



8200 Liquid Fertilizer Applicator
OPERATION MANUAL
Fast Distributing, Inc.
54859 County Road 44
Mountain Lake, MN 56159

General Information

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Parts information in this manual represents components installed when product was manufactured based upon the best available information. Modifications made subsequent to initial delivery are not included. Always verify the parts and color required with Fast Distributing, Inc at 1-800-772-9279.

If you have any questions, please contact your dealer or our Parts and Service Department.

Limited Warranty

Fast Distributing Inc. warrants to the buyer that the new machinery is free from defects in material and workmanship.

This warranty is only effective as to any new machinery which has not been altered, changed, repaired or treated since its delivery to the buyer, other than by FAST DISTRIBUTING or its authorized dealers or employees, and does not apply to accessories, attachments, tools or parts, sold or operated with the new machinery, if they have not been manufactured by FAST DISTRIBUTING.

FAST DISTRIBUTING shall only be liable for defects in the materials or workmanship attributable to faulty material or bad workmanship that can be proved by the buyer, and specifically excludes liability for repairs arising as a result of normal wear and tear of the new machinery or in any other manner whatsoever, and without limiting the generality of the foregoing, excludes application or installation of parts not completed in accordance with FAST DISTRIBUTING operator's manual, specifications, or printed instructions.

Written notice shall be given by registered mail, to FAST DISTRIBUTING within seven (7) days after the defect shall have become apparent or the repairs shall have become necessary, addressed as follows:

FAST DISTRIBUTING INC.
54859 County Road 44,
Mountain Lake, MN 56159.

This warranty shall expire one (1) year after the date of delivery of the new machinery.

If these conditions are fulfilled, FAST shall at its own cost and at its own option either repair or replace any defective parts provided that the buyer shall be responsible for all expenses incurred as a result of repairs, labor, parts, transportation or any other work, unless FAST has authorized such expenses in advance.

The warranty shall not extend to any repairs, changes, alterations, or replacements made to the new equipment other than by FAST or its authorized dealers or employees.

This warranty extends only to the original owner of the new equipment.

Rubber parts (including tires, hoses, grommets) are not warranted.

This warranty is limited to the terms stated herein and is in lieu of any other warranties whether express or implied, and without limiting the generality of the foregoing, excluded all warranties, express or implied or conditions whether statutory or otherwise as to quality and fitness for any purpose of the new equipment. FAST disclaims all liability for incidental or consequential damages.

This Applicator is subject to design changes and FAST DISTRIBUTING INC. shall not be required to retrofit or exchange items on previously sold units except at its own option.

Fast Distributing Inc.

Warranty void if not registered.

FAST DISTRIBUTING

LIQUID FERTILIZER APPLICATOR

Warranty Registration Form & Inspection Report

Warranty Registration

This form must be filled out by the dealer and signed by both the dealer and the customer at the time of delivery.

Customer's Name _____
Address _____
City, State, Code _____
Phone Number _____
Dealer Name _____
Address _____
City, State, Code _____
Applicator Model _____
Serial Number _____
Delivery Date _____

DEALER INSPECTION REPORT

____ All Fasteners Tight
____ Wheel Bolts Torqued
____ Hydraulic Hoses and Fittings Free and Tight
____ Fertilizer Hoses and Fittings Free and Tight
____ Wheel Drive Turns Freely
____ Lubricate Machine
____ Check Tire Pressure
____ Frame and Wings Level
____ Monitors and Controllers Function
____ Wiring Harness Connected

SAFETY

____ Safety Chain Installed
____ All Guards Installed
____ All Safety Signs Installed
____ Reflectors, SMV and Lights Clean
____ Review Operating and
Safety Instructions

I have thoroughly instructed the buyer on the above described equipment which review included the Operator's Manual content, equipment care, adjustments, safe operation and applicable warranty policy.

Date _____ Dealer's Rep. Signature _____

The above equipment and Operator's Manual have been received by me and I have been thoroughly instructed as to care, adjustments, safe operation and applicable warranty policy.

Date _____ Owner's Signature _____

White - Fast Distributing
Yellow - Dealer
Pink - Customer

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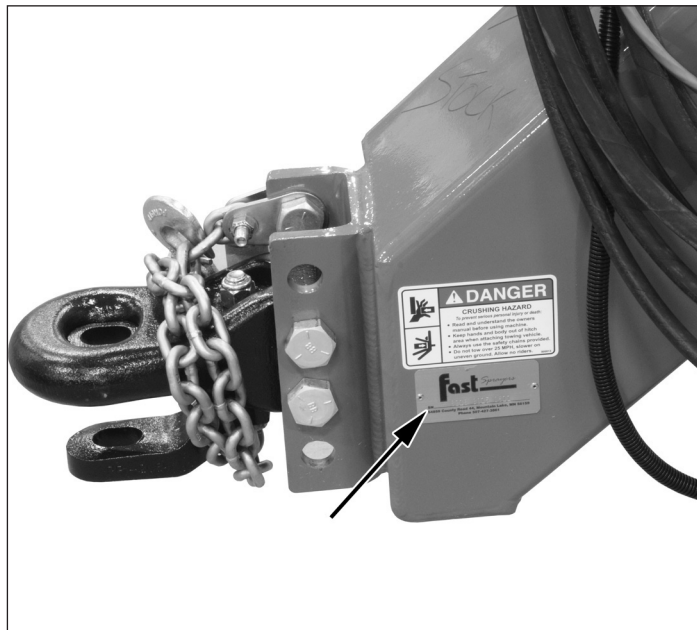
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Serial Number Location

Always give your dealer the serial number of your Fast Distributing Liquid Fertilizer Applicator when ordering parts or requesting service or other information.

The serial number is stamped into the frame where indicated. Please write number in space provided for easy reference.



Model Number _____

Applicator Serial Number _____

1. Introduction

Congratulations on your choice of a Fast Distributing Liquid Fertilizer Applicator to complement your operation. This equipment has been designed and manufactured to meet the needs of a discriminating buyer for the efficient application of liquid fertilizer.

Safe, efficient and trouble free operation of your Fast Distributing Liquid Fertilizer Applicator requires that you and anyone else who will be operating or maintaining the applicator, read and understand the Safety, Operation, Maintenance and Trouble Shooting information contained in the Operator's Manual.

This manual covers the 8200 Series Liquid Fertilizer Applicators built by Fast Distributing. Use the Table of Contents as a guide when searching for specific information.

Keep this manual handy for frequent reference and to pass on to new operators or owners. Call your Fast Distributing dealer or distributor if you need assistance or information.

OPERATOR ORIENTATION - The directions left, right, front and rear, as mentioned throughout this manual, are as seen from the tractor driver's seat and facing in the direction of travel.

If you have any questions not answered in this manual or require additional copies or the manual is damaged, please contact your dealer or

Fast Distributing Inc.
54859 Country Road 44,
Mountain Lake, MN 56159
(Telephone) 507-427-3861
(FAX) 507-427-3030.

2. Safety

YOU are responsible for the **SAFE** operation and maintenance of your Fast Distributing Liquid Fertilizer Applicator. **YOU** must ensure that you and anyone else who is going to operate, maintain or work around the Liquid Fertilizer Applicator be familiar with the operating and maintenance procedures and related **SAFETY** information contained in this manual. This manual will take you step-by-step through your working day and alerts you to good safety practices that should be adhered to while operating the applicator.

Remember, **YOU** are the key to safety. Good safety practices not only protect you but also the people around you. Make these practices a working part of your safety program. Be certain that **EVERYONE** operating this equipment is familiar with the recommended operating and maintenance procedures and follows all the safety precautions. Most accidents can be prevented. Do not risk injury or death by ignoring good safety practices.

- Applicator owners must give operating instructions to operators or employees before allowing them to operate the unit, and at least annually thereafter per OSHA regulation 1928.57.
- The most important safety device on this equipment is a **SAFE** operator. It is the operator's responsibility to read and understand **ALL** Safety and Operating instructions in the manual and to follow these. All accidents can be avoided.
- A person who has not read and understood all operating and safety instructions is not qualified to operate the machine. An untrained operator exposes himself and bystanders to possible serious injury or death.
- Do not modify the equipment in any way. Unauthorized modification may impair the function and/or safety and could affect the life of the equipment.
- Think **SAFETY!** Work **SAFELY!**

2.1 Safety Alert Symbol And Signal Words

This symbol means **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**



The level of risk is indicated by the following signal words:

DANGER

DANGER - Indicates a hazardous situation, which, if not avoided, **WILL** result in death or serious injury.

WARNING

WARNING - Indicates a hazardous situation, which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION - Indicates a hazardous situation, which, if not avoided, could result in minor or moderate injury.

NOTICE

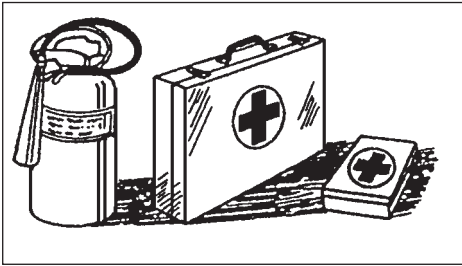
NOTICE - Indicates a situation that could result in damage to the equipment or other property.

2.2 General Safety

1. Read and understand Operator's Manual and all safety signs before operating, maintaining or adjusting applicator.



2. Only trained competent persons shall operate applicator. An untrained operator is not qualified to operate machine.
3. Have a first-aid kit available for use should the need arise and know how to use it.
4. Have a fire extinguisher available for use should the need arise and know how to use it.



5. Do not allow riders.
6. Wear appropriate protective devices as instructed on the chemical or fertilizer MSDS.



7. Lower machine to ground, place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
8. Read chemical manufacturers warnings, instructions and procedures before starting and follow them exactly.
9. Post Poison Control Emergency telephone number for your area on applicator before using Agricultural chemicals.

Washington: (202) 962-4525

Ottawa: (613) 992-5606

Have container label handy when seeking medical attention.

10. Review safety related items with all personnel annually.

2.3 Operating Safety

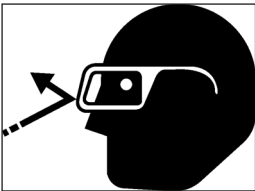

1. Read and understand Operator's Manual and all safety signs before using.
2. Lower machine to ground, place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
3. Install and secure all guards and shields before starting or operating.
4. Keep hands, feet, hair and clothing away from all moving and/or rotating parts.
5. Do not allow riders on applicator or tractor during operation or transporting.
6. Clear area of all bystanders, especially children, before starting or filling with chemical or fertilizer.
7. Read chemical or fertilizer manufacturers warnings, instructions and procedures before starting and follow them exactly.
8. Do not breathe, touch or ingest chemicals or fertilizer. Always wear protective clothing and follow safe handling procedures.
9. Stay away from wings when folding or extending wings. Keep others away.
10. Clean reflectors, SMV and lights before transporting.
11. Attach securely to towing unit using a hardened pin with a retainer and a safety chain.
12. Do not exceed a safe travel speed.
13. Use hazard flasher on tractor and applicator when transporting.
14. Stay away from overhead power lines when folding or extending wings and during transport.
15. Before applying pressure to hydraulic system, make sure all components are tight, hoses and couplings are in good condition.
16. Review safety instructions annually.

2.4 Maintenance Safety

1. Review Operator's Manual and all safety items before working with, maintaining or operating applicator.
2. Lower machine to ground, place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.
3. Follow good shop practices:
 - Keep service area clean and dry.
 - Be sure electrical outlets and tools are properly grounded.
 - Use adequate light for job at hand.
4. Before applying pressure to a hydraulic system, make sure all components are tight, hoses and couplings are in good condition.
5. Relieve pressure from hydraulic circuit before servicing or disconnecting from tractor.
6. Keep hands, feet, clothing and hair away from all moving and/or rotating parts.
7. Clear area of bystanders, especially children, when carrying out any maintenance and repairs or making any adjustments or filling.
8. Place stands or blocks under frame before working beneath machine or when changing tires.
9. Be sure all guards are in place and secured when maintenance work is completed.
10. Use only tools, jacks and hoists of sufficient capacity for the job.



2.5 Hydraulic Safety ⚠

1. Always place all tractor hydraulic controls in neutral before dismounting.
2. Make sure that all components in hydraulic system are kept in good condition and are clean.
3. Replace any worn, cut, abraded, flattened or crimped hoses.
4. Do not attempt any makeshift repairs to hydraulic lines, fittings or hoses by using tape, clamps or cements.
5. The hydraulic system operates under extremely high-pressure. Such repairs will fail suddenly and create a hazardous and unsafe condition.
6. Pressurized fluids can penetrate the skin. Hydraulic hoses can fail from age, damage and exposure. Do not search for hydraulic leaks without body and face protection. A tiny, almost invisible leak can penetrate the skin, thereby requiring immediate medical attention. Use wood or cardboard to detect hydraulic leaks, never use your hands.
7. If injured by a concentrated high-pressure stream of hydraulic fluid, seek medical attention immediately. Serious infection or toxic reaction can develop from hydraulic fluid piercing skin surface.
8. Before applying pressure to system, verify all components are tight, hoses and couplings are in good condition.

