



ST MODELS

RAPTOR STRIP-TILLAGE TOOL



MODEL 2115ST & 2130ST PULL-TYPE TILLAGE TOOL MAINTENANCE

MODEL 2015ST & 2030ST PULL-TYPE TILLAGE TOOL MAINTENANCE

**INNOVATING
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STRIP-TILLAGE

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SECTION IV

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PULL-TYPE RAPTOR — Maintenance

Lubrication Points

To keep your implement in top operating condition and to assure its proper performance and reliability for a long period of time, periodic inspection and lubrication is a must.

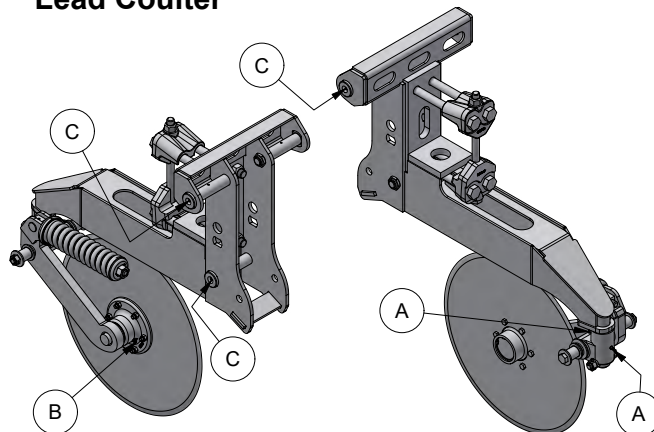
Use EP-2 lubricant at the locations described in the chart. All exposed cylinder rods should be coated with grease before seasonal storage to prevent rusting. After seasonal storage, check wing latch for freedom of movement.

The lubrication locations and recommended schedule are as follows:

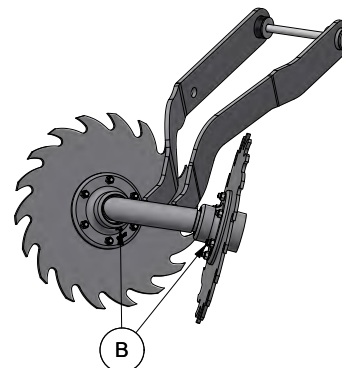
ITEM	DESCRIPTION	POINT	QTY	HOURS
A	Lead Coulter Swivel Arms	2	1 Shot	100 Hours
B	All Hubs	8	2 Shots	200 Hours/Annually
C	Lead Coulter Pivots	3	2 Shots	200 Hours/Annually
D	Depth Control Pivots	2	2 Shots	200 Hours./Annually
E	Closing Coulter Pivots	2	2 Shots	100 Hours
F	Conditioner Pivot	1	2 Shots	200 Hours/Annually
G	Hitch	2	1 Shot	10 Hours
H	Jack Stand	2	2 Shots	200 Hours/Annually
I	Jack Cylinder	2	1 Shot	200 Hours/Annually

Lubrication Points (continued)

