838-092C
Caution: Tire Pressure and Bolt Torque
On wheels with 265/70B16.5 (10-16.5) NHS 8-Ply tires; 0, 2 or 6 total

838-380C
Caution: Transport Locks
Pull-Type: on mount of each front caster wheel, Pull-Type (shown) and 2-point: on mount of each lift-assist; 0, 2 or 6 total
838-595C
Caution: Tire Pressure and Bolt Torque
On gauge wheel arms with 20.5x8.0 10-Ply Load rating E 2-Point tires; 0 or 2 total

848-846C
Caution: Tire Pressure and Bolt Torque
On wheels with 10-16.5 NHS 10-Ply tires; 0, 2 or 6 total
**858-021C**

**Caution: Tire Pressure and Bolt Torque**

On wheels with 12-16.5 NHS 14-Ply tires; 0, 2 or 6 total

- Maximum inflation pressure of tires is 90 psi.
- Torque wheel bolts to 300 ft-lb.

---

**848-539C**

**General Safety: First Aid Water**

On left and right sides of the wash water tank; 2 total

See “Ammonia Emergency Action” in the “Using Anhydrous Ammonia Safely” manual (407-551M), and “Wash Water” on page 43.
Great Plains welcomes you to its growing family of new product owners. The 30- and 40-Foot NH₃ (Anhydrous Ammonia) Applicators (NP30A or NP40A) 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.

**Models Covered**

**Anhydrous Ammonia Models**

- NP30A-11C30 30-Foot, 11-Row, 30 inch, NH₃ coulter
- NP30A-11R30 30-Foot, 11-Row, 30 inch, Rigid knife
- NP30A-11S30 30-Foot, 11-Row, 30 inch, Spring knife
- NP30A-12C30 30-Foot, 12-Row, 30 inch, NH₃ coulter
- NP30A-12R30 30-Foot, 12-Row, 30 inch, Rigid knife
- NP30A-12S30 30-Foot, 12-Row, 30 inch, Spring knife
- NP30A-13C30 30-Foot, 13-Row, 30 inch, NH₃ coulter
- NP30A-13R30 30-Foot, 13-Row, 30 inch, Rigid knife
- NP30A-13S30 30-Foot, 13-Row, 30 inch, Spring knife
- NP30A-18R20 30-Foot, 18-Row, 20 inch, Rigid knife
- NP30A-18S20 30-Foot, 18-Row, 20 inch, Spring knife
- NP30A-25C15 30-Foot, 25-Row, 15 inch, NH₃ coulter
- NP40A-15C30 40-Foot, 15-Row, 30 inch, NH₃ coulter
- NP40A-15R30 40-Foot, 15-Row, 30 inch, Rigid knife
- NP40A-15S30 40-Foot, 15-Row, 30 inch, Spring knife
- NP40A-16C30 40-Foot, 16-Row, 30 inch, NH₃ coulter
- NP40A-16R30 40-Foot, 16-Row, 30 inch, Rigid knife
- NP40A-16S30 40-Foot, 16-Row, 30 inch, Spring knife
- NP40A-17C30 40-Foot, 17-Row, 30 inch, NH₃ coulter
- NP40A-17R30 40-Foot, 17-Row, 30 inch, Rigid knife
- NP40A-17S30 40-Foot, 17-Row, 30 inch, Spring knife
- NP40A-22R20 40-Foot, 22-Row, 20 inch, Rigid knife
- NP40A-22S20 40-Foot, 22-Row, 20 inch, Spring knife
- NP40A-25R20 40-Foot, 25-Row, 20 inch, Rigid knife
- NP40A-25S20 40-Foot, 25-Row, 20 inch, Spring knife
- NP40A-31C15 40-Foot, 31-Row, 15 inch, NH₃ coulter

**Intended Usage**

Use the NP30A or NP40A Fertilizer Applicator to apply liquid anhydrous ammonia. Do not modify Great Plains-provisioned components, or install aftermarket components, except as authorized or recommended by Great Plains.
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.

**NOTICE**

A crucial point of information related to the preceding topic. Read and follow the directions to remain safe, avoid serious damage to equipment and ensure desired field results.

Note: Useful information related to the preceding topic.

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. An orientation rose in some line art illustrations shows the directions of: Up, Back, Left, Down, Front, Right.

A consistent system of callouts is used for most applicator and nurse tank cart components.

- Callouts in the range \[A_{11}\text{ to } A_{49}\] refer to Nutri-Pro™ NH₃ system components.
- Callouts in the range \[A_{51}\text{ to } A_{58}\] refer to nurse tank cart components. See 407-551M for full list.
Owner Assistance

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

Refer to Figure 2 and Figure 3

Your machine’s parts were specially designed and should only be replaced with Great Plains specified parts. Always use the serial and model number when ordering parts from your Great Plains dealer.

For 2013 and later 5-section applicators, the serial number plate is located on the center section, on the front face of the left front fold cylinder mount.

On 3-section applicators, and 2012 and earlier 5-section models, the serial-number plate is located on the left face of the top 3-point hitch weldment.

Record your NP30A or NP40A Fertilizer Applicator 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 NP30A, NP40A. 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.
Metering Overview

Anhydrous Flow Diagram

Single-Cooler Configuration - see pages 144 through 147 for dual-cooler and single-section.

Callout numbers A11 through A86 identify the same applicator and cart components throughout this manual.

Legend:
- Liquid NH₃
- NH₃ Vapor
- Direction of Flow
- Vapor Flow
- Exception Flow

Figure 4
Anhydrous Ammonia (NH₃) Plumbing (Single-Cooler w/ Section Control)
Systems Overview

This list describes a single-cooler system. A dual-cooler system has two of components A11 through A24, and two additional dual-tube knives or tines A49. 

Refer to Figure 4 on page 21

A11. Acme cap

Suffocation, Blinding and Burning Hazards:
See “Making Nurse Tank Connections” on page 71, for safe opening procedure.

This captive cap protects the inlet when no nurse tank is connected. NH₃ might be sealed behind this cap.

A12. Acme inlet

The nurse tank hose coupler A57 connects here and must have 13/4-4 female Acme swivel coupler. See page 71 for nurse tank connection.

A13. Coupler Inlet Bleed Valve

Suffocation, Blinding and Burning Hazards:
See “About Bleed Valves” on page 32.

This fitting is carefully opened at normal and abnormal disconnects, to bleed NH₃ liquid and vapor from the hoses (or to bleed just the nurse tank hose upon breakaway). It is also opened prior to Acme cap removal to verify that the line is discharged. See “Making Nurse Tank Connections” on page 71, “Unhitching Nurse Tank” on page 80 and “Breakaway Event” on page 78.

A14. Breakaway Coupler

DANGER

Upon Event: Probable Chemical Hazard:
See “Breakaway Event” on page 78.

This assembly is designed to separate and seal the lines if between 300 to 400 pounds of pull force is applied to the nurse tank hose. In normal operations, this never happens.

Should the hitch fail, and both safety chains fail, or an operator makes serious basic safety errors, the breakaway separates to protect the hoses from rupture. Spring-loaded checks inside the breakaway seal both ends of the now-broken connection. If the line was charged, 60 cc of liquid NH₃ is released on breakaway.

Resetting a parted breakaway coupler is a complex operation requiring tools. Consult the breakaway manual for details. More significant matters are safing the applicator and nurse tank, then correcting the cause of the breakaway. See “Breakaway Event” on page 78.

A15. Breakaway Hydrostatic Relief Valve

In normal operation, this valve never activates. It is designed to open at 375 psi, well above the 250-265 psi operating pressure of the nurse tank’s main pressure relief valve. Operator action is periodic inspection, and to replace this hydrostatic relief valve, a time-dated part, when it reaches the end of its operating life (see page 121). See “Hydrostatic Relief Valve Maintenance” on page 119 for maintenance.

Valve function: when operating valves are closed on both sides of the breakaway (or on just the applicator side upon a breakaway event), NH₃ can be trapped in the breakaway coupler. As the NH₃ warms, it could create dangerously high pressure. This relief valve opens to vent excess pressure.

---

a. Acme refers to the ANSI/ASME B1.5-1997 screw thread, which has a trapezoidal thread profile.
A16. Coupler Outlet Bleed Valve

Suffocation, Blinding and Burning Hazards:
See “About Bleed Valves:” on page 32.

This fitting is kept closed in normal operations. When the breakaway is properly coupled, the inlet bleed valve A13 bleeds the entire assembly, and applicator supply hose. On breakaway, this valve is used to bleed the applicator side of the disconnection. See “Breakaway Event” on page 78.

A17. Supply Hose

This connects the breakaway coupler to the emergency shut-off valve. Operator action is to replace this hose, a time-dated part, when it reaches the end of its operating life (see page 121).

A18. Emergency Shut-off Valve

The handle of this valve has a rope which is routed to the tractor cab (see page 32). Closing this valve stops NH₃ flow to the cooler, metering system and rows. There can still be a substantial amount of NH₃ in the system, for some time, with this valve closed. See the “Using Anhydrous Ammonia Safely” manual (407-551M) for emergency operation.

If the handle has a warning decal (page 13), the ball may have a cavity that can contain a hazardous amount of NH₃ if closed with the line full.

A19. Strainer

This filter contains a 20 mesh screen and two ceramic magnets to remove debris from the NH₃ flow.

A20. Strainer Magnets

These capture ferrous metal debris of any size. They need to be cleaned every 4 to 5 tank loads. See page 124.


For effective application, NH₃ needs to remain in the liquid state until released underground. This is accomplished by refrigeration. Some of the flow is tapped A32, fed back to the cooler at A34, vaporized and used to chill the fluid passing from A22 to A24.

A22. Cooler Intake

Liquid NH₃ enters the cooler here.

A23. Cooler Hydrostatic Relief Valve

In normal operation, this valve never activates. NH₃ can get trapped in the system between the emergency shut-off valve A18 and the On/Off valve A33, if both valves are closed while the system is charged. As the liquid warms and pressure rises, this valve protects the system with periodic releases.

This valve is set to activate at 350 psi, higher than the nurse tank’s relief valve.

Operator action is periodic inspection, and to replace this hydrostatic relief valve, a time-dated part, when it reaches the end of its operating life (see page 122). See “Hydrostatic Relief Valve Maintenance” on page 119 for maintenance.

A24. Cooler Outlet

Chilled liquid NH₃ exits the cooler here.

A25. Flow Meter

This fitting converts fluid flow to pulses for the SCS 450 controller. It has a range of 1-60 gpm. A tag on the cable lead provides a “METER CAL” number specific to the installed meter (and accurate only for NH₃ fluid flow, and not NH₃ vapor flow).

A26. Drain Cap

The plumbing cross and lower cap below the temperature gauge are provided to allow the gauge probe to be exposed to the full NH₃ stream. This cap does not require periodic clean-out.

A27. Temperature Gauge

This gauge reports the temperature of the chilled, flowing, NH₃. When NH₃ is not flowing, this gauge slowly drifts up to ambient temperature.

Checking the temperature and pressure A28 gauges against the chart in the “Using Anhydrous Ammonia Safely” manual (407-551M), or in the Raven AccuFlow™ manual, indicates whether the flowing NH₃ is in a liquid state.

Normal field temperatures of the chilled flowing NH₃ are in the range 20 to 83°F (-7 to 28°C).
A28. Pressure Gauge
This gauge reports the pressure of the NH₃ after it exits the cooler. If line valves are closed, a pressure reading above zero indicates NH₃ is present between the emergency shut-off valve A18 and the On/Off solenoid valve A33 (the Control Valve A30 does not completely close).

Checking the pressure and temperature A27 against the chart in the "Using Anhydrous Ammonia Safely" manual (407-551M), or in the Raven AccuFlow™ manual, indicates whether the flowing NH₃ is in a liquid state.

When valves are open but NH₃ is not flowing, this gauge normally reads within 5 psi of the nurse tank pressure gauge A67. If they are materially different at zero flow, one of the gauges may be defective.

When NH₃ is flowing, the pressure reported by this gauge A28 is lower than the tank pressure.

A29. Cooler Bleed Valve

**CAUTION**

Suffocation, Blinding and Burning Hazards: See “About Bleed Valves:” on page 32.

This valve is normally closed. It is used to bleed trapped NH₃ from the cooler system when valves are closed. It can also be used to accelerate clearing the cooler system for maintenance.

A30. Control Valve
This is a variable electronic valve controlled by the SCS 450. It is the primary control point for application rate. When power is off, this valve remains at its most recent setting.

This valve has a visible indicator above the valve ball casing, indicating whether open, closed or in between.

When commanded to a rate of zero, this valve does not completely close. A full slew from fully open to minimum takes approximately 9 seconds.

A31. Master Shut-Off Valve
This is the normal control for starting and stopping application flow in the field (for turns, etc.). This component is an open/closed solenoid valve controlled by the SCS 450. The “MASTER” switch on the SCS 450 controls this valve. When power is off, this valve remains at its most recent setting.

This valve has a visible indicator above the valve ball casing, indicating whether open or closed.

Operation of this valve is essentially instantaneous. Its valve ball is equipped with a downstream relief orifice.

A32. Refrigerant Tap
A small amount of the NH₃ flow is taken at this point to provide refrigeration at the cooler. There are no operational items for this fitting.

A33. Refrigerant Line
This tubing passes tapped refrigerant NH₃ to the cooler. Operator action is to replace this tubing, a time-dated part, when it reaches the end of its operating life. See page 122.

A34. Cooler Refrigerant Inlet
Tapped refrigeration flow enters the cooler at this fitting, and is vaporized to chill the liquid entering at fitting A22. There are no operational items for this fitting.

A35. Section Control Check Valve
(Section Control Option Only)
This prevents back flow when section shut-off valves A39 are off with NH₃ present. There are no operational items for this fitting.

A36. Section Control Bleed Valve

**CAUTION**

Suffocation, Blinding and Burning Hazards: See “About Bleed Valves:” on page 32.

(Section Control Option Only)
This valve is normally closed. It is used to bleed trapped NH₃ from the section control system if all section valves A39 are closed.
A37. Section Control Relief Valve
(Section Control Option Only)
In normal operation, this valve never activates. NH₃ can get trapped in the system between the section control check valve and the section shut-off valves, if all section valves are closed while the system is charged. As the liquid warms and pressure rises, this relief valve protects the system with periodic releases.

This valve is set to activate at 350 psi.

Operator action is periodic inspection, and to replace this hydrostatic relief valve, a time-dated part, when it reaches the end of its operating life (see page 122). See “Hydrostatic Relief Valve Maintenance” on page 119 for maintenance.

A38. Section Flow Divider
(Section Control Option Only)
This is a CDS-John Blue® Impellicone® manifold. It evenly splits the NH₃ flow for distribution through the row flow dividers. There are no operational items for this component.

A39. Section Shut-Off Valves
(Section Control Option Only)
These are the normal controls for suspending per-section application flow in the field (for point rows, pass overlap, etc.). These are open/close solenoid valves controlled by the “BOOMS” switches on the SCS 450.

When used with the SCS 450 or other suitable sectional application controller, shutting off a section causes the total flow to be reduced by 1/3 of the all-sections-on rate, keeping the rate constant for the section(s) still active.

Each section valve has a visible indicator above the valve ball casing, indicating whether open or closed.

Operation of each section valve is essentially instantaneous. However, there is considerable residual NH₃ in the section flow divider and delivery tubes after shut-off. When console power is off, the valves remain at their most recent setting.

The valve balls are equipped with a downstream relief orifice.

A40. Row Flow Divider(s)
This is a CDS-John Blue® Impellicone® manifold. It evenly splits the NH₃ flow for distribution through the delivery tubes. There are no operational items for this component.

A41. Flow Divider Manifold Inlet
NH₃ liquid flow enters the flow divider here.

A42. Flow Divider Pressure Gauge
This gauge reports the pressure prior to flow division. It normally reads lower than the cooler and nurse tank pressure gauges.

A43. Flow Divider Outlet
Each of these ports receives an equal fraction of the NH₃ liquid flow.

A44. Flow Divider Plug
Unused ports are plugged with a steel NPT plug. Unused ports do not affect flow balance at the other ports.

A45. Delivery Tube
This tubing passes NH₃ liquid flow to the knives or tines. Operator action is to replace this tubing, a time-dated part, when it reaches the end of its operating life. See page 123.

A46. Knife or Tine (Single)
Knives and tines open a furrow and inject the liquid NH₃. Tines inject the liquid in the furrow opened by the anhydrous coulter. All but two (or four) of the rows are equipped with knives or tines having a single smaller liquid delivery tube. Knives and tines need frequent inspection for wear and damage.

A47. Cooler Vapor Outlets (2)
Two vapor outlets direct the now-gaseous refrigerant flow (that entered at ) to two special knives or tines per cooler.

A48. Vapor Tube
This tubing passes NH₃ vapor flow to the dual knives or dual tines. Operator action is to replace this tubing, a time-dated part, when it reaches the end of its operating life. See page 123.

A49. Knife or Tine (Dual)
There are two of these special knives or tines per cooler (four total on a dual-cooler applicator). They direct the vaporized refrigerant NH₃ gas into the soil at the larger rear vapor tube. They are otherwise identical to the single-tube knives and tines.
The following callouts are for trailing nurse tank cart components. See the "Using Anhydrous Ammonia Safely" manual (407-551M) for all nurse tank callouts (A51 - A86). The present manual lists only those required for applicator field operations.

A56. Acme Parking Plug
A threaded stud (or other means) for storage of the outlet hose when not coupled to the applicator.

**Excess NH₃ Release Hazard:**
If the outlet hose is entirely dismounted (both ends free) for transport and storage, and both ends are 1\(\frac{3}{4}\)-4 Acme, be sure about which end is which. Installing a hose backwards can result in needless excess NH₃ release at unhitching, or a line segment unprotected by bleed and/or relief valves.

A57. Acme Female Hose Coupler
This end of the hose connects the tank withdrawal valve (A63) to the leading applicator inlet (A72) at the breakaway coupler. For use with a Nutri-Pro® applicator, the outlet end of the hose must be equipped with a 1\(\frac{3}{4}\)-4 female Acme fitting.

The outlet end of the hose has a swivel collar or shroud containing the female Acme fitting. This allows connection without needing to twist the hose.

Acme hose couplers are intended for hand tightening only. Do not use tools to make the cart-applicator connection. A liquid-tight seal is made by the gasket in the male Acme fitting on the applicator break-away coupler.

A58. Outlet Hose Assembly
The hose may have zero, one or two operating valves (A60), one or more bleed valves (A6), and a hydrostatic relief valve (A62). The outlet end may have an Acme plug.

Hose valves are typically hand wheel valves, or lever valves. Read any documents provided for the valves. Have the terminal or dealer explain how the valves work.

**WARNING**
Suffocation, Blinding and Burning Hazards:
Never test an anhydrous ammonia hose valve unless you are absolutely certain the hose and valve bodies are empty, or both hose ends are securely connected to sealed systems.

▲ A two-valve hose can contain a substantial amount of NH₃ even when completely disconnected. See “Avoid Line Traps” on page 113.

▲ Older ball valves can contain NH₃ inside the ball when closed, even though disconnected at both ends. See “Avoid Ball Traps” on page 114.

Follow instructions for bleeding and checking. Never use a valve handle as a carrying handle. Keep hands clear of bleed valves when carrying a hose.

A60. Hose Valve(s)
The hose may have zero, one or two operating valves (A60).

**CAUTION**
Excess NH₃ Release and Trapping Hazards:
Understand hose and tank withdrawal valve functions and sequencing. This manual presumes a hose with a single outlet-end shut-off valve (A60) and a tank outlet with a withdrawal valve (A63). If the hose in use is different, have the hose provider explain the correct order for operations.

---

a. Acme collars may be aluminum, but all internal coupler components must be NH₃-safe, typically stainless steel.
A61. Bleed Valve(s)

**CAUTION**

*Suffocation, Blinding and Burning Hazards:*
Be up-wind when operating a bleed valve.
Wear chemical gloves when operating a bleed valve.
Wear goggles when operating a bleed valve.
Do not place your body or head in front of the orifice.
Follow a check-list when operating a bleed valve.
Open a bleed valve slowly.

Hose valves typically have bleed valves. Have the hose provider explain exactly what is bled by each bleed valve.

The purpose of a bleed valve is to perform a controlled release, via an orifice, of any fluid or gas trapped in the *closed line* prior to disconnect at a nearby Acme fitting.

A single bleed valve may be located on the inlet or outlet side of the valve, and only protects that side of the circuit when the valve is closed. More rarely, a shut-off valve has bleed valves on both sides of the valve. An older ball valve may have a bleed valve for the ball itself.

A65. Withdrawal Valve

In field operations, this valve is opened first, and closed first.

**CAUTION**

*Ammonia Release Hazard:*
Never open the withdrawal valve unless:
- all other valves and bleed valves, are closed, or;
- the applicator is configured and ready for use.
Always be on the up-wind side for valve operation.
Always open slowly.
Always check for signs of release when opening this valve.

The withdrawal valve is the application outlet valve. It is usually located on the tank top, but may be located on the bottom. It is color coded red or orange.

A67. Pressure Gauge

This gauge reports the pressure (usually in psi) of the NH₃ gas at the top of the tank. The reading varies with tank and ammonia temperature.
Preparation and Setup

This section helps you prepare your tractor and fertilizer applicator for use, and covers tasks that need to be done seasonally, or when the tractor/fertilizer applicator configuration changes.

Before using the applicator in the field, you must hitch it to a suitable tractor, inspect systems, level the applicator, and then hitch a suitable nurse tank to the applicator. Before using the fertilizer applicator for the first time, and periodically thereafter, certain adjustments and calibrations may be required.

**Anhydrous Ammonia Exposure Hazard:**
Do not modify the NH₃ system of this applicator. Designing NH₃ systems, selecting and installing components is serious engineering. Testing a custom system could be extremely hazardous (and field PPE is inadequate for such testing). Malfunction of a custom system could result in a major release of NH₃ gas or liquid.

**Anhydrous Ammonia Release Hazard:**
Use only the Great Plains rear hitch for a trailing nurse tank cart. A custom hitch and/or mount, including any safety chain anchors, could fail entirely, resulting in a tank cart upset. Consequences could include a catastrophic release of NH₃. At the very least expect a breakaway event and cart damage.

**Initial Setup**

Other first-time/infrequent setup tasks include:

- 2-Point: set lift assist valve (page 158).
- Install meter console in tractor (page 158).
- Install any Options not factory- or dealer-installed.

**Post-Delivery/Seasonal Setup**

On initial delivery, use with a new tractor, and seasonally, check and as necessary, complete these items before continuing to the routine setup items:

- Bleed hydraulic system (page 125).
- De-grease exposed cylinder rods if so protected at last storage.
- Verify that all time-dated components are within their service lives.

---

a. PPE: Personal Protective Equipment
Get Expert Advice

Anhydrous ammonia is 82% Nitrogen, the highest of any fertilizer. The compound NH₃ is normally a gas at ambient temperatures. It is retained in the soil only by chemical reactions and physical mechanisms, primarily reactions with soil moisture.

Consult with your agronomist about optimal application timing, rate and depth, based on proposed crop, soil temperature, soil moisture content and ambient temperature. Non-optimal applications can result in NH₃ loss to the atmosphere, soil drying, and undesired long term changes in soil pH.

Pre-Application Setup

Complete this checklist before routine setup:

- Read and understand “Important Safety Information”, pages 1 to 7.
- Check that all working parts are moving freely, bolts are tight, and cotter pins are spread.
- Check that all grease fittings are in place and lubricated. See “Lubrication and Scheduled Maintenance” on page 127.
- Check that all safety decals and reflectors are correctly located and legible. Replace if damaged. See “Safety Decals” on page 8.
- Inflate tires to pressure recommended and tighten wheel bolts as specified. See “Tire Inflation Chart” on page 140.

Anhydrous Ammonia Exposure Hazard:

Use a tractor with a fully enclosed cab. A tractor that is not fully enclosed exposes the operator to substantially more NH₃ vapor, particularly if field requirements result in downwind turns or downwind passes.

Repeated exposure to NH₃ vapor may exceed PEL (Permissible Exposure Limits) and also induces olfactory fatigue (adaptation). Over time, you become less sensitive to ammonia odor, and may fail to recognize dangerously high concentrations.
Hitching Tractor to Applicator

This manual presumes the following (recommended) operations sequence:

1. Hitch tractor to applicator for transport
   2- and 3-Point Hitching: page 31
   Pull-Type Hitching: below
2. Transport applicator separately from nurse tank:
   page 66
3. Hitch nurse tank to applicator at field:
   page 70

To prevent soil compaction on rows, set tractor wheels between rows, for example: 60 inches center-to-center. For hillsides and steep slopes, set tractor wheels as wide as possible for maximum stability.

**Pull-Type Hitching**

**DANGER**

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

Refer to Figure 5

1. Use parking jack 1 to raise and lower applicator tongue.
2. Back tractor draw bar into alignment with hitch.

**CAUTION**

**Loss of Control Hazard:**
Do not operate without locking hitch pins. A pin working loose could cause abrupt applicator motions resulting in a tank upset and fertilizer release.

4. Secure safety chain to an anchor on the tractor.

Refer to Figure 5 and Figure 6

5. After hitching tractor to applicator, store jack on storage stob 3 on top of fertilizer applicator tongue.

Loss of Control / Public Safety Hazards:
Do not transport on public roads with a nurse tank hitched to the applicator. Transport with an anhydrous ammonia nurse tank hitched to an applicator is illegal in many places. See "Transport" on page 66.
2- and 3-Point Hitching
The NP30A or NP40A is engineered to be used with Category II or Category III tractors.

Refer to Figure 7
This applicator is factory set for Category III tractors. Category II requires an optional hitch pin kit (see page 132).

In addition, the following bushings (not supplied by Great Plains) may be needed to fit your quick hitch or tractor’s 3-point arms:

- **Upper Link (full 3-point only):**
  - 1 inch (25.4 mm) I.D. x 1 1/4 inch (31.8 mm) O.D.
- **Lower Links:**
  - $1\frac{1}{8}$ inch (28.6 mm) I.D. x $1\frac{7}{16}$ inch (36.5 mm) O.D.

1. Adjust tractor lower links to maximize lifting height.
2. Normally the lower arms engage pins in the lower holes of the applicator’s three point lugs. You may use the upper holes if necessary.
3. Set tractor sway blocks to minimize side sway. Set tractor hitch lift control to Float.
4. Back tractor up to applicator. Align lower links with the lower hitch clevis on applicator. Adjust hitch bushings and spacers supplied with applicator according to the category of your tractor. Lock pins in place.
5. Set hitch for depth control mode.

**Full 3-Point Hitching**
For 2-Point hitching (3-Point semi-mounted), continue at “Electrical Hookup” (next topic).

Determine which top holes to use:

- **Upper**
  - Category III
- **Middle**
  - Category III Quick Hitch
- **Lower**
  - Category IIa
  - Category IIa Quick Hitch
  - Requires an optional hitch pin kit (page 132)

Attach tractor top link to applicator upper hitch clevis.

For intended results, the frame must be level side-to-side and front-to-back. This must be done in the field, and cannot normally be established at first hitching. See “Leveling Applicator” on page 38.

---

**Crushing Hazard:**
Do not stand or place any body part between applicator and moving tractor. You may be severely injured or killed by being crushed between the tractor and applicator. Stop tractor engine and set parking brake before attaching cables and hoses.
Emergency Shut-Off Rope

This part of hitching requires operating the emergency shut-off valve. If the applicator was correctly shut down and discharged after last use, there is no anhydrous ammonia liquid in the system, and only small amounts of vapor, at low pressure. If the applicator was improperly shut down, checking the emergency valve could be hazardous.

**Possible Chemical Hazard:**
Wear your NH₃ PPEa. Be up-wind of any possible release points. Residual NH₃ (possibly in dangerous quantities) may be present in the applicator systems, from the inlet Acme cap (A3) to the On/Off solenoid valve (not shown). Unprotected exposure could result in permanent lung/eye injury or death.

Refer to Figure 9
At each cooler inlet emergency shut-off valve (A18):
Check System Discharged
1. Check that both halves of the breakaway coupler (A14) are fully mated. If they are not, STOP.
   Treat this as a breakaway event (see page 78).

Refer to Figure 10
About Bleed Valves:
The purpose of a bleed valve is to perform a controlled release, via an orifice (1), of any fluid or gas trapped in the closed line prior to operating other valves or uncapping at a nearby Acme fitting.
If the line is discharged, opening the valve may have no result, or may release a small amount of NH₃ vapor at low pressure. If there is a low pressure release, leave the valve open at the current position. Move away up-wind. Return when the release concludes.
If the line was not discharged, opening a bleed valve may release NH₃ vapor at high pressure, or may release NH₃ liquid, most likely as a spray.
If the there is liquid in the line segment, completion of a bleed can take a long time. As the fluid turns to vapor, it chills the remaining fluid, slowing evaporation.
If opening a bleed valve results in an unexpected large discharge, immediately close the valve and follow the instructions for discharging the system (page 115).

---
a. PPE: Personal Protective Equipment
Refer to Figure 11

2. Check the pressure gauge A28. If it is not 0, STOP. Discharge the system before resuming hitching. See page 115.

3. From up-wind, and with the bleed valve orifice pointing away from you, slowly open the cooler bleed valve A29. If any liquid appears, or vapor at high pressure, close valve and STOP. Discharge the system before resuming hitching. See page 115.

Once there is no vapor flow at the bleed valve, close it and continue at the next step.

Refer to Figure 12

4. Check the state of the emergency shut-off valve A18.

   If the valve A18 is closed, NH₃ may be trapped on the cooler side of the valve. Continue at step 5.

   If the valve A18 is open, step 3 above has already verified that the line is discharged on both sides of valve A18. Close bleed valve and continue at step 6

5. Standing up-wind, and with the bleed valve orifice pointing away from you, slowly open the breakaway coupler inlet bleed valve A18. If any liquid appears, or vapor at high pressure, close valve and STOP. Discharge the system before resuming hitching. See page 115.

   Once there is no vapor flow at the bleed valve, close it and continue at the next step.

Refer to Figure 12 (which depicts the shut-off valve closed)

6. If the emergency shut-off valve A18 was closed, open it.

7. Locate the emergency rope ①.

8. Inspect the attachment of the rope to the valve handle, and the rope itself. Replace the rope if cut, frayed or worn. If the handle connection is not secure, take corrective action.

9. Uncoil the rope. Remove any knots.

10. Route the rope forward and above the plumbing center-line (but otherwise near center-line), toward the tractor cab. Avoid having the rope rest on or rub against any applicator or tractor parts that could cause a snag or abrasion. Avoid running too far sideways, or operation may bend the handle.

11. Route the rope into the tractor cab.

12. Test each rope. Make sure each rope can quickly and smoothly close its valve.

Rope Function Hazard:
Avoid rope routes at or below plumbing centerline. Routes below plumbing center-line cannot operate the valve. Routes at plumbing center-line may fail to operate the valve.

Avoid routes that are too vertical. A rope running at a high angle may fail to fully close the valve.

Note: On a 2-point or 3-point applicator, the tractor cab may be high enough to provide the angle needed. On a pull-type applicator, it may be necessary to route the rope(s) over the transport rest.
Electrical Hookup

Refer to Figure 13

Your fertilizer applicator is equipped with systems that require separate electrical connections. For future reference, note any optional connectors on this checklist.

- ☑ Lighting connector (standard)
- ☑ Rate Controller connector (standard)
- ☑ Hydraulic harness
  (2013+ 5-Section 2-point NP40A only)
- ☑ Pressure sensor
- ☐ Console speed connector (not shown, optional, and only if sensor/radar is mounted on applicator)
- ☐ _____________________

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

These connections may be made in any order. The key requirement is that all connections be made prior to fertilizer applicator movement.
Hydraulic Hose Hookup

**WARNING**

**High Pressure Fluid Hazard:**
Shut down tractor before making hydraulic connections. Only trained personnel should work with system hydraulics.

Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. If an accident occurs, seek immediate medical assistance from a physician familiar with this type of injury.

Use paper or cardboard, NOT BODY PARTS, to check for leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems.