2.6 Transport Safety ⚠

1. Read and understand ALL information in Operator's Manual regarding procedures and SAFETY when operating applicator in field and/or on road.
2. Check with local authorities regarding applicator transport on public roads. Obey all applicable laws and regulations.

NOTICE

Prevent equipment damage.

Verify main tank is empty before transporting on road.

3. Always travel at a safe speed. Use caution when making corners or meeting traffic.
4. Make sure the SMV (Slow Moving Vehicle) emblem and all lights and reflectors that are required by the local highway and transport authorities are in place, are clean and can be seen clearly by all overtaking and oncoming traffic.
5. Daybreak and dusk are particularly dangerous and pilot vehicles are recommended.
6. Be sure applicator is properly connected to towing vehicle and a retainer is used through drawbar pin. Always attach a safety chain between frame and towing vehicle.
7. Keep right and yield right-of-way to allow faster traffic to pass. Drive on road shoulder, if permitted by law.
8. Do not exceed 20 mph (32 km/h). Reduce speed on rough roads and surfaces.
9. Always use hazard warning flashers on tractor when transporting unless prohibited by law.
10. Stay away from overhead power lines during transport. Electrocuting can occur without direct contact.

2.7 Storage Safety

1. Store unit in an area away from human activity.
2. Do not permit children to play on or around the stored applicator.

2.8 Tire Safety

1. Failure to follow proper procedures when mounting a tire on a wheel or rim can produce an explosion which may result in serious injury or death.
2. Do not attempt to mount a tire unless you have the proper equipment and experience to do the job.
3. Have a qualified tire dealer or repair service perform required tire maintenance.

2.9 Safety Signs

1. Keep safety signs clean and legible at all times.
2. Replace safety signs that are missing or have become illegible.
3. Replaced parts that displayed a safety sign should also display the current sign.
4. Safety signs are available from your Distributor or the factory.

How to Install Safety Signs:

- Be sure that the installation area is clean and dry.
- Be sure temperature is above 50°F (10°C).
- Decide on exact position before you remove backing paper.
- Remove the smallest portion of the split backing paper.
- Align the sign over the specified area and carefully press the small portion with the exposed sticky backing in place.
- Slowly peel back the remaining paper and carefully smooth the remaining portion of the sign in place.
- Small air pockets can be pierced with a pin and smoothed out using the piece of sign backing paper.

2.10 Sign-Off Form

Fast Distributing Inc. follows the general Safety Standards specified by the American Society of Agricultural Engineers (ASAE) and the Occupational Safety and Health Administration (OSHA). Anyone who will be operating and/or maintaining the Fast Distributing Liquid Fertilizer Applicator must read and clearly understand ALL Safety, Operating and Maintenance information presented in this manual.

Do not operate or allow anyone else to operate this equipment until such information has been reviewed. Annually review this information before season start-up.

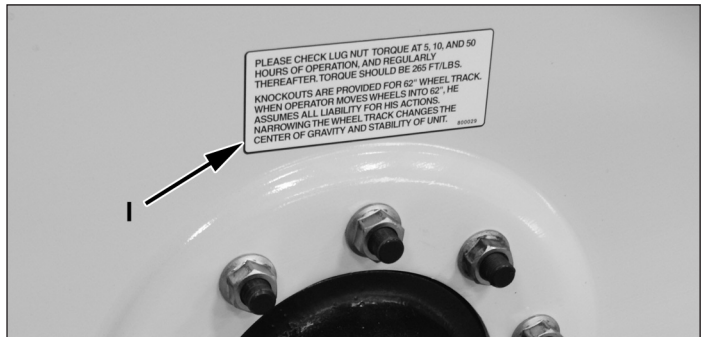
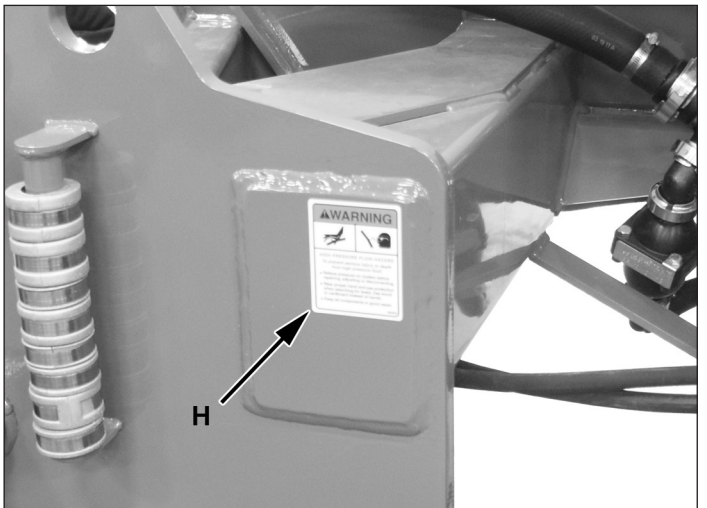
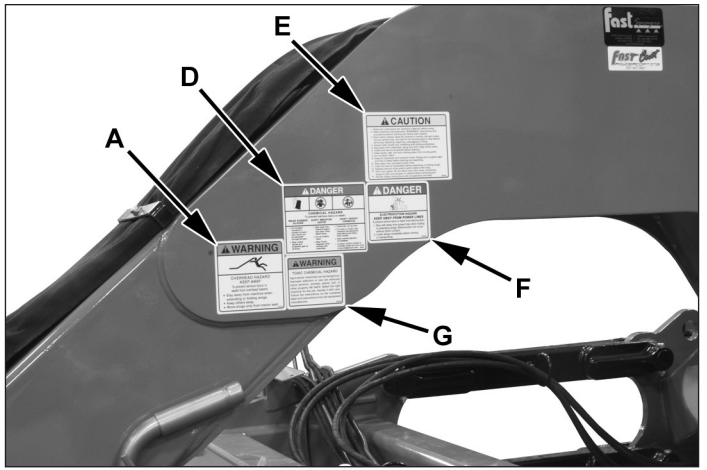
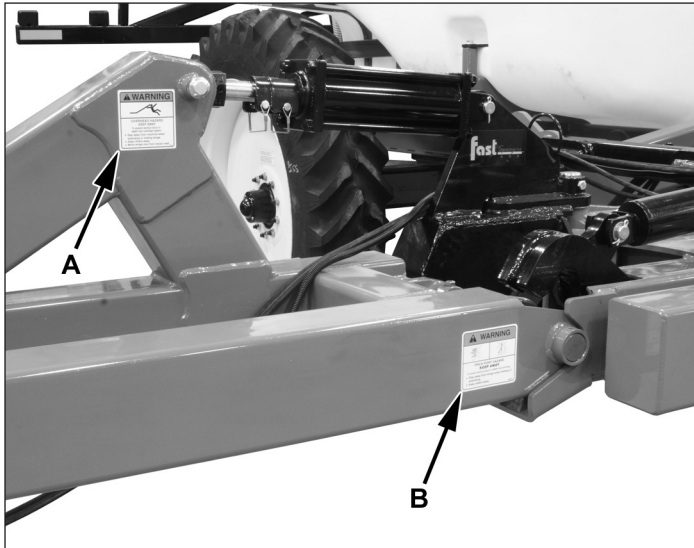
A sign-off sheet is provided for your record keeping to show that all personnel who will be working with the equipment have read and understand the information in the Operator's Manual and have been instructed in the operation of the equipment.

Sign-Off Form

[illegible]

2.11 Safety Sign Locations

Safety signs and locations on machine are shown in the following illustrations. Familiarize yourself with safety signs, type of warning and area, or particular function related to that area, that requires your SAFETY AWARENESS.



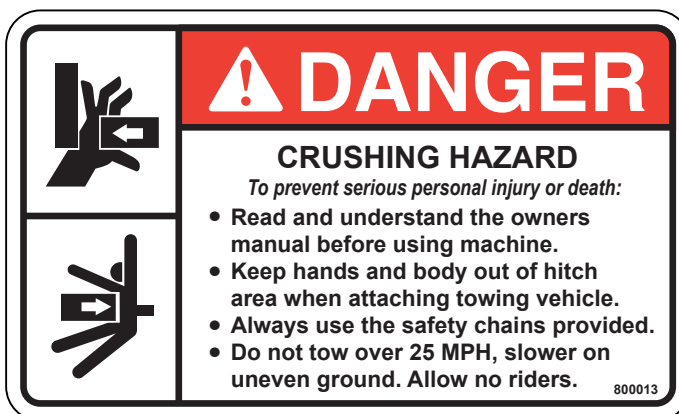
Decal A



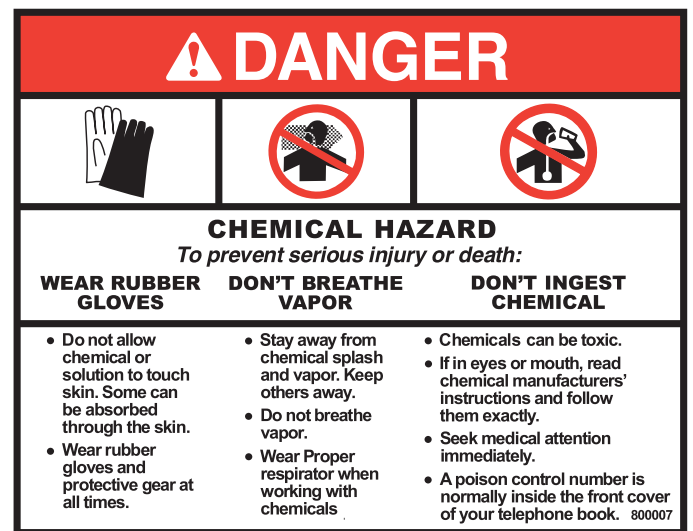
Decal B



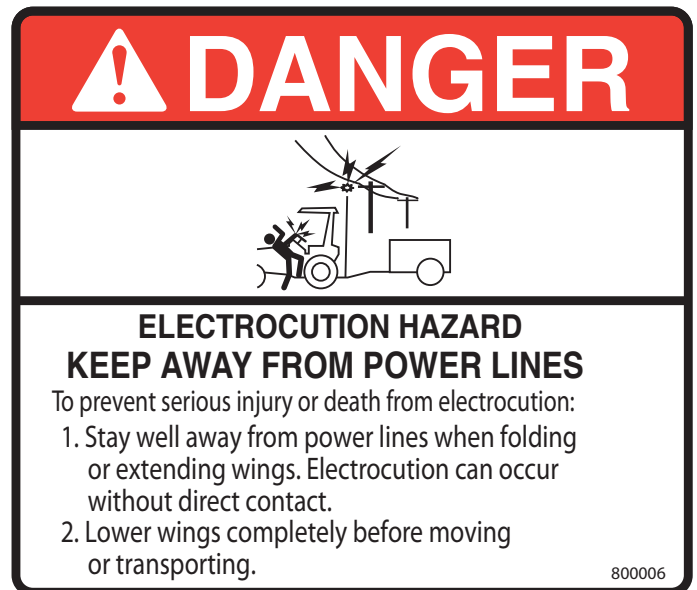
Decal C



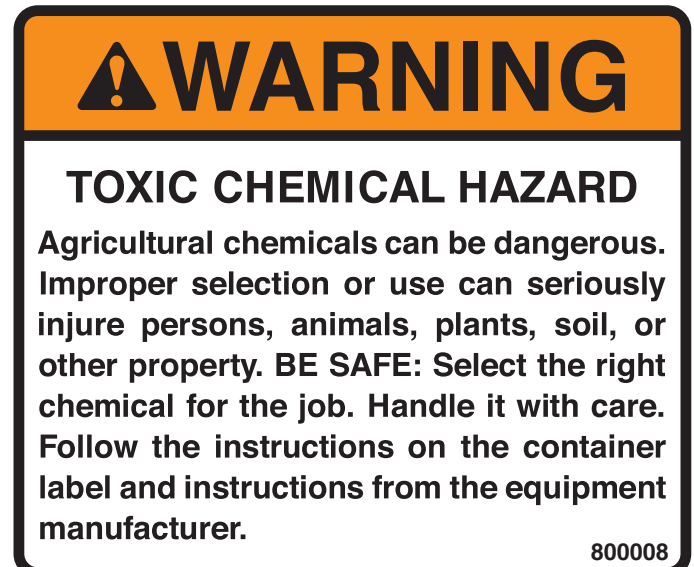
Decal D



Decal E



Decal F



⚠ CAUTION

1. Read and understand the Operator's Manual before using.
2. Read Chemical manufacturers' WARNINGS, Instructions and procedures before starting and follow them exactly.
3. Stop tractor engine, place all controls in neutral, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing, unplugging or filling.
4. Always wear proper eye, breathing and clothing protection.
5. Stay away from chemicals, spray and drift. Keep others away.
6. Install and secure all guards before starting.
7. Keep hands, feet hair and clothing away from moving parts.
8. Do not allow riders.
9. Keep all chemicals and hydraulic lines, fittings and couplers tight and free of leaks before starting and operating.
10. Stay away from overhead power lines.
11. Clear the area of bystanders before extending or folding wings.
12. Release second wing extend switch before first wing.
13. Hitch can upend. Do not stand over hitch when unhooking. Support hitch and sprayer on stands before removing pin.
14. Review Safety Instructions with all operators annually.