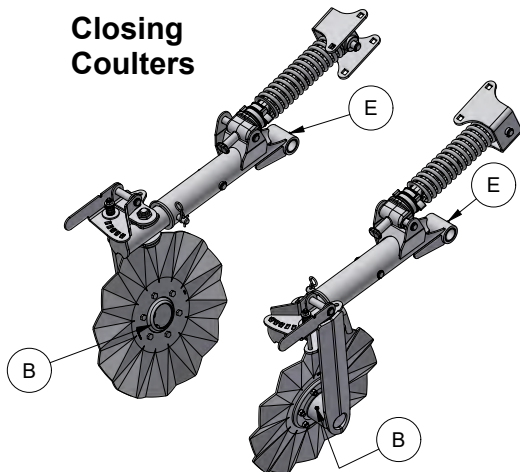
Lead Coulter



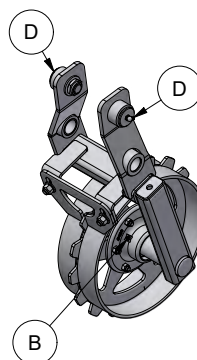
Row Cleaner



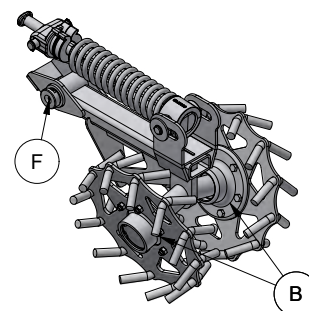
Closing Coulters



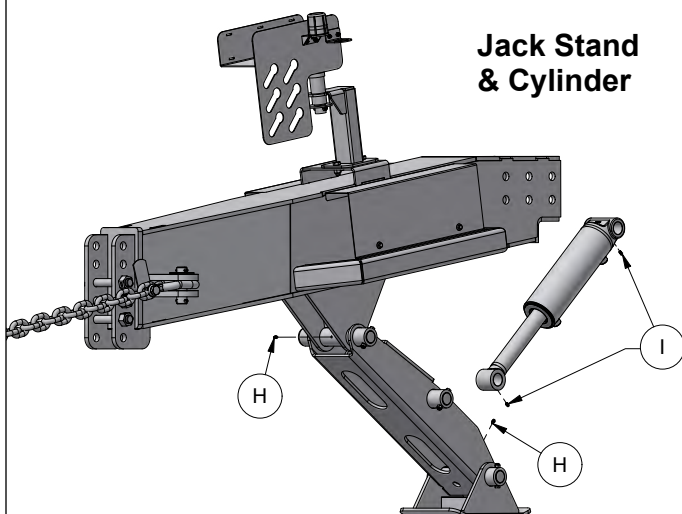