On applicators with more than one hydraulic circuit, hydraulic hoses are color coded to help you hookup hoses to your tractor outlets. Hoses that go to the same remote valve are marked with the same color.

<table>
<thead>
<tr>
<th>Handle Color</th>
<th>Hose Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Lift</td>
</tr>
<tr>
<td>Blue</td>
<td>Lift and Fold</td>
</tr>
<tr>
<td>Gray</td>
<td>Fold</td>
</tr>
<tr>
<td>Red</td>
<td>2013+ 5-Section Fold, Lift, Weight Transfer</td>
</tr>
</tbody>
</table>

**Refer to Figure 14**

To distinguish hoses on the same hydraulic circuit, refer to hose label on handles.

- The hose under an extended-cylinder symbol feeds a fold\(^a\) cylinder base end (lift cylinder rod end), or the return side of a hydraulic motor.
- The hose under a retracted-cylinder symbol feeds a fold cylinder rod end (lift cylinder base end), or the pressure side of a hydraulic motor.

Use a regular remote and not a dedicated tractor 3-point remote\(^b\).

Secure hoses and cables so that they have sufficient slack for hitch movements, but cannot get caught between moving parts. Failure to safely route and secure hoses and cables could result in damage requiring component repair/replacement, and lost field time.

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\(^a\) Fold and lift functions are combined on the pull-type and 2013+ 5-section 2-point NP40A configurations. When fold is extending, lift is retracting. The handles are coded for fold priority. For the Extend/Retract terms in this manual to have their intended results, connect the extend and retract handled hoses to extend and retract remote ports respectively.

\(^b\) Some tractors provide a special remote pair at the 3-point hitch arms. On some tractor models, this circuit has specific flow and/or pressure-sensing behavior intended for certain applicators (other than Nutri-Pro\(^\circ\)). Nutri-Pro\(^\circ\) lift and/or fold and weight transfer may not function on this type of circuit.
Raise Parking Stands (2- and 3-Point Only)

Slide-Up Stands

Refer to Figure 16

⚠️ CAUTION ⚠️

Heavy Object Hazard:
Use the lifting handle ②. Push leg against frame while raising or lowering. The leg weighs approximately 45 pounds (20 kg). The leg could cause injury if you lose control of it while raising or lowering.

1. Use tractor 2-point hitch and the fold/lift circuit to slightly raise the applicator. See "Raising/Lowering Applicator" on page 50.
2. Remove cotters from pins ①.
3. Grasp the lifting handle. Use an assistant or shoulder to hold leg against frame and inside flanges.
4. Remove the pins ①.
5. Lift or lower the stand straight up or down.

Swing-Up Stands

This applies to older 2-point (lift assist) hitching, and older 3-point hitching.

Refer to Figure 16

1. Use tractor 3-point hitch (and if so equipped, the lift-assist circuit) to slightly raise the applicator. See "Raising/Lowering Applicator" on page 50.
2. Remove the pivot pin ① at each stand. To prevent the leg from reaching (and possibly passing) full vertical, insert the pin in the rear storage hole ②.

⚠️ CAUTION ⚠️

Crushing Hazard:
Do not stand in front of the leg while raising it. The stand leg is is heavy. If you lose control of it, it can fall forward and may cause injury.

3. Swing the stand forward, up and then back.
4. Re-insert the pivot pin in either of the two upper holes, and the leg tube, to secure the leg at vertical.

Note: The rear hole ② holds the stand at full vertical.
5. If the leg cannot be swung up due to interference with a tractor component (such as a tire), see "Parking Stand Clearance" on page 37.
Parking Stand Clearance

This applies to older 2-Point and 3-point models only.
Parking stands must clear tractor tires for normal operations. See page 36 for stand operation.

Refer to Figure 17

If the parking stand leg \( \textcircled{1} \) strikes any tractor component when swung up for stowage, relocate both parking stand mounts \( \textcircled{2} \).

NOTICE

Equipment Damage Risk:
Do not rely on stand foot retraction as an alternative to moving the mounts. The stand feet do not retract far enough for adequate highway and field clearance. Striking an object with a foot could result in substantial machine or tractor damage.

1. Elevate the center section front tool bar to lift the stand feet \( \textcircled{1} \) off the ground.
2. Support the tool bar with other stands.
3. To reduce the weight, remove the leg.
4. Loosen or remove the U-bolts \( \textcircled{3} \).
5. Re-position the mounts. Use the widest stance at which both stands are equidistant from implement center-line, and clear tractor parts.
6. Secure mounts to frame tube.
   Re-install leg assembly.
7. Test swing arc of leg.

Adjust inner leg position as for normal parking (page 36). Raise implement. Remove extra stands. Lower onto legs.

Note: This applies only to 2-point and 3-point implements. Pull-type implements have a single tongue side-mount parking stand.
Leveling Applicator

During initial setup and periodically throughout the season, check that the applicator runs level. When applying, the top of the main frame should be parallel to the ground, and level left to right.

Set Application Depth

Before checking or correcting side-to-side or front-to-back level, set the application depth (which is controlled by tool bar height).

The Nutri-Pro® Anhydrous is designed for application at 4 to 6 in. (10 to 15 cm)

For adjustment, see “Application Depth” on page 96.

To check level, lower the applicator into the ground in representative conditions.

3-Point Leveling

Refer to Figure 18

Leveling is controlled entirely by the tractor hitch.

2-Point Front-to-Back Level (Spacers)

The rear lift-assist assembly must be set to match the gauge wheels and 2-point hitch in front. Lift-assist lowered height is controlled by (provided) spacers on the lift cylinder rods.

To set:
1. Lower applicator until lift assist wheels are just off the ground.
2. Raise applicator until wheels touch ground just firmly enough to resist spinning.

Refer to Figure 19

3. Insert a combination of spacers 5 to fill the space on the rod 6 between the cylinder end and clevis.
4. Raise and lower applicator. Pull forward. Check knife/tine depth and front-to-back level. Adjust spacers as required to achieve application depth.
Pull-Type Hitch Leveling

Refer to Figure 21
With the knives or tines 4 inches into the ground, the tool bar height is:
① 24 inches (61 cm)
and normally requires a pull-type hitch height of:
② 16.75 inches (42.5 cm)
measured from the bottom of the tongue to the ground.

Refer to Figure 20
To obtain the correct height, and a level tongue, remove the two hitch bolts ③, and reposition the fertilizer applicator hitch ④ on the tongue.
The hitch can be inverted in the tongue for extreme height changes.

NOTICE
Sudden Hitch Slump or Failure Risks:
Always have two bolts through two holes on both hitch and tongue. Never rely on a single bolt.
Meter Setup

This topic presumes that the applicator has a Raven SCS 450 console, single or dual Raven AccuFlow™ metering system and the console is installed per “Console Installation” on page 158.

**NOTICE**

If the Nutri-Pro® applicator has a user-provisioned controller, carefully follow supplier documentation for installation, setup, use and maintenance. Great Plains cannot assume any liability for results with equipment not supplied by Great Plains.

Before first use, the SCS 450 must be programmed with system configuration data, consisting of various “CAL” numbers and user elected “RATE” numbers. See the Raven SCS 450 manual (or the Calibration Card) for the keystroke sequence for setting each of these values.

**Raven Data (Single-Section):**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>BOOM CAL</th>
<th>SPEED CAL</th>
<th>METER CAL</th>
<th>VALVE CAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NP30A-11C30</td>
<td>30-Foot, 11-Row, 30-Inch</td>
<td>330 inches (838.2 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP30A-11R30</td>
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<td>NP30A-11S30</td>
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<tr>
<td>NP30A-12C30</td>
<td>30-Foot, 12-Row, 30-Inch</td>
<td>360 inches (914.4 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP30A-12R30</td>
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<tr>
<td>NP30A-12S30</td>
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</tr>
<tr>
<td>NP30A-13C30</td>
<td>30-Foot, 13-Row, 30-Inch</td>
<td>390 inches (990.6 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP30A-18R20</td>
<td>30-Foot, 18-Row, 20-Inch</td>
<td>360 inches (914.4 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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</tr>
<tr>
<td>NP30A-25C15</td>
<td>30-Foot, 25-Row, 15-Inch</td>
<td>375 inches (952.5 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-15C30</td>
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<td>450 inches (1143 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-16C30</td>
<td>40-Foot, 16-Row, 30-Inch</td>
<td>480 inches (1219.2 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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</tr>
<tr>
<td>NP40A-17C30</td>
<td>40-Foot, 17-Row, 30-Inch</td>
<td>510 inches (1295.4 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-22R20</td>
<td>40-Foot, 22-Row, 20-Inch</td>
<td>440 inches (1117.6 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-25R20</td>
<td>40-Foot, 25-Row, 20-Inch</td>
<td>500 inches (1270 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-31C15</td>
<td>40-Foot, 31-Row, 15-Inch</td>
<td>465 inches (1181.1 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Cable Tag&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

b. This value is printed on a durable tag attached to the meter cable.
c. This value, for example “2123”, is printed on the label on the valve body.
# Raven Data (Section Control)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>BOOM CAL&lt;sup&gt;a&lt;/sup&gt;</th>
<th>SPEED CAL</th>
<th>METER CAL</th>
<th>VALVE CAL</th>
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<td>1 (LH)</td>
<td>2 (CTR)</td>
<td>3 (RH)</td>
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<td>NP30A-11C30</td>
<td>30-ft., 11-Row, 30-in.</td>
<td>4 Rows 120 in. (304.8 cm)</td>
<td>3 Rows 90 in. (228.6 cm)</td>
<td>4 Rows 120 in. (304.8 cm)</td>
<td>598&lt;sup&gt;b&lt;/sup&gt; Cable Tag&lt;sup&gt;c&lt;/sup&gt; Body Label&lt;sup&gt;d&lt;/sup&gt;</td>
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</tr>
<tr>
<td>NP30A-12C30</td>
<td>30-ft., 12-Row, 30-in.</td>
<td>4 Rows 120 in. (304.8 cm)</td>
<td>4 Rows 120 in. (304.8 cm)</td>
<td>4 Rows 120 in. (304.8 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP30A-13C30</td>
<td>30-ft., 13-Row, 30-in.</td>
<td>4 Rows 120 in. (304.8 cm)</td>
<td>5 Rows 150 in. (381.0 cm)</td>
<td>4 Rows 120 in. (304.8 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP30A-18R20</td>
<td>30-Ft., 18-Row, 20-In.</td>
<td>6 Rows 120 in. (304.8 cm)</td>
<td>6 Rows 120 in. (304.8 cm)</td>
<td>6 Rows 120 in. (304.8 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP30A-25C15</td>
<td>30-ft., 25-Row, 15-in.</td>
<td>8 Rows 120 in. (304.8 cm)</td>
<td>9 Rows 135 in. (342.9 cm)</td>
<td>8 Rows 120 in. (304.8 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-15C30</td>
<td>40-ft., 15-Row, 30-in.</td>
<td>5 Rows 150 in. (381.0 cm)</td>
<td>5 Rows 150 in. (381.0 cm)</td>
<td>5 Rows 150 in. (381.0 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-16C30</td>
<td>40-ft., 16-Row, 30-in.</td>
<td>5 Rows 150 in. (381.0 cm)</td>
<td>6 Rows 180 in. (457.2 cm)</td>
<td>5 Rows 150 in. (381.0 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-17C30</td>
<td>40-ft., 17-Row, 30-in.</td>
<td>6 Rows 180 in. (457.2 cm)</td>
<td>5 Rows 150 in. (381.0 cm)</td>
<td>6 Rows 180 in. (457.2 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-22R20</td>
<td>40-ft., 22-Row, 20-in.</td>
<td>7 Rows 140 in. (355.6 cm)</td>
<td>8 Rows 160 in. (406.4 cm)</td>
<td>7 Rows 140 in. (355.6 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>NP40A-22S20</td>
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<tr>
<td>NP40A-25R20</td>
<td>40-ft., 25-Row, 20-in.</td>
<td>8 Rows 160 in. (406.4 cm)</td>
<td>9 Rows 180 in. (457.2 cm)</td>
<td>8 Rows 160 in. (406.4 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td>NP40A-31C15</td>
<td>40-ft., 31-Row, 15-in.</td>
<td>10 Rows 150 in. (381.0 cm)</td>
<td>11 Rows 165 in. (419.1 cm)</td>
<td>10 Rows 150 in. (381.0 cm)</td>
<td>598&lt;sup&gt;a&lt;/sup&gt; Cable Tag&lt;sup&gt;b&lt;/sup&gt; Body Label&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Based on equal or near-equal symmetrical balancing of row counts for each section flow divider, and not based on wing wing pivots. If you or your dealer configured a different set of row assignments, re-calculate BOOM CAL values by section (number of rows on each divider x row spacing).

<sup>b</sup> Suggested initial value. Refine using calibration procedure in Raven SCS 450 manual.

<sup>c</sup> This value is printed on a durable tag attached to the meter cable.

<sup>d</sup> This value, for example “2123”, is printed on the label on the valve body.

## SCS 450: BOOM CAL

Models without section control have one “boom section” (BOOM 1, whether single- or dual-cooler). The BOOM CAL number is simply the applicator swath on single-section applicators. See the tables beginning on page 40.
SCS 450: SPEED CAL
A speed sensor connection to the Raven SCS 450 is required. Perform a calibration per the manuals for the sensor and the SCS 450.

A speed sensor input allows the SCS 450 to determine and control application rates at arbitrary field speeds.

Note: The Great Plains Raven AccuFlow™ and SCS 450 bundles do not include a speed sensor, nor the cable necessary to connect a Raven-compatible sensor or radar to the SCS 450. See page 131 for an available radar kit. See page 141 for harness cables available from Great Plains or Raven.

SCS 450: METER CAL
This is the pulse-vs.-rate calibration number for the flow meter (A25 in system diagrams in this manual).

Obtain this number from the tag affixed to the meter. Enter it into the SCS 450 and record it on the Calibration Card.

SCS 450: VALVE CAL
This is the response time calibration number for the control valve (A30 in system diagrams in this manual).

Obtain this number from the tag affixed to the valve. Enter it into the SCS 450 and record it on the Calibration Card.

SCS 450: RATE 1 CAL
This is your primary desired application rate, typically in gallons per acre.

SCS 450: RATE 2 CAL
This is your secondary desired application rate, typically in gallons per acre. If you have no alternate rate preferred, set this to RATE 1 CAL, so that the control valve won’t slew if you need to switch to MAN mode.

SCS 450: TANK VOL
Optional. If entered, the NH3 consumed (as measured by the flow meter) is continuously subtracted from this number, and may be used to signal a low tank alarm. The number needs to be re-entered at each refill.

SCS 450: TIME
Optional. The SCS 450 (which is always in 24:00 hour time format) defaults to 00:00 (and resets to that after 10 days of inactivity). You may use this menu to set the actual time.
Wash Water

Refer to Figure 23

Empty the 10 gallon applicator First Aid Water tank. Refill it with fresh clean water. If the nurse tank cart is at hand, refill the nurse tank wash water as well.

The water needs to be changed daily. Water absorbs ammonia vapor from the air, and becomes an ammonium hydroxide solution over time.

When emptying wash tanks, use the time and water to train operators on tank operations, and first aid rinsing procedures.

Sealer Setup (Option)

As shipped from the factory, sealers are preset for optimal shipping configuration. The factory default settings are not likely to be suitable for your field conditions.

Adjustments may also be required for different fields and from season to season.

See “Sealer Adjustments” on page 102.

Figure 23
First Aid Water Station
Applicator Operating Instructions

This section covers general operating procedures. Experience, machine familiarity, and the following information will lead to efficient operation and good working habits. Always operate farm machinery with safety in mind.

Pre-Start Checklist

Perform the following steps before transporting the Nutri-Pro® fertilizer applicator to the field.

This checklist presumes that the nurse tank is not yet connected.

☑ Carefully read "Important Safety Information" on page 1.
☑ Empty the applicator’s 5 gallon wash water tank, Refill it with fresh clean water.
☑ Review the Material Safety Data Sheet (MSDS) for the anhydrous ammonia.
☑ Check that all time-dated applicator components are still within their specified service lives.
☑ Check all plumbing components, hose, tubing and fittings are in satisfactory working condition.
☑ Lubricate fertilizer applicator as indicated under “Lubrication and Scheduled Maintenance” on page 127.
☑ Check all tires for proper inflation. See “Tire Inflation Chart” on page 140.
☑ Check all bolts, pins, and fasteners. Torque as shown in “Torque Values Chart” on page 140.
☑ Check fertilizer applicator for worn or damaged parts. Repair or replace parts before going to the field.
☑ Check hydraulic hoses, fittings, and cylinders for leaks. Repair or replace before going to the field.

WARNING

High Pressure Fluid Hazard:
Relieve pressure and shut down tractor before connecting, disconnecting or checking hydraulic lines. Use a piece of paper or cardboard, NOT BODY PARTS, to check for leaks. Wear protective gloves and safety glasses or goggles when working with hydraulic systems. Escaping fluid under pressure can have sufficient pressure to penetrate the skin causing serious injury. If an accident occurs, seek immediate medical assistance from a physician familiar with this type of injury.
Applicator Locks

Channels, pins, latches and solenoid valves limit movement for various situations. Channels and pins require operator attention. Latches and valves are automatic if the systems are operating properly.

The lock set combinations vary by applicator width, hitch type and year. Consult the following table for locks provided on your applicator.

<table>
<thead>
<tr>
<th>NP30A</th>
<th>Pull-Type</th>
<th>2-Point</th>
<th>3-Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift-Assist Locks</td>
<td>Lift-Assist Locks</td>
<td>Wing Lock Channels</td>
<td></td>
</tr>
<tr>
<td>Front Caster Wheel Lock Channels</td>
<td>Wing Lock Channels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NP40A 2012-3-section frame</td>
<td>Lift-Assist Locks</td>
<td>Wing Lock Channels</td>
<td></td>
</tr>
<tr>
<td>Front Caster Wheel Lock Channels</td>
<td>Lift-Assist Locks</td>
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<tr>
<td>Lift-Assist Locks</td>
<td>Wing Lock Channels</td>
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</tr>
</tbody>
</table>
| 2-point and pull type. Use the lift-assist transport locks (and front caster wheel cylinder locks, if any) to hold the fertilizer applicator at raised for transport, adjustments, maintenance and storage.

2-Point Applicators

Refer to Figure 24

To install cylinder stops:
1. Fully raise applicator (page 50). Set lift circuit to Neutral.
2. Remove and store lift-assist spacers (page 38).
3. Remove lock channel (1) from storage location (2).
4. Place a lock channel on the lift cylinder rod of each cylinder to be locked.
5. Re-install locking pin and secure with cotter pin.
6. Install center section wheel lock channels.
7. Lower fertilizer applicator onto lock channels.
8. Set lift circuit to Float.

Falling Hazard:
Do not climb or stand on tires or wheels. Even at full extension on level ground, tires may not be in firm ground contact. They could spin without warning. A fall could result in serious injury.

Figure 24
Lift-Assist Cylinder Lock Channel (2-Point)
Pull-Type Applicators

Refer to Figure 25

To install cylinder stops:
1. Fully raise applicator (page 50). Set lift circuit to Neutral.
2. Remove lock channel 1 from storage location.
3. Place a lock channel on the lift cylinder rod of each cylinder to be locked.
4. Re-install locking pin and secure with cotter pin.
5. Install center section wheel lock channels.
6. Lower fertilizer applicator onto lock channels.
7. Set lift circuit to Float.

Front Caster Wheel Lock Channels

In routine use, install only the center section locks. For maintenance, install all four. Installing the left wing lock requires disabling the hydraulic depth stop.

CAUTION

Falling Hazard:
Do not climb or stand on tires or wheels. Even at full extension on level ground, tires may not be in firm ground contact. They could spin without warning. A fall could result in serious injury.

Refer to Figure 26 and Figure 27

To install cylinder stops:
1. Fully raise applicator (page 50). Set lift circuit to Neutral.
2. Install lift-assist locks.
3. At each section lift cylinder to be locked, remove cotter pin and lock pin. Remove lock channel 1 from storage location.
4. If locking for maintenance, at the left wing lift cylinder, remove the rear pin ④ of the depth stop clevis. Swing the clevis forward.

**NOTICE**

*Machine Damage Risk:*
*Do not install a lock channel on the depth stop cylinder unless the clevis has been rotated clear of the cylinder rod. Lowering the applicator onto a lock channel with the clevis in place will damage the clevis.*

5. Place a lock channel on the lift cylinder rod of each cylinder to be locked.
6. Re-install locking pin and secure with cotter pin.
7. Lower fertilizer applicator onto lock channels.
8. Set lift circuit to Float.

**Wing Lock Channels**

*Refer to Figure 28*

These lock channels are only present on 2012- NP40A, NP30A, NP3000 2-point with lift assist and 3-point models. They enable a partial “gull wing” fold during field lift. On 2013+ models, this function is controlled by solenoid valves.

See page 60 for operation.

**Wing Lock Pins**

These pins are present only on NP40A models with 5-section wings (inner and outer wings).

*Refer to Figure 29*

These pins ⑤ are manually inserted after fold, both as a safety precaution, and to minimize wing-cradle impacts during transport.

When not engaged, the pins are stored in tubes ⑥ at the base of the rest weldment.

See “*Folding 3-Section and 2012- 2-Point 5-Section*” on page 62.
Outer Wing Fold Latches

These pins are present only on NP40A models with 5-section wings (inner and outer wings).

Refer to Figure 30

These latches are automatic, and should never require operator action. The latches couple the outer wing to the inner wing when folded, preventing movement of the outer wing during transport (the two outer wings might otherwise be able contact each other in unusual circumstances).

When unfolded, the latch @ pivots out and down (disengaged). During fold, the outer wing folds first, until the stop posts # contact each other. As the inner wing then folds, and passes vertical, the latch @ swings into engagement on the pins of the outer wing stop post.

At the start of unfold, the latches restrain the outer wings, causing the inner wings to unfold first. As the inner wings near the ground, the latches fall away, allowing the outer wings to unfold.

Solenoid Valves

These valves are present only on 2013+ 2-Point NP40A models. They normally require no operator attention.

See “2013+ NP40A 2-Point Fold/Lift Circuit” on page 49 for functions controlled by solenoid valves.

See “Wing Leveling” on page 92 and See “Field Fold Stop Adjustment” on page 94.
2013+ NP40A 2-Point Fold/Lift Circuit

On 2-point 5-section NP40A applicators made in 2013 or later, the fold and lift cylinders share a single hydraulic circuit. Solenoid valves (controlled by a switch box), one or more passive valves, and mechanical locks control hydraulic sequencing.

This system design provides a partial fold, as a single self-limiting hydraulic operation, during field lift, providing extra wing clearance in field turns.

If the hydraulic harness is not connected at the hitch, or the switch box is off, or power is off, most valves default to an Open state.

FOLD / FIELD Switch

Refer to Figure 31 (depicting the switch in PARK)

This switch is mounted in the tractor cab (page 157), and connected to the applicator at the hitch. It controls several solenoid valves on the applicator. It has three toggle positions and two indicator lamps.

Note: The switch is powered by the tractor. An illuminated lamp indicates power sent to the harness. The harness must be connected at the hitch for the function to be effected.

Switch Positions

PARK  
All solenoid valves are powered off and are spring-loaded to flow-open positions.  
Use this position only for parking, to save tractor battery power. With the switch in PARK, any hydraulic flow to the fold/lift circuit may have undesired results.

FOLD  
Full fold and unfold sequence is controlled.
Down-pressure is disabled.

UNFOLD  
During unfold, the inner wings unfold before the outer wings. During fold, the outer wings fold before the inner wings. Fold range from fully folded to wings level (excepting down-pressure) is available.

FIELD  
Outer wings locked.  
Inner wing fold restricted to “gull wing”.  
Down-pressure available.  
Use this position in the field. It engages the down-pressure circuit for weight transfer.
It provides a partial fold for extra wing clearance in field turns.

NOTICE

Machine Damage Risks:
Lift/lower (except field lift) and fold/unfold operations are possible with the hydraulic harness off, but care must be exercised. It is possible to lower below level, which can result in row unit ground strikes and dragging.
Raising/Lowering Applicator

When raising in the field, first turn off anhydrous flow. See page 76.

Lift/lower procedures depend on applicator model, year and hitch type:

- Pull-type applicators use six cylinders for lift/lower. The lift circuit is separate from the fold circuit. See “Raise/Lower Pull-Type” on page 51.
- 3-point applicators rely solely on the tractor hitch. Separate partial activation of the fold circuit is necessary to avoid wing droop in lift. See “Raise/Lower 3-Point” on page 52.
- 2-point applicators rely on the tractor hitch at applicator front, and a lift-assist cylinder circuit at rear. Lift and fold share a remote circuit.

3-section and 2012-5-section: Wing lock channels must be configured to arrest fold during lift. See “Raise/Lower 3-Section and 2012-2-Point” on page 53.

2013+5-section: Solenoid valves provide partial “gull wing” fold during lift. See “Raise/Lower 2013+5-Section” on page 55.

Operate the tractor hitch in “position” or “depth” control mode, regardless of applicator hitch type.

The applicator may be raised and lowered while folded.

Weight-Transfer Shut-Off Valve

This applies to all 3-section, all pull-type, all-3-point, and all 2012-NP40A (3 and 5-section). The 2013+5-section 2-point weight transfer has no interaction with raise/lower.

Refer to Figure 32 (depicting the valve closed on an NP3000, which has the same weight transfer hydraulic system)

Model 2011 and later (and updated model 2010) applicators have a shut-off valve in the weight transfer system. This “weight-transfer shut-off valve”, when closed, bypasses the pressure reducing valve, and allows fold cylinders to operate at full speed. The weight-transfer shut-off valve must be open for the weight transfer system to operate in the field.

NOTICE

Equipment Damage Risk:

Do not back up when lowered. Always raise the applicator for any reverse/backing. Backing when lowered will plug delivery ports in knife shoes or tines, and can damage delivery and vapor tubing.

Note: Lowering while stationary may result in lift-assist or front caster wheels being lifted off the ground. The applicator may not be at operating depth until it is pulled forward in field conditions.
Raise/Lower Pull-Type

Five of the six lift cylinders are slaved to the left front caster wheel cylinder, which has a hydraulic down stop.

NOTICE

Equipment Damage Risk:
Do not fold while in ground. Fold only when fully raised. When lowered, the wing coulters and knives or tines near the wing pivot may be damaged by ground dragging.

Raising Pull-Type

CAUTION

Anhydrous Ammonia Exposure Hazard:
When raising in field, be facing into the wind or be turning up-wind. Even if NH3 flow was stopped some distance before the lift point, the knives or tines will still be emitting NH3 vapor when out of the ground.

To raise the applicator, extend the cylinders (normally with an Extend operation of the tractor remote).

The applicator raises fully at end of stroke, regardless of depth setting. Holding the circuit at raised for a few seconds re-phases the cylinders.

If raising for highway transport, parking or storage, engage center section lift cylinder lock channels (page 45).

If raising for maintenance, swing out hydraulic depth stop and engage all lift cylinder lock channels (page 45).

Lowering Pull-Type

If lock channels are engaged on any lift cylinders, raise the applicator and disengage the channels (page 45). Re-engage the depth stop as needed.

To lower the applicator, retract the lift cylinders (normally with a Retract operation of the tractor remote).

The applicator lowers to the depth set at the hydraulic depth stop at the left front caster wheel. See "Hydraulic Depth Stop Adjustment Pull-Type" on page 85 for details on height adjustment.

CAUTION

Gradual Crushing Hazard:
Do not rely on hydraulic pressure alone to keep the fertilizer applicator raised. Use transport/lift locks (page 45) when working around a raised fertilizer applicator. The bypass orifices in the re-phasing system cause it to slowly lower.

Re-Phasing Pull-Type Lift System

In typical use during a single application operation, it is normal for the lift cylinders to get out of phase, resulting in uneven raising and lowering of the fertilizer applicator.

Every 8 to 10 passes, re-phase the cylinders with this procedure:

1. Raise the applicator completely, and hold the hydraulic lever or switch in Extend for several seconds after the applicator reaches full elevation.

2. When all cylinders are fully extended, momentarily reverse (Retract) the control to lower the applicator 1/2 inch (12 mm).

3. Set circuit to Neutral to hold for level check.

If re-phasing does not bring the applicator into level, other possibilities include:

- tire pressures too high or too low (page 140),
- worn tires,
- pull-type tongue height incorrect (page 38),
- 2-point tractor hitch height and level incorrect,
- 2-point gauge wheel height incorrect (page 86),
- 2-point lift-assist height spacers incorrect or not installed (page 38), and;
- front caster wheel / lift-assist eyebolts (page 92)
- significant amounts of air in the hydraulic system, indicating a need to perform a hydraulic bleed.
Raise/Lower 3-Point

The height/depth of the center section of a 3-point fertilizer applicator is controlled entirely by the tractor hitch.

The height of the wings is controlled by manually-set wing gauge wheels. Operator action during lift and lower is needed to control wing droop.

Raising 3-Point (Field Lift, Unfolded)

These instructions presume that the intention is to lift without folding, that the applicator is unfolded, and that the wing fold locks are auto-engaged at the last unfold, and have not been reset. If the intention is to lift and fold, see “Folding 3-Point” on page 60.

Anhydrous Ammonia Exposure Hazard:
When raising in field, be facing into the wind or be turning up-wind. Even if NH₃ flow was stopped some distance before the lift point, the knives or tines will still be emitting NH₃ vapor when out of the ground.

1. Fold the wings up. The wing locks arrest the fold just above wings-level. Set circuit to Neutral.
2. Lift the center section with the 3-point.

Raising 3-Point (Transport/Service Lift, Folded)

If the wings are already folded, and are being left that way, you may raise (and lower) the 3-point hitch without touching the fold circuit.

Lowering 3-Point (Field Lower, Unfolded)

See sidebar for first pass.

1. Lower the 3-point hitch to field setting.
2. Set hitch to Depth Control mode.
3. Set fold circuit to Float.

If you are already in forward motion, the knives or tines will pull the applicator to application depth. Otherwise, the applicator will rest on the knives or tines until pulled forward.

Lowering 3-Point (Parking/Service, Folded)

Deploy parking stands (page 36) if parking, storage or service is the intention.

If the wings are already folded, and are being left that way, you may lower (and raise) the 3-point hitch without touching the fold circuit.

First Pass Lowering:

• If the wings are drooped, retract the fold circuit (page 60) to bring the wings into contact with the wing locks, or to wings level. Set fold circuit to Neutral until lowered to ground.
Raise/Lower 3-Section and 2012-2-Point

These instructions apply to 3-section applicators and 2012-5-section applicator. For 2013+ 5-section applicators, see page 55.

Refer to Figure 33 (depicting an NP40L, which has the same hitch and hydraulic system)

The front height of the applicator center section is controlled by the lower two tractor 3-point arms (not visible in figure).

The rear height of the applicator is controlled by two lift-assist cylinders. Spacers are provided to limit the "lowered" position (page 38).

Raising 3-Section and 2012-2-Point (Field, Unfolded)

These instructions presume that the intention is to lift without folding, that the applicator is unfolded, and that the wing fold locks auto-engaged at the last unfold, and have not been reset. If the intention is to lift and fold, see "Folding 3-Section and 2012-2-Point 5-Section" on page 62.

When raising in the field, the wings tend to droop. Use the fold circuit to counter this.

1. Retract the fold cylinder circuit until the wing locks stop motion, or the outside row knives or tines just start to lift out of the ground. Set the circuit to Neutral.
2. Raise the tractor hitch. This raises the knives or tines with a slight forward motion, preventing plugging of the ammonia tube outlets.
3. Extend the lift-assist cylinders (normally with an Extend operation of the tractor remote).
   Note: Holding the lift-assist circuit at raised for a few seconds re-phases the cylinders.
4. When fully raised, set all remotes to Neutral.

Raising 3-Section and 2012-2-Point (When Folded)

Refer to Figure 33 (depicting an NP3000, which has the same weight transfer hydraulic system)

If the applicator is already folded:

1. Close the weight-transfer shut-off valve.
2. Raise it with the 2-point and lift-assist circuits in any order.
3. Hold at raised with Neutral circuits.
4. Install rear lift-assist lock channels (page 45).
5. Deploy parking stands (page 36).