800002

⚠ WARNING




HIGH PRESSURE FLUID HAZARD
To prevent serious injury or death from high pressure fluid:


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


800004


ATTENTION: PLEASE CHECK LUG NUT TORQUE AT 5, 10, AND 50 HOURS OF OPERATION, AND REGULARLY THEREAFTER. TORQUE SHOULD BE 265 FT/LBS.


3. Operation


Read and understand Operator's Manual and all safety signs before using.


 Lower machine to the ground, place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.


 Install and secure all guards and shields before starting or operating.


 Keep hands, feet, hair and clothing away from all moving and/or rotating parts.

 Do not allow riders on the applicator or tractor during operation or transporting.


 Clear area of all bystanders, especially children, before starting or filling with chemical or fertilizer.


 Read chemical or fertilizer manufacturers warnings, instructions and procedures before starting and follow them exactly.


 Do not breathe, touch or ingest chemicals or fertilizer. Always wear protective clothing and follow safe handling procedures.


 Stay away from wings when folding or extending wings. Keep others away.


 Clean reflectors, SMV and lights before transporting.

 Attach securely to towing unit using a hardened pin with a retainer and a safety chain.

 Do not exceed a safe travel speed.

 Use hazard flasher on tractor when transporting.

 Stay away from overhead power lines when folding or extending the wings and during transport.

 Before applying pressure to the hydraulic system, make sure all components are tight, hoses and couplings are in good condition.

 Review safety instructions before operating machine.

3.1 New Operator Or Owner

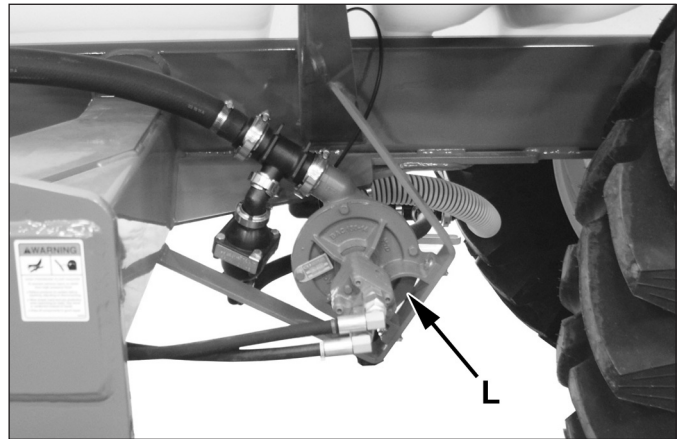
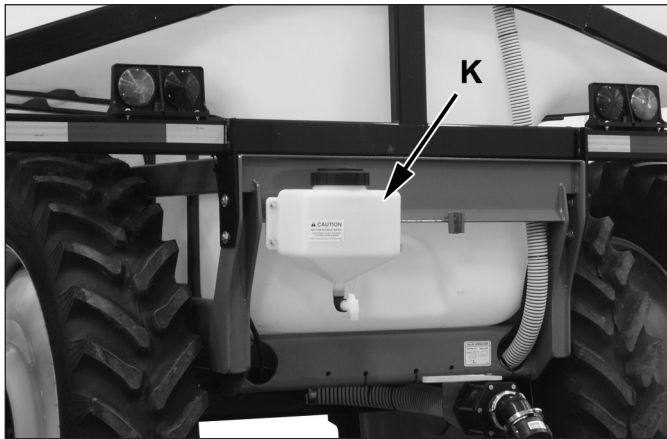
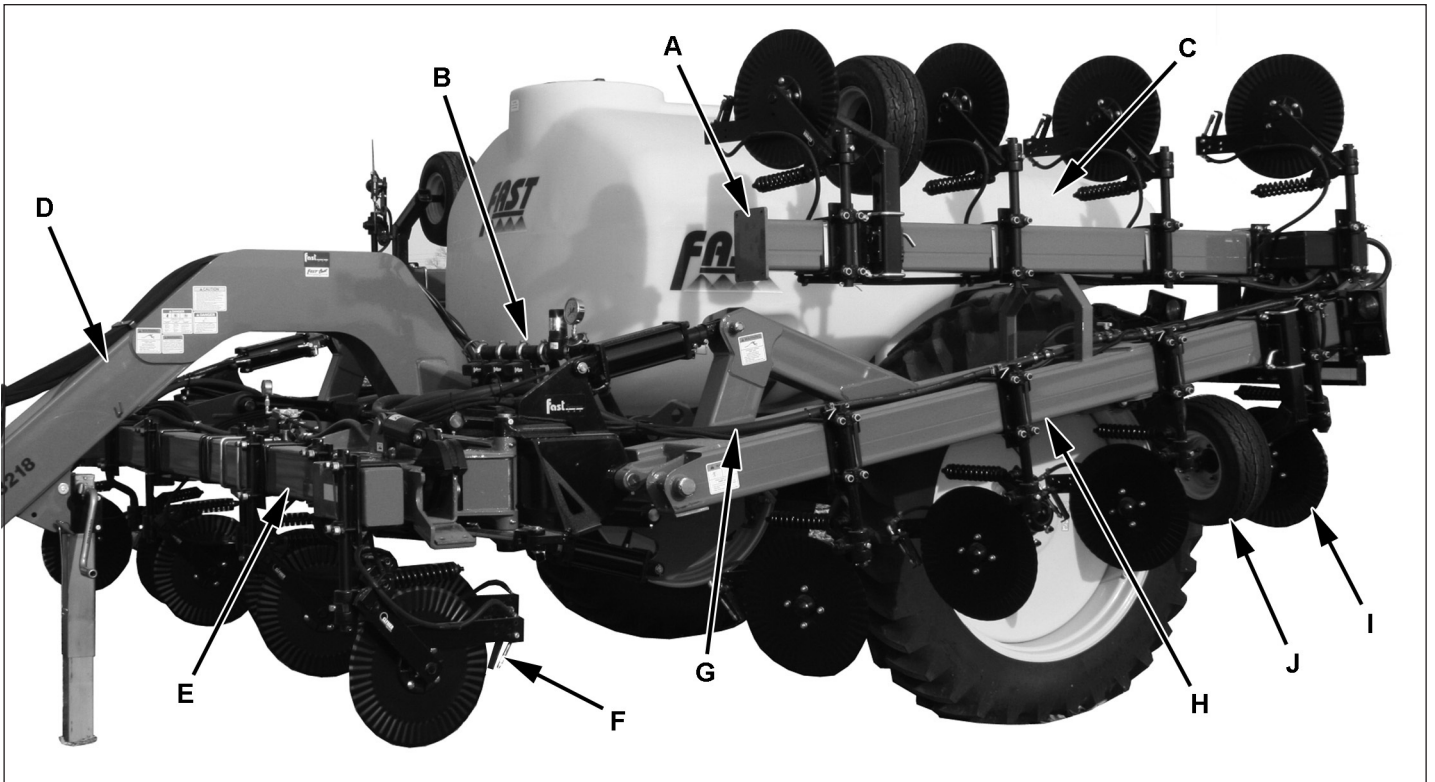
The Fast Distributing Liquid Fertilizer Applicator is designed to meter out and distribute liquid chemical or fertilizer and place it where required.

It is the responsibility of the owner or operator to read this manual and to train all other operators before they start working with the machine. Follow all safety instructions exactly. Safety is everyone's business. By following recommended procedures, a safe working environment is provided for the operator, bystanders and the area around the worksite. Untrained operators are not qualified to operate the machine.

Many features incorporated into this machine are the result of suggestions made by customers like you. Read this manual carefully to learn how to operate the machine safely and how to set it to provide maximum field efficiency. By following the operating instructions in conjunction with a good maintenance program, your applicator will provide many years of trouble-free service.

3.2 Machine Components

The Fast Distributing Liquid Fertilizer Applicator has a hydraulic powered metering pump to send liquid chemicals or fertilizer to the distribution lines on the tool bar. Coulters open the soil to receive the liquid. Nozzles mounted to the tool bar spray the fluid into the soil.



- A - Outer Wing
- B - Flow Control
- C - Tank
- D - Hitch
- E - Center Frame
- F - Nozzle
- G - Liquid Line
- H - Inner Wing
- I - Coulter
- J - Gauge Wheel
- K - Rinse Tank
- L - Pump

3.3 Break-In

Perform the following steps on a new applicator:

A. After 1 hour of operation:

1. Tighten all wheel lugs to 265 lb/ft of torque.
2. Tighten all other fasteners and hardware to required torque.
3. Check that no chemical or hydraulic lines are being pinched or crimped. Re-route as required.
4. Check that all coulters, nozzles and placement components are clean and working properly. Clean as required.
5. Check that metering pump is functioning properly. Adjust as required.
6. Lubricate all grease fittings.

B. After 5 hours of operation:

1. Tighten all wheel lugs to 265 lb/ft of torque.

C. After 10 hours of operation:

1. Tighten all fasteners and hardware to required torque.
2. Check chemical and hydraulic line routing.
3. Check that all placement components are clean and working properly.

D. After 50 hours of operation:

1. Tighten all wheel lugs to 265 lb/ft of torque.
2. Then follow normal servicing and maintenance schedule as defined in Maintenance Section.

3.4 Pre-Operation Checklist

Efficient and safe operation of the Fast Distributing Liquid Fertilizer Applicator requires that each operator reads and understands operating procedures and all related safety precautions outlined in this section. A pre-operational checklist is provided for the operator. It is important for both personal safety and maintaining the good mechanical condition of the applicator that this checklist be followed.

Before operating applicator, check the following items:

1. Lubricate machine per schedule outlined in "Maintenance Section".
2. Use only a tractor of adequate power and weight to operate applicator. See Section 3.5.1 for recommendations.
3. Be sure that machine is properly attached to tractor. Be sure that a mechanical retainer is installed through drawbar pin and safety chain is installed.
4. Inspect all hydraulic lines, hoses, fittings and couplers for tightness.
5. Check tires and verify they are inflated to specified pressure.
6. Calibrate applicator if at start of season or a new applicator rate is being used.
7. Check condition and routing of all fluid hoses and lines. Be sure that all lines are routed in large arcs. Replace any that are damaged. Re-route those that are rubbing, pinched or crimped.
8. Check placement components. Remove and replace any that are worn.
9. Remove all entangled material.
10. Raise tool bar and turn metering pump slightly. Check that there is liquid coming out of each nozzle. Unplug or connect lines as required. Replace any nozzles that are plugged.

3.5 Equipment Matching

To insure the safe and reliable operation of the applicator, it is necessary to use a tractor with appropriate specifications. As a guideline, insure that these requirements are met:

1. Tractor Horsepower:

Refer to table below minimum recommended horsepower for your machine. Although recommended tractor horsepower is not required to pull machine, it does provide required strength in drawbar as hitch is very heavy. This will also insure that the unit has the required stability and control in hilly terrain and during transport.

Model	Width	Horsepower
8200	40	130
	44	150
	60	150
	66	170

2. Front End Weights:

By following recommendations for tractor power, tractor will have sufficient weight to provide stability during field operation or when transporting. It is also recommended that each tractor be equipped with a full compliment of suitcase weights on front of tractor. This will provide the required weight on front for turning and extra traction if equipped with front wheel assist.

3. Hydraulic System:

Tractor hydraulic system must be capable of 8 gpm (24 lpm) at 2000 psi (13,800 kPa) to operate lift cylinders and drive motor. Either closed center or open-centered systems can be used. However an open centered hydraulic system is limited to 8 gpm maximum.

Note: Contact factory for an optional flow control for use with high flow open center system.

Three remote outlets are required to operate the applicator.

1. Tool bar lift cylinders and wing kick.
2. Inner wing extend/fold cylinders and outer wing extend/fold cylinders
3. Chemical / fertilizer pump drive motor.