Depth Control



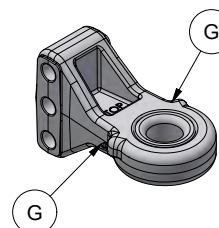
Conditioner



Jack Stand & Cylinder

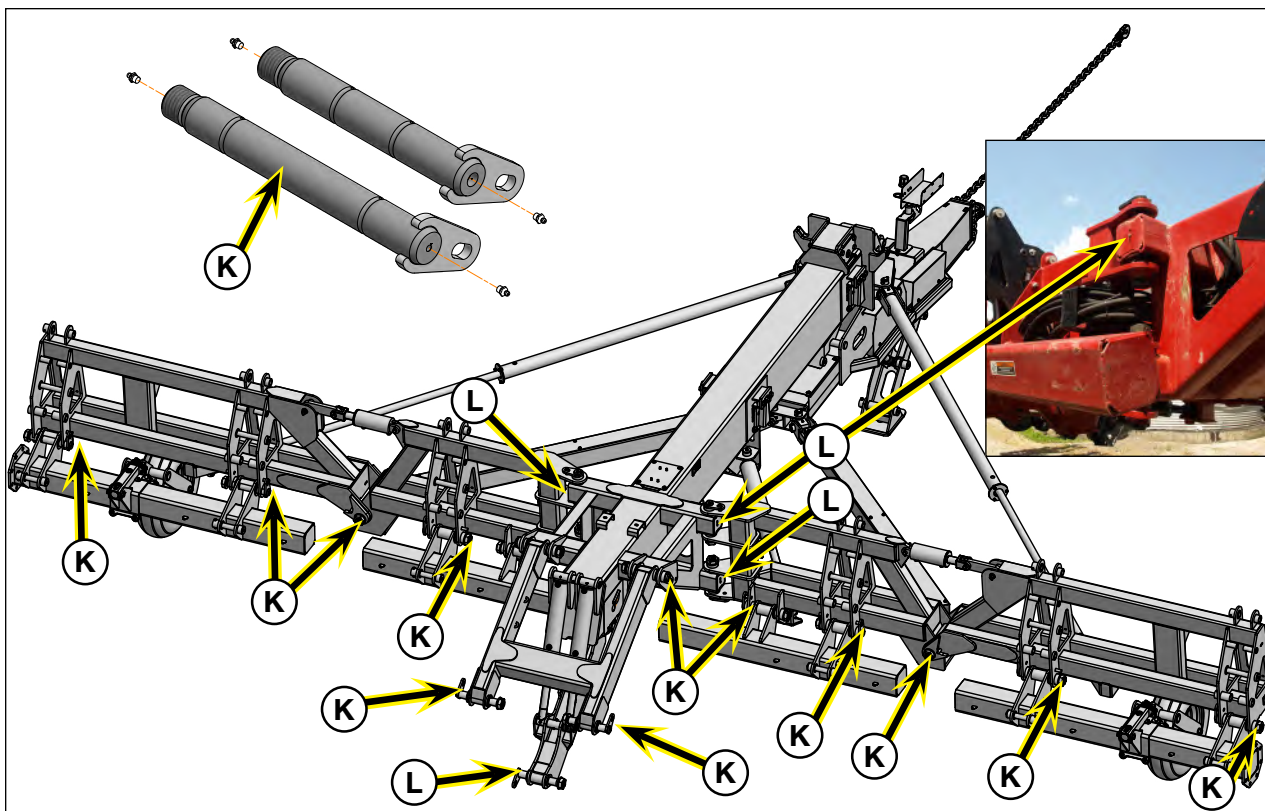
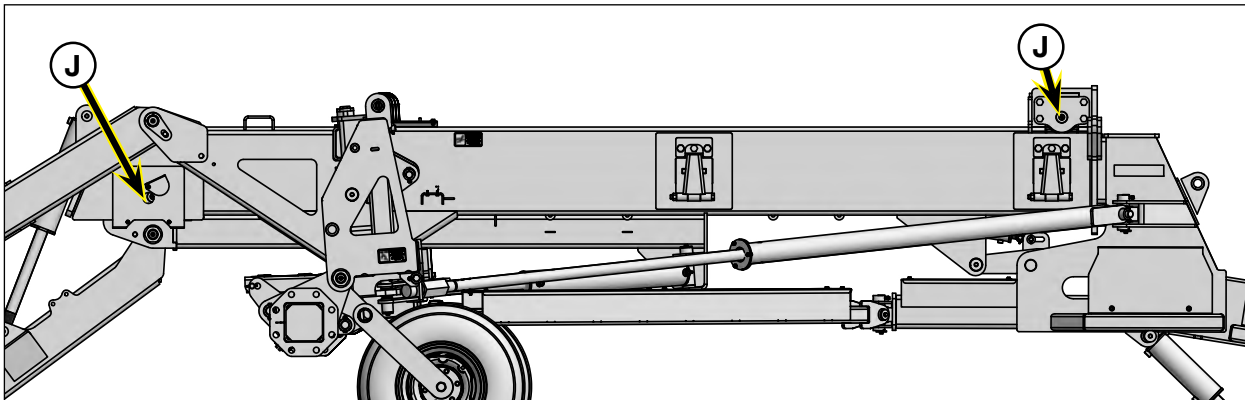