If the applicator is unfolded, and the intention is to lift and fold, see "Folding 3-Section and 2012-2-Point 5-Section" on page 62.

Anhydrous Ammonia Exposure Hazard:
When raising in field, be facing into the wind or be turning up-wind. Even if NH₃ flow was stopped some distance before the lift point, the knives or tines will emit NH₃ vapor when out of the ground, and for some time.

Gradual Crushing Hazard:
Do not rely on hydraulic pressure alone to keep the applicator raised. Use parking stands (page 36) and transport/lift locks (page 45) when working around a raised applicator. The tractor hitch may settle. The bypass orifices in the applicator lift-assist re-phasing system cause it to slowly lower.
Lowering 3-Section and 2012-2-Point (Field, Unfolded)

See sidebar for considerations on a first pass.

1. Close the weight-transfer shut-off valve (page 53).
2. To lower the applicator, lower the tractor hitch and retract the lift-assist cylinders (normally with a Retract operation of the tractor remote).
3. The front of the applicator lowers until the hitch movement is stopped by your control, or by any depth stop set on that control.
4. The rear of the applicator lowers until the cylinders are stopped by the installed spacers (page 38), or until fully retracted if there are no spacers. If the knives or tines are not in the ground, the lift-assist wheels come off the ground until you pull forward into the field.
5. The unfolded wings lower to the height set by the wing gauge wheels (page 86) or onto the knives or tines.
6. Set the 2-Point to Depth Control.
   Set lift and fold circuits to Float.

Lower 3-Section and 2012-2-Point (Service/Parking, Folded)

This topic presumes that the intention is to lower a folded applicator without unfolding. If the intention is to both lower and unfold, see “Unfolding 3-Section and 2012-2-Point 5-Section” on page 61.

1. Close the weight-transfer shut-off valve (page 53).
2. Raise the applicator. Set circuits to Neutral.
3. Remove spacers (page 38) and install lift-assist lock channels. Deploy parking stands (page 36) as desired.
4. Lower rear of applicator with lift/fold circuit. Stop as soon as rear cylinders are fully retracted or on spacers/locks.
5. Lower front of applicator with 2-point hitch.
6. Set circuits to Float.

First Pass Lowering:

- If lock channels are engaged on the rear lift-assist cylinders, raise the applicator, disengage the channels (page 45), and insert the desired number of spacers (page 38).
- If the wings are drooped, retract the fold circuit (page 62) to bring the wings into contact with the wing locks, or to wings level. Set fold circuit to Neutral until lowered to ground.

**NOTICE**

Equipment and Pavement Damage Risk:

Fully fold before lowering onto parking stands. Parking stands support only the center section. If unfolded, wings may be drooped, or will droop. Knives or tines will strike the ground, immediately or eventually.
Raise/Lower 2013+ 5-Section
These instructions apply to 2013 and later 5-section applicators. For 3-section applicator, and 2012- 5-section applicators, see page 53.

Raise For Transport (Folded) 5-Section 2013+
These steps presume an applicator parked or stored folded, already raised, but on lift-assist locks and parking stands. No use of the applicator hydraulics is required.

1. Verify that lock channels are installed on the lift-assist cylinders (page 45).
2. Verify that wing lock pins are installed on the folded wings (page 47).
3. Raise the tractor 3-point hitch just enough to lift the parking stand bases off the ground. Set the hitch circuit to Neutral. Shut off the tractor.
4. Raise the parking stands (page 36).

Note: The FOLD / FIELD switch may be in any position for lift while folded.

Raise Pre-Folding (from Unfolded) 5-Section 2013+
These steps presume an applicator parked or stored unfolded, already raised, but on lift-assist locks at rear, on extended gauge wheels at wing tips, and on parking stands at hitch.

1. Verify that lock channels are installed on the lift-assist cylinders (page 45), that wing lock pins are not in the locking holes (page 47) and that the hydraulic harness is connected at the hitch (page 34).
2. Raise the tractor 3-point hitch enough to lift gauge wheels, coulters, and the parking stand bases off the ground. Set the hitch circuit to Neutral.

Refer to Figure 35
3. Set the FOLD / FIELD switch to FIELD. This arrests fold at field lift.
4. Retract the fold/lift circuit until lift-assist and wing fold operations each their stops. Set fold/lift circuit to Neutral. Shut off the tractor engine, leaving the FOLD / FIELD switch powered-up.a
5. Raise the parking stands (page 36).

---
a. If the FOLD / FIELD switch is wired directly to the tractor battery, the tractor may be shut off completely. Otherwise leave the ACC active.
Field Lift: 5-Section 2013+

These steps presume an unfolded applicator in field configuration (lift-assist locks out, spacers in, coulters in ground).

Refer to Figure 37

1. Set the FOLD / FIELD switch to FIELD. This arrests fold at field lift and locks the outer wings at level.
2. Raise the tractor 3-point hitch.

Refer to Figure 38

3. Raise the applicator by retracting the fold/lift circuit to retract the wing fold cylinders and extend the lift-assist. Wing sections partially fold.
4. Set hitch and fold/lift circuits to Neutral for extended turns or field moves.

**CAUTION**

Gradual Crushing Hazard:
Do not rely on hydraulic pressure alone to keep the applicator raised. Use parking stands (page 36) and locks (page 45) when working around a raised applicator. The tractor hitch may settle.

**NOTICE**

Equipment Damage Risk:
Do not fully fold or fully unfold while lowered. Perform complete fold and unfold only when fully raised. When lowered, the wing coulters near the wing pivots may be damaged by bending or ground dragging.

![Figure 37: FOLD / FIELD Switch for Field Lift](image)

![Figure 38: Partial Fold in Field Lift](image)
Lower While Folded: 5-Section 2013+
These steps presume that the intention is parking or storage, on lift-assist locks and parking stands.
1. Verify that the lift lock channels are installed on the lift-assist cylinders (page 45).
2. Verify that the wing lock pins are installed. Wings unfold during lower if these pins are not in place.
3. Extend the fold/lift circuit to lower the lift-assist cylinders onto their locks.
4. Raise the tractor three-point hitch until the applicator mainframe is level front-to-rear, or the front is slightly higher than the rear. Set the hitch circuit to Neutral. Shut off the tractor.
5. Deploy the parking stands. Pin them so that the frame will be level when lowered onto the stands.
6. Start the tractor. Lower the tractor hitch until the applicator is supported by the parking stands.

Lower While Unfolded: 5-Section 2013+
These steps presume that the applicator is presently folded with lift-assist lock channels installed, and parking stands deployed, and that the intention is to park, store or service the applicator. For field lower and field adjustments, see topic “Field Lower: 5-Section 2013+” following.
1. Perform a Lower While Folded: 5-Section 2013+ operation (page 57).
2. Set the lift/fold/circuit to Neutral or Float.
3. Remove the wing lock pins (page 47).

Refer to Figure 39
4. Set the FOLD / FIELD switch to FOLD / UNFOLD
   This arrests unfolding at wings-level.
5. Extend the fold/lift wing to unfold the wings, until wings-level.
6. To keep all coulters off the ground when unfolded and lowered, crank the gauge wheels to full extension (page 86).
7. If the tractor hitch is raised, lower it until the applicator rests on the parking stands at front.
8. Set the FOLD / FIELD switch to FIELD
   This allows the wings to move below level.
9. Extend the fold/lift wing to further unfold the wings until the gauge wheels touch the ground, then set the circuit to Float (to relieve pressure at hitch hoses).
   Note: The counterbalance valve holds the inner wings at their current position.
10. Set the FOLD / FIELD switch to PARK.

Tip-Over and Crushing Hazard:
Never unhitch without using parking stands, particularly while folded. A folded applicator without parking stands deployed may tip forward immediately upon unhitching. Anyone at the hitch or in the tractor could be seriously injured or killed. The tractor cab may be crushed.

Equipment Damage Risk:
Although it is possible to fully lower the applicator while folded, this is not recommended. This can place the full weight of the machine on the center coulters, exceeding their spring capability.
Note: If wing lock pins are installed, the FOLD / FIELD switch may be in any position for lowering while folded.
Field Lower: 5-Section 2013+

These steps are for lowering in the field after initial line-up and after turns. Lift-assist lock channels (page 45) are presumed to have been replaced by spacers (page 38). The down-pressure/weight transfer system (page 87) is presumed to be adjusted.

The key objectives for an optimal lowering are:

• avoid side loads on coulter discs or tines by avoiding lowering with drooped wing tips, and
• avoid tine plugging by avoiding any reverse motion of the tines at the ground.

Being in slow forward motion during lower avoids both of these risks. The following instructions presume a lowering while stationary.

Refer to Figure 40

1. Verify that the FOLD / FIELD switch is set to FIELD

2. Check that wings are partially folded in field lift, or at least level. If they are drooping, retract the fold cylinders to correct.

3. Lower the tractor 3-point hitch to the preset field height. Set the hitch circuit to Position or Depth Control.

4. Extend the fold/lift circuit to lower the wings below level into down-pressure mode, and to retract the lift-assist cylinders to their spacers.

   Note: You may lower the hitch and lift-assist simultaneously, but avoid lowering the lift-assist before the hitch.

5. Pull forward.

6. Leave the fold/lift circuit active in the lower/unfold position, to supply oil to the down-pressure system.
Unfolding and Folding

Nutri-Pro® applicators differ in locks and operational steps:

• Pull-Type applicators have a simple dedicated fold system with no wing locks. See “Unfolding and Folding Pull-Type” below.
• 3-Point applicators have wing locks requiring reset prior to fold. See “Unfolding and Folding 3-Point” on page 60.
• 2-Point applicators have a lift-assist that usually requires reconfiguring just prior to unfold and fold. Additional steps vary with configurations:

On 3-section, and 2012- 5-section, wing locks require reset prior to fold. See “Unfolding and Folding 3-Section and 2012- 2-Point 5-Section” on page 61.

2013+ 5-section applicator require a switch setting change. See “Unfolding and Folding 2013+ 2-Point 5-Section” on page 63

Unfolding and Folding Pull-Type

The pull-type applicator has no particular restrictions on unfolding or folding on or off the field. As long as the lift circuit is fully raised, knife/tine strike is not an issue.

Unfolding Pull-Type (At Field)

These instructions presume the applicator has just completed transport, and is being unfolded for field use.

1. Point the applicator into the wind.
2. Close the weight-transfer shut-off valve (page 50).
3. Extend the fold cylinders to unfold.
4. Set control to Float when wing front caster wheels contact the ground.
5. Extend the lift circuit (page 51) to raise the applicator fully.
6. Remove and store the transport locks at center section and lift-assist cylinders (page 45). If wing lift cylinder lock channels were installed. Remove them and re-engage hydraulic depth stop (page 47).
7. Open the weight-transfer shut-off valve.
8. If lined up at field, retract the lift circuit to lower the applicator to height set by the hydraulic depth stop (page 85).
9. Set the lift circuit to Float.

Loop Ammonia Exposure Hazard:

Allow no one down-wind of the applicator when folding and unfolding. Delivery tubing loops may contain liquid NH₃ that can drain out of knives or tines during wing movement. This liquid can remain in the loops long after application has ended.

After parking overnight or longer, any liquid present may be highly caustic ammonium hydroxide (concentrated NH₄OH, a solution of NH₃ and atmospheric moisture) rather than pure NH₃. Assume any liquid in loops is extremely hazardous. Take full NH₃ field precautions.

Ammonia Exposure Hazard:

Face applicator up-wind or clear the delivery lines (page 116) before unfolding or folding. Fluid in delivery line loops, whether pure NH₃ or concentrated NH₄OH, is likely to move from the loops and drip out at the knives or tines.

Folding Pull-Type

These instructions presume the applicator has just completed application, and is being folded for transport or parking.

1. Stop NH₃ flow (page 77), which includes heading into the wind, and raising the applicator out of the ground.
2. Close the weight-transfer shut-off valve (page 50).
3. Wait for the lines to discharge.
4. When the applicator is safe to approach, re-extend the lift circuit to assure that it is fully raised.
5. Install lock channels at the lift-assist and center section lift cylinders (page 45).
6. Retract the fold cylinders to fold the wings.
7. Stop, circuit in Neutral, when both wings are on the transport rest.
8. Leave the fold circuit in Neutral for transport, or set the to Float for unhitching.
Unfolding and Folding 3-Point

Unfolding 3-Point

The 3-Point applicator should only be unfolded in the field, or fully supported by parking stands.

Unfolding 3-Point (At Field)

These instructions presume the applicator has just completed transport, and is being unfolded for field use.

1. Line the applicator up into the wind.
2. Close the weight-transfer shut-off valve (page 50).
3. Raise the 3-Point hitch fully.
4. Unfold the wings. Slowly extend the fold cylinders.
   After the wings pass vertical, lock channels swing into contact with the cylinder rods.
   Stop the unfold when the wings are approximately level. Hold at level with circuit Neutral.
5. Lower the applicator to the ground with the 3-point hitch.
6. Open the weight-transfer shut-off valve.
7. Set the hitch to Depth Control mode.
   Set the fold circuit to Float.

Unfolding 3-Point (Service)

To unfold, off field, for servicing, unfold with the center section fully raised. Unless the wing gauge wheels have been previously extended to maximum height, or extra stands or supports are used, the wing end knives or tines will reach the ground first. Take precautions if parking surface damage is a concern.

1. Fully raise the 3-Point hitch.
2. Close the weight-transfer shut-off valve (page 50).
3. Point the applicator into the wind.
4. Deploy parking stands. Set them to maximum height.
5. Extend fold cylinders.
6. As the wings near level, set circuit to Neutral.
7. Unless using blocks or stands, fully extend the gauge wheels to maximum height.
8. Resume unfolding until gauge wheels are on ground.
   Set fold circuit to Float.
9. Lower the 3-point hitch.

Ammonia Exposure Hazard:

Face applicator up-wind or clear the delivery lines (page 116) before unfolding. Fluid in delivery line loops, whether pure NH₃ or concentrated NH₄OH, is likely to move from the loops and drip out at the knives or tines.

Folding 3-Point

These instructions presume that the applicator is unfolded and lowered.

1. Stop NH₃ flow (page 77).
2. Close the weight-transfer shut-off valve (page 50).
3. Retract the fold cylinder circuit until the wing locks stop motion, or the outside row knives or tines just start to lift out of the ground. Set the fold circuit to Neutral.
4. Raise the 3-point hitch.
5. Wait for the delivery lines to discharge.
6. Deploy parking stands if the applicator is to be parked at the folding spot.

Refer to Figure 41 (depicting an NP40L, which has similar wing locks)

7. Swing the wing locks up and out of their engaged positions, and into their reset positions.
8. Retract the fold cylinders until the wings contact the transport rest. Set circuit to Float if unhitching, or Neutral for transport.

For parking/storage/service, lower the applicator onto parking stands.
Unfolding and Folding 3-Section and 2012-2-Point 5-Section

Unfolding 3-Section and 2012-2-Point 5-Section
The 2-Point applicator should only be unfolded in the field, or fully supported by parking stands and lift-assist cylinder transport locks.

Unfolding 3-Section and 2012-2-Point 5-Section (At Field)
These instructions presume the applicator has just completed transport, and is being unfolded for field use.
1. Point the applicator into the wind.
2. Close the weight-transfer shut-off valve (page 53).
3. Raise the 2-Point hitch and perform a lift-assist raise operation. Set circuit to Neutral.
4. Remove the transport locks (page 45).
5. Install the spacers (page 38).
6. Unfold the wings. Slowly extend the fold cylinders.

After the wings pass vertical, lock channels swing into contact with the cylinder rods.

Stop the unfold when the wings are approximately level. Hold at level with circuit Neutral.
7. Retract the lift-assist cylinders to lower the applicator at the rear, and lower the 2-point hitch in the front.
8. Set the hitch to Depth Control mode.
   Set both fold and lift-assist circuits to Float.
9. Open the weight-transfer shut-off valve.

Unfolding 3-Section and 2012-2-Point 5-Section (Service)
To unfold, off field, for servicing, unfold with the center section fully raised. Unless the wing gauge wheels have been previously extended to maximum height, or extra stands or supports are used, the wing end knives or tines will reach the ground first. Take precautions if parking surface damage is a concern.
1. Point the applicator into the wind.
2. Close the weight-transfer shut-off valve (page 53).
3. Raise the 2-Point hitch.
4. If transport locks are not yet installed, perform a lift-assist raise operation. Set circuit to Neutral. Remove spacers (page 38). Install lift-assist transport locks (page 45).
5. Deploy parking stands. Set them to maximum height.
6. Extend fold cylinders.
7. As the wings near level, set circuit to Neutral.
8. Unless using blocks or stands, fully extend the gauge wheels to maximum height.
9. Resume unfolding until gauge wheels are on ground. Set fold circuit to Float.
10. Lower the lift-assist onto the lock channels. Set lift circuit to Float.
11. Lower the 2-point hitch.

Ammonia Exposure Hazard:
Face applicator up-wind or clear the delivery lines (page 116) before unfolding or folding. Fluid in delivery line loops, whether pure NH₃ or concentrated NH₄OH, is likely to move from the loops and drip out at the knives or tines.

2019-03-11
Folding 3-Section and 2012-2-Point 5-Section
These instructions presume that the applicator is unfolded and lowered.

**CAUTION**

*Ammonia Exposure Hazard:*
*Face applicator up-wind or clear the delivery lines (page 116)*
*before folding. Fluid in line loops, whether pure NH₃ or*
*concentrated NH₄OH, is likely to move from the loops and*
drip out at the knives or tines.

1. Stop NH₃ flow (page 77).
2. Close the weight-transfer shut-off valve (page 50).
3. Retract the fold cylinder circuit until the wing locks stop motion, or the outside row knives or tines just start to lift out of the ground. Set the fold circuit to Neutral.
4. Raise the 2-point hitch.
5. Extend the lift-assist cylinders to raise the applicator rear.
6. Wait for the applicator lines to discharge.
7. Activate lift-assist again, in case the cylinders have settled during discharge.
8. Cautiously approach the rear of the applicator. Install lift locks at the rear casters.
9. Deploy parking stands if the applicator is to be parked at the folding spot.

Refer to Figure 42
*(depicting an NP40L, which has similar wing locks)*

10. Swing the wing locks up and out of their engaged positions, and into their reset positions.
11. Retract the fold cylinders until the wings contact the transport rest. Set circuit to Float if unhitching, or Neutral for transport.

For parking/storage/service, lower the applicator onto parking stands. For transport, the lift-assist circuit may be left in Neutral fully raised, or lowered onto the lock channels and set to Float or Neutral.
Unfolding and Folding 2013+ 2-Point 5-Section

Unfolding 2013+ 5-Section (At Field)

These instructions presume the applicator has just completed transport, is raised, and transport locks are installed. It is being unfolded for field use.

1. Remove the wing lock pins (page 47).

Refer to Figure 43

2. Set the FOLD / FIELD switch to FOLD / UNFOLD.

3. Extend the fold/lift circuit to unfold the wings

4. Retract the fold/lift circuit slightly to raise the lift-assist off the lock channels.

5. Set all circuits to Neutral. Shut off the tractor.

6. Remove the lift-assist lock channels (page 45). Install the spacers (page 38).

7. If wing gauge wheels were extended, crank them to field height (page 86).

8. Lower the hitch to field height.

Notes about normal unfold:

- Inner wings unfold first. The outer wings are constrained by the wing latches (page 48).
- Outer wings unfold last. The wing latches release just before the inner wings are level.
- Wings do not unfold to below wings-level.

**NOTICE**

**Machine Damage Risk:**

*Set the switch to UNFOLD. If set to PARK or FIELD, the wings may unfold to below level and drag inward on the ground.*
Unfolding 2013+ 5-Section (Parking, Storage, Service)

To unfold, off field, for parking, storage or servicing, unfold with the center section fully raised.

1. Hitch to a suitable tractor (page 30).
2. Retract the fold/lift circuit to fully raise the applicator lift-assist.
3. Raise the tractor 3-point hitch.
4. If lift-assist lock channels are not installed, set circuits to Neutral. Shut off the tractor. Remove spacers (page 38). Install lock channels (page 45). Re-start the tractor.
5. Remove the wing lock pins (page 47).

Refer to Figure 45

6. Set the Fold switch to FOLD / UNFOLD
7. Extend the fold/lift circuit to unfold the wings.
8. Set all circuits to Neutral.
9. Shut off the tractor.
10. Unless using blocks or stands under wings, fully extend wing gauge wheels (page 86).
11. Deploy parking stands at desired or maximum height.
12. Start the tractor. Lower the 3-point hitch until the applicator rests on the parking stands at front.
13. If wings stop above horizontal, move switch to FIELD position, and Extend fold/lift to further unfold.
14. Extend until the gauge wheels contact the ground or the wings stop. Set the fold/lift circuit to Float.

Notes about normal unfold:

• Inner wings unfold first. The outer wings are constrained by the wing latches (page 48).
• Outer wings unfold last. The wing latches release just before the inner wings are level.
• Wings do not unfold to below wings-level.

NOTICE

Machine Damage Risk:
Set the switch to UNFOLD. If set to PARK or FIELD, the wings may unfold to below level and drag inward on the ground.
Folding 2013+ 5-Section

These instructions presume that the applicator is unfolded and lowered.

1. Verify that the wing lock pins (page 47) are not in the wing rest cradles. Typically they are in storage tubes.

Refer to Figure 47

2. Set the Fold switch to FOLD / UNFOLD.

Refer to Figure 49

Electrocution and Overhead Collision Hazards:

Do not fold with switch in FIELD position. In FIELD, the outer wing sections cannot fold. The folded applicator would be over 21 feet (6.2 m) high. This dramatically increases the risk of electrocution from overhead lines, with or without direct contact. It is also too high for safe transport.

Refer to Figure 48

3. Raise the hitch.

4. Retract the fold/lift circuit to simultaneously raise and fold the applicator. Observe the fold sequence. Lift and fold do not start and end at the same time.

If an abnormal fold is detected, set the fold/lift circuit to Retract, then Neutral at wings level. Troubleshoot the problem.

5. Set the fold/lift circuit to Neutral.

6. Remove spacers (page 38). Install lift-assist cylinder locks (page 45).

7. Insert wing lock pins (page 47).

8. Extend fold/lift to lower lift-assist cylinders onto lock channels. Set fold/lift circuit to Float. Shut off tractor.

For parking/storage/service, lower the applicator onto parking stands.
Transport

⚠️ DANGER

Loss of Control Hazard:
Never use the applicator to tow a nurse tank on public roads. Tow the tank to the field with a separate vehicle. The applicator cannot provide sufficient lateral control of a trailing cart at highway speeds. The total weight of the train can also easily exceed the steering and/or braking capability of the tractor. A tank upset could occur during normal highway maneuvers. The resulting accident or spill could cause serious injury or death. Highway towing of an anhydrous ammonia tank behind an applicator is prohibited by law in many locales.

⚠️ DANGER

Loss of Control Hazard (2P, Pull-Type):
Never tow a pull-type or 2-point applicator that weighs more than 150% of the tractor (transport tractor must weigh at least 67% of applicator). Ensure that the towing vehicle is adequate for the task. Using an inadequate tow vehicle is extremely unsafe, and can result in loss of control, serious injury and death.

Tractor weight matters. For field configuration (after transport), tractor must weigh at least 150% of the applicator plus the loaded nurse tank. This weight is substantially higher than the required transport weight.

⚠️ DANGER

Loss of Control Hazard (2P, 3P):
Never transport a 2-point or 3-point applicator unless the tractor is properly ballasted to provide adequate weight on the steering wheels. A heavy 2-point or 3-point applicator can dangerously reduce steering control. A normal turn could result in an accident and serious injury or death. Check your tractor manual for ballasting requirements.

Tractor weight matters. For field configuration (after transport), tractor must weigh at least 150% of the applicator plus the loaded nurse tank. This weight is substantially higher than the required transport weight.

⚠️ CAUTION

Braking and Loss of Control Hazard:
Do not exceed 20 mph (32 kph).
Transport Steps
Know your applicator weight. See page 136 or page 139 for tables including approximate weights of representative configurations.
If tractor capabilities are marginal, check the actual weight of the applicator at a scale.

Pull-Type Applicators
1. Check that applicator is securely hitched to a sufficient tractor (page 30).
2. Always use a locking-style hitch pin sized to match holes in hitch and draw-bar (minimum 1-inch-diameter, heat-treated pin).
3. Attach safety chain to tractor with enough slack to permit turning (page 30).
4. Verify correct operation of lights.
5. Raise fertilizer applicator (page 51).
6. Install center and lift-assist cylinder locks (page 45).
7. Fold applicator if unfolded (page 59).
8. Check that tires are properly inflated (page 140).
10. Always have lights on for highway operation.
11. Do not exceed 32 kph (20 mph). Comply with all national, regional and local laws when traveling on public roads.
12. Remember that the applicator may be wider than the tractor. Allow safe clearance.
13. Transport slowly over uneven or rough terrain.
14. At field, stop transport with the tractor facing up-wind.

2-Point and 3-Point Applicators
1. Check that fertilizer applicator is securely hitched to a sufficient tractor (page 31)
2. Verify correct operation of lights.
3. Raise fertilizer applicator (page 53).
4. Install cylinder locks (2-point, page 45).
5. Fold applicator if unfolded (page 59).
6. Plan the route. Avoid steep hills.
7. Always have lights on for highway operation.
8. Do not exceed 32 kph (20 mph). Comply with all national, regional and local laws when traveling on public roads.
9. Remember that the fertilizer applicator may be wider than the tractor. Allow safe clearance.
10. Transport slowly over uneven or rough terrain.
11. At field, stop transport with the tractor facing up-wind.

Final Applicator Setup
Prior to hitching nurse tank, make and check final applicator adjustments. This could include:
• Application depth, page 96:
  2-Point, page 38, page 86 and tractor hitch
  3-Point, page 86 and tractor hitch
  Pull-Type, page 85
• Coulter (Option) depth and castering, page 99.
• Knife or tine condition, page 100.
• Sealer (Option) adjustments, page 102.
• Make a dry run to check applicator functions, running depth and sealing.

For nurse cart hitching, the applicator may be raised or lowered, folded or unfolded. However, being raised and folded hastens departure if any nurse tank problems are discovered before cart hitching.
Nurse Tanks

Use nurse tanks with proper current safety certification, and current safety equipment and features.
Consult with your anhydrous ammonia supplier for safety information and correct safe handling, transport and use of anhydrous ammonia.
Consult with local and regional authorities on safe and legal use of anhydrous ammonia, including emergency and environmental contacts, and release reporting requirements.
Review any decals and manuals available for your nurse tank cart, and for any of its components. There may be separate manuals for the tank, running gear, indicators, valves and fittings.
This (Nutri-Pro® applicator) manual covers typical operations for a representative NH₃ nurse tank cart. Your cart is likely to vary. See the “Using Anhydrous Ammonia Safely” manual (407-551M) for further information about nurse tank carts.

Safing Applicator Before Cart Hitch

Close Line Valves

1. If any emergency shut-off valve is open, use the rope to close it. This also tests the rope and path.

Refer to Figure 59

2. Close solenoid valves:
   a. Set console MASTER switch OFF
   b. Set BOOM 1 BOOM 2a and BOOM 3a switches OFF.
   c. Turn POWER switch ON.
      If the valves were open, setting either MASTER or all BOOM switches off closes the On/Off Valve (A31).
   d. Wait 10 seconds.
      The Control Valve (A30) goes to minimum due to zero speed. It does not completely close.
   e. Set POWER switch OFF.

a. If the applicator has a single-section boom, only switch BOOM 1 needs to be operated.
Check Hydrostatic Relief Valves

3. Check that the plastic cap is in place at each valve. In the Great Plains configuration, this would be:
   • A29 at each cooler
   • A15 at the outlet side of the breakaway coupler

Ammonia Exposure and Loss Hazards:
Understand the reason for any lifted or missing hydrostatic relief valve caps. If a cap is out of place, that line section may have been closed with liquid NH₃ present, which later vented, dislodging the cap. It is also possible that the valve disc has deteriorated and is venting at normal operating pressures.

Close Bleed Valves

4. Put on goggles and gloves. Approach the applicator from up-wind.
5. Check that all bleed valves are closed:
   • A29 at the pressure/temperature gauges.
   • A15 at the outlet side of the breakaway coupler.
   • A13 at the inlet side of the breakaway coupler.

Check Hose Discharged

6. Visually check the general condition of the breakaway connection A14. If the two halves appear mated, use the inlet side bleed valve A13 for the next step. Otherwise treat this as a breakaway event (page 78).
7. Orient the bleed valve orifice so that it points away from you and down-wind.
8. Wearing rubber chemical gloves, slowly open the bleed valve A13 by rotating the T-handle counter-clockwise.
   Check for signs that there may be residual NH₃ in between the Acme cap and the shut-off valve:
   • strong ammonia odor
   • hissing of escaping gas
   • valve getting cold
   • dripping or spraying fluid
9. If there are any signs of residual NH₃, leave the bleed valve open until the ammonia has vented, and the inlet fittings have re-warmed to ambient temperature. This could take tens of minutes if the applicator was recently and improperly shut down.
10. Close the bleed valve.
Hitching Nurse Tank

Consult with the nurse tank supplier, and all available nurse tank documents, before hitching for the first time.

**CAUTION**

\[NH_3\]: Possible Chemical Hazard:
Clear all non-essential personnel from the area at this time. Take normal NH3 field precautions. Although ammonia release is not expected for mechanical hitching, the tank could be venting small amounts, or large amounts if mis-configured, or if a component fails. On a re-hitch, the applicator may also be venting residual material. Unprotected exposure could cause serious lung or eye irritation.

Hitch a nurse tank to the applicator only at the field, and not prior to transport.

If taking delivery of a tank at the field, complete an inspection (see "Using Anhydrous Ammonia Safely" manual, 407-551M) before accepting the tank.

**Mechanical Cart Hitching**

1. Spot the applicator. Three objectives are:
   - All tank carts:
     - Spot to avoid reverse moves after cart hitching.
     - Face the tractor and applicator basically up wind, but with a cross-wind component such that:
       - the hose connection(s) and valve operations will be made down-wind of where you stand for those operations.
   - Refer to Figure 54

2. Bring the applicator rear hitch tongue and nurse tank cart tongue into close proximity (a few inches).

3. Push down on the red tongue release handle 1. This frees the applicator rear hitch tongue to extend 7 inches (17.8 cm) to the rear, and 9 inches (23 cm) to either side, to assist with cart tongue alignment.

4. Align the cart clevis hitch with the applicator pull bar. Insert and secure the 1 inch hitch pin.

5. Securely attach the cart’s safety chains to the hitch chain anchors 2.

6. Optionally re-seat the applicator rear hitch tongue, at this time, by using the tractor to move the applicator backward several inches, until the latch on the hitch re-engages.
Making Nurse Tank Connections

These instructions presume an applicator with Great Plains-supplied Squib-Taylor Flo-Max™ coupler and Raven AccuFlow™ application system.

1. Perform the steps at “Safing Applicator Before Cart Hitch”, pages 68.

**WARNING**

Anhydrous Ammonia Exposure Hazard:

Do not skip step 1. Wear your PPE. Never open a line without first performing a bleed to check it. If the applicator was improperly shut-down, the hose can contain more NH₃ than your PPE can handle. Lung damage, burning, blindness and death are possible.

Refer to Figure 55

2. Check that the two halves of the breakaway coupler A14 are firmly mated at the swivel bracket. If not, see the Squibb-Taylor Flo-Max™ manual for re-connection instructions.

3. Check that the break-away coupler bracket 7 is free to swivel, relative to pointing directly rearward horizontal, by at least:
   - 80° to each side,
   - 45° up, and;
   - 20° down.

4. Remove, the Acme cap A11 on the inlet side of the break-away coupler.

Refer to Figure 56

5. Inspect the inlet Acme threads A12. Clean away any debris or other contamination.

**CAUTION**

Blinding, Choking and Respiratory Hazard:

Never look directly into an ammonia hose or fitting. Use a mirror. Always assume that ammonia is present in the system. There are many ways it can hide, and surprise you later. See “Avoid Trapped Anhydrous” on page 113.