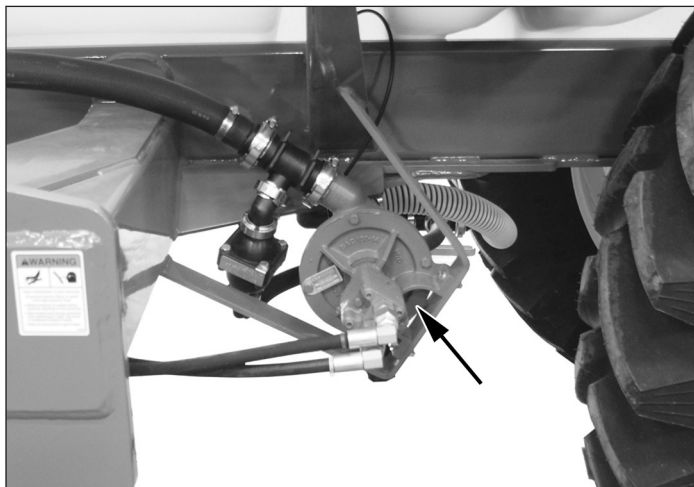
Note: Always place hydraulic control lever in detent to provide a constant flow of oil to pump drive motor.

3.6 Controls

It is recommended that all operators review this section of manual and metering pump manual to familiarize themselves with location and function of all machine controls and settings before starting.

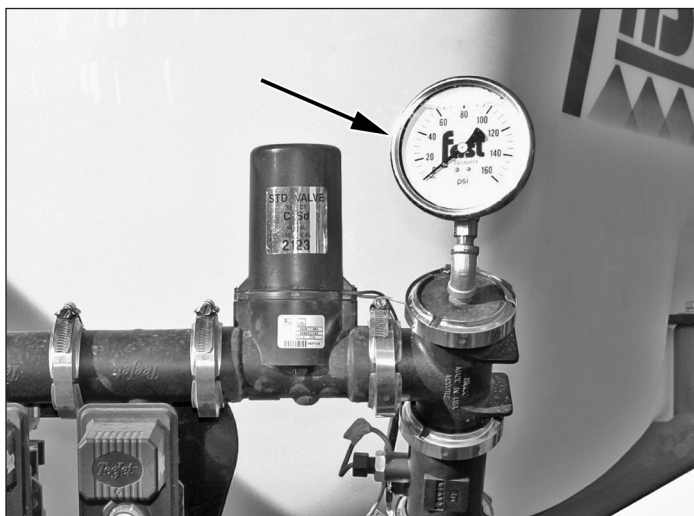
1. Metering Pump:

An Operator's Manual is supplied with machine. Review manual carefully to determine required hydraulic setting on pump for your application.



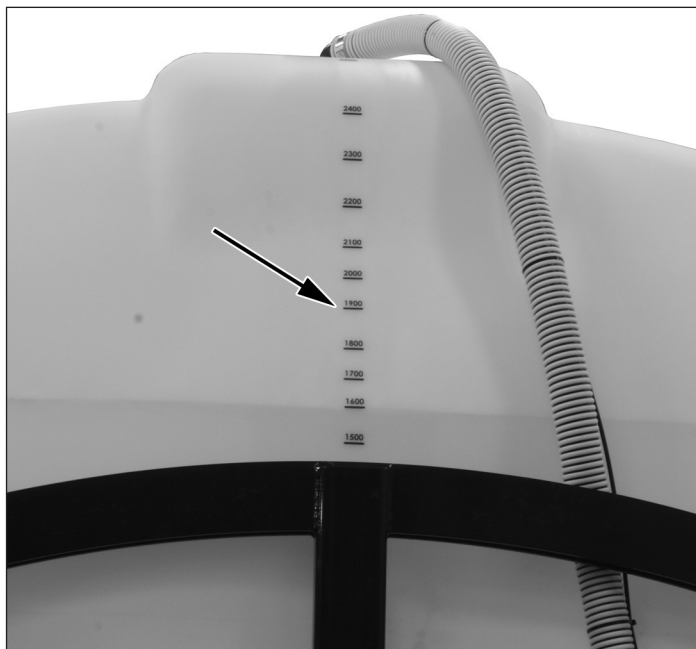
2. Liquid System Pressure Gauge:

This gauge monitors pressure in liquid circuit providing flow to injector orifices. It is normally used to determine pressure in chemical/fertilizer circuit when setting system for a specific application rate. Monitor gauge during operation. Stop and check system if pressure changes suddenly.



3. Tank Scale:

The back end of tank has a capacity scale molded into it to assist operator when filling tank.

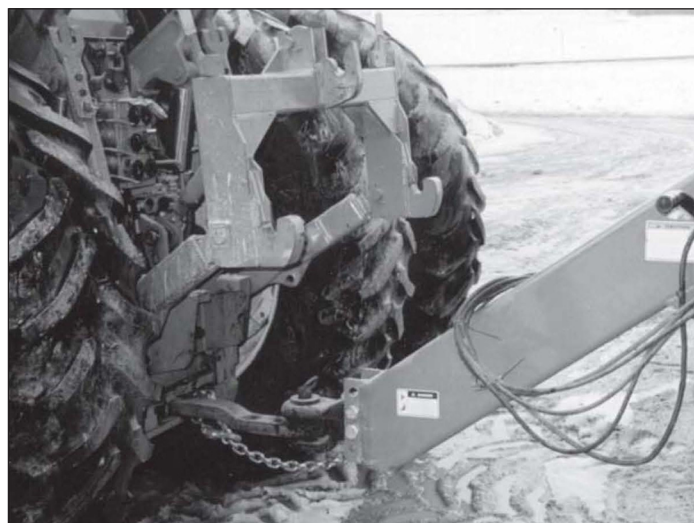


4. Automatic Controller (Optional):

This optional automatic controller will monitor, set and control the operation of the applicator. Refer to the operators manuals supplied with the controller for detailed instructions.

3.7 Attaching/Unhooking Tractor

1. Make sure that all bystanders are clear of working area.
2. Make sure there is enough room and clearance to safely back up to machine.
3. Slowly back tractor until holes on hitch and drawbar are aligned.
4. Install drawbar pin and retainer.
5. Attach safety chain securely around tractor drawbar cage to prevent unexpected separation.
6. Check that applicator hydraulic system is compatible with tractor hydraulics. Change applicator if required. Do not operate unless tractor and applicator hydraulics are compatible.



WARNING

The following instructions must be carefully followed to avoid damage to your tractor hydraulic system!

LOAD SENSING

(John Deere 6000, 7000, 8000 & 9000 Series, CaseIH Magnum & Maxxum Series, Ford Genesis)

Purchase a Flow limiting Valve (Part No. LS206 or LS304) from your dealer and install it on the inlet port of the ACE Pump hydraulic motor.

Follow the detailed instructions found at the beginning of the PUMP section of the Fast catalog.

PRESSURE COMPENSATING

(John Deere, except 6000, 7000, 8000 & 9000 Series, AGCO White)

Use the Restrictor Orifice that is wire-tied to the ACE pump. Install it in the inlet port of the ACE hydraulic motor.

Follow the detailed instructions found at the beginning of the PUMP section of the Fast catalog.

OPEN

(Steiger, Cougar and Panther)

Do NOT use the Flow Limiting Valve or the Restrictor Orifice.

Follow the detailed instructions found at the beginning of the PUMP section of the Fast catalog.

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7. Connect hydraulics:
 - a. Use a clean rag or paper towel to clean dirt from couplers on hose ends and tractor couplers.

! WARNING

Prevent serious injury or death.

Relieve hydraulic system pressure before connecting hydraulic hoses.

- b. Relieve pressure in hydraulic system.
- c. Route hoses over hitch and connect hoses to tractor couplers. Verify couplers are securely seated. Be sure to provide slack for turning.

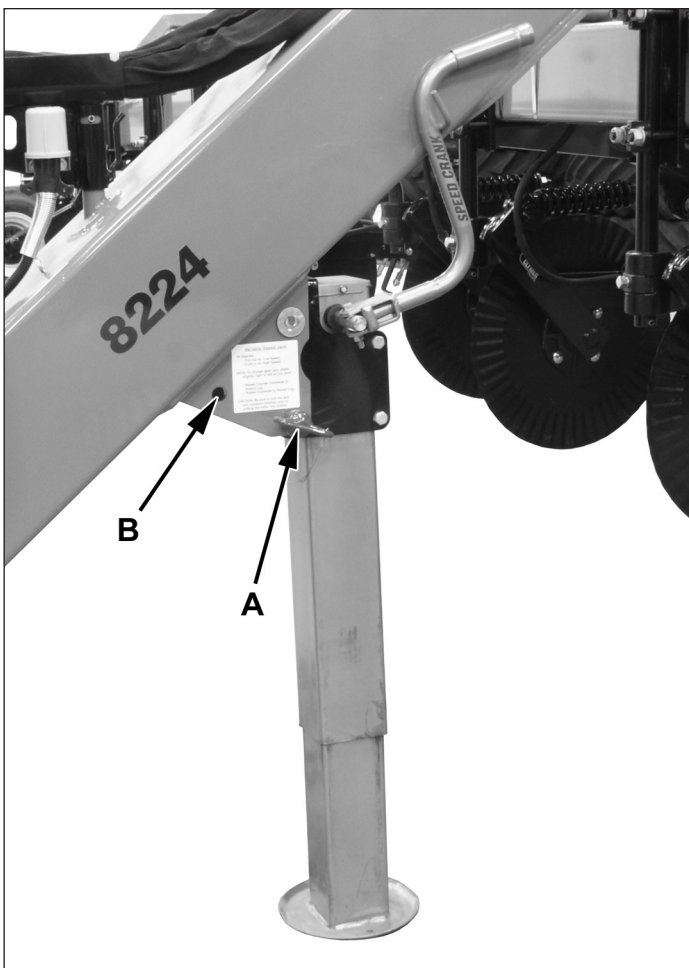
Hydraulic hose key decal is installed on machines starting with serial numbers:

- Model 8218 - 3015-0611
- Model 8224 - 3025-0611

HYDRAULIC HOSE KEY

COLOR	DESCRIPTION OF USE
Red	Pump Pressure
Yellow	Pump Return
Grey	Main Lift\Wing Kick Pressure (Raise)
Orange	Main Lift\Wing Kick Return (Lower) -Run in Constant Flow
Purple	Hydraulic Block Pressure
Brown	Hydraulic Block Return

8. Route electrical lines over hitch and connect to tractor electrical connectors. Be sure to provide slack for turning.
9. Turn crank handle to raise jack. Pull pin (A) out and pivot jack frame forward into its stowed position. Insert pin in hole (B) to secure jack.



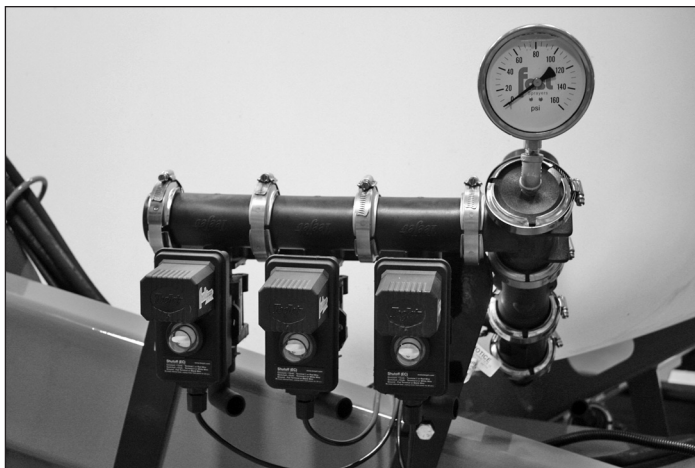
10. Reverse procedure when unhooking.

3.8 Machine Setting

Applicator is equipped with a pump that meters out a quantity of fluid and sends it through distribution line to nozzles mounted along the tool bar. The pump can be set to give a wide range of application rates.

Always be aware of the size of the field to be covered, the application rate and the amount of liquid in the tank. If there is liquid left over or you run short, check the application rate. Reset if required or verify tank volume.

Always check that liquid comes out of each nozzle at the start of the season and each day by engaging the hydraulic circuit momentarily. A nozzle that does not work properly will skew your application efficiency.



Your machine is equipped with automatic controller. Review controller manual to become familiar with applicator settings and control.

Optional Wheel Speed Sensor

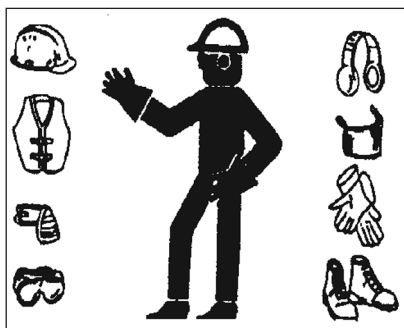
Verify speed sensor on left wheel hub is set with a gap of 1/8 inch (3mm) or the thickness of a nickel. Sensor supplies a signal to controller for determining ground speed and allows controller to vary application rate appropriate for speed.

! WARNING

Prevent serious injury or death.