6. Using a hand mirror, inspect the gasket 2 inside the fitting A12. If there is no sign of ammonia, and no odor, you can remove the gasket by hand for closer inspection.

   This gasket makes the liquid-tight seal between the hose and break-away coupler. Inspect it for a smooth face, no cracks, chips or weathering, and no sign of permanent compression. Replace gasket as needed for a tight seal.

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a. PPE: Personal Protective Equipment
Connect Cart Hose

Refer to Figure 57

Continue wearing your NH₃ PPE.

7. Verify that the nurse tank hose withdrawal valve (A65) is closed. Hand tighten only. Do not use tools.

8. Verify that any hose valves (A57, not shown here) are also closed. Hand tighten only. Do not use tools.

9. Check for signs that there may be residual NH₃ in between the Acme plug and the outlet shut-off valve:
   • strong ammonia odor
   • hissing of escaping gas
   • fitting getting cold
   • dripping or spraying fluid

   If there are any signs of residual NH₃, leave the plug in, but loose, until the ammonia has vented, and the Acme fitting has re-warmed to ambient temperature. This could take tens of minutes if the cart was improperly configured during or after filling.

10. Disconnect the outlet end of the hose (A57) from the Acme parking plug, or remove the Acme plug. Inspect the outlet Acme threads. Clean away any debris or other contamination.

Refer to Figure 57

11. Route the cart hose along the cart tongue, securing it to any clamps or caddies provided.

   Do not clamp or tie the hose within 3 feet (92 cm) of the breakaway coupler inlet (A12).

   Allow at least 13 inches (33 cm) slack in the hose within the first 3 ft. Do not allow excess slack that could allow the hose to snag or drag on the ground.

12. Bring the hose outlet (A57) and applicator inlet (A12) into contact. Hand tighten the swivel collar or shroud on the hose fitting. Do not use tools. You only need to adequately compress the gasket in the applicator inlet.

Dry Run

Before activating the NH₃ delivery, cautious practice is to make one dry run pass, including a turn in each direction. This assures that knife or tine depth is set correctly, hydraulics are working correctly, the nurse tank cart is tracking without issue, proper slack exists for all hoses and harnesses, and the meter console is reporting correct field speed.

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a. PPE: Personal Protective Equipment
Pass Planning

If field requirements permit, you can minimize exposure to NH₃ vapor with the following recommendations:

Refer to Figure 58

- Check the wind direction.
- Plan passes to be cross-wind and turns up-wind.
- Plan first pass on down-wind side of field.
- Choose your first pass to allow you to be up-wind while operating valves at the nurse tank and applicator. Opening the emergency shut-off valve typically requires climbing on the applicator from the right. Starting with the wind from the right is optimal.

CAUTION

Anhydrous Ammonia Exposure Hazard:
If field requirements result in any down-wind operations:

▲ Use only a tractor with an enclosed cab.
▲ Have an escape route (up-wind turn) available for all down-wind operations.
▲ Conduct end-of-pass operations to minimize above-ground releases.
▲ Be mindful of the risks of olfactory fatigue. You can “get used to” the odor and fail to notice when concentrations get dangerously high.

Start of Pass Planning

Ideally, you want NH₃ to begin flowing out of the knives or tines right at the start of a pass, with the knives or tines already in the ground. This minimizes atmospheric releases.

Depending on wind direction, tractor capability, available headlands, and field conditions, there are several ways to start each pass.

A. Capable Tractor:
   Lower applicator into ground at start of pass. Pull forward to set them to operating depth. Start meter flow. Do not start moving until flow divider pressure gauge nears typical operating value.

B. Headlands Available, Any Tractor:
   Lower applicator to ground some distance ahead of the application area. Move forward slowly. As knives or tines enter ground, start meter flow.

C. No Headlands, Marginal Tractor:
   Lower applicator to ground at start of pass. Start forward movement, then meter flow. Move slowly until console rate display nears target rate.

Note: The procedures at left are not operating instructions or checklists. They are outlines for planning pass starts. See the step details starting on page 75 and the checklists on page 82.
Monitor Operation

Refer to Figure 59

The optional SCS 450 console monitors NH₃ flow, monitors field speed, and operates the (rate) control valve to deliver anhydrous ammonia at your desired rate. Once setup for the applicator and preferences, and configured for the rates/limits, the monitor is typically used in the “RATE 1” or “RATE 2” FLOW CONTROL modes.

- **POWER**: must be ON
- **FLOW CONTROL**: as desired
- **BOOMS**: 1 or BOOMS 1,2&3 ON, all others don’t-care (suggest OFF)
- **MASTER**: OFF except when in field and in ground

**CAUTION**

**POWER Switch: Ammonia Release Hazard:**

The MASTER switch only controls the On/Off valve A53 if the POWER switch is ON (and power is supplied to the console). If you turn the POWER switch off with the MASTER and any BOOM switch on, the On/Off valve A53 remains OPEN, the Control Valve A30 may be open and ammonia may continue to flow from the nurse tank to the knives or tines.

See SCS 450 manual for monitor operation details.

Field Application

Starting NH₃ Tank Flow

13. Spot the applicator at the start of the first pass.
14. If the tractor has adequate power, lower the knives or tines into the ground and pull forward to fully seat them.

Refer to Figure 59

15. Check console MASTER switch OFF.
16. Put on your chemical gloves and goggles.

Refer to Figure 60

17. Check all applicator and nurse tank valves closed (all in-line valves and all bleed valves).
18. From up-wind, open the tank withdrawal valve A65. Check for leaks and open valves. Expect NO ammonia odor at this time.
19. Open the applicator emergency shut-off valve A18. Check for leaks and open valves. Expect NO ammonia odor at this time.
20. Open hose inlet end valve (A31), if any - tank depicted has no hose valves). Check for leaks and open valves. Expect NO ammonia odor at this time.

21. Open hose outlet end valve (A31), if any - tank depicted has no hose valves). Check for leaks. In an all-Great Plains configuration, if there has been no odor so far, there should be no odor now, as flow is blocked at the On/Off valve A31 (not visible).

Refer to Figure 61

22. At the meter gauges, pressure gauge A28 should read within 5 psi of the nurse tank gauge. The flow divider gauge A7 should be zero. The temperature gauge A27 is likely to be below ambient.

Starting Application

23. Enter the tractor cab.

24. Check the emergency shut-off rope. Make sure you know where it is. Make sure the rope cannot slip away. Leave enough slack in the line for field turns and uneven ground.

Refer to Figure 62

25. At the console, set the POWER switch ON.

26. Set the MASTER switch to ON.

27. Set the BOOMS 1 or BOOMS 1,2 & 3 switches on to ON.

28. Select the desired RATE preset.

29. Lower applicator to operating depth (if not already lowered) and begin first pass.

**CAUTION**

NH₃: Possible Chemical Hazard:
Anhydrous ammonia is now flowing into the ground. Some routinely escapes to the atmosphere. Check for leaks. Take action if strong odor is detected or a leak seen. Turn up wind. Turn off flow. Check gauges from tractor cab. Engage emergency shut-off valve if a leak is detected.

Minor odor during application is normal, particularly if the tractor cab is ever down wind of recent passes.

Strong or irritating odor indicates a problem. Conditions may not be suitable for application (soil too dry, cloddy and deeply cracked, for example), or there may be a system problem.

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**Note:** This 5 psi correlation is only true under no-flow conditions. When NH₃ application begins, the pressure reading at the cooler gauge drops, due to the reduced temperature of the cooled fluid, and pressure losses due to flow in plumbing.
Suspending Application

These instructions are for brief stops in the field, for example, to make a phone call. See also “Stopping Application” on page 77.

a. What is the wind direction?

b. Turn MASTER switch OFF. This turns On/Off Valve off.

With On/Off off, there is still a substantial amount of liquid NH₃ downstream of all valves, in the flow divider, row application tubing, and row knives or tines. When stopped, in ground, this slowly warms, vaporizes, and is expelled into the soil. See warning at right.

c. Continue field application until the Flow Divider pressure gauge reads zero. Wait at least another 5 minutes.

d. Turn up-wind.

e. Leave the applicator in the ground. There is still considerable NH₃ vapor in the lines that are open to the soil. There may also be a modest amount of liquid in cold tubing loops.

Field Turns

a. Before the turn, set the MASTER switch OFF. Leave the applicator in the ground, and continue forward movement.

b. Lift the applicator (page 50) at the turn point.

**Major Spill / Equipment Damage Hazards:**

Do not turn too tightly. The nurse tank could strike the applicator, be upset, and leak. On 2-Point and Pull-Type, the nurse tank tongue could strike the caster tires. On 3-Point, the nurse tank tires could strike sealers or knife/tine shanks.

c. Turn up-wind for the next pass.

d. Line up per your start of pass plan.

e. Lower the applicator into the ground.

**WARNING**

Ammonia Vapor Release Occurs at Turns:

Avoid down-wind turns. Do not raise for turns if unprotected individuals or sensitive livestock are immediately down-wind of the turn. Stop instead.

Turning off NH₃ flow prior to raising for turns does deplete some of the liquid ammonia in the applicator lines, but not all of it, and considerable vapor remains. At turns, there will be some release of NH₃ vapor, and possibly some NH₃ liquid. Be prepared for it. Minimize exposure to yourself and others.

Turn up-wind immediately if a hazardous concentration of fumes reaches the tractor cab.
Stopping Application

Plan your stops. A safe stop requires depleting the anhydrous, from the nurse tank withdrawal valve to the knives or tines.

a. What is the wind direction?
b. Suspend application per “Suspending Application” on page 76.
c. Put on your chemical gloves.
   Be wearing your goggles.
d. Carefully approach the nurse tank from up-wind.
   Expect some ammonia odor, but if it is extremely strong, there may be an above-ground release in progress due to malfunction or part failure. If so, remain clear until the release subsides.
e. When safe to do so, shut off the nurse tank withdrawal valve (A65).
f. Re-enter the tractor cab.
g. Turn MASTER switch ON.
h. Resume field application until reported rate begins to fall. Increase rate to maximum (to fully open Control Valve (A30)).
i. Continue field application until both cooler and divider pressure gauges read zero.
j. Facing into the wind, raise the applicator and stop.
k. Set the MASTER switch to OFF.
l. Wait at least 1 minute for row line vapor to dissipate.
m. Turn so that the wind is directly from the right.

n. Open all bleed valves. Standing up-wind of each, and making sure orifices point away from you, slowly open bleed valves at:
   • nurse tank hose inlet end (A61)
   • nurse tank hose outlet end (A61)
   • breakaway valve (A3 or A18, whichever is safer)
   • cooler temperature gauge (A30).
o. Close all remaining operating valves:
   • nurse tank hose inlet end (A63)
   • nurse tank hose outlet end (A63)
   • emergency shut-off valve (A18).
p. Wait at least one hour before moving applicator to any spot near unprotected people or livestock. It will continue to out-gas ammonia vapor for some time.

---

**WARNING**

**Ball Valves: Trapped NH₃ Hazard:**
Avoid routinely closing ball valves (other than the nurse tank withdrawal valve) with liquid NH₃ in the lines. Fluid is trapped in the line above the valve, may trigger relief valves, and can get trapped inside the valve ball unless it has a bleed port (not yet common on nurse tank hoses). See “Avoid Line Traps” on page 113 and “Avoid Ball Traps” on page 114.

A typical ball valve can trap enough NH₃ to make a room the size of a two-care garage uninhabitable (concentrations above IDLH in moments). When the ball valve is later opened, while warm, the NH₃ is expelled at high pressure. If the line is pointed at your face, you could receive a fatal exposure.
Breakaway Event

Initially treat a breakaway coupler separation event as you would any other field emergency. Perform the steps at “Ammonia Emergency Action” in the “Using Anhydrous Ammonia Safely” manual (407-551M). Only then consider performing the steps on this page.

Although the breakaway coupler is designed to separate, such breakaways are not routine events.

Upon a breakaway, what to do about the breakaway coupler itself is the last consideration. Priorities are:

1. Protect: Perform basic field emergency action, which may included summoning emergency responders if a major release is in progress, or the nurse tank is tipped over, or is otherwise at risk of a major release.
2. Assess: If the nurse tank appears intact, sound and stable, determine the cause of the breakaway. It is unlikely to be something simple that will allow a timely re-coupling and resumption of application.

If, and only if, the nurse tank is safe to approach, take the next steps to discharge both sides of the breakaway.

Discharge applicator:

3. Perform the steps at “Stopping Application” on page 77. Remain up wind and clear of nurse tank while doing this.
4. With the orifice pointing away from you, and down-wind, slowly open the coupler bleed valve at the applicator half of the breakaway coupler(s). If you closed the emergency shutoff(s) after breakaway, each bleed will release liquid NH₃, under pressure, most likely as a spray.

Discharge Nurse Tank Hose(s):

5. Position the tractor and applicator near the nurse tank. Stop up-wind of the tank, but slightly cross-wind of the tank (so that you are not exposed to residual applicator fumes while working around the tank). Face the tractor into the wind.
6. From up-wind, approach the nurse tank.
7. Close the nurse tank withdrawal valve.
8. From up-wind, approach the nurse tank hose outlet end(s).
9. Locate a bleed valve on the nurse tank hose outlet half of a coupler. Be careful not to touch or loosen the Acme coupler. Bleed only one hose at a time.
10. Position the outlet such that the bleed valve orifice points both away from you AND points down-wind AND can be opened and left pointing that way unattended. If this is not possible, get expert help.

---

Upon Event: Probable Chemical Hazard:

A 60cc (single-cooler) or 120cc (dual-cooler) liquid release to air has already occurred. Assume a major release is also in progress or imminent. Act accordingly. Request assistance from trained experts rather than risk blindness, disfiguring/disabling injury or death.

A breakaway event is most likely due to a major equipment failure (such as nurse tank running gear fracture), or a gross operator error (such as towing/turning too fast, or departing level ground). These cases can result in an immediate serious spill, or result in a damaged tank at risk of leak at any time.

Even in the case of a basic operator error (such as movement with only the nurse tank hose connected) both applicator systems and nurse tank hose(s) at breakaway are fully charged with liquid NH₃, right up to the checks in the breakaway halves. The nurse tank side is under full tank pressurization. The applicator hose(s) may be under pressure.

This was an unplanned event. Wind direction may not be favorable for discharging and re-coupling. If the wind is light or calm, do not attempt to bleed the breakaway coupler halves. Your field PPE is not sufficient for the releases necessary.

---

a. PPE: Personal Protective Equipment
11. Opening this bleed valve WILL release the substantial amount of liquid NH₃ presently trapped in the hose, most likely as a spray. Open the valve very slowly, just until some fluid appears. Leave the valve just slightly open.

12. Walk away, up-wind. Stay away until the release concludes. Carefully open bleed valve completely to confirm hose is discharged. For dual-cooler, repeat step 9 through step 12 for the other hose.

13. Close all breakaway bleed valves (A13× and A16), and any nurse tank hose valves A60. Disconnect the nurse tank half of the breakaway coupler at the Acme coupler (A57).

14. Correct the cause of breakaway, only if trivial to do in the field.

15. Consult the breakaway manual for re-coupling instructions.

---

**Before Re-connection: Elevated Exposure Hazard:**
Exercise extreme care. Even if the nurse tank is undamaged, sound and upright, a breakaway event is not a normal re-hitch situation. A substantial NH₃ bleed is required that WILL release a flow of liquid anhydrous ammonia under pressure. If the wind is calm or light, do not attempt to bleed the nurse tank hose(s). Your field PPEa is not sufficient.

---

a. PPE: Personal Protective Equipment
Unhitching Nurse Tank

The procedure is different for exchanging tanks vs. concluding application.

Exchanging Nurse Tanks

Consult with the nurse tank supplier, and all nurse tank documents, before unhitching or exchanging tanks.

a. Suspend NH₃ application per "Suspending Application" on page 76.

The purpose of this step is to minimize atmospheric NH₃ vapor while working at the rear hitch. You may not be able to conduct all unhitching and re-hitching steps from up-wind of all the knives or tines.

b. Position the applicator cross-wind, with the wind from the right, knives or tines in ground.

c. Use the rope to close the emergency shut-off valve.

d. Put on your goggle and rubber gloves.

e. Shut off the nurse tank withdrawal valve A65. Leave the nurse tank hose valves (A85, if any), open.

f. From up-wind, and with the orifice facing away from you, slowly open the breakaway coupler inlet bleed valve A13.

g. Stand clear and wait for the hoses to discharge.

h. From the up-wind side, unscrew the nurse tank hose outlet coupler (A57). Secure the hose using whatever means the cart provides.

i. Close all opened bleed valves.

j. Release the nurse tank safety chains.

k. Remove the nurse tank hitch pin.

Final Nurse Tank Unhitch

a. Conclude NH₃ application per "Stopping Application" on page 77.

The purpose of this step is to minimize atmospheric NH₃ vapor while working at the rear hitch, because you may not be able to conduct all unhitching steps from up-wind of all the knives or tines.

b. From the up-wind side, unscrew the nurse tank hose outlet coupler (A57) on page 21.

c. Secure the outlet coupler with the nurse tank’s Acme parking plug.

d. Close all opened bleed valves.

e. Release the nurse tank safety chains.

f. Remove the nurse tank hitch pin.

g. Remove nurse tank from behind applicator.

Control Variation Hazard:
If you are using multiple nurse tanks, study each one separately. Unless they are owned by you, and known to be identical, there is a high probability that there are differences between them, even if they are all from the same terminal.
Field Set-Up Checklists

Use the following tables to develop a final checklist for your tractor/fertilizer applicator configuration. Additional or fewer steps may be necessary depending on tractor features, fertilizer applicator options and accessories.

<table>
<thead>
<tr>
<th>Mechanical Checklist (Tractor Hitching)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Fertilizer Applicator hitched</td>
<td>30</td>
</tr>
<tr>
<td>✘ Hitch pin locked (pull-type)</td>
<td></td>
</tr>
<tr>
<td>✘ Safety chain secured to tractor (pull-type)</td>
<td>30</td>
</tr>
<tr>
<td>✘ Parking jack or stands stowed</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical Checklist</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Verify electrical hookups solid</td>
<td>34</td>
</tr>
<tr>
<td>✘ Turn console POWER switch to ON. Check console and observe any diagnostic messages</td>
<td>a. Refer to console manual.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hydraulic System Checklist</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Check tractor hydraulic reservoir full</td>
<td>-</td>
</tr>
<tr>
<td>✘ Make hydraulic connections</td>
<td>35</td>
</tr>
<tr>
<td>✘ Inspect connections for leaks</td>
<td>-</td>
</tr>
<tr>
<td>✘ Perform a raise operation (leave transport locks in)</td>
<td>50</td>
</tr>
<tr>
<td>✘ Unfold applicator</td>
<td>59</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Row Units Checklist</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Check tubing connections to knives/tines</td>
<td></td>
</tr>
<tr>
<td>✘ Check knife/tines outlets</td>
<td></td>
</tr>
<tr>
<td>✘ Check knife/tine shoe condition</td>
<td></td>
</tr>
<tr>
<td>✘ Check shoes all at same height</td>
<td></td>
</tr>
<tr>
<td>✘ Check knife/tine Shank alignment</td>
<td></td>
</tr>
<tr>
<td>✘ Check knife shear bolts in place</td>
<td>100</td>
</tr>
<tr>
<td>✘ Check coulter height</td>
<td>99</td>
</tr>
<tr>
<td>✘ Check coulter-to-row alignment or caster</td>
<td>99</td>
</tr>
<tr>
<td>✘ Check sealer adjustments</td>
<td>102</td>
</tr>
<tr>
<td>✘ Check sealer disc or spider condition</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical Checklist (post-Hitching)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Raise applicator.</td>
<td>50</td>
</tr>
<tr>
<td>✘ Disengage transport locks</td>
<td>45</td>
</tr>
<tr>
<td>✘ Engage hydraulic depth stop (if nec.)</td>
<td>47</td>
</tr>
<tr>
<td>✘ Check front-to-rear level</td>
<td>39</td>
</tr>
<tr>
<td>✘ Check side-to-side level</td>
<td>86, 92</td>
</tr>
<tr>
<td>✘ Set application depth</td>
<td>96</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NH₃ System Checklist (Cart Unhitched)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Shut-off rope routed to tractor cab</td>
<td>33</td>
</tr>
<tr>
<td>✘ Emergency shut-off valve closed</td>
<td>68</td>
</tr>
<tr>
<td>✘ On/off solenoid valve closed</td>
<td>68</td>
</tr>
<tr>
<td>✘ Control valve closed</td>
<td>68</td>
</tr>
<tr>
<td>✘ Console POWER switch off</td>
<td>68</td>
</tr>
<tr>
<td>✘ All bleed valves closed (3 or more)</td>
<td>69</td>
</tr>
<tr>
<td>✘ Breakaway coupler mated (visual check)</td>
<td>69</td>
</tr>
<tr>
<td>✘ All hydrostatic relief valve caps seated</td>
<td>69</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical Checklist (Cart Hitching)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Nurse tank hitched</td>
<td>70</td>
</tr>
<tr>
<td>✘ Hitch pin locked</td>
<td></td>
</tr>
<tr>
<td>✘ Safety chains secured</td>
<td>70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NH₃ Checklist (Cart Hitched)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>✘ Check breakaway firmly mated</td>
<td>71</td>
</tr>
<tr>
<td>✘ Check breakaway swivel function</td>
<td>71</td>
</tr>
<tr>
<td>✘ Remove inlet Acme cap.</td>
<td>71</td>
</tr>
<tr>
<td>✘ Inspect inlet with mirror.</td>
<td>71</td>
</tr>
<tr>
<td>✘ Check withdrawal valve and all nurse tank hose valves closed</td>
<td>72</td>
</tr>
<tr>
<td>✘ Check for signs of liquid NH₃ in hose</td>
<td></td>
</tr>
<tr>
<td>✘ Separate hose and Acme plug</td>
<td>72</td>
</tr>
<tr>
<td>✘ Route hose to breakaway</td>
<td>72</td>
</tr>
<tr>
<td>✘ Connect hose to breakaway</td>
<td>72</td>
</tr>
</tbody>
</table>
Field Operation Checklists
Perform all steps in "Pre-Start Checklist" on page 44 and "Field Set-Up Checklists" on page 81.

<table>
<thead>
<tr>
<th>First Pass Operation Checklist</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Raise fertilizer applicator.</td>
<td>50</td>
</tr>
<tr>
<td>2 Unfold, if not already unfolded.</td>
<td>59</td>
</tr>
<tr>
<td>3 Line-up at pass start per plan</td>
<td>73</td>
</tr>
<tr>
<td>4 Pull forward and stop.</td>
<td>74</td>
</tr>
<tr>
<td>5 Check console MASTER switch OFF and POWER switch ON</td>
<td>74</td>
</tr>
<tr>
<td>6 Re-check all line valves and bleed valves closed.</td>
<td>74</td>
</tr>
<tr>
<td>7 Open tank withdrawal valve. Check for zero releases.</td>
<td>74</td>
</tr>
<tr>
<td>8 Open applicator emergency shut-off valve. Check for zero releases.</td>
<td>74</td>
</tr>
<tr>
<td>9 Open nurse tank hose inlet valve (if any). Check for zero releases.</td>
<td>75</td>
</tr>
<tr>
<td>10 Open nurse tank hose outlet valve (if any). Check for zero releases.</td>
<td>75</td>
</tr>
<tr>
<td>11 Check meter pressure gauge matches tank pressure gauge.</td>
<td>75</td>
</tr>
<tr>
<td>12 Enter tractor cab. Check ropes present with nominal slack.</td>
<td>75</td>
</tr>
<tr>
<td>13 Console:</td>
<td>75</td>
</tr>
<tr>
<td>a. POWER on</td>
<td></td>
</tr>
<tr>
<td>b. BOOMS 1 or BOOMS 1,2&amp;3 on RATE as desired</td>
<td></td>
</tr>
<tr>
<td>Lower applicator:</td>
<td>58</td>
</tr>
<tr>
<td>a. hitch (lower, then Depth Control)</td>
<td></td>
</tr>
<tr>
<td>b. cab switch to FIELD (if present)</td>
<td></td>
</tr>
<tr>
<td>c. wings (extend, then low rate continuous extend)</td>
<td></td>
</tr>
<tr>
<td>14 Begin first pass, lowering applicator if not already lowered and setting MASTER on.</td>
<td>75</td>
</tr>
<tr>
<td>15 Monitor the console for expected reports of application rate/speed, and any alarms.</td>
<td>-</td>
</tr>
<tr>
<td>16 Periodically check the applicator gauges for expected pressures and temperature.</td>
<td>-</td>
</tr>
<tr>
<td>17 Pay attention to odors. Watch for leaks.</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suspending Application Checklist</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Set console MASTER switch OFF</td>
<td>76</td>
</tr>
<tr>
<td>2 Continue application until flow divider pressure is 0</td>
<td>76</td>
</tr>
<tr>
<td>3 Turn into the wind</td>
<td>-</td>
</tr>
<tr>
<td>4 Stop tractor, with knives/tines in ground</td>
<td>76</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field Turns® Checklist</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 For point row operation (section control option only) set BOOMS 1, 2 or 3 off when nearing edges of field geometry.</td>
<td>76</td>
</tr>
<tr>
<td>2 Set MASTER switch off some distance before end of pass, or stop at end of pass, then set MASTER off.</td>
<td>76</td>
</tr>
<tr>
<td>3 To minimize vapor release, wait for flow divider pressure gauge to read zero during final pass distance or while waiting at end of pass.</td>
<td>50</td>
</tr>
<tr>
<td>4 For 3-point: perform a partial fold.</td>
<td>59</td>
</tr>
<tr>
<td>5 Raise applicator, hitch first on 2-Point.</td>
<td>50</td>
</tr>
<tr>
<td>6 Turn up-wind if possible. Turn slowly to avoid tank cart upset. Do not turn too tightly.</td>
<td>76</td>
</tr>
<tr>
<td>7 Line up for pass, per your start of pass plan</td>
<td>73</td>
</tr>
<tr>
<td>8 Commence pass per plan</td>
<td>50</td>
</tr>
<tr>
<td>9 Set console switch MASTER on.</td>
<td>-</td>
</tr>
<tr>
<td>10 For point row operation (section control option only) set BOOMS 1, 2 or 3 on when nearing edges of field geometry.</td>
<td>76</td>
</tr>
</tbody>
</table>

a. Monitor flow divider pressure during end-of-pass operations and turns. Adjust operations as needed if true zero pressure is desired.

b. These steps are for a full stop prior to a turn. If the lift is conducted while in motion, the exact order of hitch and lift-assist raising is not critical. The objective is to avoid any reverse motion of tines.
### Short-Term Parking

1. Conclude application per “Stopping Application” on page 77.
2. Unhitch nurse tank per “Final Nurse Tank Unhitch” on page 80.
3. Choose an applicator parking location with level firm ground. Do not unhitch on a steep slope.
4. Recover emergency shutoff rope from tractor. Store on applicator.
5. Fully raise applicator (page 50).
6. Fold applicator (page 59).
7. Depending on hitch type:
   - Engage center section and lift-assist transport locks (page 45), and/or
   - swing down parking stands (page 36) and/or
   - install jack stand on tongue (page 30).
8. Lower fertilizer applicator onto locks/stands. On pull-type, use parking jack to neutralize tongue weight at tractor hitch.
9. Set hydraulic circuits to neutral.
10. Disconnect hydraulic lines. Secure them so that they do not touch the ground.
11. Disconnect electrical cables, capping where provisioned.

### Long-Term Storage

1. Conclude application per “Stopping Application” on page 77.
2. Unhitch nurse tank per “Final Nurse Tank Unhitch” on page 80.
3. Choose an applicator parking location with level firm ground. Do not unhitch on a steep slope.
4. Recover emergency shutoff rope from tractor. Store on applicator.
5. Fully raise applicator (page 50).
6. Clean fertilizer applicator of mud, dirt, excess oil and grease.
7. Lubricate all points listed in Maintenance.
8. Apply grease to exposed cylinder rods to prevent rust.
9. Inspect fertilizer applicator for worn or damaged parts. Make repairs and service during off season.
10. Use spray paint to cover scratches, chips, and worn areas on the fertilizer applicator to protect the metal.
11. Fold applicator.
12. Cover fertilizer applicator with a tarp if stored outside.

### Ending Application Checklist

<table>
<thead>
<tr>
<th>ending application checklist</th>
<th>page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  suspend operations as at left, then…</td>
<td>76</td>
</tr>
<tr>
<td>2  put on your goggles and gloves</td>
<td>-</td>
</tr>
<tr>
<td>3  close nurse tank withdrawal valve</td>
<td>77</td>
</tr>
<tr>
<td>4  re-enter cab. turn master switch on</td>
<td>-</td>
</tr>
<tr>
<td>5  resume field application. raise flow rate to maximum.</td>
<td>77</td>
</tr>
<tr>
<td>6  continue application until both cooler and flow divider pressures are zero.</td>
<td>-</td>
</tr>
<tr>
<td>7  turn into wind.</td>
<td>-</td>
</tr>
<tr>
<td>8  raise applicator and stop.</td>
<td>50</td>
</tr>
<tr>
<td>9  set master switch off.</td>
<td>-</td>
</tr>
<tr>
<td>10 wait one minute.</td>
<td>-</td>
</tr>
<tr>
<td>11 turn left (wind from right). stop.</td>
<td>-</td>
</tr>
<tr>
<td>12 open all bleed valves.</td>
<td>77</td>
</tr>
<tr>
<td>13 close all line valves.</td>
<td>77</td>
</tr>
<tr>
<td>14 wait one hour.</td>
<td>77</td>
</tr>
</tbody>
</table>
To get full performance from your NP30A or NP40A fertilizer applicator, you need an understanding of all component operations, and many provide adjustments for optimal field results. Some of these have been covered earlier in this manual. Even if your application conditions rarely change, some of these items need periodic adjustment due to normal wear.

<table>
<thead>
<tr>
<th>Adjustment</th>
<th>Page</th>
<th>The Adjustment Affects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hitch Class</td>
<td>31</td>
<td>Tractor compatibility</td>
</tr>
<tr>
<td>Frame Height Adjustments</td>
<td>85</td>
<td>Application depth consistency</td>
</tr>
<tr>
<td>Hydraulic Depth Stop Adjustment Pull-Type</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>2- and 3-Point Height</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Frame Level, front to back</td>
<td>38</td>
<td>Application consistency</td>
</tr>
<tr>
<td>Wing Leveling</td>
<td>92</td>
<td>Wings level in unfold</td>
</tr>
<tr>
<td>Field Fold Stop Adjustment</td>
<td>94</td>
<td>“Gull wing” partial fold in field lift</td>
</tr>
<tr>
<td>Fertilizer Rate</td>
<td>40</td>
<td>Application rate</td>
</tr>
<tr>
<td>Weight Transfer Adjustment</td>
<td>87</td>
<td>Depth consistency across applicator</td>
</tr>
<tr>
<td>3-Section, Pull-Type, and 2012-2-Point Weight Transfer</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>2013+ 2-Point 5-Section Weight Transfer</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Application Depth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rigid Knife Release Depth</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Spring Knife Release Depth</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Anhydrous Coulter Application Depth</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>Frame-Mounted Row Accessories (Options)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame-Mounted Coulters (Option)</td>
<td>99</td>
<td>Row pre-trench depth and trash cutting</td>
</tr>
<tr>
<td>Sealer Adjustments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knife/Tine Row Sealer Adjustments</td>
<td>102</td>
<td>Trench closing and coverage</td>
</tr>
<tr>
<td>Anhydrous Coulter Sealer Adjustments</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>Caster Stabilizers</td>
<td>130</td>
<td>Eliminate caster vibration in transport</td>
</tr>
</tbody>
</table>
Frame Height Adjustments

Hydraulic Depth Stop Adjustment Pull-Type

This applies to pull-type applicators only. The lift system includes an adjustable stop valve, on the left front caster wheel, to fix the height of the opener frame when the applicator is lowered.