Check chemical or fertilizer MSDS for proper handling instructions.

Toxic chemicals can enter the body by breathing, spray or contact with bare skin. Do not take a chance with your health and safety.



3.9 Field Operation

Read and understand Operator's Manual and all safety signs before using.

! Lower machine to the ground, place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.

! Install and secure all guards and shields before starting or operating.

! Keep hands, feet, hair and clothing away from all moving and/or rotating parts.

! Do not allow riders on the applicator or tractor during operation or transporting.

! Clear area of all bystanders, especially children, before starting or filling with chemical or fertilizer.

! Read chemical or fertilizer manufacturers warnings, instructions and procedures before starting and follow them exactly.

! Do not breathe, touch or ingest chemicals or fertilizer. Always wear protective clothing and follow safe handling procedures.

! Stay away from wings when folding or extending wings. Keep others away.

! Clean reflectors, SMV and lights before transporting.

! Attach securely to towing unit using a hardened pin with a retainer and a safety chain.

! Do not exceed a safe travel speed.

NOTICE

Prevent equipment damage.

Verify main tank is empty before transporting on road.

! Use hazard flasher on tractor.

! Stay away from overhead power lines when folding or extending the wings and during transport.

! Before applying pressure to the hydraulic system, make sure all components are tight and that hoses and couplings are in good condition.

! Review safety instructions before operating machine.

Set machine and desired application rate for operating conditions. Time spent setting machine and application rate before starting will result in a quality job.

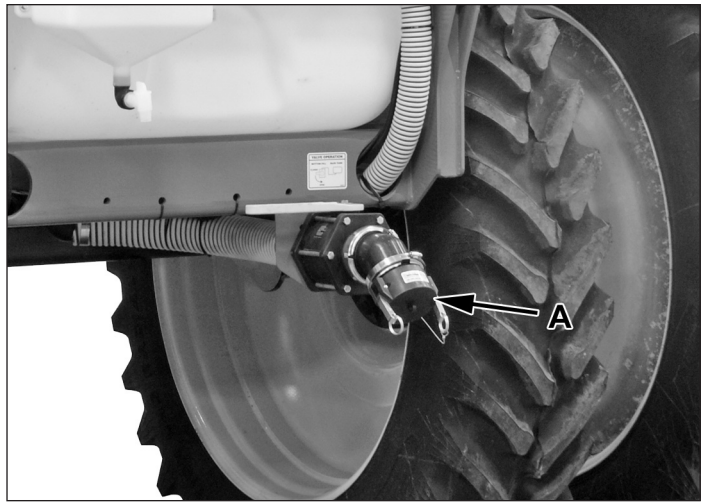
1. Attach applicator to machine (see Section 3.8).
2. Review and follow pre-operation checklist .
3. Read and follow chemical/fertilizer manufacturers' instructions.
4. Set applicator so you know exactly how much liquid is being applied (see Section 3.8). Incorrect application rates can dramatically affect seed germination and yields. Set at start of season or when changing application rate.
5. Transport machine to working area.
6. Open machine to field position (see Step 14).
7. Starting:
 - Set engine RPM at rated speed.
 - Place hydraulic motor control lever in detent.
 - Start into field.
 - Lower the tool bar into ground.
 - Turn on boom sections
8. Stopping:
 - Turn off boom sections
 - Place hydraulic motor control lever in float position and lift tool bar out of ground.
 - Stop forward motion of machine, place hydraulic lever in its off position
 - Reduce engine RPM to low idle.
9. Emergency stop:

If an emergency arises, shut engine off to stop machine or stop forward motion. Refer to Step 7 when restarting the machine.
10. Filling:

It is recommended that machine be transported to the field empty and filled in the field.

To fill tank:

 - Pull up to tender truck or drive truck to machine.
 - Connect transfer hose to bottom fill line (A).



! WARNING

Prevent serious injury or death.

Check chemical or fertilizer MSDS for proper handling instructions.

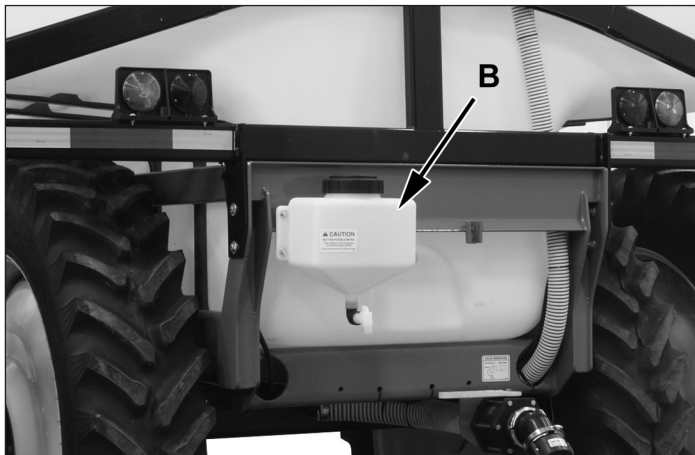
Toxic chemicals can enter the body by breathing, spray or contact with bare skin. Do not take a chance with your health and safety.



- Start pump on tender truck and open valve on input line.
- Pump until tank is filled to desired level. Do not over-fill.
- Close input valve and stop pump on tender truck.
- Remove and stow fill line.
- Install and fasten input line covers.

11. Fresh Water Rinse Tank:

Each machine is equipped with a fresh water rinse tank (B) on rear frame. Fill rinse tank with clean fresh water whenever rinse water has been used. Do not allow tank to run low on fresh water. Use water from rinse tank to clean, rinse or wash anything that has become contaminated.



12. Ground speed:

It will be necessary to establish travel speed and then set flow to give desired application rate. Always run at established travel speed.

However, best results are obtained ground speed is 5 - 8 mph. Ground speed variations in the field will automatically be compensated. Always operate at a comfortable speeds. Do not operate so fast that tool bar or tank bounce while going through field. Effective results require that liquid be applied at a consistent depth in a consistent manner. Machine bouncing will prevent this required consistency.

13. Unfolding/Extending Tool Bar:

- Verify tool bar is fully raised.

WARNING

Prevent serious injury or death.

Machine coming near or contacting power lines can cause electrocution.

Electrocution can occur without contact.

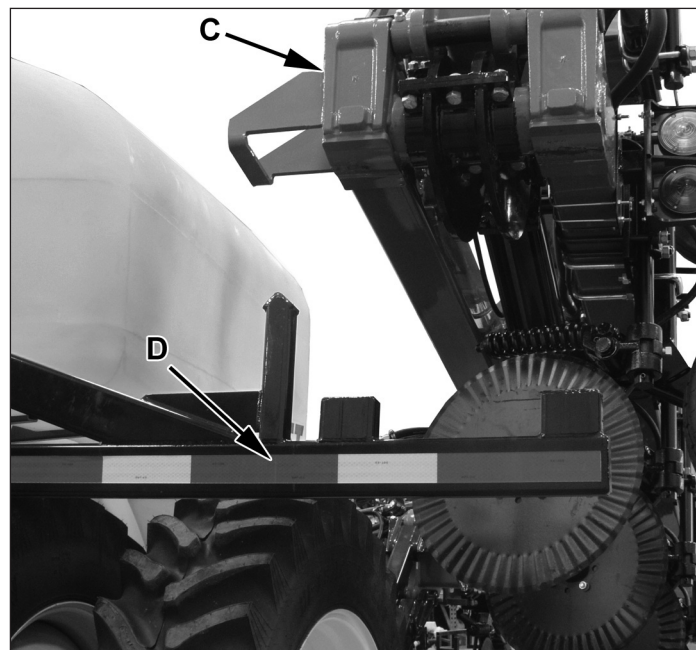
Fully lower wings before moving or transporting.

NOTICE

Prevent wing rest damage.

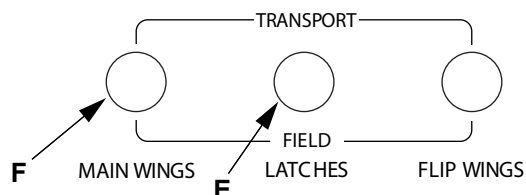
Never engage tractor remote lever to lower center section (orange labeled hose) while main wings are in transport position.

- Move tractor remote lever (grey labeled hose) to raise center section and main wings (C) up off wing rest (D).



- Move tractor remote lever (purple labeled hose) to detent to supply continuous oil flow to electronic fold box functions.
- Move latches switch (E) to transport position for a few seconds to be certain wing latches are fully raised. Verify latches are fully raised.
- Move main wing switch (F) to field position and hold until wings are unfolded. Wings will be laterally in line with center section when fully unfolded.

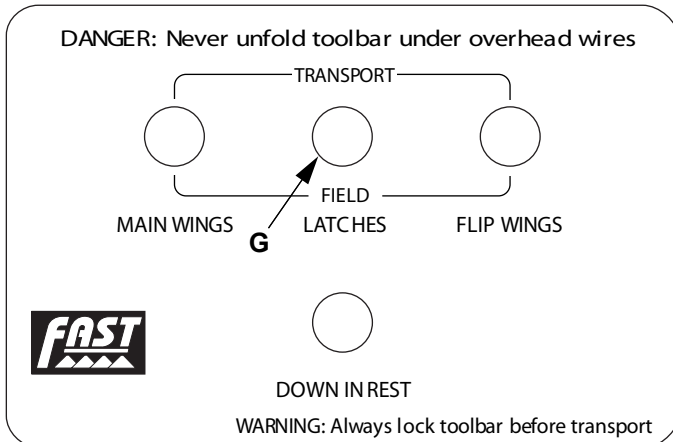
DANGER: Never unfold toolbar under overhead wires



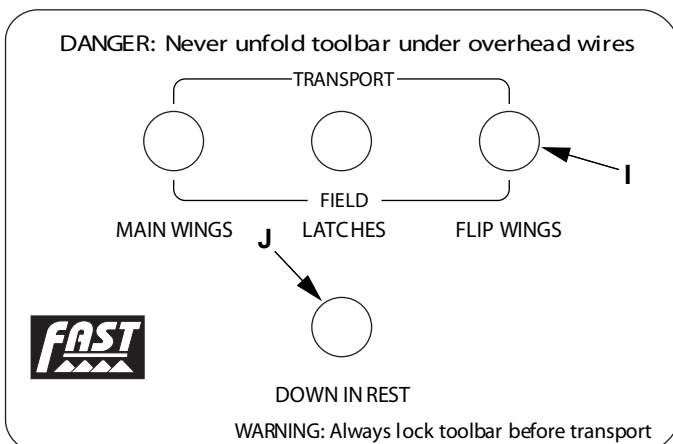
DOWN IN REST

WARNING: Always lock toolbar before transport

- Move latches switch (G) to field position and hold to fully engage wing latches (H).

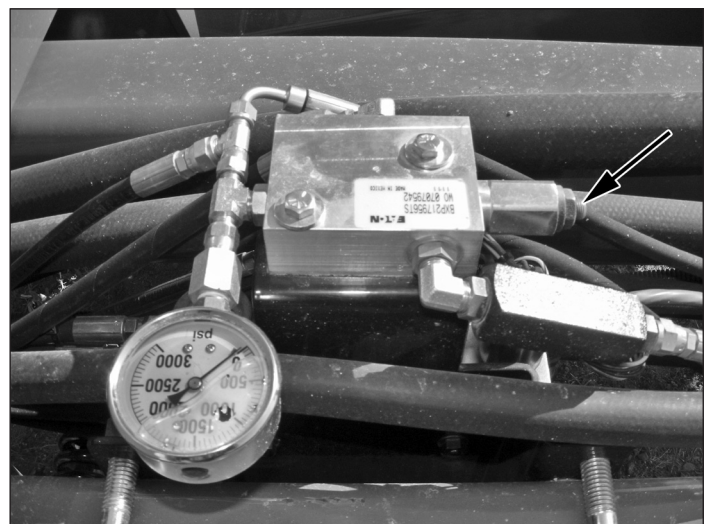


- Move flip wing switch (I) to field position and hold to unfold flip wings.



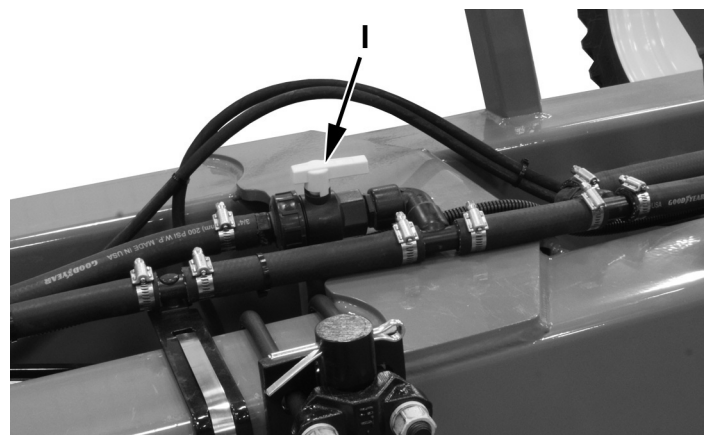
- The toolbar should be completely unfolded with wing tips angled up in the kicked position. To set desired height of wing kick, hold down in rest toggle switch (J) until wings are slightly below desired kick height. Install depth stops on cylinder rod of wing kick/down pressure cylinders on both sides of the toolbar according to amount of wing kick preferred.

- Tractor remote lever (purple labeled hose) may now be disengaged and returned to neutral until a wing folding function is required.
- Check amount of down pressure applied to main wings by engaging remote #1 continuously and lowering coulters into the ground while remaining stationary with unit. Hydraulic down pressure gauge should read between 700 and 1500 psi. Down pressure may be adjusted by turning socket head screw on down pressure valve located on toolbar near wing fold manifold.
- Use only as much down pressure as needed to get coulters to proper depth. Excess pressure could cause damage to toolbar. Turn socket head screw clockwise to increase pressure and turn counter clockwise to decrease down pressure. To change pressure, loosen jam nut, turn adjustment stem a 1/4 turn at a time. Do not exceed 1500 PSI. Reverse the tractor remote #1 to fully raise toolbar and kick wings up. Toolbar is now ready for field application.



14. Outer Wing Valve - 60 Ft Machines:

Chemical lines to outer wings have a valve to shut off flow to nozzles on Flip wing. Turn valves (K) off to get a 40 ft. application width. Open valves when 40 ft. requirements are finished. Right wing valve illustrated.

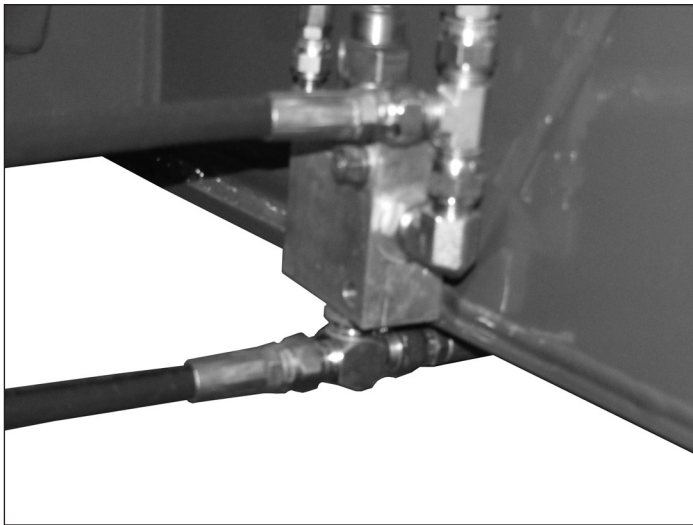


15. Application Depth:

Depth of material placement can vary depending on type of application. Check with fertilizer or chemical manufacturer for information regarding application depth. Set tool bar, coulter or nozzle to required depth.

Once desired field location of application is reached, center section and main wing kick may be lowered by engaging the tractor remote #1. Even after coulters are in ground, tractor remote #1 must be constantly engaged providing oil supply to and from down pressure circuit.

Failure to keep tractor remote #1 engaged and supply a constant oil flow to down pressure system will result in coulter riding out of the ground, and could result in structural failure of the toolbar and/or hydraulic cylinder components.

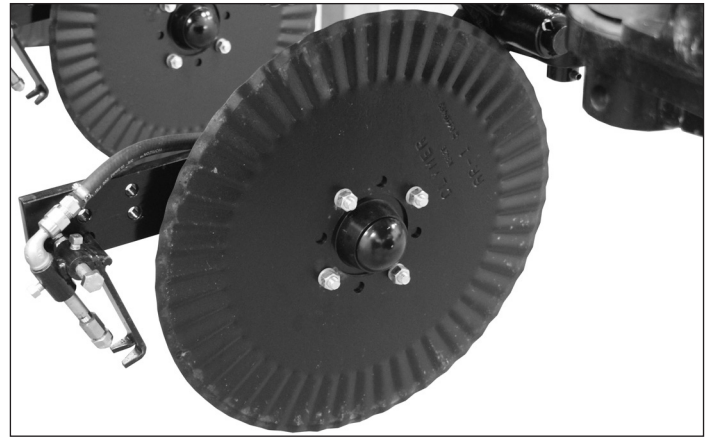


When lowering center section and main wings, they should come down simultaneously. If they do not come down simultaneously, incrementally turn up hydraulic flow to this circuit to make sure flow is adequate and not the problem. If center section is still slow, loosen jam nut and turn stem out, adjust 1/4 turn at a time and check operation, (turning to far out will allow center section to settle in storage and/or transport). If center section is too fast in down movement, turn stem in 1/4 turn to slow drop, and check operation.

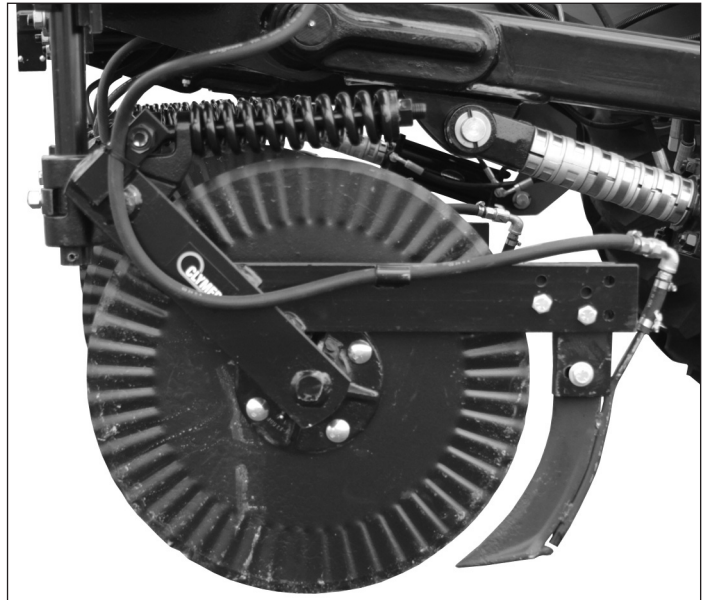
16. Coulters:

Coulters are used to cut crop residue on surface, penetrate ground and part the soil to accept liquid from nozzle. Coulter depth is controlled by spacers on lift cylinder ram and gauge wheel position.

Inspect coulters frequently if operating in rocky conditions. Bent, chipped or broken coulters will not penetrate soil properly. Always remove entangled material from any component.



Coulter With Injector Nozzle



Coulter With Knife

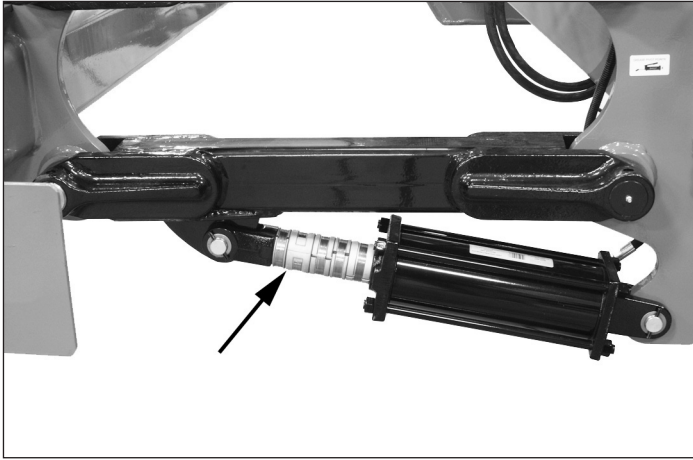
17. Gauge Wheels:

Each inner wing and flip wing is equipped with a gauge wheel that helps to maintain application depth. Lower gauge wheels if soil conditions are soft and raise if hard to obtain the same application depth.



18. Depth Control:

Install spacers on tool bar lift cylinder ram to give required machine depth. Tool bar can then be fully lowered and always return to same depth.



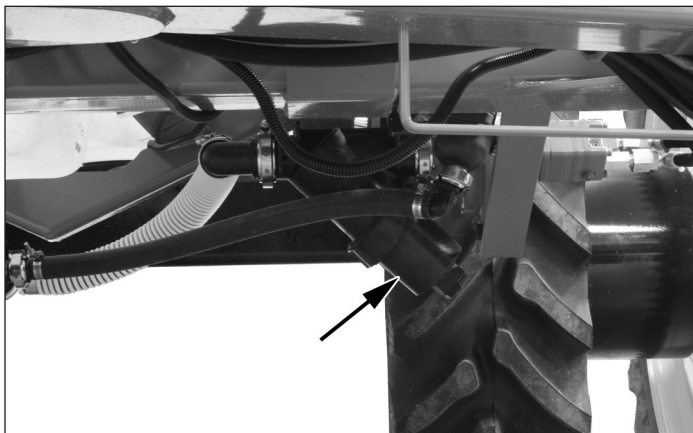
19. Nozzles / Knives:

Refer to nozzle/knife manufacturers instructions to determine correct of tip or orifice.

As a general guideline, tip of nozzle should be slightly above ground as unit moves over the field. This will insure that liquid enters soil via furrow and is retained in soil as the furrow closes.

20. System Screen:

The liquid system is equipped with a screen in suction line to remove dirt and impurities. Close valve, remove screen and wash with clear water on a daily basis. Clean liquid is required to prevent nozzle plugging.



21. Sump:

⚠ WARNING

Prevent serious injury or death.

Check chemical or fertilizer MSDS for proper handling instructions.

Toxic chemicals can enter the body by breathing, spray or contact with bare skin. Do not take a chance with your health and safety.



Remove plug on end of screen canister to drain tank at the end of each season.

22. Add only the amount of liquid to the tank that is required for the job. Excess liquid must be removed from the machine at the end of the season to prevent corrosion of metal parts.

Emptying at the end of each day is also recommended to prevent corroding over night. Remove all excess liquid from the machine through the plug on the bottom of the screen canister.

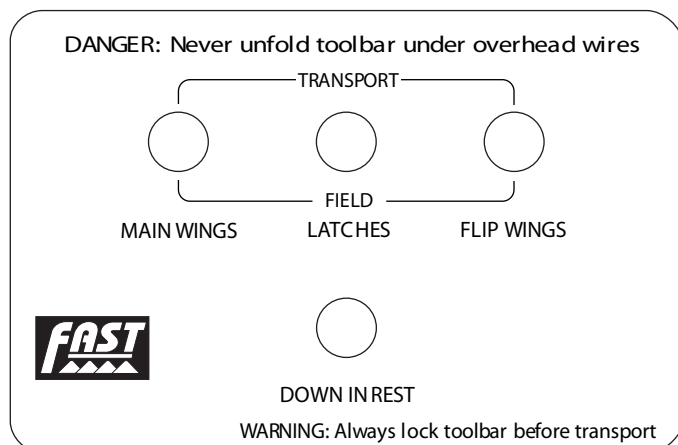
Note: Always turn sump valve off whenever working on liquid circuit components to isolate the liquid in tank.

23. Drive at a comfortable speed whenever operating in field. Operating too fast for conditions can cause coulter depth to vary and lead to inconsistent application efficiencies.

24. To fold toolbar for transporting:

- Move tractor remote lever (grey labeled hose) to raise toolbar and kick wings up.
- Move tractor remote lever (purple labeled hose) to supply oil for cab box folding functions.
- Hold down in rest switch until main wings lower enough to remove cylinder stops that were previously placed on kick/down pressure cylinder.
- Move tractor remote lever (grey labeled hose) to fully raise center and kick wings up.
- Hold flip wings toggle switch to transport position until flip wings are fully folded.
- Move and hold latches switch to transport position to raise latches.
- Move and hold main wing toggle switch to transport position until main wing bumps into wing rest vertical back stop.

- Move and hold down in rest toggle switch until main wings are fully supported.
- Disengage tractor remote lever (purple labeled hose) and install main lift transport brace on both main lift cylinders.



3.10 Transport

! Read and understand ALL information in Operator's Manual regarding procedures and SAFETY when operating applicator in the field and/or on the road.

! Check with local authorities regarding applicator transport on public roads. Obey all applicable laws and regulations.

! Always travel at a safe speed. Use caution when making corners or meeting traffic.

NOTICE

Prevent equipment damage.

Verify main tank is empty before transporting on road.

! Make sure SMV (Slow Moving Vehicle) emblem and all lights and reflectors that are required by the local highway and transport authorities are in place, are clean and can be seen clearly by all overtaking and oncoming traffic.

! Daybreak and dusk are particularly dangerous and pilot vehicles are recommended.

! Be sure applicator is hitched positively to towing vehicle and a retainer is used through drawbar pin. Always attach a safety chain between frame and towing vehicle.