Note: The change in knife/tine depth is not linear and can be greater than the change in down-stop adjustment. Make adjustments in small amounts.

Refer to Figure 63

To adjust the stop height (assuming a desired 2 in (2.5 cm) application depth):

1. Move to smooth level ground with soil as similar as possible to field conditions.
2. Using grease pen or similar, mark the desired soil level on a knife or tine near the left outside row, but not in the tire tracks (knives and tines in tracks run shallower than other rows).
3. Lower the applicator until the knives or tines just touch the ground. Hold that height by setting the lift circuit to Neutral.
4. Using the knob  on the stop, adjust the stop position until the plunger  just touches the top of the stop clevis bolt .

Note: It is not necessary to adjust the stop clevis bolt.
5. Raise and then fully lower the applicator.
6. Pull forward 10 feet (3 m) and stop.
7. Measure the depth at which the knives or tines are running. If the knives or tines are at the desired depth, no further adjustment is necessary. Skip to step 11.
8. Raise the applicator and set the lift circuit to neutral.
9. Adjust the stop up (to increase depth) or down (to reduce depth). Adjust in small increments.
10. Check the new setting starting at step 5.
11. Raise and lower several times and confirm that the applicator stops consistently at the new height.

WARNING

Crushing Hazard:

Make all down-stop adjustments with circuit in Neutral and applicator raised (actuator plunger not in contact with down-stop). Loosening the down-stop with circuit active and applicator lowered results in rapid lowering of the frame.

Figure 63

Hydraulic Depth Stop

Crushing Hazard:

Make all down-stop adjustments with circuit in Neutral and applicator raised (actuator plunger not in contact with down-stop). Loosening the down-stop with circuit active and applicator lowered results in rapid lowering of the frame.

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Figure 63

Hydraulic Depth Stop

Crushing Hazard:

Make all down-stop adjustments with circuit in Neutral and applicator raised (actuator plunger not in contact with down-stop). Loosening the down-stop with circuit active and applicator lowered results in rapid lowering of the frame.
2- and 3-Point Height

This applies to 2-point and 3-point applicators only.
Center section tool bar height is set by the tractor hitch.
Wing end tool bar height is set by independent gauge wheels on each wing end.

1. Move to smooth level ground with soil as similar as possible to field conditions. Set tractor brakes.
2. Using grease pen or similar, mark the desired soil level on a knife or tine near the left outside row, but not in the tire track (knives or tines in tracks run shallower than other rows).
3. Raise the applicator (page 53 or page 52).
4. Unfold the applicator (page 59).
5. Lower the applicator until the center section knives or tines are just above the ground. Set circuit to Neutral to hold this height.

Manual Gauge Wheel Height

Refer to Figure 64

6. At each gauge wheel, use the crank to remove tension at the pin. Remove the pin.
7. Adjust the wheel height to bring the wing knives or tines to the same height as the center section knives or tines (just above the ground).
8. Lower the applicator (page 53 or page 52) until the center section knives or tines are resting on the ground.
9. Use the gauge wheel cranks to raise the wheels until the clearance under the bottom of the tires equals the desired knife/tine depth (to shoe bottom).
10. Use the crank to bring one set of mount and tube holes into alignment. Insert and secure pins.
11. Pull forward, lowering the center section until all sections are level from left to right.
12. Measure the depth at which the knives or tines are running. If the knives or tines are at the desired depth, no further adjustment is necessary. Skip to step 14.
13. If wing tip height needs to be adjusted, raise the applicator slightly as needed, remove pins and adjust gauge wheel height. Re-pin. Recheck per step 12.
14. Adjust hitch height until center section knife or tine depth matches wings, and applicator is level. Capture this hitch setting.

Equipment Damage Risk:
Use the pin to crank the tube up against the pin. Wheel loads transmitted to the crank can damage the crank.

Note: Turn crank clockwise to raise applicator (lower wheel), and counterclockwise to lower applicator (raise wheel).

Note: At maximum height, the knives or tines are off the ground. This configuration is useful for unfolded parking, storage and service.

Make a record of the setting needed for field height prior to setting for maximum.
Weight Transfer Adjustment

Weight Transfer Safety Information

⚠️ DANGER

**Anhydrous Ammonia Exposure Hazard:**
Make this adjustment only on a fully discharged applicator. Knives or tines are likely to raise and lower during adjustment, and may rise out of the ground altogether. If the applicator has recently been used for application, wear your PPEa.

⚠️ DANGER

**Crushing and High Pressure Fluid Hazards:**
This adjustment requires working near the unfolded and lowered applicator with the hydraulic system active. Assign two people to this task, one in the tractor, ready to shut down on hand signal from adjuster or any unplanned event.

⚠️ WARNING

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

⚠️ WARNING

**Crushing Hazard:**
Keep body parts clear of wings, row cleaners and coulters while adjusting. Keep all bystanders well away. You will be seriously injured or killed if you are caught between lowering row components and ground.

⚠️ CAUTION

**Falling Hazard - Tires Not a Step:**
Do not use tires as steps or platforms. At some transfer settings, cylinders can raise lift-assist wheels sufficiently for them to spin. Gauge wheels can also be in light or no ground contact when the weight-transfer system is not active.

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a. PPE: Personal Protective Equipment
3-Section, Pull-Type, and 2012- 2-Point Weight Transfer

For 2013+ 2-Point 5-Section weight transfer, see page 90.

See important safety information on page 87.

Description of system

Note: See circuit diagrams in the Appendix starting on Page 148.

Refer to Figure 65

Wing fold cylinders can extend, during field operation, to push the wings down using mainframe/center weight. Weight transfer is enabled by opening the weight-transfer shut-off valve, and controlled by two adjustment valves. The fold circuit is set to continuous flow (in unfold mode) to maintain the active weight transfer.

The weight-transfer shut-off valve ① must be open for weight transfer. When closed, it bypasses the reducing valve for faster fold cylinder operation (and faster 2-point lift-assist).

The pressure reducing valve ② controls the flow to the cylinders.

The bypass valve ③ returns excess oil to the tractor.

Adjust the weight transfer to achieve consistent coulter depth, while keeping the wings level with the center section. If insufficient weight is transferred, outside (wing) coulters may run higher than center section. If too much weight is transferred, center section may run high.

If adjusted when the tractor is cold, re-adjustment may be required when the oil warms. Monitor the pressure gauge during early field operations.
Adjusting the Weight-Transfer

Refer to Figure 66

1. In field conditions, unfold (page 59), lower applicator (page 50), and set or check application depth (page 96).

2. Pull forward to put coulters in ground.

3. Put tractor in Park and set parking brake.

4. Open weight-transfer shut-off valve ①.

5. Release the bypass valve lock disc ②. Turn the bypass valve knob ③ fully clockwise to shut-off all bypass oil flow. Tighten lock disc.

6. Set tractor to half throttle. Adjust tractor flow control valve so that wings fold/unfold at a reasonable speed. Keep tractor running for step 7 through step 10.

Note: On 2-point applicators, fold and unfold are followed by lift and lower operations.

7. Set tractor remote circuit for unfold. Lock lever for continuous operation.

8. At the pressure reducing valve ④, release the lock disc ⑤.

9. Adjust the knob ⑥ for an initial value of 800 psi on the gauge ⑦. Tighten the lock disc.

10. At the bypass valve ⑧, release the lock disc ⑨. Adjust the bypass valve knob counter-clockwise until the pressure reading just begins to fall from the value set at step 9. Turn the knob clockwise 1/4 turn. Tighten the lock disc.

11. Observe applicator operation, and re-adjust down-pressure as necessary after oil warm-up. Repeat step 7 through step 10. The bypass valve needs to be closed prior to any adjustment to increase weight transfer.
2013+ 2-Point 5-Section Weight Transfer
For 3-Section, Pull-Type, and 2012-2-Point 5-Section, see page 88.
See important safety information on page 87.

Description of system
Note: See circuit diagrams in the Appendix starting on Page 148.
Inner wing fold cylinders can extend, during field operation, to push the wings down using mainframe/center weight. Weight transfer is enabled by:
1. Set the FOLD / FIELD switch to FIELD.
2. Adjust the weight transfer valve.
The fold/lift circuit is set to continuous flow (in unfold mode) to maintain the active weight transfer. This system is designed for use with tractors having closed center hydraulics. It is incompatible with open center systems.
Note: Do not set or adjust the weight transfer system if the outer wings are not level with the inner wings at unfold. Do not use the weight transfer system to compensate for unfold stop adjustment issues. See “Wing Leveling” on page 92.
Adjust the weight transfer to achieve consistent coulter depth, while keeping the wings level with the center section. If insufficient weight is transferred, outside (wing) coulters may run higher than center section. If too much weight is transferred, center section may run high.
If adjusted when the tractor is cold, re-adjustment may be required when the oil warms. Monitor the pressure gauges during early field operations.
Adjusting the Weight-Transfer

Note: See circuit diagrams in the Appendix starting on Page 148.

Refer to Figure 66

1. In field conditions, unfold applicator (page 59).
2. Set FOLD / FIELD to FIELD.
3. Lower applicator (page 50), and set or check application depth (page 38).
4. Pull forward to put coulters in ground.
5. Put tractor in Park and set parking brake.
6. Set tractor to half throttle. Extend the fold/lift circuit (unfold). Lock lever for continuous operation.
7. Adjust tractor flow control valve so bypass gauge needle is within the 1500 - 2200 PSI range. Larger models will require the higher end of this range while smaller models will want to be within the lower end.

NOTE
On older models without an electronic down pressure valve, less PSI is required and pressure should fall within the 1000 - 1500 PSI range.

8. Release the lock disc ③.
9. Adjust the knob ④ for an initial value of 800 psi on the gauge ⑤. Tighten the lock disc.
10. Check that bypass gauge ② is still in the green zone. Adjust the tractor remote flow to correct. Re-check the reading on the pressure-reducing gauge ⑥.
11. Observe applicator operation, and re-adjust down-pressure as necessary after oil warm-up. Repeat step 7 through step 10.
Wing Leveling

Before checking wing level, check that the center section is level left to right ("Rear Eyebolt Adjustment"). On 2-point and pull-type, rear eyebolts above the rear casters can affect left-right level if out of adjustment.

**Wing Level: 2- and 3-Point**

On 2-point and 3-point applicators, wing level is controlled entirely by gauge wheel height. If wings are not running level, adjust gauge wheels.

**Wing Level: Pull-Type**

On Pull-Type applicators, wing level is controlled by the lift cylinders and the top eyebolt.

If wings get out of level, perform re-phasing operations (page 51) until the lengths of the exposed rods are identical across the applicator.

If the wings are still not level, check that the eyebolt reveal is still at the factory setting (or is at least identical at all eyebolts).

*Refer to Figure 68*

The factory setting is a distance of:

1. 3.5 in. (8.9 cm)

from the end of the eyebolt to the top face of the wheel lug tube.

To adjust the eyebolt, loosen the hose guide nut ② and jam nut ③. Rotate the adjust nut ④ to set bolt reveal. Tighten jam nut.

**Rear Eyebolt Adjustment**

On 2-point and Pull-Type applicators, side to side level at rear is controlled by eyebolts at the lift cylinder bases. On 2-point, rear height is set by spacers (page 38). On Pull-Type, rear height is controlled by the cylinders, slaved to the hydraulic depth stop valve on the left wing.

Check that both eyebolts are set to the same reveal ⑤.

On Pull-Type, check front to back level (after re-phasing) at full lift on level ground. If front eyebolts have been changed from their factory settings, adjust the rear eyebolts to bring the frame back into front-back level.

*Refer to Figure 69*

The factory setting is a distance of:

⑤ 3.5 in. (8.9 cm)

from the end of the eyebolt to the top face of the lug tube.

To adjust the eyebolt, loosen the hose guide nut ②, then the jam nut ③. Rotate the adjust nut ④ to set bolt reveal.

Check that the hose loop ⑤ is on top. Tighten jam nut ③, then hose guide nut ②.
Unfold Stop Adjustment

This applies to 2103+ 5-Section applicators only.

Refer to Figure 70

During unfold (FOLD / FIELD switch in FOLD), the inner wing sections 1 are intended to stop 0 to 5° above wings-level relative to the center section 2. The stopping point is controlled by a vertical proximity sensor 20 at each center/wing hinge. If a wing does not stop in this range, adjust the proximity sensor.

1. Verify that the misalignment is not caused by air in the hydraulic system. Do not use the proximity adjustment to compensate for hydraulic problems.

2. Move the applicator to a level surface. Raise and fold (page 62). Install lift-assist lock channels (page 45) and parking stands (page 36).

3. Set the FOLD / FIELD switch to FOLD. Extend the fold/lift circuit to unfold until the inner wings stop. Set the circuit to Neutral. Shut off the tractor.

4. Check the sensor-actuator (20-7) gap 3 at the affected wing pivot. With the actuator near the marked region on the sensor, the gap must be:

   $\frac{1}{8}$ to $\frac{1}{4}$ inch (3.2 to 6.3 mm)

   If the gap is incorrect, correct that, at the current sensor height. Fold and unfold to see if further adjustment is required.

5. To adjust the sensor, loosen the bolts securing the sensor 20 to the bracket. Do not adjust the actuator 7 position.

   To lower the angle at which the wing stops, raise the sensor.

   To raise the angle at which the wing stops, lower the sensor.

6. Secure the bolts. Fold and unfold to test.
Field Fold Stop Adjustment

This applies to 2103+ 5-Section applicators only.

Refer to Figure 71

During field fold (FOLD / FIELD switch in FIELD), the inner wing sections ① are intended to stop 5 to 10° above wings-level relative to the center section ②. The stopping point is controlled by an angled proximity sensor ③ at each center/wing hinge. If a wing does not stop in this range, adjust the proximity sensor.

1. Verify that the misalignment is not caused by air in the hydraulic system. Do not use the proximity adjustment to compensate for hydraulic problems.
2. Move the applicator to a level surface. Raise and fold (page 62). Install lift-assist lock channels (page 45) and parking stands (page 36).
3. Set the FOLD / FIELD switch to FOLD. Extend the fold/lift circuit to unfold until the inner wings stop.
4. Set the FOLD / FIELD switch to FIELD. Retract the fold/lift circuit until the wings stop at “gull wing” (field lift, page 56). Set the circuit to Neutral. Shut off the tractor.
5. Check the sensor-actuator (③) gap ④ at the affected wing pivot. With the actuator near the marked region on the sensor, the gap must be: 1/8 to 1/4 inch (3.2 to 6.3 mm)
   If the gap is incorrect, correct that, at the current sensor height. Fold and unfold to see if further adjustment is required.
6. To adjust the sensor, loosen the bolts securing the sensor ③ to the bracket. Do not adjust the actuator ⑤ position.

To lower the angle at which the wing stops, raise the sensor.

To raise the angle at which the wing stops, lower the sensor.
7. Secure the bolts. Fold and unfold to test.
Caster Brake Adjustment

*Refer to Figure 72*

The rear lift-assist wheels each have independent adjusters for the caster pivot brake. The piston 1 acts as a pivot brake, and helps prevent caster oscillation during transport. The adjustments will vary depending on different field-to-field conditions as well as road transport conditions.

If the caster is oscillating during transport turns or in field use, adjust the pressure plate bolt 5.

**Pressure Plate Adjustment**

*Refer to Figure 72 and Figure 73*

The factory setting for a new piston is:

1. Loosen the jam nut 3.
2. Turn the bolt 4 counterclockwise until the bolt is turning freely.
3. Drive screw in (down) until it contacts spring plate 4.
4. Drive screw in until the bolt reveal (from top of welded nut to bottom of bolt head) is:
   - 2.0 inches (5.1 cm)
5. Tighten the jam nut.

Use more or less tension as needed to eliminate caster vibration during highway transport. Adjust as needed to compensate for piston wear.

Replace UHMW piston 1 if its length is less than 1\(\frac{1}{4}\) in. (3.2 cm). Also replace piston if missing, damaged, tilted, or top of piston is visible.

**Pull-Type Wing Caster Brake Adjustment for Field Use**

On wing caster wheels only apply light pressure (\(\frac{1}{8}\) inch or less) to allow for easier swiveling of casters during turning.
Application Depth

Rigid Knife Release Depth

*Refer to Figure 74*

Knife release depth ① is set by tool bar height ② above the ground. Control of height depends on hitch type.

Pull-Type applicators have an adjustable hydraulic down-stop for controlling tool bar height (page 85).

2-Point and 3-Point applicators rely on tractor hitch height for center tool bar height. Wing tool bar height is set to match the center using a crank-assisted manual adjustment (page 86).

Design shoe operating depth is 4 to 6 in (10 to 15 cm). Operation at and below 8 in (20 cm) is not recommended, as a high rate of bolt shears (page 100) is likely.

**Rigid Knife Depth Reference Information**

Overall height of the tool bar base to knife shoe base is:

③ 28.5 in (72.4 cm)

Liquid NH₃ is released from the tube at:

④ 3/4 in (19 mm) above the shoe base.

For a precise release depth, subtract this amount from the total knife depth ①.

**CAUTION**

Adjust height dry. Make this adjustment before charging the metering system with anhydrous ammonia, or after thoroughly discharging the system. With the knives or tines out of the ground, there could otherwise be releases of ammonia at dangerous concentrations.
Spring Knife Release Depth

Refer to Figure 75

Knife release depth ① is set by tool bar height ② above the ground. Control of height depends on hitch type.

Pull-Type applicators have an adjustable hydraulic down-stop for controlling tool bar height (page 85).

2-Point and 3-Point applicators rely on tractor hitch height for center tool bar height. Wing tool bar height is set to match the center using a crank-assisted manual adjustment (page 86).

Design shoe operating depth is 4 to 6 in (10 to 15 cm). Operation at and below 8 in (20 cm) is not recommended, as a high rate of bolt shears (page 100) is likely.

Spring Knife Depth Reference Information

Overall height of the tool bar base to knife shoe base is:
① 30.25 in (76.8 cm)

Liquid NH₃ is released from the tube at:
② 3/4 in (19 mm) above the shoe base.

For a precise release depth, subtract this amount from the total knife depth ①.

⚠️ CAUTION

Chemical Hazard:
Adjust height dry. Make this adjustment before charging the metering system with anhydrous ammonia, or after thoroughly discharging the system. With the knives or tines out of the ground, there could otherwise be releases of ammonia at dangerous concentrations.
Anhydrous Coulter Application Depth

Refer to Figure 76

Tine release depth ① is set by tool bar height ② above the ground, coulter shank height ③ and tine height ④.

Chemical Hazard:
Adjust height dry. Make adjustments before charging the metering system with anhydrous ammonia, or after thoroughly discharging the system. With the tines out of the ground, there could otherwise be releases of ammonia at dangerous concentrations.

Tool bar height is controlled by the tractor hitch in the center section. Wing tool bar height is set to match the center using a crank-assisted manual adjustment (page 86).

Tine height ④ is adjusted at the mount ⑤. This requires adjustment as the coulter blades wear. Loosen the nuts on the U-bolts ⑥. Lower the shank and re-tighten.

Design coulter operating depth is 3 to 7 in (7.6 to 18 cm). Operation below 7 in (18 cm) is not recommended, as high rates of disc wear are likely.

Application depth is unaffected by the coulter spring ⑦ (page 101) and sealer spring ⑧ (page 104) settings.

Anhydrous Coulter Reference Information

These are the factory settings.

Shank height below tool bar is:
⑥ 1111/16 in (29.7 cm)

Overall height of the tool bar base to coulter edge is:
⑦ 329/32 in (79.5 cm)

At factory settings, NH₃ is released from the tube at:
⑧ 3/8 in (9.7 mm) above the lower coulter edge.

For a precise release depth, subtract this amount from the total coulter depth ⑥.
Row Implement Adjustments
Frame-Mounted Coulters (Option)

Refer to Figure 77

Coulters are factory-installed if ordered with the implement, and are configured for in-row operation at knife or tine shoe depth. They can be set for fixed or limited castering.

Coulter depth is adjusted via the shaft ①, at the tool bar clamp. Loosen the U-bolt nuts ②. Slide the shaft up or down. Check coulter-to-knife/tine alignment. Re-tighten nuts.

For in-row, adjust the coulter depth for a running depth ③ at the bottom of the knife or tine shoe, or about $\frac{3}{4}$ in (19mm) below application level.

For fields where frequent sharp turns are unavoidable, you can reduce coulter plowing by allowing the coulter to caster at the pivot casting. Loosen the jam nuts at ⑤. Loosen the set screws just enough to allow the casting to swivel. Re-tighten the jam nuts. Do not remove the center stop screw.

Refer to the Vantage I manual (204-376M) for further coulter adjustments.

Coulter arms normally operate resting on their down stops. They ride up and compress the springs briefly as obstructions are encountered. Do not adjust the spring tension ⑥. If you service a coulter, reset the spring tension to the factory length of:

⑦ $\frac{9}{8}$-10in (25.2 cm).

Sensor Adjustment

The proximity sensor on the left-hand side of the front of the machine is for starting the gull winging process. This sensor should be set to activate by the upper lift arm. Once the arm passes the sensor, the gull winging process will begin. The rear proximity sensors are located near the wing hinges. They control the height or angle of the gull winging process.

All three sensors should be given between 1/8-1/4” clearance.

To adjust, loosen the hardware securing the sensor, then slide the sensor up or down in the bracket. The further the sensor is raised in the bracket the more delayed the gull winging process will be. Once the sensor is set to the desired position, secure the sensor with hardware. Test this configuration by lifting and gull winging the wings of the machine. If you want gull winging to delay or hasten the process more, make further adjustments until satisfied.
Knife Adjustment

Refer to Figure 79

Knives have no adjustments. Application depth is set by the tool bar (page 96).

Knives have (Grade 5) shear bolts. Should the knife encounter a substantial obstruction, such as a large rock, or if speed plus conditions are too challenging, the shear bolt fails, and the knife swings back on the (Grade 8) mounting bolt.

A shear usually results in the need to replace all of:

- 802-038C HHCS 1/2-13X2 1/4 GR5
- 803-020C NUT HEX 1/2-13 PLT
- 804-015C WASHER LOCK SPRING 1/2 PLT
- 804-094C WASHER FLAT 1/2 HARD ASTMF436

Inspect tubing connections to the knife whenever replacing a shear bolt.

Ammonia Exposure Hazard:
Discharge the system (page 115) before replacing a shear bolt. Bolt replacement requires raising the applicator. Minimize your vapor exposure. If shears are frequent, application may be too deep, or the soil conditions too rough. Even with cautious system discharges, your accumulated ammonia exposure could exceed PEL and lead to health problems or injury.

CAUTION

Ammonia Exposure Hazard:
Do not back up with knives in ground to realign a knife for bolt replacement. This will plug outlets on other knives.

If 1/2-13 Grade 5 bolts are not immediately available, temporarily substitute metric M12x1 Class 8.8.

Spring Shanks

Refer to Figure 80

If applicator is equipped with spring shanks (optional item) the spring should be compressed to measure:

@ 11 1/4 inch to 11 3/8 inch (28.6 to 28.9 cm)

once mounted. The distance is measured from end of spring to end of spring.

Note: When encountering substantial obstructions in the field, spring shanks help alleviate stress on the knife shear bolt. Spring shanks reduce, but do not eliminate all shear bolt failures.
Anhydrous Coulter Spring Setting

If the NH₃ coulter is ever disassembled for maintenance, reset the spring length to factory setting. Raise the applicator to ensure that the coulter is relaxed.

Refer to Figure 81

At the rear end of the spring ①, loosen the outer jam nut. Adjust the inner nut for a spring length ② of:

② 10\(\frac{3}{8}\) inches (26.4 cm)

This corresponds to a vertical trip force of 1557 pounds (705 kg).

**NOTICE**

**Machine Damage Risk:**

Do not attempt to compensate for extreme field conditions by adjusting the springs to higher forces (shorter springs). Higher trip force is not likely to improve penetration, and results in premature blade wear, higher risk of blade damage, and may simply lift the applicator.

Anhydrous Coulter Castering

Coulters may be operated locked in-line, or with limited free castering.

Refer to Figure 82

To lock the coulter, loosen the jam nut at ③. Align the coulter front to back. Tighten the set screw at ④, then the jam nut.

To unlock the coulter, loosen the jams nut at ③. Loosen the set screw bolts at ⑤, then tighten the jam nuts.

Note: Do not loosen the stop bolts ⑥.

Anhydrous Coulter Blade Wear

Blade wear is normal and the rate of wear varies with field conditions and operating depth. Consider replacing the blade when the initial diameter has been reduced by 1 to 2 inches.

Note: Although a nominal 22 inches in diameter, blades are lightly larger.
Sealer Adjustments

The sealers close the trench behind the knives or tines, manage residue. Adjustable to control or avoid berm.

Knife/Tine Spider Sealer Adjustments

Refer to Figure 83, 84 and Figure 85 on page 103

To provide consistent action, the sealer wheels and discs are free to move downward from their normal operating position. This system maintains consistent closing/cleaning/berming action.

Ammonia Exposure Hazard:

Fine tune sealer adjustment with dry runs prior to initial application. Making adjustments after beginning application, even with knives or tines left in the ground, could cause your exposure to exceed PEL, leading to health problems or injury.

If you need to make adjustments after application begins, discharge the system (page 115), and then lower the knives or tines into the ground. Minimize your vapor exposure.

Spring Energy and Sharp Object Hazards:

Do not attempt to lift springs off weldment pins unless fully compressed. Springs are always in tension in operating configurations. Follow instructions carefully to avoid injury from pinching or flying parts. Sealer discs may be sharp. Use caution when working around them.

Disc Sealer Adjustments

There are four to six sealer adjustments available, depending on sealer type:

1. Down stop (shown at maximum)
2. Down pressure (shown at minimum)
3. Wheel/disc mount tilt (shown at wheels aft)
4. Wheel/disc mount height (shown at factory default)
5. Wheel arm spacing (shown at factory default)
6. Wheel arm angle (shown at maximum)
7. Disc direction (shown dished out)

Sealer Down Stop

The maximum range of motion is available with the pin in the factory setting (lower hole). Moving the pin to the upper hole increases sealer ground clearance in applicator lift.

To change the pin position, lower the applicator until the sealer wheels or disc are in ground contact, and the arms are lifted above both down-stop holes. Remove the cotter pin. Relocate the stop pin and re-insert cotter.

![Sealer Adjustments Diagram]

Figure 83
Spider Sealer Adjustments

Figure 84
Disc Sealer Adjustments

Note: Do not operate with the pin entirely removed. The pin is temporarily removed for down pressure adjustments.
Sealer Down Pressure

Factory setting is the front hole. Additional sealer down-force is available by moving the spring adjustment weldment to the rear. To change:

a. Lower the applicator until the sealer wheels or disc are in ground contact, and the arms are lifted above both down-stop holes. Remove down stop pin.

b. Raise applicator until springs are fully compressed and loose at adjustment weldment.

c. Remove spring adjustment pin. Slide weldment to new position. Re-pin and cotter. Place spring ends on weldment pins.

d. Lower applicator to raise arm above down-stop holes. Re-insert down-stop pin and its cotter.

Sealer Tilt

This adjustment is to compensate for large changes in sealer height, which can cause undesired changes in sealer arm angle.

To adjust, raise and lock-up the applicator. Remove the upper height adjustment pin. Swing the mount to the new position and re-pin.

Sealer Height

Check and adjust this when changing knife depth. The recommendation is to keep the vertical tube near vertical and the arm level at the new knife depth.

To adjust, remove both adjustment pins. Slide the tube up or down, ad re-pin.

Sealer Disc/Wheel Spacing

Spacing and angle have the most effect on trench closing and berm control. Adjusting one may require adjustments to the other.

To change spacing, remove both bolts, reposition the disc or wheel arm, and re-install bolts.

Sealer Disc/Wheel Angle

Angle and spacing have the most effect on trench closing and berm control. Adjusting one may require adjustments to the other.

Note: Wheel arms have 3 holes. Disc arms have 5. Factory setting is the center hole in both cases.

To change angle, remove the outer bolt, loosen the inner bolt. Reposition the disc or wheel arm. Re-install bolt and re-tighten bolt. The factory setting is with the inner pivot bolt in the 3rd hole from sealer center.

Sealer Disc Direction

This applies to disc sealers only. To change the direction of throw, dismount the disc from the hub. Invert and re-mount it.
Anhydrous Coulter Sealer Adjustments

The spider sealers have three adjustments. You may need to alter these from factory settings, based on soil conditions, crop residue and application speed.

Refer to Figure 86

1. Down-pressure: T-handles ① set the arm spring tension. The adjustment plates ③ have 3 settings.
2. Spacing: The arm weldments have 8 bolt holes ② allowing 2 setback positions and 2 spacing positions.
3. Angle: The sealer mount plates ④ have 4 holes: 2 in-line ⑦, and 2 extra holes ⑧, slightly offset, providing an angle adjustment.

These adjustments are most easily made with the applicator raised. The down-pressure adjustment may be made with rows in the ground, with some extra effort.

**CAUTION**

Chemical Hazard:
Adjust sealers with rows dry. Make adjustments before charging the metering system with anhydrous ammonia, or after thoroughly discharging the system. With the tines out of the ground, there could otherwise be releases of ammonia at dangerous concentrations.

Sealer Down-Pressure Adjustment

The following trip down-presures are available. These values are per sealer arm, and are with the coulters in the ground, and arms slightly raised per nominal factory assumptions (as depicted in Figure 76 on page 98).

Note: With the applicator raised, position ⑤ has minimal spring tension.

<table>
<thead>
<tr>
<th>Handle Slot</th>
<th>Down-Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Rear/Lowest</td>
<td>12 pounds</td>
</tr>
<tr>
<td>② Mid/Medium</td>
<td>17 pounds</td>
</tr>
<tr>
<td>③ Forward/Max.</td>
<td>28 pounds</td>
</tr>
<tr>
<td></td>
<td>5.4 kg</td>
</tr>
<tr>
<td></td>
<td>7.7 kg</td>
</tr>
<tr>
<td></td>
<td>12.7 kg</td>
</tr>
</tbody>
</table>

Sealer Spacing or Setback Adjustment

For in-line (parallel) sealer wheel running, use the center holes ⑥ in the mount plates ③. In-line orientation is recommended for high-residue fields.

Sealer Angle Adjustment

10° of leading toe-out (20° total) is available by using the inner center hole of the mount plate and the leading offset hole ⑧. No setback adjustment is available when using toe-out. Toe-out is not recommended for high-residue fields.
Troubleshooting

The topics in this section presume that the applicator has a Great Plains-supplied Raven SCS 450 console, Raven AccuFlow™ metering system, and CDS-John Blue® Impellicone® flow divider.

Troubleshooting sections are also found in the following component manuals:
016-0159-403
Raven AccuFlow™ Operator manual
016-0159-831
Raven SCS 450 Installation, Operation and Service manual

### General Applicator Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fold or unfold jerky or imbalanced</td>
<td>Air in lines</td>
<td>Bleed fold circuit (page 126).</td>
</tr>
<tr>
<td>Lift jerky or imbalanced</td>
<td>Air in lines</td>
<td>Re-phase lift circuit (page 51).</td>
</tr>
<tr>
<td>Depth stop uneven</td>
<td>Air in lines</td>
<td>Re-phase lift circuit (page 51).</td>
</tr>
<tr>
<td>Lift-Assist casters oscillitating</td>
<td>Caster stabilizer too lightly set</td>
<td>Increase spring tension on caster stabilizer piston (page 130).</td>
</tr>
</tbody>
</table>

#### Excessive NH₃ loss to atmosphere (all rows)

<table>
<thead>
<tr>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application depth too shallow</td>
<td>Pull-type: check/adjust depth stop (page 85).</td>
</tr>
<tr>
<td></td>
<td>2-Point: check/adjust tractor hitch (page 38), lift-assist spacers (page 38) and gauge wheel height (page 86).</td>
</tr>
<tr>
<td></td>
<td>3-Point: check/adjust tractor hitch (page 38) and gauge wheel height (page 86)</td>
</tr>
<tr>
<td>Coulters set too deep; lifting knives or lines</td>
<td>Reduce coulter depth to shoe depth (page 99).</td>
</tr>
<tr>
<td>Insufficient sealing</td>
<td>Adjust sealers (page 102). Test running dry. Try multiple settings on different rows at the same time if the adjustment needed is not obvious. Check applicator front-to-back level. Check wear on disc sealers.</td>
</tr>
<tr>
<td>Application rate too high for soil or weather conditions</td>
<td>Consult with agronomist on optimal rate and conditions.</td>
</tr>
<tr>
<td>Field speed too high</td>
<td>Slow down.</td>
</tr>
</tbody>
</table>

#### NH₃ loss to atmosphere (some rows)

<table>
<thead>
<tr>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wings not level</td>
<td>Re-phase cylinders on pull-type and 2-Point (page 51).</td>
</tr>
<tr>
<td></td>
<td>Check tire pressures (all models).</td>
</tr>
<tr>
<td></td>
<td>Check wings level on all models (page 92).</td>
</tr>
<tr>
<td>Fold cylinders locked in Neutral, and unable to follow terrain</td>
<td>Set fold circuit to Float for field application.</td>
</tr>
<tr>
<td>Worn knives inadequately preparing trench</td>
<td>Replace worn knives.</td>
</tr>
</tbody>
</table>
## General Applicator Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NH₃ loss to atmosphere (one row)</strong></td>
<td>Plugged knife or tine</td>
<td>See “Clearing Plugged Knives or Tines” on page 117.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If knives or tines are plugging frequently, check: coulter setup, application depth, knife/tine wear. Field conditions and weather may also be unsuitable at the moment.</td>
</tr>
<tr>
<td></td>
<td>Disconnected delivery or vapor line</td>
<td>Treat this as knife or tine plugging (page 117) until the cause is determined. If the cause is tall tough field trash, consider re-working the field if disconnects are frequent.</td>
</tr>
<tr>
<td></td>
<td>Knife shear bolt failed</td>
<td>Replace shear bolt (page 100).</td>
</tr>
<tr>
<td></td>
<td>Sealer mis-adjusted or failed (such as a broken spring)</td>
<td>Check sealer. Adjust (page 102) or repair.</td>
</tr>
<tr>
<td></td>
<td>Rows in tractor tracks too shallow</td>
<td>Reset tractor wheel spacing to avoid rows.</td>
</tr>
<tr>
<td><strong>Uneven application depth</strong></td>
<td>Excessive field speed.</td>
<td>Reduce field speed.</td>
</tr>
<tr>
<td></td>
<td>Incorrect coulter depth setting.</td>
<td>Set coulters to depth of knife or tine shoes (page 99).</td>
</tr>
<tr>
<td><strong>Wings too Shallow</strong></td>
<td>Insufficient weight transferred to wings</td>
<td>Increase weight transfer (page 87).</td>
</tr>
<tr>
<td><strong>Center too Shallow</strong></td>
<td>Excess weight transferred to wings</td>
<td>Decrease weight transfer (page 87).</td>
</tr>
<tr>
<td><strong>Knives or tines plugging frequently</strong></td>
<td>Knives or tines worn</td>
<td>Replace worn knives or tines.</td>
</tr>
<tr>
<td></td>
<td>Field too wet</td>
<td>Wait for drier conditions.</td>
</tr>
<tr>
<td></td>
<td>Tractor rocking backward during stops, or lift sequence pushing knives or tines backward</td>
<td>Refine stopping and/or lifting technique to avoid reverse knife or tine motion.</td>
</tr>
<tr>
<td><strong>Sealers plugging</strong></td>
<td>Conditions too wet.</td>
<td>Wait for drier conditions.</td>
</tr>
<tr>
<td></td>
<td>Too much pressure on row-units.</td>
<td>Reduce spring pressure.</td>
</tr>
<tr>
<td></td>
<td>Coulters set too deep, bring up excess dirt and moisture.</td>
<td>Check coulter adjustment.</td>
</tr>
<tr>
<td></td>
<td>Fertilizer Applicator not level from front to rear</td>
<td>Check applicator front-to-back level (page 38).</td>
</tr>
<tr>
<td></td>
<td>Failed bearings</td>
<td>Replace bearings.</td>
</tr>
<tr>
<td></td>
<td>Disc blades worn</td>
<td>Replace disc blades.</td>
</tr>
<tr>
<td><strong>Sealers not compacting the soil as desired.</strong></td>
<td>Sealer adjustment not optimal.</td>
<td>Adjust sealer (page 102).</td>
</tr>
<tr>
<td></td>
<td>Not level front to rear.</td>
<td>Check applicator front-to-back level (page 38).</td>
</tr>
<tr>
<td></td>
<td>Too wet or cloddy</td>
<td>Wait until drier weather or rework ground.</td>
</tr>
<tr>
<td><strong>2-Point Lift-Assist slow</strong></td>
<td>Adjustment valve not fully open.</td>
<td>Open valve (page 158).</td>
</tr>
</tbody>
</table>
## FOLD / FIELD Troubleshooting (2013+ 5-Section only)

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fold or Unfold Abnormal with Switch Box Indicator Illuminated</td>
<td>Circuit to solenoid valves broken, typically a disconnected harness at hitch</td>
<td>Check harness connections at hitch, then, check for 12 Vdc at solenoids.</td>
</tr>
<tr>
<td>Outer wings folding in field lift</td>
<td>No power to outer wing fold solenoid, or switch in FOLD or PARK</td>
<td>Check connections and continuity, or set switch to FIELD.</td>
</tr>
<tr>
<td></td>
<td>Air in hydraulic system</td>
<td>Cycle system several times, and as needed bleed hydraulics (page 126).</td>
</tr>
<tr>
<td>Outer wings not folding before inner wings</td>
<td>Possible harness problem</td>
<td>Check connections.</td>
</tr>
<tr>
<td>Unfold: Inner wings do not stop at wings-level</td>
<td>Switch not in FOLD</td>
<td>Check switch position and indicator lamps</td>
</tr>
<tr>
<td></td>
<td>No power to switch or harness</td>
<td>Check power to switch, harness connections at hitch.</td>
</tr>
<tr>
<td></td>
<td>Defective switch, damaged harness</td>
<td>Check 12 Vdc at solenoids.</td>
</tr>
<tr>
<td>One inner wing unfold does not stop at wings-level</td>
<td>Proximity switch damaged or disconnected</td>
<td>Check 12 Vdc at solenoids.</td>
</tr>
<tr>
<td></td>
<td>Inner proximity switch Mis-adjusted</td>
<td>If 12 Vdc present, check/adjust switch, see “Wing Leveling” on page 92.</td>
</tr>
<tr>
<td>Field fold: wings do not stop at gull-wing</td>
<td>Switch not in FIELD</td>
<td>Check switch position and indicator lamps</td>
</tr>
<tr>
<td></td>
<td>No power to switch or harness</td>
<td>Check power to switch, harness connections at hitch.</td>
</tr>
<tr>
<td></td>
<td>Defective switch, damaged harness</td>
<td>Check 12 Vdc at solenoids.</td>
</tr>
<tr>
<td>Field fold: outer wing does not reach gull-wing</td>
<td>Air in system</td>
<td>Cycle system several times, and as needed bleed hydraulics (page 126).</td>
</tr>
<tr>
<td>Field fold: one wing does not stop at gull-wing</td>
<td>Proximity switch damaged or disconnected</td>
<td>Check 12 Vdc at solenoids.</td>
</tr>
<tr>
<td></td>
<td>Inner proximity switch Mis-adjusted</td>
<td>If 12 Vdc present, check/adjust switch, see “Field Fold Stop Adjustment” on page 94.</td>
</tr>
<tr>
<td>Outer wing does not unfold at all</td>
<td>Automatic wing latch stuck</td>
<td>Slightly re-fold to release latch. If latch does not release, lubricate pivot.</td>
</tr>
<tr>
<td></td>
<td>Insufficient oil flow to system</td>
<td>Increase flow on fold/lift circuit.</td>
</tr>
<tr>
<td>Wings won't fold at all.</td>
<td>Switch in FIELD</td>
<td>Set switch to FOLD.</td>
</tr>
<tr>
<td></td>
<td>Loose connection on weight transfer solenoid</td>
<td>Check harness connections and 12 Vdc at solenoid.</td>
</tr>
</tbody>
</table>
# Metering System Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Spikes (no alarm)</td>
<td>Plugged knives or tines</td>
<td>Stop application per page 77. Lift applicator and inspect knives or tines. Clear any plugging per &quot;Clearing Plugged Knives or Tines&quot; on page 117.</td>
</tr>
<tr>
<td>Flow divider pressure sag</td>
<td>Open delivery line or lines</td>
<td>Stop application per page 77. Lift applicator and inspect knives or tines for open line plugging. Clear any plugging per &quot;Clearing Plugged Knives or Tines&quot; on page 117.</td>
</tr>
<tr>
<td>Temperature Rise (no alarm)</td>
<td>Plugged refrigerant vapor line</td>
<td>Stop application per page 77. Lift applicator and inspect knives or tines. Clear any plugging per &quot;Clearing Plugged Knives or Tines&quot; on page 117.</td>
</tr>
<tr>
<td>Rate Alarm, Low</td>
<td>System not fully charged</td>
<td>Expect early rate alarms until the cooler is ensuring that all meter flow is liquid.</td>
</tr>
<tr>
<td>Rate Alarm, Low</td>
<td>One or more manual valves not fully open</td>
<td>Suspend operations (per page 76). Check all manual valves from nurse tank withdrawal valve to emergency shut-off valve.</td>
</tr>
<tr>
<td>Rate Alarm, Low</td>
<td>Solenoid or control valve malfunction or harness status</td>
<td>Suspend operation (page 76). Close emergency shut-off valve. Discharge line from emergency shut-off valve to knives or tines. Wait for applicator to be safe to approach. Check harness connections and fuses. Use console SELF-TEST mode to command Raven valves open. Check valve ball indicators at valves.</td>
</tr>
<tr>
<td>Rate Alarm, High</td>
<td>Incorrect VALVE CAL for Control Valve or METER CAL for flow meter.</td>
<td>Recheck console setup against values provided for components (page 40).</td>
</tr>
<tr>
<td>Rate Alarm, High</td>
<td>Control Valve failed, or harness status</td>
<td>Suspend operation (page 76). Close emergency shut-off valve. Discharge line from emergency shut-off valve to knives or tines. Wait for applicator to be safe to approach. Check harness connections and fuses. Use console SELF-TEST mode to command rate to zero open. Check valve ball indicators at valves. Command rate to maximum. Check ball indicator.</td>
</tr>
<tr>
<td>Excess NH₃ Remaining (but no alarms)</td>
<td>Incorrect console setup</td>
<td>Re-check METER CAL and BOOM CAL.</td>
</tr>
<tr>
<td>Excess NH₃ Remaining (but no alarms)</td>
<td>Field size different.</td>
<td>After ruling out metering problems, re-check geography.</td>
</tr>
<tr>
<td>Excess NH₃ Remaining (but no alarms)</td>
<td>Excessive gaps between fertilizer applicator passes.</td>
<td>Gap between opposing pass end trenches should be one row space (e.g. 30in)</td>
</tr>
<tr>
<td>Excess NH₃ Remaining (but no alarms)</td>
<td>Flow meter malfunction</td>
<td>Consult dealer.</td>
</tr>
<tr>
<td>NH₃ Consumption Too High (but no alarms)</td>
<td>Incorrect console setup</td>
<td>Re-check METER CAL and BOOM CAL.</td>
</tr>
<tr>
<td>NH₃ Consumption Too High (but no alarms)</td>
<td>Field size different.</td>
<td>After ruling out metering problems, re-check geography.</td>
</tr>
<tr>
<td>NH₃ Consumption Too High (but no alarms)</td>
<td>Excessive overlap</td>
<td>Gap between opposing pass end trenches should be one row space (e.g. 30in). Also check tracks for unintended re-applications, particularly if relying on GPS mapping.</td>
</tr>
<tr>
<td>NH₃ Consumption Too High (but no alarms)</td>
<td>Tank or system Leak</td>
<td>Suspend application. Carefully approach applicator and nurse tank from up-wind. Check for leaks in</td>
</tr>
<tr>
<td>NH₃ Consumption Too High (but no alarms)</td>
<td>Flow meter malfunction</td>
<td>Consult dealer.</td>
</tr>
</tbody>
</table>
## Metering System Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rows Not Fertilized</strong></td>
<td>Check for plugged row-unit tube</td>
<td>Stop application per page 77. Lift applicator and inspect knives or tines. Clear any plugging per &quot;Clearing Plugged Knives or Tines&quot; on page 117.</td>
</tr>
<tr>
<td></td>
<td>Failed or malfunctioning aftermarket section control.</td>
<td>Consult system supplier documentation.</td>
</tr>
<tr>
<td><strong>No Fertilizer Flow</strong></td>
<td>Strainer plugged</td>
<td>Close all valves. Inspect strainer (page 124). Clean screen and magnets as needed.</td>
</tr>
<tr>
<td></td>
<td>Material run-out</td>
<td>Check tank level.</td>
</tr>
<tr>
<td></td>
<td>Temperature too low</td>
<td>Wait for warmer conditions.</td>
</tr>
<tr>
<td></td>
<td>On/Off solenoid valve failure or open circuit.</td>
<td>Suspend operation (page 76). Close emergency shut-off valve. Discharge line from emergency shut-off valve to knives or tines. Wait for applicator to be safe to approach. Check harness connections and fuses. Use console SELF-TEST mode to command Raven valves open. Check valve ball indicators at valves.</td>
</tr>
</tbody>
</table>
# General Application Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Excess Material Remaining</strong></td>
<td>Field size different.</td>
<td>After ruling out metering problems, re-check geography.</td>
</tr>
<tr>
<td></td>
<td>Excessive gaps between applicator passes.</td>
<td>Gap between opposing pass end trenches should be one row space (e.g. 30in)</td>
</tr>
<tr>
<td><strong>Material Consumption Too High</strong></td>
<td>Field size different.</td>
<td>After ruling out metering problems, re-check geography.</td>
</tr>
<tr>
<td></td>
<td>Excessive overlap</td>
<td>Gap between opposing pass end trenches should be one row space (e.g. 30in). Also check tracks for unintended re-applications, particularly if relying on GPS mapping.</td>
</tr>
<tr>
<td></td>
<td>Tank or system Leak</td>
<td>Suspend application. Check for leaks.</td>
</tr>
<tr>
<td><strong>Rows Not Fertilized</strong></td>
<td>Check for plugged row-unit tube</td>
<td>Stop application. Lift applicator and inspect tines.</td>
</tr>
<tr>
<td><strong>No Fertilizer Flow</strong></td>
<td>Strainer plugged</td>
<td>Close all valves. Inspect strainer (page 124). Clean screen as needed.</td>
</tr>
<tr>
<td></td>
<td>Material run-out</td>
<td>Check tank level.</td>
</tr>
<tr>
<td><strong>Tines plugging frequently</strong></td>
<td>Tine tips too low for coulter depth</td>
<td>Raise tine weldment (page 98).</td>
</tr>
<tr>
<td></td>
<td>Coulter blades too worn</td>
<td>Replace coulter blades.</td>
</tr>
<tr>
<td></td>
<td>Field too wet</td>
<td>Wait for drier conditions.</td>
</tr>
<tr>
<td></td>
<td>Applicator not level from front to rear</td>
<td>Check applicator front-to-back level (page 38).</td>
</tr>
<tr>
<td></td>
<td>Tractor rocking backward during stops, or lift sequence pushing tines backward</td>
<td>Refine stopping and/or lifting technique to avoid reverse coulter motion in ground.</td>
</tr>
<tr>
<td><strong>Excessive NH₃ loss to atmosphere (all rows)</strong></td>
<td>Application depth too shallow</td>
<td>Check/adjust tractor hitch (page 38), lift-assist spacers (page 38) and gauge wheel height (page 86).</td>
</tr>
<tr>
<td></td>
<td>Coulters set too deep; lifting tines</td>
<td>Reduce coulter depth to tine depth (page 98).</td>
</tr>
<tr>
<td></td>
<td>Insufficient sealing</td>
<td>Adjust sealers (page 104). Test running dry. Try multiple settings on different rows at the same time if the adjustment needed is not obvious. Check applicator front-to-back level.</td>
</tr>
<tr>
<td></td>
<td>Application rate too high for soil or weather conditions</td>
<td>Consult with agronomist on optimal rate and conditions.</td>
</tr>
<tr>
<td></td>
<td>Field speed too high</td>
<td>Slow down.</td>
</tr>
<tr>
<td><strong>NH₃ loss to atmosphere (some rows)</strong></td>
<td>Wings not level</td>
<td>Check tire pressures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check wings level (page 92).</td>
</tr>
<tr>
<td></td>
<td>Fold cylinders locked in Neutral, and unable to follow terrain</td>
<td>Set fold/lift circuit to continuous Extend (unfold/lower) for field application.</td>
</tr>
</tbody>
</table>
## General Application Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH₃ loss to atmosphere (one row)</td>
<td>Plugged tine</td>
<td>See “Clearing Plugged Knives or Tines” on page 117. If tines are plugging frequently, check: coulter setup, application depth, tine wear. Field conditions and weather may also be unsuitable at the moment.</td>
</tr>
<tr>
<td></td>
<td>Disconnected delivery or vapor line</td>
<td>Treat this as tine plugging (page 117) until the cause is determined. If the cause is tall tough field trash, consider re-working the field if disconnects are frequent.</td>
</tr>
<tr>
<td></td>
<td>Sealer mis-adjusted or failed (such as a broken spring)</td>
<td>Check sealer. Adjust (page 104) or repair.</td>
</tr>
<tr>
<td></td>
<td>Rows in tractor tracks too shallow</td>
<td>Reset tractor wheel spacing to avoid rows.</td>
</tr>
<tr>
<td>Tines plugging frequently</td>
<td>Tines worn</td>
<td>Replace worn tines.</td>
</tr>
<tr>
<td></td>
<td>Field too wet</td>
<td>Wait for drier conditions.</td>
</tr>
<tr>
<td></td>
<td>Tractor rocking backward during stops, or lift sequence pushing tines backward</td>
<td>Refine stopping and/or lifting technique to avoid reverse tine motion.</td>
</tr>
<tr>
<td>Sealers plugging</td>
<td>Conditions too wet.</td>
<td>Wait for drier conditions.</td>
</tr>
<tr>
<td></td>
<td>Too much pressure on row-units.</td>
<td>Reduce spring pressure.</td>
</tr>
<tr>
<td></td>
<td>Sealers running at an angle</td>
<td>Adjust sealers to run straight.</td>
</tr>
<tr>
<td></td>
<td>Coulters set too deep, bring up excess dirt and moisture.</td>
<td>Check coulter adjustment.</td>
</tr>
<tr>
<td></td>
<td>Fertilizer Applicator not level from front to rear</td>
<td>Check applicator front-to-back level (page 38).</td>
</tr>
<tr>
<td></td>
<td>Failed bearings</td>
<td>Replace bearings.</td>
</tr>
</tbody>
</table>
**Maintenance and Lubrication**

**Maintenance**

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

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

**Suffocation, Blinding, Burning, Freezing, Disabling and Disfigurement Hazards:**

Do not perform maintenance with anhydrous ammonia in the system. Fully discharge the system of NH₃ liquid and vapor before working on the applicator. See page 115.

**Crushing Hazard:**

Always have transport locks and/or parking stands in place when working on applicator. You may be severely injured or killed by being crushed under a falling applicator.

**High Pressure Fluid Hazard:**

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

1. After using your fertilizer applicator for several hours, check all bolts to be sure they are tight.
2. Remove excess slack from chains. Clean and use chain lube on all roller chains as needed.
3. Maintain proper air pressure in fertilizer applicator tires.
4. Clean fertilizer applicator on a regular basis. Regular and thorough cleaning will lengthen equipment life and reduce maintenance and repair.
5. Lubricate areas listed under “Lubrication and Scheduled Maintenance” on page 127.
6. Replace any worn, damaged, or illegible safety labels by obtaining new labels from your Great Plains dealer.
Avoid Trapped Anhydrous

Before servicing anhydrous equipment, or storing it near untrained individuals, be absolutely certain that there is no liquid NH₃ trapped in the system, and no NH₃ vapor present (or only trace amounts).

Follow bleeding and discharge instructions carefully. Beware of places in the systems where NH₃ can be trapped.

Avoid Line Traps

Refer to Figure 88

Any two line valves in the system, if both closed with NH₃ present, can trap that ammonia indefinitely. Line valves include:
- tank withdrawal [A65],
- nurse tank hose valve(s) [A60],
- check valves at a disconnected breakaway [A76],
- emergency shut-off valve [A78],
- control valve at rate zero [A36],
- On/Off solenoid valve [A31], and
- aftermarket section valves.

In a properly designed system, segments not open to the atmosphere are protected by hydrostatic relief valves, but the operation of such valves only releases a small portion of the trapped ammonia.

Normal shut-down instructions, after closing the tank withdrawal valve, are intended to bleed most of the system NH₃ into the soil. However, there can still be substantial vapor in the system after that. If shut-down procedures were not followed, liquid may be present. If the state of the equipment is not known with certainty at time of servicing, you need to assume that a closed valve represents a risk of trapped NH₃.

The illustration at right depicts a nurse tank hose [A53] in use, and shut-off while still full of liquid NH₃. If this hose is removed to an enclosed space, then opened, it represents an extreme hazard. Vapor concentrations could rise to well above IDLH⁸ levels in moments.

This example system line segment is equipped with relief orifice-equipped ball valves [A60], but that only bleeds the downstream side of a valve ball, the outlet valve in this example. See page 114 for information about ball traps.

The downstream side of this system line segment is equipped with a bleed valve [A61]. The upstream side of the inlet valve is equipped with a hydrostatic relief valve [A62].

If this line segment warms, pressure can rise high enough to cause periodic releases at the relief valve. This protects the segment from rupture, but does not clear the line.

Clearing a Line Trap

To clear a line segment with possible trapped NH₃:

▲ Move the equipment outdoors.
▲ If calm, wait for wind.
▲ Stand up-wind of the bleed valve.
▲ Point the bleed valve orifice down-wind and away from all personnel.
▲ If it’s a hose bleed valve, make sure you can set the hose down with the valve still pointing in a safe direction.
▲ Open the valve very slowly. Once any discharge is observed, (set any hose down) depart up-wind.
▲ Remain up-wind until the discharge completes.

---

a. IDLH: Immediately Dangerous to Life and Health
Avoid Ball Traps

**DANGER**

**IDLH Anhydrous Ammonia Exposure Hazard:**

Beware of closed ball valves. A ball valve can trap liquid NH₃. If opened when disconnected, this liquid is likely at extreme pressures, is emitted forcefully and vaporizes rapidly. A 1 3/4-in ball valve can trap enough NH₃ to reach IDLH vapor concentrations, within moments, in a space the size of a two car garage. Anyone present could be burned, blinded, or receive serious or permanent lung injury. If this happens in an enclosed space, the consequences could be fatal.

Refer to Figure 88

Always assume a closed ball valve contains liquid NH₃ under high pressure.

The flow gate of a traditional ball valve is a solid steel ball with a hole through it. When closed, the hole cavity is sealed by the side walls of the valve body.

If closed with the line full, the ball cavity is full of NH₃. If the valve is well constructed, that fluid remains there indefinitely, presenting future field and service hazards.

Note: If the valve has a bleed valve and/or relief valve, those safety valves do not vent the ball cavity when a solid ball valve is closed. One of them may vent just the downstream side of an orifice ball with the ball closed.

The emergency shut-off valve supplied on Great Plains applicators in October 2010 and later has a relief orifice on the downstream (strainer) side of the valve. See note on page 13 regarding valve Warning decal.

Nurse tank hoses are likely to have solid ball valves indefinitely. Treat all ball valves as potential traps.

- Wear your PPE when servicing lines and fittings that are in an uncertain status.
- Fully bleed all lines prior to servicing.
- Never carry a valve by the operating wheel or handle.
- Open ball valves when both sides of their lines are bled.
- Re-check the bleed on at least one side of the opened valve.
- If closing a ball valve for storage or parking, first wait for the valve to warm to ambient temperature to ensure that no liquid NH₃ remains.
- Never point a hose at your face.
- Treat all closed valves as possible traps.

Never open a closed valve in an enclosed area. In addition to the exposure hazard, a release of NH₃ could result in a concentration level that is flammable or explosive.

Never point a closed valve at your face.

If replacing a ball valve, don’t just check that the new valve is specified for NH₃ service:

- Replace orifice ball valves only with orifice ball valves.
- Replace solid ball valves with orifice ball valves.
- Install an orifice ball valve correctly. The orifice side points down-stream (in the direction of flow).

---

a. IDLH: Immediately Dangerous to Life and Health
b. PPE: Personal Protective Equipment
System Discharge

These steps are for clearing an applicator for service or for storage near untrained persons. These instructions presume that you have followed the steps at: “Stopping Application” on page 77, and the nurse tank is unhitched, per: “Final Nurse Tank Unhitch” on page 80.

For a breakaway event, follow the instructions on page 78 up through breakaway re-connection. Then perform a normal shutdown (other than nurse tank steps), per page 77.

The challenges in system discharge are:

- NH₃ liquid can remain in the system after the recommended stopping procedures.
- NH₃ liquid self-cools as it evaporates, slowing evaporation. It can take a long time for all of it to turn to vapor, particularly in cooler weather.
- Once there is only vapor in the system, there is usually little gas movement to drive the rest of it out.
- The tubing loops are usually the last to clear, and may not fully clear. See sidebar.

Even if no ammonium hydroxide forms, the NH₃ vapor in the system dilutes slowly with air. Harmless trace amounts, noticed as occasional odor, may remain indefinitely.

Normal Discharge

At the completion of stopping application and nurse tank unhitching, all line valves are closed and all bleed valves are open, and have been that way for at least an hour. Transport may also have occurred, which aids clearing.

1. Verify that all line valves are closed, and all bleed valves open. If this is not the case, there is risk of trapped ammonia. See “Clearing a Line Trap” on page 113.

2. Carefully walk down-wind of the applicator. Check for ammonia odor. If pungent, there is at least some pure NH₃ vapor in the system, and possibly some liquid. Give the applicator some time to vent.

   If there is no, or only mild odor, check the loops for visible fluid. If only a few hours have elapsed since application ended, this liquid is pure NH₃. Stay away until it has vaporized.

3. From up-wind, check all the fittings and lines. If any are cold (more than a few degrees below ambient temperature), liquid evaporation is still in progress or has only recently completed. Give the applicator more time to vent.

Steps continue on next page...

Suffocation, Blinding, Burning, Freezing, Disabling and Disfigurement Hazards:

Do not perform maintenance with anhydrous ammonia in the system. Fully discharge the system of NH₃ liquid and vapor before working on the applicator.

The delivery tubes are open to the atmosphere at the knives or tines. When they don’t clear immediately, they are likely to absorb atmospheric moisture, forming ammonium hydroxide (NH₄OH) in the tubes. This liquid is highly caustic, and can persist for weeks or months, but remains liquid at ambient temperatures, is harmless to the tubing, and emits ammonia vapor slowly. If there is liquid in the tubes, and it is not cold, it is likely to be an NH₄OH solution, and not pure NH₃.
System Blow-Out

4. To rapidly reduce the vapor in the system to trace amounts, use compressed air at the Acme inlet A12.
   a. You will need to have the console connected to the meter harness and powered up. Have the console up-wind of the applicator.
   b. If liquid NH₃ is suspected to be present, lower the knives or tines into the ground.
   c. Connect the air hose to the Acme inlet A12. Use hose extensions as needed to perform this blow-out outdoors. You also need a connection at the Acme inlet that does not rely on a person standing there to maintain it.
   d. Open all line valves.
      Open the emergency shut-off valve A18.
      On the console, turn the POWER switch on, MASTER switch on, and BOOM 1 switch on, and any section valves ON.
      Command a high rate.
   e. Set the air source regulator to no more than 150 psi.
   f. Flow air through the system until odor falls to acceptable levels.

Loop Clearing

5. Loop fluid: If it has been more than a day, with the temperature above freezing, since application completed, and there is still fluid in the loops, it is probably ammonium hydroxide (NH₄OH). If necessary to clear it from the lines, follow these steps:
   a. You will need a funnel with tip O.D. smaller than the delivery tube I.D. (3/8 inch, 9.5 mm), and a fresh water source.
   b. Face the applicator into the wind.
   c. Disconnect a delivery line A45 at a flow divider outlet A43.
   d. Connect the funnel to the line.
   e. Add water until it appears at the knives or tines. Then add one more gallon (4 liters). This results in an NH₄OH solution that is more dilute than household cleaning ammonia.
   f. Blow out the line if air is available.
      Do not exceed 150 psi.
   g. Reconnect the line at the flow divider.
   h. Repeat step 5a through step 5f for all tubes.

If there is ammonium hydroxide (NH₄OH) fluid (or merely condensed water) in the delivery loops, this blow-out procedure may remove some, but not all, of that fluid.

WARNING

Violent Reaction Hazard:
If the delivery loop fluid was freshly formed, or is cold, assume it is pure liquid NH₃, and do not perform a loop clearing for several hours, and then only after performing discharge step 1 through step 4f.

Adding water to pure NH₃ causes a violent solution reaction. It could cause large irregular discharges of liquid and vapor back up the delivery tube and at the knives or tines. This liquid is likely to be highly caustic, and emitting dangerous concentrations of anhydrous ammonia vapor.
Clearing Plugged Knives or Tines

Knives or tines can get plugged at release ports ①, due to sticky soil, reverse movement and other causes. Routinely check knives or tines for evidence of plugging just prior to nurse tank hitching. More rarely, unusual field debris can cause a tubing disconnect at a knife or tine. Treat it as a plugged line until you confirm otherwise.

Elevated Ammonia Exposure Hazard:
Follow clearing instructions carefully. Wear your PPE a. Plugged delivery lines with tubing still attached can have significantly greater than normal NH3 liquid which is not likely to be mitigated by the normal Discharge procedures. Hastily disconnecting a charged line will release a dangerous amount of NH3 liquid and vapor. Your PPE is not designed to protect you against such a release. Burning, respiratory injury, blinding or death could result.

Refer to Figure 90

Clearing Plugged Application Tubes

A plugged application tube ① often results in the delivery tubing ② lifting off the knife or tine tubing at the clamp (an "open line plug"). The disconnect is usually easy to spot in the field as a condensation cloud from the row. The row is likely to be taking more than its equal share of NH3 from the flow divider. You may see a drop in pressure at the flow divider gauge (③ on page 21).

If the plugged line remains closed ("closed line plug"), the tubing may be completely full of liquid NH3 by the time you detect the problem. You may notice an increase in pressure at the flow divider gauge ④, or pressure pulses, as trapped liquid warms, periodically vaporizes, and blows back into the flow divider (⑤ on page 21).

Clearing Open Line Application Plugs

1. Stop operation (page 77).
2. Discharge the system (page 115).
3. If the knife or tine tubing is cold, wait for it to warm to ambient temperature (and vaporize any liquid NH3 inside).
4. Use a thin flexible tool (a coat hanger wire may suffice) to clear the knife or tine tube from above or below.
5. Reconnect the application tubing. Squeeze the spring clamp ②. Slide it up the delivery tubing. Push the delivery tubing onto the knife or tine tube about 3/4 inch (19 mm). Slide the spring clamp to centered in the overlap.

Clearing Closed Line Application Plugs

1. Review the WARNING at the top of this page.
2. Stop operation (page 77).
3. Discharge the system (page 115). The standard discharge is not likely to adequately discharge any plugged, closed, delivery lines. Expect continuing vapor release at non-plugged rows. The plugged line discharges back through the flow divider, and out the other rows.
4. Wait until the plugged knife or tine has warmed to ambient temperature, and the liquid level in the plugged loop is about the same as in the open loops.
5. Squeeze the spring clamp ②. Slide it up the tubing. Pull the delivery tubing off the knife or tine tubing.
6. Use a thin flexible tool (a coat hanger may suffice) to clear the knife or tine tube from above or below.
7. Reconnect the application tubing. Squeeze the spring clamp ②. Slide it up the delivery tubing. Push the delivery tubing onto the knife or tine tube about 3/4 inch (19 mm). Slide the spring clamp to centered in the overlap.

a. PPE: Personal Protective Equipment
Clearing Plugged Vapor Tubes

**WARNING**

Elevated Ammonia Exposure Hazard:
Follow clearing instructions carefully. Wear your PPe a.
Plugged vapor tubes with tubing still attached can contain significantly greater than normal NH3 vapor which is not likely to be mitigated by normal Discharge procedures. Hastily disconnecting a charged line releases a dangerous amount of NH3 vapor. Your PPE is not designed to protect you against such a release. Burning, respiratory injury, blinding or death could result.