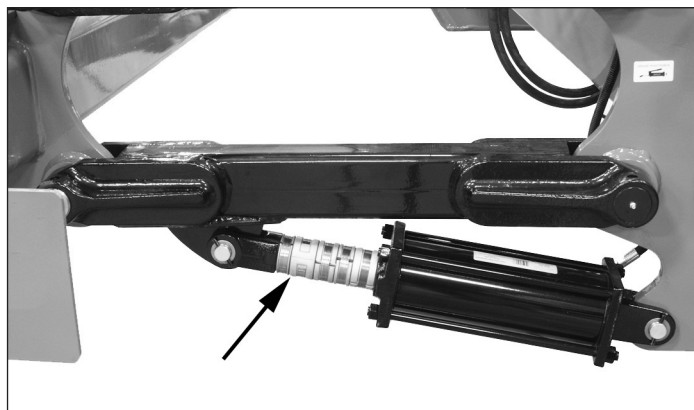
! Keep to right and yield right-of-way to allow faster traffic to pass. Drive on the road shoulder, if permitted by law.

! Do not exceed 20 mph (32 km/h). Reduce speed on rough roads and surfaces.

! Always use hazard warning flashers on tractor and applicator when transporting unless prohibited by law.

! Stay away from overhead power lines during transport. Electrocutation can occur without direct contact.

1. Be sure all bystanders are clear of machine.
2. Be sure that applicator is properly connected towing vehicle. Always attach safety chain between machine and tractor and install a retainer through drawbar pin.
3. Stay away from overhead power lines when folding or extending the wings. Electrocutation can occur without direct contact.
4. Install transport lock spacers on lift cylinders before transporting.



Note: Add more lock spacers to prevent the tool bar from dropping during transport.

5. Depending on machine configuration, wheels may need to be moved in, inverted or duals removed to reduce machine transport width to 18 feet or less.
6. Make sure SMV (Slow Moving Vehicle) emblem and all lights and reflectors that are required by local highway and transport authorities are in place, are clean and can be seen clearly by all overtaking and oncoming traffic.
7. It is not recommended that machine be transported faster than 20 mph (32 km/ hr).

Road Speed	Weight of fully equipped or loaded machine relative to weight of towing machine
Up to 32 km/h (20 mph)	1 to 1, or less
Up to 16 km/h (10 mph)	2 to 1, or less
Do not tow	More than 2 to 1

8. Do not allow riders on machine or tractor.
9. During periods of limited visibility, use pilot vehicles and use extra lights on machine.
10. Always use hazard flashers on tractor and applicator when transporting unless prohibited by law.

3.11 Storage



Store unit in an area away from human activity.



Do not permit children to play on or around stored applicator.

3.11.1 Placing In Storage

At end of season, thoroughly inspect and prepare applicator for storage. Repair or replace any worn or damaged components to prevent any unnecessary down time at beginning of next season.

1. Empty remaining liquid from tank.
2. Open liquid line connections, screen canister and pump. Drain all fluids out of system. Reinstall all plugs.
3. Use 10 gallons Marine RV Anti freeze, pump thru screens, valve, nozzles/check valves and orifices/tips.
4. Thoroughly wash machine using a pressure washer to remove all dirt, mud, debris or residue to protect against corrosion.
5. Lubricate all grease points. Make sure all grease cavities have been filled with grease to remove any water residue from washing.
6. Inspect all hydraulic hoses, couplers and fittings. Tighten any loose fittings. Replace any hose that is damaged or separating from crimped end of a fitting.
7. Inspect all liquid lines and connections. Tighten any loose fittings. Replace any line that is cut, nicked or abraded.
8. Touch up all paint nicks and scratches to prevent rusting.

9. Fold flip wings and outer wings to transport configuration.
10. Install spacers on lift cylinder rams.
11. Move machine to a storage position.
12. Select an area that is dry, level and free of debris.
13. Place planks under jack for added support if required.
14. Unhook applicator from tractor.

3.11.2 Removing From Storage

1. Clear area of bystanders, especially small children, and remove foreign objects from machine and working area.
2. Attach tractor to applicator.
3. Check
 - A. Attach and secure all liquid lines.
 - B. Coulters and nozzles.
 - C. All hardware. Tighten as required.
 - D. Tire pressure.
 - E. All hydraulic lines, fittings and connections. Tighten as required.
4. Lubricate all grease fittings.
5. Replace any defective parts.
6. Turn pump metering system momentarily.
7. Make sure it turns freely.
8. Add a small amount of liquid to tank. Turn metering pump on momentarily and check that liquid comes out of each nozzle.
9. Follow pre-operation checklist (Section 3.4) before using.

4. Service And Maintenance

! Review the Operator's Manual and all safety items before working with, maintaining or operating the applicator.

! Lower machine to the ground, place all controls in neutral, stop engine, set park brake, remove ignition key, and wait for all moving parts to stop before servicing, adjusting, repairing or unplugging.

! Follow good shop practices:

- Keep service area clean and dry.
- Be sure electrical outlets and tools are properly grounded.
- Use adequate light for the job at hand.

! Before applying pressure to a hydraulic system, make sure all components are tight, hoses and couplings are in good condition.

! Relieve pressure from hydraulic circuit before servicing or disconnecting from tractor.

! Keep hands, feet, clothing and hair away from all moving and/or rotating parts.

! Clear the area of bystanders, especially children, when carrying out any maintenance and repairs or making any adjustments or filling.

! Place stands or blocks under the frame before working beneath the machine or when changing tires.

! Be sure all guards are in place and secured when maintenance work is completed.

! Use only tools, jacks and hoists of sufficient capacity for the job.

4.1 Service

4.1.1 Fluids And Lubricants

1. Grease:
Use an SAE multi-purpose high temperature grease with extreme pressure (EP) performance. Also acceptable is an SAE multi-purpose lithium base grease.
2. Storing Lubricants:
Your machine can operate at top efficiency only if clean

lubricants are used. Use clean containers to handle all lubricants. Store them in an area protected from dust, dirt, moisture and other contaminants.

4.1.2 Greasing

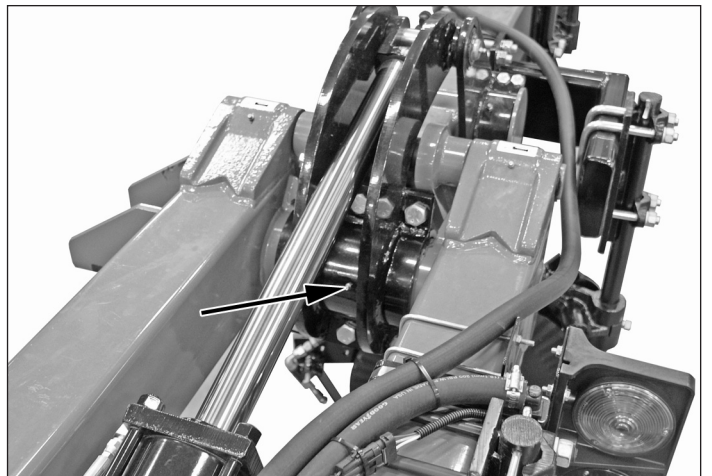
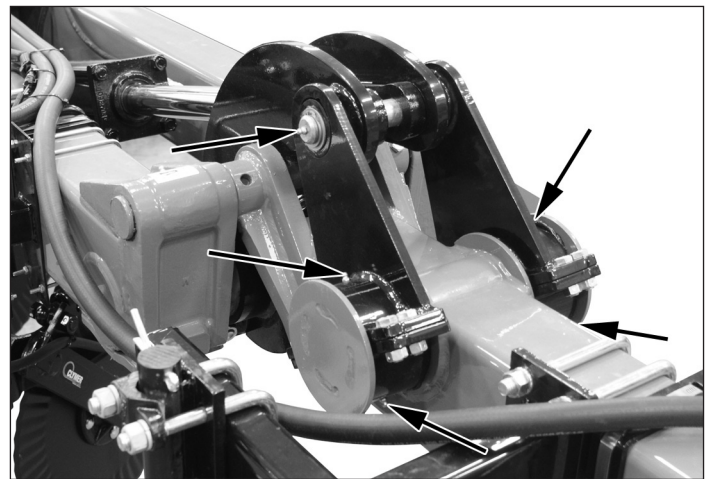
Refer to Section 4.1.1 for recommended grease. Use Maintenance Checklist provided to keep a record of all scheduled maintenance.

1. Use only a hand-held grease gun for all greasing.
2. Wipe grease fitting with a clean cloth before greasing, to avoid injecting dirt and grit.
3. Replace and repair broken fittings immediately.
4. If a fitting will not take grease, remove and clean thoroughly. Also clean and lubricant passageway. Replace fitting if necessary.

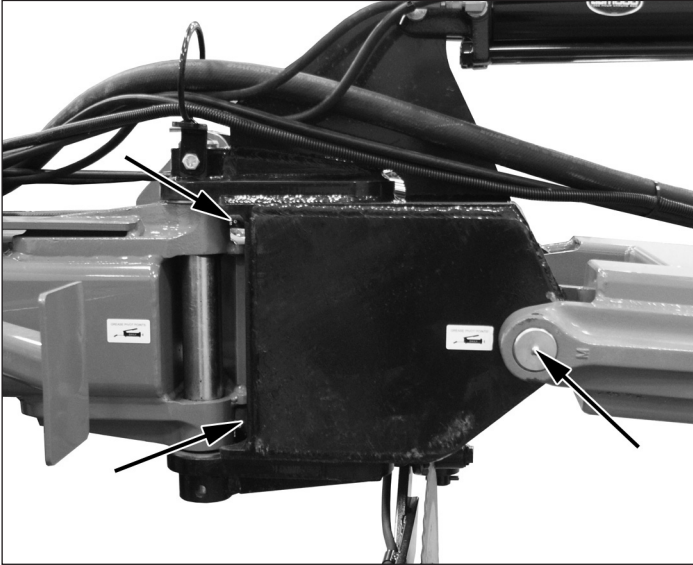
4.1.3 Servicing Intervals

8 Hours or Daily

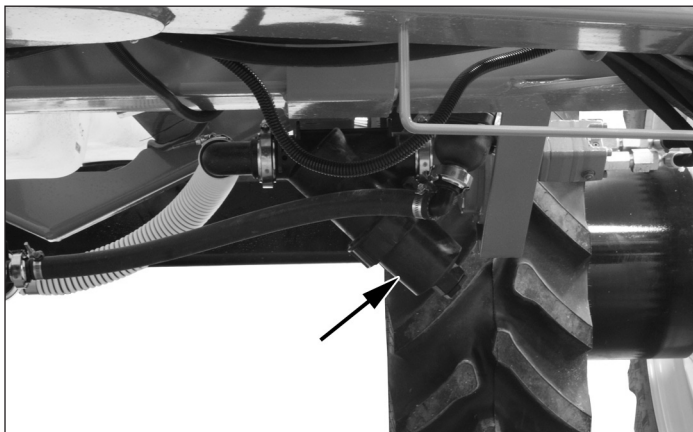
1. Grease flip wing tool bar hinges (6 locations each hinge).



2. Grease inner wing hinges and fold pins (5 locations on each hinge).



3. Remove and wash fertilizer strainer screen using clean water.

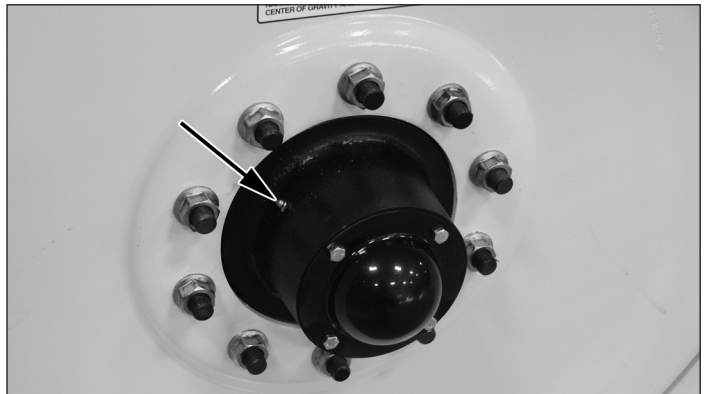


4. Grease tool bar parallel linkage (4 locations per side - 8 total).



Annually

1. Grease wheel bearings. One per side.



2. Remove jack from mount.
3. Remove top cover and check grease level.
4. Install cover and install jack on machine.



5. Clean and wash machine.

4.1.4 Service Record

See Lubrication and Maintenance sections for details of service. Copy this page to continue record.