Refer to Figure 91
A plugged vapor tube often usually does not result in the vapor tubing lifting off the knife or tine tubing at the clamp (it is a “closed line plug”).

If only one vapor line is plugged, the symptom may be an elevated temperature at the cooler gauge (A77 on page 21), and possibly a rate alarm if cooling is insufficient. If both vapor lines at a cooler are plugged (at moderate or warm ambient temperatures) the temperature gauge rises higher, and more quickly. Cooling ceases. Cooler pressure rises. Flow divider pressure falls. Rate alarm is likely. Normal Discharge may not clear the line.

If the plugged line disconnects (“open line plug”), you may see little change from normal operations. Odor is elevated, if you drive down-wind of application. The vapor line may not cause a cloud. The change in cooler pressure may be minor. You are most likely to detect an open line plugging of a vapor line during routine row inspection at re-hitch.

Clearing Closed Line Vapor Plugs
1. Review the WARNING at the top of this page.
2. Stop operation (page 77).
3. Discharge the system (page 115). The standard discharge is not likely to adequately discharge any plugged, closed, vapor lines. Expect continuing vapor release at non-plugged rows. The plugged line discharges back through the cooler, then through the flow divider and out the other rows.
4. Wait until the plugged knife or tine has warmed to ambient temperature, and there is no liquid in the vapor line.
5. Loosen the screw clamp (A48). Slide it up the vapor tubing. Pull the vapor tubing off the knife or tine tubing.
6. Use a thin flexible tool (a coat hanger wire may suffice) to clear the knife or tine tube from above or below.

Clearing Open Line Vapor Plugs
1. Stop operation (page 77).
2. Discharge the system (page 115).
3. If the knife or tine tubing is cold, wait for it to warm to ambient temperature (and vaporize any liquid NH3 inside).
4. Use a thin flexible tool (a coat hanger may suffice) to clear the knife or tine tube from above or below.
5. Reconnect the vapor tubing. Push the vapor tubing onto the knife or tine about 3/4 inch (19 mm). Slide the screw clamp to centered in the overlap and secure.

---
a. PPE: Personal Protective Equipment
Hydrostatic Relief Valve Maintenance

Relief valves require scheduled replacement and periodic inspection.

Relief Valve Inspection

Inspect relief valves seasonally, and during periodic maintenance. Check for cap present (step 2) prior to each application from a fresh tank of anhydrous.

1. Bleed the line at a relief valve before a detailed inspection. See "System Discharge" on page 115.

Refer to Figure 91 (depicting cooler relief valve A23)

2. Check that the rain/dust cap is in place and fully seated.

Do not operate with a missing cap. The cap keeps the spring mechanism, outlet (vent port) 1 and weep holes 2 free of contaminants that could prevent valve operation in an over-pressure situation.

A missing or dislodged cap also indicates that the valve may have operated, or may be malfunctioning. Understand and correct the reason for a dislodged or missing cap prior to field operations.

Replacement caps are:
breakaway: Continental 400-DC
cooler: Squibb-Taylor 1325-8.

Ammonia Exposure and Loss Hazards:

Understand and correct the reason for any lifted or missing hydrostatic relief valve caps. If a cap is out of place, that line section may have been closed with liquid NH₃ present, which later partially vented, dislodging the cap.

Liquid NH₃ may still be present. Carefully bleed the line section before taking any other action.

It is also possible that the valve disc has deteriorated, or has debris under the seat and is venting or leaking at normal operating pressures.

Any hydrostatic relief valve that fully opens ("pops") must be removed and re-tested (or simply replaced).

3. Carefully remove the dust cap.
4. Check the replace-by date 3 stamped on the valve. If it has passed, replace the valve before next use.
5. Clean any clogged weep holes 2. If they cannot be cleaned, replace the valve.

Ammonia Exposure Hazards:

▲ Wear safety equipment when inspecting or performing maintenance on relief valves. Even if the line is bled, NH₃ liquid or vapor may still be present.
▲ Always bleed the system before removing a relief valve cap or performing any more detailed inspection or valve maintenance.
▲ Never stand in front of or look directly into a relief valve. Use a mirror. If an overpressure event or valve malfunction is imminent or in progress, you can expect multiple valve activations. The initial activation can blow debris as well as liquid ammonia into your face.
▲ Follow inspection and replacement instructions carefully. Use the instructions on these two pages only if no separate instructions were supplied with the original and/or replacement valve.

Note: In severe conditions (such as exposure to salt, corrosive chemicals or pollutants), or if a valve has fully opened, you may need to replace a hydrostatic relief valve sooner than 5 years.
6. Inspect for dirt, sand, grease, paint, damage, corrosion, signs of tampering or insect activity. If visible, check the metal surface of the spring.

   If debris cannot be easily cleared, replace the valve.
   If there are signs of damage, replace the valve.
   If there is any question, replace the valve.

7. If a valve is venting at normal operating pressures, replace the valve.

8. Never force a valve closed. If a valve has remained open after operating, or is leaking, it is seriously contaminated or failed. Replace the valve.

9. Never attempt to protect a valve orifice with grease. Grease can harden over time, and/or collect contaminants. Either factor could prevent valve operation in an overpressure situation.

   Never plug a relief valve outlet. Relief valves are economical defense against serious ruptures and major releases. Help a valve do its job of protecting you.

**Valve Replacement**

The safest source for a replacement valve is Great Plains. Check the latest edition of the Parts manual (407-313P) or the Great Plains internet parts lookup. This assures a correct and compatible part that reflects any engineering enhancements.

---

**Ammonia Exposure Hazard:**

Fully discharge the system (page 115) before removing an old valve. Wear protective equipment. If the applicator was recently used, or ammonia was trapped, there could still be NH₃ liquid or vapor behind the valve.

Do not attempt to repair or adjust a relief valve. Hydrostatic relief valves are factory-set and tested, on specialized equipment, to discharge at a specific pressure.

On the component being protected by the valve, inspect the threaded hole after removing the valve. If there are signs of corrosion, replace the entire component.

Use pipe sealant when installing a replacement valve. Use only pipe sealant specified for use with anhydrous ammonia, such as RectorSeal No. 5. Do not use tape.

Record the replace-by date of the new valve in the “Replacement Log” section of this manual (beginning on page 121).

---

**CAUTION**

**Ammonia Exposure and Rupture Hazards:** Always replace a relief valve with a valve:

- that is an external “hydrostatic relief valve”,
- that is specified for anhydrous ammonia service,
- that has the same NPT pipe thread size, and;
- that is rated for the same discharge pressure as the valve removed (or as otherwise specified by Great Plains or the manufacturer of the protected component).

Discharge pressure is specific to the valve location in the system.

Using a valve rated too high could result in bursting of system components and a major liquid NH₃ release.

Using a valve rated too low could result in unexpected liquid NH₃ release, and material loss during application.
Replacement Log

Certain components and fittings used with anhydrous ammonia service have limited service lives.

The service life of components originally installed by Great Plains is pre-printed in the tables. The life of replacement parts may vary.

Once past their expiration dates, they must be replaced before the applicator is used again to apply anhydrous, even if they appear to be in excellent condition.

Use this page, or a copy, to record the replacement schedule and history for your applicator.

Be sure to remove and save these pages, or transfer the data, if you update the manual itself.

### Breakaway Coupler Hydrostatic Relief Valve

<table>
<thead>
<tr>
<th>Part ID</th>
<th>Service Life</th>
<th>Date Life Started</th>
<th>Replace Before Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Plains 891-203C</td>
<td>5 years: the replace-by date is stamped on the valve.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Plains 891-196C</td>
<td>10 years: replace-by date is molded in hose data stripe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Plains 891-197C</td>
<td>10 years: replace-by date is molded in hose data stripe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Supply Hose

<table>
<thead>
<tr>
<th>Part ID</th>
<th>Service Life</th>
<th>Date Life Started</th>
<th>Replace Before Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Plains 891-196C</td>
<td>10 years: replace-by date is molded in hose data stripe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great Plains 891-197C</td>
<td>10 years: replace-by date is molded in hose data stripe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Cooler Hydrostatic Relief Valve

<table>
<thead>
<tr>
<th>Part ID</th>
<th>Service Life</th>
<th>Date Life Started</th>
<th>Replace Before Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raven or Great Plains</td>
<td>5 years: the replace-by date is stamped on the valve.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>334-0002-005</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Refrigerant Line

This is the same tubing used for row delivery.

<table>
<thead>
<tr>
<th>Part ID</th>
<th>Service Life</th>
<th>Date Placed in Service</th>
<th>Replace Before Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Plains</td>
<td>10 Year rated life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>990-259R</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Row Delivery Tubing

It might be necessary to replace this tubing before the 10 year life if the knife or tine end of the tubing is damaged by harsh field conditions.

When replacing delivery tubing:

- Use the same length of tubing as removed. This length is identical for all rows of a specific applicator model. This is required to ensure equal rate at each knife or tine from the flow divider.
- Coil excess length. Secure it to the rear tool bar at the row. For wing rows, coil inboard of the row, so that the coil is below the knife or tine when the applicator is folded.

<table>
<thead>
<tr>
<th>Part ID</th>
<th>Service Life</th>
<th>Date Life Started</th>
<th>Replace Before Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Plains 990-259R</td>
<td>10 Year rated life</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Row Vapor Tubing

This is a different (larger ID) tubing compared to the row delivery and refrigerant tubing.

It might be necessary to replace this tubing before the 10 year life if the knife or tine end of the tubing is damaged by harsh field conditions.

<table>
<thead>
<tr>
<th>Part ID</th>
<th>Service Life</th>
<th>Date Life Started</th>
<th>Replace Before Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Plains 990-261R</td>
<td>10 Year rated life</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Metering System Maintenance

Fully discharge system before performing any maintenance. See “System Discharge” on page 115.

If any system components are removed from plumbing, when replacing or re-installing them, use only a pipe sealant specified for use with anhydrous ammonia, such as RectorSeal #5.

**Strainer [ATB] Maintenance**

Clean magnets every 4 to 5 tank loads. Check strainer screen at that time.

Ceramic magnets scavenge ferrous metal debris from the flow, preventing this material from contaminating the magnets in the flow meter.

The 20 mesh screen filters out non-magnetic particles that could interfere with both accurate flow metering and flow control. If the screen cannot be cleaned, or is damaged, the replacement is Raven part number 339-9000-032.

**Cooler [ATB] Maintenance**

Manual 016-0159-403, the Raven AccuFlow™ Operator manual, has specific recommendations for seasonal cooler storage, cleaning, and preserving the interior of the supercooler.

**Cooler Hydrostatic Relief Valve [ATB]**

This is a limited life part (page 122). Check for expiration whenever servicing the cooler.

**Flow Meter [ATB] Maintenance**

If flow meter readings are irregular, or consistently low relative to the amount of NH₃ known to have flowed from the tanks, remove the meter for cleaning and inspection. Refer to 016-0159-403, the Raven AccuFlow™ Operator manual, for details.

---

**DANGER**

_Suffocation, Blinding, Burning, Freezing, Disabling and Disfigurement Hazards:_

Do not perform maintenance with anhydrous ammonia in the system. Fully discharge the system of NH₃ liquid and vapor before working on the applicator.

**CAUTION**

_Tank Failure Early Warning:_

An excessive build-up on the magnets suggests that or more nurse tanks, employed since the most recent magnet cleaning, is/are deteriorating internally. Notify the tank cart provider. If you own the tanks used, take steps to identify the failing tank.

**NOTICE**

_Equipment Damage Risk:_

Periodic cleaning is essential if NH₃ additives have been used, such as Dow Chemical N-Serve or Amoco ACA.
Hydraulic Maintenance

As with any hydraulic system, contamination is the most common cause of performance problems and pre-mature wear. Make a special effort to properly clean quick couplers prior to attaching the hoses to tractor, and never let them fall to the ground.

**WARNING**

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

Bleed only at JIC and NPT fittings.
Never try to bleed a QD (Quick Disconnect) fitting.
Avoid bleeding at ORB fittings. The O-ring is likely to be torn if any pressure remains in the circuit.

**CAUTION**

**Crushing Hazard:**
When reconnecting fittings at fold cylinder ports, verify that a 0.063 inch (1/16 inch, 1.6 mm) orifice plate (Great Plains part number 196-430D) is installed at each port. A missing plate could result in a dangerously fast unfold, which might result in equipment damage, injury or death.

**NOTICE**

**System Contamination Risk:**
Always use liquid pipe sealant when adding or replacing NPT (National Pipe Thread, tapered thread) pipe-thread fittings. To avoid cracking hydraulic fittings from over tightening, and to keep tape fragments from clogging filters, do not use plastic sealant tape.

**NOTICE**

**Over-Torque and Leak Risks:**
JIC (Joint Industry Conference 37° Flare) fittings do not require high torque. Excess torque causes leaks. JIC and ORB (O-Ring Boss) fittings do not require sealant.

**Bleeding Lift Hydraulics**

Normally the lift hydraulics are bled at the factory before shipping, and bleeding should not be required other than to raise fully and hold lever on for one minute or until all cylinders extend fully. See “Re-Phasing Pull-Type Lift System” on page 51.

**JIC Torque Chart**

<table>
<thead>
<tr>
<th>Size</th>
<th>Foot-Pounds</th>
<th>N-m</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/16-20</td>
<td>11-12</td>
<td>15-16</td>
</tr>
<tr>
<td>1/2-20</td>
<td>15-16</td>
<td>20-22</td>
</tr>
<tr>
<td>5/16-18</td>
<td>18-20</td>
<td>24-28</td>
</tr>
<tr>
<td>3/4-16</td>
<td>38-42</td>
<td>52-58</td>
</tr>
<tr>
<td>7/8-14</td>
<td>57-62</td>
<td>77-85</td>
</tr>
<tr>
<td>11/16-12</td>
<td>79-87</td>
<td>108-119</td>
</tr>
</tbody>
</table>
Bleeding Fold Hydraulics

Normally the fold hydraulics are bled at the factory before shipping, and bleeding should not be required.

1. Connect the fold circuit to a hydraulic source, such as a tractor remote.
2. Set the source circuit to Float to relieve any pressure in the lines.
3. Disconnect both base and rod ends of all fold cylinders.
4. Support the cylinders with ports facing up, and with cylinders oriented so that rods cannot strike applicator parts when at full extension.
5. Orient cylinders with base ends higher than rod ends. Set circuit to Neutral.

One cylinder at a time:
6. Crack (slightly loosen) a JIC connection at a fold cylinder base end.
7. Extend the circuit slowly until fluid appears at the fitting.
8. Set the circuit to Neutral. Tighten the fitting.
9. Repeat step 6 through step 8 for the remaining cylinders.
10. Retract the fold cylinders. Set circuit to Neutral.
11. Orient cylinders with rod ends higher than base ends.

One cylinder at a time:
12. Crack (slightly loosen) a JIC connection at a fold cylinder rod end.
13. Extend the circuit slowly until fluid appears at the fitting.
14. Set the circuit to Neutral. Tighten the fitting.
15. Repeat step 12 through step 14 for the remaining cylinders.
16. Set circuit to Float.
17. Re-pin base and rod ends of cylinders to center section and wing lugs.
18. Test fold function carefully.

**WARNING**

Crushing and Equipment Damage Hazards:
Bleed after servicing fold cylinders or their hoses. Air in the system makes it hazardous to fold the applicator. If it is necessary to service fold hydraulics while folded, the first unfold is especially dangerous. Wing motion can be uneven or jerky in fold. Unfolding wings could fall suddenly. Anyone nearby could be seriously injured or killed. Equipment damage is likely.

**WARNING**

High Pressure Fluid Hazard:
Wear safety goggles and gloves. The bleed procedure requires partially opening pressurized hydraulic lines. Escaping fluid under pressure can penetrate the skin, causing serious injury. If an accident occurs, seek immediate medical assistance from a physician familiar with this type of injury.
Lubrication and Scheduled Maintenance

See "Replacement Log" on page 121 for components that require replacement at specific calendar dates.

**Wing Pivots**

1 zerk each pin,  
2 pins per wing;  
4 zerks total
Type of Lubrication: Grease  
Quantity: Until grease emerges

**Caster Pivots**

1 zerk each caster;  
4 zerks total (pull-type)  
2 zerks total (2-point)
Type of Lubrication: Grease  
Quantity: Until grease emerges

**Sealer Pivots (Option)**

1 zerk per pivot;  
11 to 15 zerks total
Type of Lubrication: Grease  
Quantity: Until grease emerges
Basket Sealer Bearings (Option)

1 zerk per bearing,
2 bearings per basket;
22 to 30 zerks total
Type of Lubrication: Grease
Quantity: Until grease emerges

Caster Wheel Parallel Arms

(2-Point and Pull-Type applicators only)
2 zerks each arm,
2 arms per caster,
4 casters per applicator - 16 zerks total (pull-type);
2 casters per applicator - 8 zerks total (2-point)
Type of Lubrication: Grease
Quantity: Until grease emerges

Rear Wheel Module Pivot

(pull-type applicators only)
4 zerks each pivot tube,
2 pivot modules per;
8 zerks total
Type of Lubrication: Grease
Quantity: Until grease emerges
Coulter Hubs (Option)

1 zerk per coulter, 11 to 15 total
Type of Lubrication: Grease
Quantity: Until grease emerges

Coulter Pivots (Option)

1 zerk per coulter pivot, 11 to 15 total
Type of Lubrication: Grease
Quantity: Until grease emerges

Tire Pressures

2, 4 or 6 tires
Check tire pressures more frequently on a new applicator, and with new tires. Check tire pressures before making any level adjustments, and whenever there are application problems.

Caster Wheel Bearings

2 races
Type of Lubrication: Grease
Quantity = until resistance is felt
Disc Sealer Hubs (Option)
Applies to knife/tine sealers only.
2 races per hub,
2 hubs per sealer,
11 to 15 sealers per applicator;
44 to 60 races total
Type of Lubrication: Grease
Quantity: Repack

Pull-Type Caster Wheel Hubs
(pull-type applicators only)
1 zerk each hub,
4 hubs per applicator;
4 zerks total
Type of Lubrication: Grease
Quantity: Until resistance is felt

Caster Stabilizers
One UHMW brake piston each caster;
4 total (pull-type)
2 total (2-point)
See “Caster Brake Adjustment” on page 95.
Options

Monitor Console

The Raven SCS 450 controls and adjusts application rate based on flow meter input, ground speed, and operator rate settings. This console is sold separately from the NH₃ metering packages (page 132), which include the applicator harnesses, flow meter and valves. This kit includes only the console and cab mounting hardware.

<table>
<thead>
<tr>
<th>Option Package</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAVEN 450 CONSOLE</td>
<td>823-211C</td>
</tr>
</tbody>
</table>

This console package does not include a speed sensor or speed sensor cable. The SCS 450 may be compatible with a speed sensor, radar or GPS speed output already installed on the tractor.

Speed Sensor Cable

If your existing or purchased speed sensor is compatible with the Raven 115-0159-539 cable (intended for use with a Raven radar), you may order it from Raven, or from Great Plains:

<table>
<thead>
<tr>
<th>Option Package</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radar Power Cable</td>
<td>115-0159-539</td>
</tr>
</tbody>
</table>

Speed Sensor

The Raven SCS 450 accepts speed inputs from traditional magnet sensors, speed radars, and GPS receivers that provide compatible speed outputs. If the tractor does not already have a compatible speed data source, Great Plains offers a DICKEY-john® radar.

<table>
<thead>
<tr>
<th>Option Package</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radar Kit</td>
<td>509-289A</td>
</tr>
</tbody>
</table>

This kit includes the radar transceiver and a Raven 115-0159-526 power and data cable.
Main Hitches

(Pull-type applicators only)
A cast or clevis hitch option is specified on initial applicator order. The hitch may be exchanged later as required. The accessory kits below include hitch, bolts, washers and nuts. The safety chain is standard on the applicator itself.

<table>
<thead>
<tr>
<th>Hitch Package</th>
<th>Original Option</th>
<th>Accessory Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Diameter Cast Hitch</td>
<td>2</td>
<td>170-004A</td>
</tr>
<tr>
<td>Small Diameter Clevis Hitch</td>
<td>3</td>
<td>170-039A</td>
</tr>
<tr>
<td>Category II Cast Hitch</td>
<td>4</td>
<td>170-073A</td>
</tr>
</tbody>
</table>

Category II Hitch Pin Kit

This kit adapts 3-Point and 2-Point applicators for use with tractors having Category II hitches.

<table>
<thead>
<tr>
<th>Option Packages</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT 2 HITCH PIN KIT</td>
<td>596-060A</td>
</tr>
</tbody>
</table>

NH₃ Metering

Based on the Raven AccuFlow™ system, Great Plains factory-installed systems include all the components identified on pages 144 through page 147, plus all the piping, tubing, fittings and console harness⁸ to hitch.

<table>
<thead>
<tr>
<th>Meter Package</th>
<th>Original Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Cooler Single-Section</td>
<td>20</td>
</tr>
<tr>
<td>Dual-Cooler Single-Section</td>
<td>21</td>
</tr>
<tr>
<td>Single-Cooler Section Control</td>
<td>22</td>
</tr>
<tr>
<td>Dual-Cooler Section Control</td>
<td>23</td>
</tr>
</tbody>
</table>

Select the dual-cooler system for application rates above 30 gpm, or for application in colder conditions, where the nurse tank vapor pressure might not support a full 30 gpm rate with a single cooler.

---

a. Console itself is sold separately (page 131).
Frame-Mounted Coulters

If ordered with the Nutri-Pro® applicator, coulters are factory-installed, aligned with knives or tines (in-row) and set for fixed (non-castering) operation. Choose between fluted and turbo 20 inch blades (turbo shown at right).

<table>
<thead>
<tr>
<th>Coulter Package</th>
<th>Original Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluted Coulters</td>
<td>10</td>
</tr>
<tr>
<td>Turbo Coulters</td>
<td>11</td>
</tr>
</tbody>
</table>

See page 99 for coulter adjustment.

Coulter Blades

<table>
<thead>
<tr>
<th>Single Blade</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.3in fluted blade ((\frac{5}{16}) inch wave)</td>
<td>820-074C</td>
</tr>
<tr>
<td>20.2in turbo blade ((\frac{3}{4}) inch wave)</td>
<td>820-180C</td>
</tr>
</tbody>
</table>

NH₃ Coulters, Blades and Tines

The choice of (left to right):
- tine (anhydrous coulter),
- spring-return knife, or
- rigid knife

is made in the selection of base applicator model. See list on page 18. Anhydrous coulter blade styles, and sealers are selected via options.

Anhydrous Couler Options

At time of publication, a single anhydrous coulter configuration was offered:

<table>
<thead>
<tr>
<th>Package</th>
<th>Original Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 inch turbo coulter</td>
<td>11</td>
</tr>
<tr>
<td>Large spider sealers</td>
<td>16</td>
</tr>
</tbody>
</table>

Knife/Tine Delivery Options

<table>
<thead>
<tr>
<th>Package</th>
<th>Original Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic knives/tines - All knives/tines liquid (no vapor delivery)</td>
<td>30</td>
</tr>
</tbody>
</table>

NH₃ (22 Inch) Coulter Blades

Order replacement blades as:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLTR TURBO 22X.19X.5WV, 4-BOLT</td>
<td>820-521C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
<th>Original Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Cooler knives or tines</td>
<td>31</td>
</tr>
<tr>
<td>Vapor delivery on 2 knives/tines</td>
<td></td>
</tr>
<tr>
<td>Dual-Cooler knives or tines</td>
<td>32</td>
</tr>
<tr>
<td>Vapor delivery on 4 knives/tines</td>
<td></td>
</tr>
</tbody>
</table>
Knife Row Sealers

If ordered with the Nutri-Pro® applicator, sealers are factory-installed. Choose between spider wheel or disc blades. The sealer kits include adjustable spring-loaded mounts\(^a\). Kits may be field-installed.

<table>
<thead>
<tr>
<th>Sealer Package</th>
<th>Original Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basket Sealers</td>
<td>17</td>
</tr>
<tr>
<td>Disc Sealers</td>
<td>15</td>
</tr>
<tr>
<td>Spider Sealers</td>
<td>16</td>
</tr>
</tbody>
</table>

See “Sealer Adjustments” on page 102.

Weight Kits

Standard applicator configurations provide sufficient weight for conventional till and most no-till conditions. For challenging no-till conditions, a weight set is available for the rear sub-frame.

The weight stacks are available as an Option with the original fertilizer applicator order, or as a separate kit.

<table>
<thead>
<tr>
<th>Description</th>
<th>Opt.</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2900# Weight Kit (5-Section)</td>
<td>70</td>
<td>407-740A</td>
</tr>
<tr>
<td>1780# Weight Kit (3-Section)</td>
<td>70</td>
<td>417-192A</td>
</tr>
</tbody>
</table>

See also: “Weight Kit Installation” on page 159.

\(^a\) To change between spider wheel and disc in the field, order only the components on and including the wheel or disc arms (unless you want duplicate mounts). See Parts manual (407-313P).
Rear Hitch
A rear hitch is required for a trailing nurse tank. An optional drop rear hitch is available.
The assembly offered by Great Plains includes hitch mount weldment, decal mount (not shown), breakaway coupler mount point, and a Schuck model 850 cushioned hitch with a 50,000 pound load rating and 2,000 pound tongue weight.

Drop Rear Hitch

<table>
<thead>
<tr>
<th>Rear Hitch Package</th>
<th>Original Option</th>
<th>Accessory Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop Rear Hitch Assembly</td>
<td>27</td>
<td>407-722A</td>
</tr>
</tbody>
</table>

Nurse Tank Light Harness
For extra safety in the field, this harness provides an SAE J560b 7-pin receptacle at the applicator rear hitch (option), interconnected with the applicator lighting system.

<table>
<thead>
<tr>
<th>Lighting Harness</th>
<th>Accessory Kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse Tank Light Kit</td>
<td>417-357A</td>
</tr>
</tbody>
</table>

**WARNING**

Loss of Control / Braking Hazards:
Do not use the lighting harness for highway transport of nurse tanks or trailers behind an applicator. At transport speeds on roads, an urgent or emergency deceleration will result in a “jackknife” upset of a trailer. Even normal braking above field speed risks loss of control. The entire train can exceed the braking capability of the tractor, particularly if a full tank is towed. An accident is likely to result in serious injury or death, and major equipment damage.

Note: Compatible with 2014+ Nutri-Pro® applicators, and earlier models having an LED lighting system. Requires an applicator rear hitch (not included - drop or high-clearance hitches are compatible).
## Appendix A - Reference Information

### Specifications and Capacities

#### NP30A Models, U.S. Customary Units

<table>
<thead>
<tr>
<th>Model</th>
<th>-11C30</th>
<th>-12C30</th>
<th>-13C30</th>
<th>-18R20</th>
<th>-25C15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row Count</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Row Spacing</td>
<td>30 in.</td>
<td>30 in.</td>
<td>30 in.</td>
<td>20 in.</td>
<td>15 in.</td>
</tr>
<tr>
<td>Swath</td>
<td>27 ft. 6 in.</td>
<td>30 ft. 0 in.</td>
<td>32 ft. 6 in.</td>
<td>30 ft. 0 in.</td>
<td>31 ft. 3 in.</td>
</tr>
<tr>
<td>Working Width (Maximum)</td>
<td>26 ft. 11 in.</td>
<td>28 ft. 11 in.</td>
<td>31 ft. 7 in.</td>
<td>31 ft. 7 in.</td>
<td>31 ft. 7 in.</td>
</tr>
<tr>
<td>Transport Width</td>
<td>17 ft. 0 in.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (2 Point)</td>
<td>9 ft. 4 in.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (3 Point)</td>
<td></td>
<td>8 ft. 10 in.</td>
<td></td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Length (Pull Type)</td>
<td></td>
<td></td>
<td>17 ft. 4 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wing Flex</td>
<td>8°</td>
<td>8°</td>
<td>8°</td>
<td>8°</td>
<td>8°</td>
</tr>
<tr>
<td>Working Height</td>
<td></td>
<td></td>
<td>6 ft. 10 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport Height (Folded)</td>
<td></td>
<td></td>
<td>12 ft. 6 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2P/PT Transport Clearance</td>
<td></td>
<td></td>
<td>16 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3P Transport Clearance</td>
<td>(depends on tractor 3-point hitch range)</td>
<td></td>
<td></td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>Min. Tractor HP Req.¹</td>
<td>140 hp</td>
<td>155 hp</td>
<td>165 hp</td>
<td>225 hp</td>
<td>300 hp</td>
</tr>
<tr>
<td>Hydraulic Circuits Req.</td>
<td>1 or 2 Circuits, 2250 psi, 4 gal/min</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight, 2P (maximum)²</td>
<td>7700 lbs</td>
<td>7900 lbs</td>
<td>8100 lbs</td>
<td>9600 lbs</td>
<td>11900 lbs</td>
</tr>
<tr>
<td>Weight, 3P (maximum)²</td>
<td>7200 lbs</td>
<td>7400 lbs</td>
<td>7600 lbs</td>
<td>8800 lbs</td>
<td>n/a</td>
</tr>
<tr>
<td>Weight, PT (maximum)²</td>
<td>11100 lbs</td>
<td>11300 lbs</td>
<td>11500 lbs</td>
<td>12800 lbs</td>
<td>15300 lbs</td>
</tr>
<tr>
<td>2P/PT Transport Tire Size</td>
<td>265/70B16.5 (10-16.5) NHS 8-Ply</td>
<td></td>
<td></td>
<td>10-16.5 NHS 10-Ply</td>
<td>12-16.5 NHS 14-Ply</td>
</tr>
<tr>
<td>PT Gauge Wheel Tire</td>
<td>265/70B16.5 (10-16.5) NHS 8-Ply</td>
<td></td>
<td></td>
<td>10-16.5 NHS 10-Ply</td>
<td>12-16.5 NHS 14-Ply</td>
</tr>
<tr>
<td>2P/3P Gauge Wheel Tire</td>
<td>20.5×8.0 10-Ply LR-E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Depth³</td>
<td>3 to 7 inches</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rear Hitch</td>
<td>Option: Schuck Model 850</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse Tank Capability</td>
<td>3000 Gallons</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metering System</td>
<td>Raven Accuflow™ with CDS-JohnBlue Impellicone (Optional)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controller Console*</td>
<td>Raven SCS 450 (Optional)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Power requirements vary significantly with conditions and practices.
2. With Great Plains-installed AccuFlow metering, Schuck hitch, coulters and spider sealers. All weights are approximate.
3. Release depth is 3/4 in. above knife/tine depth, or 3/8 in. above coulter depth.

* Implement functions not monitored include: pressure and temperature
## NP30A Models, Metric Units

<table>
<thead>
<tr>
<th>Model</th>
<th>-11C30</th>
<th>-12C30</th>
<th>-13C30</th>
<th>-18R20</th>
<th>-25C15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row Count</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
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<td>Controller Console*</td>
<td>Raven SCS 450 (Optional)</td>
<td></td>
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</table>

1. Power requirements vary significantly with conditions and practices.
2. With Great Plains-installed AccuFlow metering, Schuck hitch, coulters and spider sealers. All weights are approximate.
3. Release depth is 3/4 in. above knife/tine depth, or 3/8 in. above coulter depth.

* Implement functions not monitored include: pressure and temperature
### NP40A Models, U.S. Customary Units

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<td>16 ft. 0 in.</td>
<td>17 ft. 0 in.</td>
<td>16 ft. 9 in.</td>
<td>16 ft. 0 in.</td>
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<td>12 ft. 6 in.</td>
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<td>2P/PT Transport Clearance</td>
<td>(depends on tractor 3-point hitch range)</td>
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<td>215</td>
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<td>310</td>
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<td>Hydraulic Circuits Req.</td>
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<td>9900 lbs</td>
<td>11000 lbs</td>
<td>11700 lbs</td>
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<td>9400 lbs</td>
<td>10500 lbs</td>
<td>11200 lbs</td>
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<td>Weight, PT (maximum)²</td>
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<td>15100 lbs</td>
<td>17850 lbs</td>
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<td>2P/PT Transport Tire Size</td>
<td>265/70B16.5 (10-16.5) NHS 8-Ply</td>
<td>10-16.5 NHS 10-Ply</td>
<td>12-16.5 NHS 14-Ply</td>
<td>265/70B16.5 (10-16.5) NHS 8-Ply</td>
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<td>PT Gauge Wheel Tire</td>
<td>265/70B16.5 (10-16.5) NHS 8-Ply</td>
<td>10-16.5 NHS 10-Ply</td>
<td>12-16.5 NHS 14-Ply</td>
<td>265/70B16.5 (10-16.5) NHS 8-Ply</td>
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<tr>
<td>2P/3P Gauge Wheel Tire</td>
<td>20.5×8.0 10-Ply LR-E</td>
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<tr>
<td>Rear Hitch</td>
<td>Option: Schuck Model 850</td>
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<td>Nurse Tank Capability</td>
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<tr>
<td>Metering System</td>
<td>Raven Accuflow™ with CDS-JohnBlue Impellicone (Optional)</td>
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<tr>
<td>Controller Console*</td>
<td>Raven SCS 450 (Optional)</td>
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</table>

1. Power requirements vary significantly with conditions and practices.
2. With Great Plains-installed AccuFlow metering, Schuck hitch, coulters and spider sealers. All weights are approximate.
3. Release depth is 3/4 in. above knife/tine depth, or 3/8 in. above coulter depth.
* Implement functions not monitored include: pressure and temperature
## NP40A Models, Metric Units

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### Row Count
-15 16 17 22 25 31

### Row Spacing
-15R30 16R30 17R30 22R20 25R20

### Swath
-15S30 16S30 17S30 22S20 25S20

### Working Width (Maximum)
-15C30 16C30 17C30 22C30 25C30

### Transport Width
-15R30 16R30 17R30 22R20 25R20

### Length (2 Point)
-2.84 m

### Length (3 Point)
-2.69 m n/a

### Length (Pull Type)
-5.28 m

### Wing Flex
-8° 10° 10° 8° 10° 10°

### Working Height
-2.08 m

### Transport Height (Folded)
-3.81 m

### 2P/PT Transport Clearance
-40.6 cm

### 3P Transport Clearance
-(depends on tractor 3-point hitch range) n/a

### Min. Tractor HP Req.¹
-140 kW 150 kW 160 kW 210 kW 230 kW 280 kW

### Hydraulic Circuits Req.
-1 or 2 Circuits, 155 bar, 15 liters/min

### Weight, 2P (maximum)²
-4300 kg 4400 kg 4500 kg 5000 kg 5300 kg 6600 kg

### Weight, 3P (maximum)²
-4000 kg 4100 kg 4300 kg 4800 kg 5100 kg n/a

### Weight, PT (maximum)²
-5800 kg 5900 kg 6000 kg 6500 kg 6800 kg 8100 kg

### 2P/PT Transport Tire Size
-265/70B16.5 (10-16.5) NHS 8-Ply
-10-16.5 NHS 10-Ply
-12-16.5 NHS 14-Ply
-265/70B16.5 (10-16.5) NHS 8-Ply

### PT Gauge Wheel Tire
-265/70B16.5 (10-16.5) NHS 8-Ply
-10-16.5 NHS 10-Ply
-12-16.5 NHS 14-Ply
-265/70B16.5 (10-16.5) NHS 8-Ply

### 2P/3P Gauge Wheel Tire
-20.5x8.0 10-Ply LR-E

### Operating Depth³
-8 to 18 cm

### Rear Hitch
-Option: Schuck Model 850

### Nurse Tank Capability
-11400 liters

### Metering System
-Raven Accuflow™ with CDS-JohnBlue Impellicone (Optional)

### Controller Console*²
-Raven SCS 450 (Optional)

---

1. Power requirements vary significantly with conditions and practices.
2. With Great Plains-installed AccuFlow metering, Schuck hitch, coulters and spider sealers. All weights are approximate.
3. Release depth is 3/4 in. above knife/tine depth, or 3/8 in. above coulter depth.

* Implement functions not monitored include: pressure and temperature
Tire Inflation Chart

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<th>Inflation</th>
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<td>60 psi (415 kPa)</td>
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<td>10-16.5 NHS 10-Ply</td>
<td>75 psi (517 kPa)</td>
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<tr>
<td>12-16.5 NHS 14-Ply</td>
<td>90 psi (620 kPa)</td>
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<tr>
<td>20.5x8.0 10-Ply</td>
<td>90 psi (620 kPa)</td>
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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 web sites listed below. For assistance or information, contact your nearest Authorized Farm Tire Retailer.

Manufacturer | Web site
---|---
Firestone | www.firestoneag.com
Goodyear | www.goodyearag.com
BKT | www.bkt-tires.com/en
Gleason | www.gleasonwheel.com
Titan | www.titan-intl.com

Torque Values Chart

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<td>Grade 2</td>
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<tr>
<td>N-m</td>
<td>ft-lb</td>
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<td>1/4-20</td>
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<td>M 36 X 2</td>
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</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 torqueing values. Unless otherwise specified use torque values listed above.
Controller System Diagram
Single-Section Controller

Accessories sold separately

---

**Wide variety of wheel drive, speedometer and radar adapter cabling. Consult Raven sales representative for part numbers.**
Section Control Controller

CONTROL CONSOLE
SCS AND: 063-0171-270
GP: 823-211C

CONSOLE CABLE
10: 115-0171-085
GP: 823-212C

EXTENSION CABLES
12: 115-0159-856 (GP: 823-215C)
24: 115-0159-857

** WIDE VARIETY OF WHEEL DRIVE, SPEEDOMETER AND RADAR ADAPTER CABLES. CONSULT RAVEN SALES REPRESENTATIVE FOR PART NUMBERS **

FLOW CABLE
115-0171-836
GP: 823-422C

FLOW METER
063-0171-666

CONTROL VALVE
063-0172-977

ON/OFF VALVE
063-0172-978

ON/OFF VALVE
063-0172-978

ON/OFF VALVE
063-0172-978
Plumbing Diagrams
See page 22 for a narrative.

System Elements
The dual-cooler systems (page 146 and 147) differ from the single-cooler systems (page 144 and 145) as follows:

- The inflow from the tank is split after the strainer (A19), feeding two coolers (A21).
- Cooler outlets are merged prior to flow meter (A25).
- Refrigerant tap (A32) is split.
- Two more tines (A49) are dual-tube for vapor dispersal. The section-control systems (pages 145 and 147) differ from the single-section systems as follows:
  - There is a check valve, bleed valve and 3-way flow divider prior to section flow dividers.
  - Each section flow divider has a shut-off solenoid valve.

Legend:

- Liquid NH₃
- NH₃ Vapor
- Direction of Flow
- Exception Flow

For more details on components A11 through A49, see "Systems Overview" on page 22.

<table>
<thead>
<tr>
<th>A11. Acme cap</th>
<th>A31. Master Shut-Off Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>A12. Acme inlet</td>
<td>A32. Refrigerant Tap</td>
</tr>
<tr>
<td>A13. Coupler Inlet Bleed Valve</td>
<td>A33. Refrigerant Line</td>
</tr>
<tr>
<td>A14. Breakaway Coupler</td>
<td>A34. Cooler Refrigerant Inlet</td>
</tr>
<tr>
<td>A15. Breakaway Hydrostatic Relief Valve</td>
<td>A35. Section Control Check Valve</td>
</tr>
<tr>
<td>A16. Coupler Outlet Bleed Valve</td>
<td>A36. Section Control Bleed Valve</td>
</tr>
<tr>
<td>A17. Supply Hose</td>
<td>A37. Section Control Relief Valve</td>
</tr>
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<td>A18. Emergency Shut-off Valve</td>
<td>A38. Section Flow Divider</td>
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<td>A20. Strainer Magnets</td>
<td>A40. Row Flow Divider(s)</td>
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<tr>
<td>A22. Cooler Intake</td>
<td>A42. Flow Divider Pressure Gauge</td>
</tr>
<tr>
<td>A23. Cooler Hydrostatic Relief Valve</td>
<td>A43. Flow Divider Outlet</td>
</tr>
<tr>
<td>A24. Cooler Outlet</td>
<td>A44. Flow Divider Plug</td>
</tr>
<tr>
<td>A25. Flow Meter</td>
<td>A45. Delivery Tube</td>
</tr>
<tr>
<td>A26. Drain Cap</td>
<td>A46. Knife or Tine (Single)</td>
</tr>
<tr>
<td>A27. Temperature Gauge</td>
<td>A47. Cooler Vapor Outlets (2)</td>
</tr>
<tr>
<td>A28. Pressure Gauge</td>
<td>A48. Vapor Tube</td>
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<tr>
<td>A29. Cooler Bleed Valve</td>
<td>A49. Knife or Tine (Dual)</td>
</tr>
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</table>
Single-Cooler Single-Section Plumbing
See legends on page 143 and "Systems Overview" on page 22.
Single Cooler Section Control Plumbing
See legends on page 143 and “Systems Overview” on page 22.
Dual-Cooler Single-Section Plumbing
See legends on page 143 and “Systems Overview” on page 22.
Dual Cooler Section Control Plumbing
See legends on page 143 and “Systems Overview” on page 22.
Hydraulic Diagrams
Hydraulic Schematic (2013+ 5-Section) 2-Point with Lift Assist
Proximity and Solenoid Locations (2013+ 5-Section) 2-Point with Lift Assist
Lift Assist and Fold Hydraulics: 2012-2-Point 5-Section

1. Shut-off valve
2. Pressure reducing valve
3. Bypass valve
Lift Assist, Weight Transfer and Fold Hydraulics: 2013+ 2-Point 5-Section

① Weight-transfer valve
Fold Hydraulics: Pull-Type 5-Section

1. Shut-off valve
2. Pressure reducing valve
3. Bypass valve
Fold Hydraulics: 3-Point and Pull-Type 3-Section

1. Shut-off valve
2. Pressure reducing valve
3. Bypass valve
Lift and Fold Hydraulics: 2-Point 3-Section

1. Shut-off valve
2. Pressure reducing valve
3. Bypass valve

Diagram with labeled components:

- U
- R
- B
- F
- D
- L
Lift Hydraulics: 2011+ Pull Type
Lift Hydraulics: 2010- Pull Type
Appendix B - Initial Setup

This Appendix covers setup tasks performed only once, or at infrequent intervals. Routine setup tasks are covered in “Preparation and Setup” on page 28. Some of these items may already have been done by your Great Plains dealer:

a. Record replacement dates.
b. Field lift partial fold adjustment (below)
c. Flow controller console installation (Option, page 158)
d. 3-point parking stand clearance (page 37)
e. Frame-mounted row options (see manual supplied with accessory)

FOLD / FIELD Switch Installation

This applies to 2013+ 5-Section only.

Refer to Figure 93

Chose a cab location for the FOLD / FIELD switch:

• Within easy reach for periodic field activation.
• Easy to observe periodically to verify state.
• Does not obstruct view of road or important tractor controls or indicators.

The switch bundle includes an optional fuse kit and both ring terminals and fuse box terminals for connection to the tractor’s 12Vdc supply.

The switch may be connected directly to battery power, or to a switched source. If connected direct, it is important to use the PARK position to save battery power when the applicator is connected but not in use.

Route the captive harness to the hitch. Secure it with the provided cable ties to prevent entanglement and damage.

Component Replacement Dates

Record replace-by dates on the "Replacement Log", pages 121 to 123.

If the applicator has Great Plains-installed metering, several components of that system have limited service lives, and must be replaced before specific dates.

Where these dates are stamped on metal parts, normal oxidation, and the corrosive effects of extended field exposure to low levels of anhydrous ammonia vapor, can render these dates difficult to read soon after the applicator is placed in service.

Post-Delivery Checklist

1. Read and understand “Important Safety Information” on page 1.
2. Check that all working parts are moving freely, bolts are tight, and cotter pins are spread.
3. Check that all grease fittings are in place and lubricated. See “Lubrication and Scheduled Maintenance” on page 127.
4. Check that all safety decals and reflectors are correctly located and legible. Replace if damaged. See “Safety Decals” on page 8.
5. Inflate tires to pressure recommended and tighten wheel bolts as specified. See “Tire Inflation Chart” on page 140.
Lift-Assist Valve Setup

This applies to 2-Point applicators only.
1. Locate the one-way restrictor valve ① at the tee that supplies the rear cylinder base ends.
2. Turn the knob fully counterclockwise.

Console Installation

*Refer to Figure 96*

The applicator's optional Raven SCS 450 flow controller system includes one or two consoles ① that need to be mounted in the cab of the tractor to be used with the applicator.

Each monitor includes cables for power ②, speed sensor ③ and sensor harness ④. Installation instructions are found in the included 016-0159-831 Raven SCS 450 Installation, Operation and Service manual manual.

Power color code is:
+ positive: red
- negative: black

The included bracket ⑤ requires customer-supplied fasteners.

Before first field use of the SCS 450, it must be programmed with data specifying the system configuration, consisting of various "CAL" numbers and user elected "RATE" numbers. See the Raven SCS 450 manual for display interpretation, and see the manual of or the Calibration Card for the keystroke sequence for setting each of these values.

See "Meter Setup" on page 40.

---

**Transport and Field Safety Risk:**
Mount the module so it is easy to monitor during application, but does not interfere with safe operation of the tractor in the field or on public roads.
Appendix C - Accessory Installation

Weight Kit Installation

407-740A (NP4000) Weight Kit Installation

Tools Required:

- Lift or hoist with a capacity of at least 750 pounds (340 kg). Two lift lines, each with a capacity of at least 750 pounds (340 kg).
- Tractor for raising and unfolding the applicator.
- Basic hand tools.

1. Raise and unfold the applicator. Leave it hitched or install parking stands.

⚠️ WARNING

Heavy Overhead Object Hazard:
Move only one weight stack at a time. Use an adequate hoist. Use two or more lines, each rated for the full weight of a single weight stack. Inspect lines for wear and damage. If the hoist fails or tips, or a line fails, a weight could fall or swing, causing serious injury or death.

Refer to Figure 97

2. Locate one:

↑ 160-296S NTA WEIGHT BRACKET ASSY

Observe that a weight stack is not symmetrical. The weight base has a long (outside) notch ① and a short (inside) notch ②.

3. As needed, orient the weight stack prior to line attachment, so that it is in the correct orientation when placed on the frame.

4. Connect hoist lines to the weight mounts ③.

5. With the longer notch ① toward the wings, and the shorter notch ② to machine center, place the weight in the openings of the rear sub-frame. Push it fully forward before releasing the lines.

6. Repeat step 2 through step 5 for all weights.

7. Select four sets:

↑ 802-091C HHCS 1/2-13X1 1/2 GR5
↓ 803-019C NUT LOCK 1/2-13 PLT

and eight:

↑ 804-016C WASHER FLAT 1/2 SAE PLT

Place a washer ⑦ on each bolt ⑧. Insert each bolt between the mounts ③ of adjacent weight stacks. Secure with second washer ⑦ and lock nut ⑧.

⚠️ CAUTION

Heavy Overhead Object Hazard:
Do not stand to either side of an elevated weight stack. Keep body parts away from gaps between the stack and other machine parts. Remain behind and out from under the elevated weight stack. Move the stack slowly and carefully. Assume a line could fail, and that the weights could swing down and to the side.

NOTICE

Machine Damage Risk:
Do not install a single weight on either side. Do not leave weight pairs uncoupled on either side. Always install or remove all four weights. When installed, always use provided fasteners to couple front and rear weights at their mounts ③. Weights are held in place largely by gravity. A single weight, or uncoupled pair, could tip forward during a sudden stop, causing machine damage.
417-192A Weight Kit Installation

Tools Required:

- Lift or hoist with a capacity of at least 890 pounds (403 kg). Two lift lines, each with a capacity of at least 890 pounds (403 kg).
- Tractor for raising and unfolding the applicator.
- Basic hand tools.

1. Raise and unfold the applicator. Leave it hitched or install parking stands.

2. Determine the mounting location. The weights are installed front-to-back in the rear sub-frame. The notched end of the stack is to the rear, with the mounting plate 1 to the right. Choose lateral locations using the following criteria:
   - One weight set on each side, and equal distance from applicator center-line.
   - Inside (between) lift-assist wheel assemblies.
   - Clear of row unit mounts at mainframe rear.

Refer to Figure 98

3. Locate one:
   - 417-193S WEIGHT BRACKET ASSY 890#

   Observe that a weight stack is not symmetrical. The weight base has a long (outside) notch at the end with the mounting plate 1.

4. As needed, orient the weight stack prior to line attachment, so that it is in the correct orientation when placed on the frame.

5. Connect hoist lines to the weight mounts 2.

6. With the long notch to rear, place the weight in the rear sub-frame. Push it fully to the rear before releasing the lines.

7. Repeat step 2 through step 5 for the other weight.

8. Select two:
   - 806-015C U-BOLT 5/8-11 X 4 1/32 X 8 and four sets:
     - 804-022C WASHER LOCK SPRING 5/8 PLT
     - 803-021C NUT HEX 5/8-11 PLT

   Insert the a U-bolt 19, from below the lift-assist tool bar, through the weight stack mounting plate 1. Place two washers 18 on each bolt 19. Secure with nuts 16.

Heavy Overhead Object Hazard:
Move only one weight stack at a time. Use an adequate hoist. Use two or more lines, each rated for the full weight of a single weight stack. Inspect lines for wear and damage. If the hoist fails or tips, or a line fails, a weight could fall or swing, causing serious injury or death. Do not stand to either side of an elevated weight stack. Keep body parts away from gaps between the stack and other machine parts. Remain behind and out from under the elevated weight stack. Move the stack slowly and carefully. Assume a line could fail, and that the weights could swing down and to the side.

Machine Damage Risk:
Always install or remove both weights. When installed, always use provided U-bolts to secure weights to tool bar. An unsecured weight could tip sideways during a turn or on a slope, causing machine damage.
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.
Index

A
abnormal folding .............................................. 65
ACA ........................................................................... 124
AccuFlow™ .................................. 9, 13, 18, 23, 40, 132
Acme cap ............................................... 22
Acme inlet ............................................. 22, 71
adjustments ............................................. 84
aluminum ................................................. 26
amber reflectors ................................................. 9
ammonium hydroxide .................. 1, 115
Amoco ............................................................. 124
anhydrous ammonia safety ........... 1
anhydrous coulter .............................................. 98
application
ending ............................................................. 83
starting .......................................................... 75
stopping ......................................................... 77
suspending ................................................. 76, 82
application depth .......................... 38, 98
apron ................................................................. 3
B
ball trap ......................................................... 77, 114
basket sealer ................................................... 103, 128
blade, coulter .................................................. 133
bleed valve .................................. 27, 32, 69
cooler ......................................................... 24
coupler ......................................................... 22, 23
hose .............................................................. 27
section control ............................................. 24
bleeding
fold .............................................................. 126
general ......................................................... 125
lift ................................................................. 125
bleeding hydraulics ......................................... 125
BOOM CAL ................................................. 40, 41
BOOMS ......................................................... 25, 74
brake, caster .............................................. 95
breakaway ..................................................... 78
breakaway coupler ......................................... 22
bypass valve ................................................. 88
C
CAL ................................................................. 40, 158
Calibration Card ........................................... 40, 42, 158
callouts, defined ............................................. 19
cap ................................................................. 22
missing ......................................................... 119
valve ......................................................... 69, 119
capacities ....................................................... 136
Card, Calibration ................................. 40, 158
cart hose, connecting ..................................... 72
cart, nurse tank ........................................... 68
cast hitch ...................................................... 132
caster brake ................................................... 95
caster pivots ................................................... 127
caster stabilizer .............................................. 130
caster wheel parallel arms .................... 128
Category II ..................................................... 31, 132
Category III ....................................................... 31
CAUTION, defined ........................................... 2
CDS-John Blue ........................................... 10, 18, 25
centering, press wheel ................................... 102
ceramic magnet ............................................ 23, 124
chain
safety ......................................................... 4, 30
check valve, section control .................. 24
checklists
electrical ....................................................... 34, 81
ending application ....................................... 83
field .............................................................. 81
field turns ...................................................... 82
first pass ....................................................... 82
hydraulic system ........................................... 81
mechanical ................................................. 81
cart hitch ...................................................... 81
implement ..................................................... 81
NH3
cart hitched ..................................................... 81
NH3 system ..................................................... 81
post-delivery .................................................. 157
pre-setup ....................................................... 29
pre-start ......................................................... 44
row units ....................................................... 81
suspending application ......................... 82
clevis hitch ..................................................... 132
clevis, depth stop ......................................... 47
closed center ............................................. 35, 90
clothing ......................................................... 9
color code
hose .............................................................. 35
power ......................................................... 158
connectors
cable speed ..................................................... 34
electrical ....................................................... 34
rate controller .............................................. 34
console ......................................................... 28, 41, 131, 158
console speed connector ......................... 34
Continental ..................................................... 119
continuous flow ............................................. 88, 90
control valve .............................................. 24, 68
controller diagram ....................................... 141
cooler bleed valve ......................................... 24
cooler hydrostatic relief valve .................... 124
cooler intake .................................................. 23
cooler outlet .................................................. 23
cooler refrigerant inlet ................................... 24
cooler vapor outlet ....................................... 25
coulter
frame-mounted .............................................. 99, 133
coulter casting ............................................. 101
coulter hubs .............................................. 129
cooler pivots .............................................. 129
coupler .......................................................... 22
coupler bleed valve ..................................... 22
coupler outlet bleed valve ......................... 23
covered models ............................................. 18
crank, gauge wheel ........................................ 86
customer service .......................................... 20
cylinder locks .............................................. 45
cylinder symbols ........................................... 35
D
DANGER, defined ............................................ 2
daylight reflectors ......................................... 9
decal replacement ....................................... 8
decals
caution
ammonia ....................................................... 13
no step ......................................................... 14
pressure & torque ....................................... 15, 16, 17
read manual ................................................ 14
transport locks ............................................. 15
danger
ammonia ....................................................... 9
bleed system ................................................. 10
chemical ...................................................... 10
electrocution ............................................... 11
hitch ............................................................ 11
Ingles ......................................................... 10
safety coupler .............................................. 11
general
water .......................................................... 17
safety ........................................................... 8
warning
high pressure fluid hazard ..................... 12
speed .......................................................... 12
towing ......................................................... 13
definitions ...................................................... 19
delivery tubing ............................................ 25, 123
depth control ............................................... 31
depth stop ..................................................... 47
depth, application ......................................... 38, 96, 97, 98
diagram, NH3 flow ......................................... 21
DICKEY-john .................................................. 131
directions, defined ........................................ 19
disc blade ...................................................... 134
disc sealer ..................................................... 102
disc sealer hubs ............................................. 130
discharge, system ........................................... 115
Dow Chemical ............................................ 124
down pressure
press wheel .................................................. 102
<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>maintenance</strong></td>
</tr>
<tr>
<td><strong>hydraulic</strong></td>
</tr>
<tr>
<td><strong>MAN mode</strong></td>
</tr>
<tr>
<td><strong>manifold inlet</strong></td>
</tr>
<tr>
<td><strong>MASTER</strong></td>
</tr>
<tr>
<td><strong>Material Safety Data Sheet</strong></td>
</tr>
<tr>
<td><strong>medical assistance</strong></td>
</tr>
<tr>
<td><strong>4, 35, 44</strong></td>
</tr>
<tr>
<td><strong>METER CAL</strong></td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>mist, spray</strong></td>
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<tr>
<td><strong>model number</strong></td>
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</tr>
<tr>
<td><strong>Note, defined</strong></td>
</tr>
<tr>
<td><strong>NOTICE, defined</strong></td>
</tr>
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<td><strong>NPT</strong></td>
</tr>
<tr>
<td><strong>NP30A</strong></td>
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</tr>
<tr>
<td><strong>ORB</strong></td>
</tr>
<tr>
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</tr>
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</tr>
<tr>
<td><strong>bleed valve</strong></td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>O-Ring Boss</strong></td>
</tr>
<tr>
<td><strong>oscillation</strong></td>
</tr>
<tr>
<td><strong>outlet hose assembly</strong></td>
</tr>
<tr>
<td><strong>outlet, cooler</strong></td>
</tr>
<tr>
<td><strong>overhead lines</strong></td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
<td><strong>parking plug</strong></td>
</tr>
<tr>
<td><strong>parking stand</strong></td>
</tr>
<tr>
<td><strong>partial fold</strong></td>
</tr>
<tr>
<td><strong>Parts manual</strong></td>
</tr>
<tr>
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<td><strong>Raven...9, 13, 18, 40, 131, 132, 141, 158</strong></td>
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<td><strong>Raven SCS-440</strong></td>
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<tr>
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<td><strong>relief orifice</strong></td>
</tr>
<tr>
<td><strong>relief valve</strong></td>
</tr>
<tr>
<td><strong>hydrostatic...22, 69, 119, 122, 124</strong></td>
</tr>
<tr>
<td><strong>section control</strong></td>
</tr>
<tr>
<td><strong>remote, 3-point</strong></td>
</tr>
<tr>
<td><strong>repair parts</strong></td>
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<tr>
<td><strong>re-phase lift system</strong></td>
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<tr>
<td><strong>replacement cap</strong></td>
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<tr>
<td><strong>replacement dates</strong></td>
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<tr>
<td><strong>respirator</strong></td>
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<tr>
<td><strong>riders</strong></td>
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<tr>
<td><strong>right-hand, defined</strong></td>
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<tr>
<td><strong>rigid knife</strong></td>
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<tr>
<td><strong>rope</strong></td>
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<tr>
<td><strong>rose, orientation</strong></td>
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<tr>
<td><strong>row flow divider</strong></td>
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<tr>
<td><strong>RVS</strong></td>
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<tr>
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<tr>
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<tr>
<td><strong>safety information</strong></td>
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<tr>
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<td><strong>Schuch</strong></td>
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<td><strong>SCS-450...18, 40, 74, 131, 141, 142, 158</strong></td>
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<td><strong>sealer</strong></td>
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<tr>
<td><strong>sealer angle</strong></td>
</tr>
<tr>
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<td><strong>seasonal</strong></td>
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<td>Numeral</td>
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</tr>
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<td>96, 97</td>
</tr>
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</tr>
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<td>40, 41, 42</td>
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<td>42, 131, 158</td>
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### Numerics

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<td>1, 105</td>
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<td>18, 105, 158</td>
<td>039-0159-034</td>
</tr>
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<td>039-0159-035</td>
</tr>
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<td>13</td>
<td>063-0171-220</td>
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<td>141, 142</td>
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<td>063-0172-143</td>
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<td>141, 142</td>
<td>063-0172-977</td>
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<td>141, 142</td>
<td>063-0172-978</td>
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<tr>
<td>133</td>
<td>10, option</td>
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<td>11, option</td>
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<td>115-0159-018</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0159-032</td>
</tr>
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<td>141, 142</td>
<td>115-0159-241</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0159-526</td>
</tr>
<tr>
<td>131</td>
<td>115-0159-539</td>
</tr>
<tr>
<td>131, 141, 142</td>
<td>115-0159-856</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0159-857</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0171-085</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0171-225</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0171-239</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0171-262</td>
</tr>
<tr>
<td>141, 142</td>
<td>115-0171-800</td>
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<td>115-0171-836</td>
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<td>117-0159-822</td>
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<td>141, 142</td>
<td>12-M-29</td>
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<tr>
<td>18</td>
<td>1325-8, cap</td>
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<td>119</td>
<td>15, option</td>
</tr>
<tr>
<td>134</td>
<td>16, option</td>
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<tr>
<td>133, 134</td>
<td>160-296S</td>
</tr>
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<td>159</td>
<td>17, option</td>
</tr>
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<td>134</td>
<td>170-004A</td>
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<td>170-039A</td>
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<td>170-073A</td>
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<td>2-point folding</td>
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<td>62, 65</td>
<td>2-point hitching</td>
</tr>
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<td>38</td>
</tr>
<tr>
<td>2, option</td>
<td>132</td>
</tr>
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<td>132</td>
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<td>132</td>
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<tr>
<td>27, option</td>
<td>135</td>
</tr>
<tr>
<td>3-point leveling</td>
<td>38</td>
</tr>
<tr>
<td>3, option</td>
<td>132</td>
</tr>
<tr>
<td>31, option</td>
<td>133</td>
</tr>
<tr>
<td>315-069, harness</td>
<td>149</td>
</tr>
<tr>
<td>32, option</td>
<td>133</td>
</tr>
<tr>
<td>339-900-032, screen</td>
<td>124</td>
</tr>
<tr>
<td>400-DC, cap</td>
<td>119</td>
</tr>
<tr>
<td>407-313Q, manual</td>
<td>18, 134</td>
</tr>
<tr>
<td>407-502M, manual</td>
<td>18</td>
</tr>
<tr>
<td>407-722A, rear hitch</td>
<td>135</td>
</tr>
<tr>
<td>407-776M, manual</td>
<td>18</td>
</tr>
<tr>
<td>417-092K, sensor</td>
<td>149</td>
</tr>
<tr>
<td>417-093K, sensor</td>
<td>149</td>
</tr>
<tr>
<td>417-193S, weights</td>
<td>160</td>
</tr>
<tr>
<td>417-193S, weights</td>
<td>160</td>
</tr>
<tr>
<td>509-289A, radar</td>
<td>131</td>
</tr>
<tr>
<td>70, option</td>
<td>134</td>
</tr>
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<td>802-038C, bolt</td>
<td>100</td>
</tr>
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<td>802-091C, bolt</td>
<td>159</td>
</tr>
<tr>
<td>803-019C, nut</td>
<td>159</td>
</tr>
<tr>
<td>803-020C, nut</td>
<td>100</td>
</tr>
<tr>
<td>803-021C, nut</td>
<td>160</td>
</tr>
<tr>
<td>804-015C, washer</td>
<td>100</td>
</tr>
<tr>
<td>804-016C, washer</td>
<td>159</td>
</tr>
<tr>
<td>804-022C, washer</td>
<td>160</td>
</tr>
<tr>
<td>804-094C, washer</td>
<td>100</td>
</tr>
<tr>
<td>810-297C, valve</td>
<td>148</td>
</tr>
<tr>
<td>810-723C, cylinder</td>
<td>148</td>
</tr>
<tr>
<td>810-842C, cylinder</td>
<td>148</td>
</tr>
</tbody>
</table>

801-877C, valve .......... 148, 149
818-055C, reflector .......... 8
818-323C, decal .......... 10
818-337C, decal .......... 12
818-339C, decal .......... 12
818-398C, decal .......... 14
818-437C, decal .......... 12
818-557C, decal .......... 10
818-587C, decal .......... 14
818-590C, decal .......... 11
818-719C, decal .......... 14
820-074C, blade .......... 133
820-180C, blade .......... 133
820-521C, blade .......... 133
823-211C, console .......... 131, 141, 142
823-212C, cable .......... 141, 142
823-215C, cable .......... 141, 142
823-354C, cable .......... 141
823-422C, cable .......... 142
833-637C, switch .......... 149
838-092C, decal .......... 15
838-265C, reflector .......... 9
838-266C, reflector .......... 8
838-267C, reflector .......... 9
838-300C, decal .......... 15
838-300C, decal .......... 16
838-599C, decal .......... 11
848-534C, decal .......... 11
848-539C, decal .......... 17
848-846C, decal .......... 16
850, hitch .......... 135
891-196C, hose .......... 121
891-197C, hose .......... 121
891-203C, valve .......... 121
990-259R, tubing .......... 122, 123
990-261R, tubing .......... 123

2019-03-11