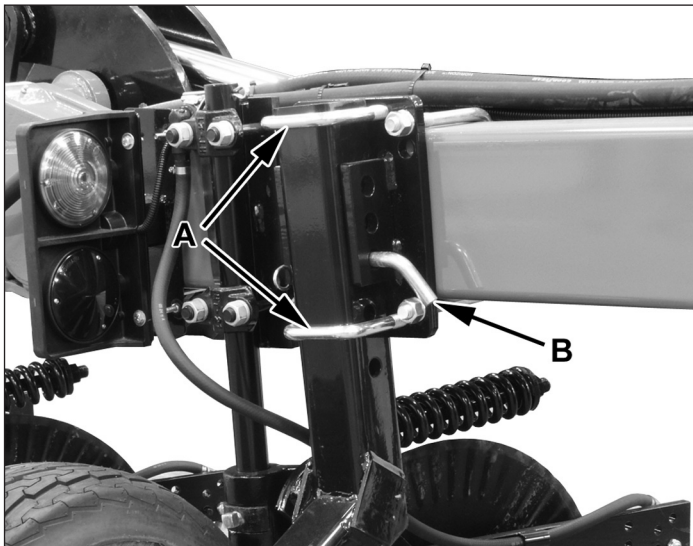
Action Code: CL Clean L Lubricate

Item	Hours														
	Serviced By														
8 hours Or Daily															
L Flip Wing Hinges															
L Inner Wing Hinges															
CL Strainer Screen															
L Tool Bar Parallel Linkage															
Annually															
L Wheel Bearings															
CL Wash Machine															

4.2 Maintenance

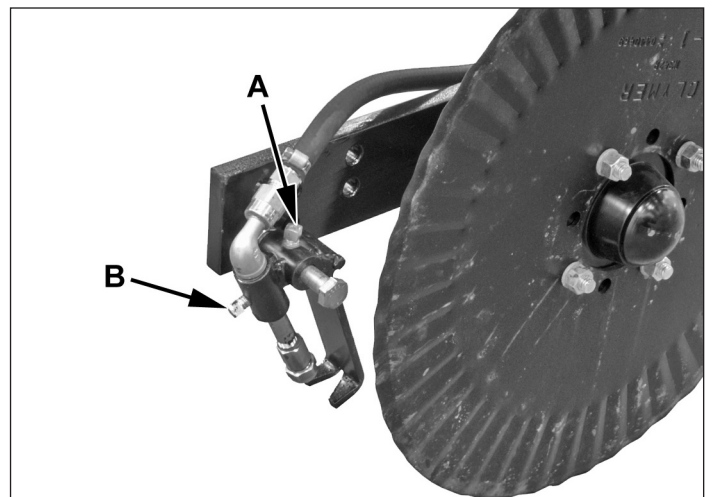
4.2.1 Adjust Gauge Wheel Height

1. Loosen U-bolts (A).
2. Remove pin (B) and adjust gauge wheel height as desired.
3. Install pin, lock pin and tighten U-bolts (A).



4.2.2 Nozzles

1. Clear area of bystanders.
2. Extend wings and raise tool bar to its fully up position.
3. Place safety stands under center tool bar or install transport lock spacers over lift cylinder rams.
4. Nozzle Angle:
 - a. The best results are obtained when nozzle directs liquid approximately 1 inch (25 mm) behind coulter.
 - b. Loosen setscrew (A) to set nozzle at required angle and centered behind coulter.
5. Nozzle Spray Pattern
 - a. Sight along nozzle and coulter. Nozzle should direct liquid directly behind coulter.
 - b. Loosen setscrew (B) to adjust nozzle spray parallel with furrow.



4.2.3 Filter

Clean the filter at the start of each day when tank is empty or dirt is detected in system.

1. Clear area of bystanders.

WARNING

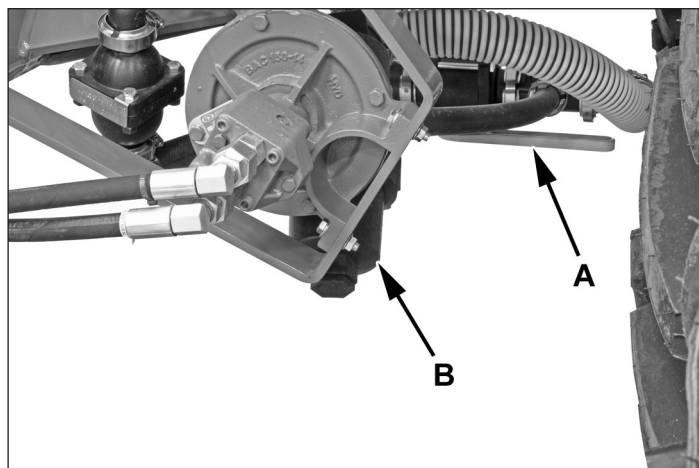
Prevent serious injury or death.

Check chemical or fertilizer MSDS for proper handling instructions.

Toxic chemicals can enter the body by breathing, spray or contact with bare skin. Do not take a chance with your health and safety.



2. Close sump valve (A) if there is liquid in tank.
3. Relieve pressure in liquid circuit.
4. Remove cap (B) to access screen.
5. Use clear water to clean screen.
6. Install screen in canister and tighten by hand. Do not over tighten canister and crack head.
7. Open sump valve (A) if there is liquid in tank.



5. Troubleshooting

In the following table, two problems, causes and solutions to problems are listed that you may encounter.

If you encounter a problem that is difficult to solve, even after having read through this troubleshooting section, please call your local Fast Distributing dealer or the factory.

Before you call, please have this Operator's Manual and the serial number from your machine ready.

PROBLEM	CAUSE	SOLUTION
Running out of liquid.	Application rate too high	Reset application rate. Refer to manual for pump.
Liquid remaining.	Application rate too low.	Check line strainers for blockage. Reset application rate. Refer to manual for pump.
	Intermittent speed signal.	Check and set speed sensor on hub.

6. Specifications

6.1 Mechanical

Dimensions	8218 / 8224 40 ft 15 Coulters	8218 / 8224 44 ft 33 Coulters	8218 / 8224 60 ft 23 Coulters	8218 / 8224 66 ft 35 Coulters
Length	20' 3"	21' 8"	20' 3"	20' 3"
Width Field Transport	35' 5" 16' 7"	41' 3" 16' 7"	57' 3" 16' 7"	63' 2" 16' 7"
Transport Height	9' 6"	9' 6"	9' 6"	9' 6"
Tank Capacity	1800 / 2400 Gal.	1800 / 2400 Gal.	1800 / 2400 Gal.	1800 / 2400 Gal.
Tires 1800 gal 2400 gal	380/90R46 - 35 psi 480/80R42 - 46 psi.	380/90R46 - 35 psi 480/80R42 - 46 psi.	380/90R46 - 35 psi 480/80R42 - 46 psi.	380/90R46 - 35 psi 480/80R42 - 46 psi.
Lug Nut Torque	265 lb/ft	265 lb/ft	265 lb/ft	265 lb/ft
Gauge Wheel	20.5 x 8-10	20.5 x 8-10	20.5 x 8-10	20.5 x 8-10
Tire Pressure	90	90	90	90
Lug Nut Torque	70 lb/ft	70 lb/ft	70 lb/ft	70 lb/ft
Empty Weight Of Unit (lbs)	1800 gal - 7428 2400 gal - 7528	1800 gal - 8868 2400 gal - 8968	1800 gal - 8668 2400 gal - 8768	1800 gal - 9622 2400 gal - 9722
Loaded Tongue Weight (lbs)	1800 gal - 7187 2400 gal - 7523	1800 gal - 7490 2400 gal - 7826	1800 gal - 8056 2400 gal - 8592	1800 gal - 8494 2400 gal - 8830

Specifications subject to change without notice

6.2 Hydraulic Fitting Torque

Tightening flare type tube fittings*

1. Check flare and flare seat for defects that might cause leakage.
2. Align tube with fitting before tightening.
3. Lubricate connection and hand tighten swivel nut until snug.
4. To prevent twisting tubes or hoses, use two wrenches. Place one wrench on connector body and with second wrench tighten swivel nut to torque shown.

*Torque values shown are based on lubricated connections.



Tube Size OD	Nut Size Across Flats	Torque Value*		Recommended Turns to Tighten (After Finger Tightening)	
(in.)	(in.)	(N.m)	(lb-ft)	(Flats)	(Turns)
3/16	7/16	8	6	1	1/6
1/4	9/16	12	9	1	1/6
5/16	5/8	16	12	1	1/6
3/8	11/16	24	18	1	1/6
1/2	7/8	46	34	1	1/6
5/8	1	62	46	1	1/6
3/4	1-1/4	102	75	3/4	1/8
7/8	1-3/8	122	90	3/4	1/8

SAE Torque-Tension Values						
Bolt Size	Grade 2		Grade 5		Grade 8	
	Dry lb-ft (N•m)	Lubricated lb-ft (N•m)	Dry lb-ft (N•m)	Lubricated lb-ft (N•m)	Dry lb-ft (N•m)	Lubricated lb-ft (N•m)
1/4-28	6 (9)	5 (6)	10 (13)	7 (10)	14 (19)	10 (14)
1/4-20	6 (8)	4 (6)	8 (11)	6 (9)	12 (16)	9 (12)
5/16-24	13 (17)	9 (13)	19 (23)	14 (20)	27 (37)	20 (28)
5/16-18	11 (15)	8 (11)	17 (24)	12 (18)	25 (33)	18 (25)
3/8-24	23 (31)	17 (23)	35 (48)	26 (36)	49 (59)	37 (44)
3/8-16	20 (27)	15 (20)	31 (42)	23 (31)	44 (59)	32 (44)
7/16-20	36 (48)	27 (36)	55 (75)	41 (56)	78 (106)	58 (79)
7/16-14	32 (43)	24 (33)	49 (67)	37 (50)	70 (95)	52 (71)
1/2-20	55 (75)	41 (56)	85 (115)	64 (86)	120 (163)	90 (122)
1/2-13	49 (66)	37 (50)	75 (102)	57 (77)	106 (144)	80 (108)
9/16-18	78 (106)	59 (80)	121 (164)	91 (123)	171 (232)	128 (174)
9/16-12	70 (95)	53 (72)	109 (148)	82 (111)	154 (209)	115 (156)
5/8-18	110 (149)	82 (111)	170 (231)	127 (172)	240 (326)	180 (244)
5/8-11	97 (132)	73 (99)	150 (204)	113 (153)	212 (288)	159 (216)
3/4-16	192 (261)	144 (195)	297 (403)	223 (303)	420 (570)	315 (427)
3/4-10	172 (233)	129 (175)	269 (365)	201 (273)	376 (510)	282 (383)
1-12	--	--	704 (955)	528 (716)	995 (1350)	746 (1012)
1-8	--	--	644 (874)	483 (655)	909 (1233)	681 (924)

Metric Torque-Tension Values

Bolt Size	Class 4.8		Class 8.8		Class 10.9		Class 12.9	
	Dry lb-ft (N•m)	Lubricated lb-ft (N•m)	Dry lb-ft (N•m)	Lubricated lb-ft (N•m)	Dry lb-ft (N•m)	Lubricated lb-ft (N•m)	Dry lb-ft (N•m)	Lubricated lb-ft (N•m)
M6	4.7 (3.5)	6 (4.5)	8.9 (6.5)	11.3 (8.5)	13 (9.5)	16.5 (12)	15.5 (11.5)	19.5 (14.5)
M8	11.5 (8.5)	14.5 (10.5)	22 (16)	27.5 (20)	32 (23.5)	40 (29.5)	37 (27.5)	47 (35)
M10	23 (17)	29 (21)	43 (32)	55 (40)	63 (46)	80 (59)	75 (55)	95 (70)
M12	40 (29.5)	50 (37)	75 (55)	95 (70)	110 (80)	140 (105)	130 (95)	165 (120)
M14	63 (46)	80 (59)	120 (88)	150 (110)	175 (130)	220 (165)	205 (150)	260 (190)
M16	100 (74)	125 (92)	190 (140)	240 (175)	275 (200)	350 (255)	320 (235)	400 (300)
M18	135 (100)	170 (125)	265 (195)	330 (245)	375 (275)	475 (350)	440 (325)	560 (410)
M20	190 (140)	245 (180)	375 (275)	475 (350)	530 (390)	675 (500)	625 (460)	790 (580)
M22	265 (195)	330 (245)	510 (375)	650 (480)	725 (535)	920 (680)	850 (625)	1080 (800)
M24	330 (245)	425 (315)	650 (480)	820 (600)	920 (680)	1150 (850)	1080(800)	1350(1000)

Raven Console Calibration Information

		BOOM CAL	SPEED CAL	METER CAL	VALVE CAL	RATE 1 CAL	RATE 2 CAL	VOL TANK	TIME	SELF TEST
1	2	3	4	5	6	7	8	9	0	←
BOOM WIDTHS										
BOOM 1										
BOOM 2										
BOOM 3										
BOOM 4										
BOOM 5										
BOOM 6										

[illegible]



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