Hitch



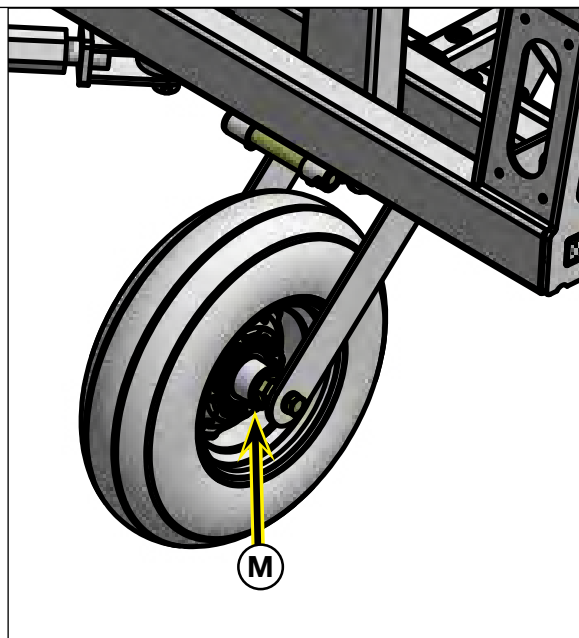
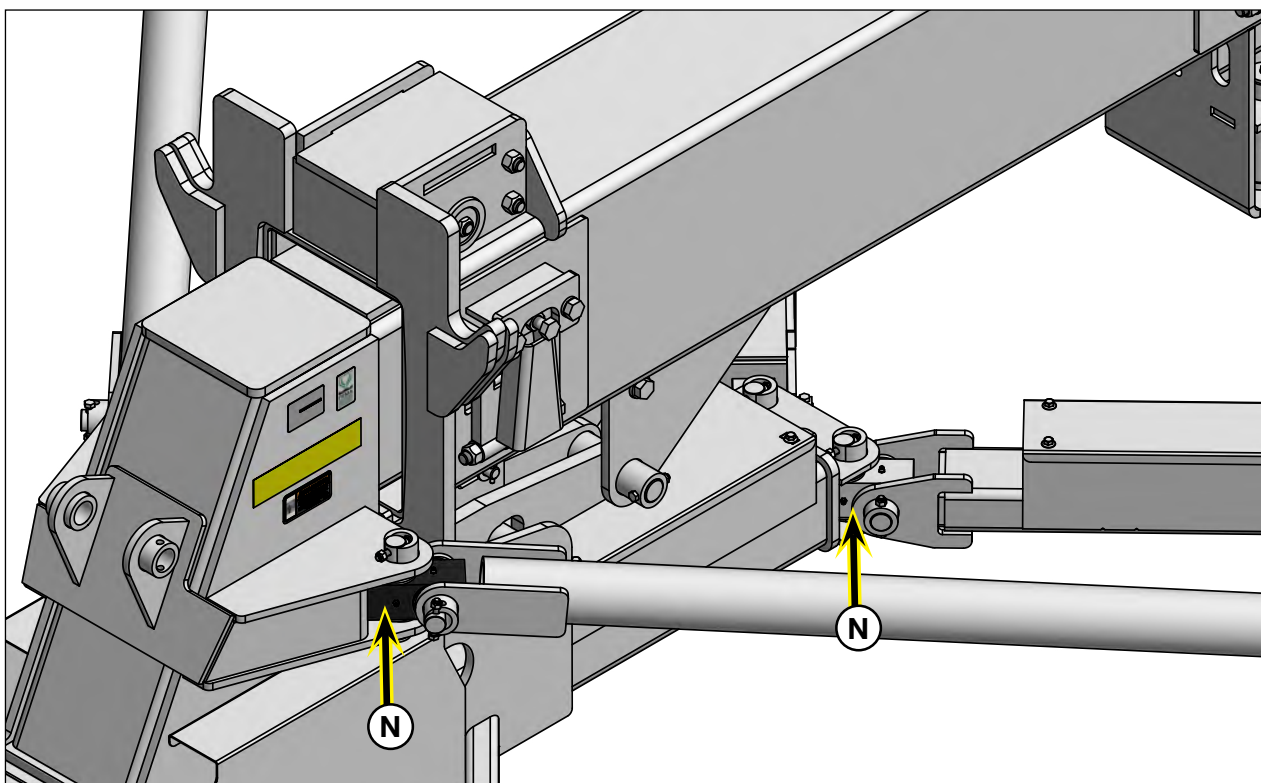
Lubrication Points (continued)

ITEM	DESCRIPTION	POINT	QTY	HOURS
J	Roller Assembly	2	1 Shot	50 Hours
K	Pin Weldments (Qty - 20; 2 Points Each) Parallel Arms, Inner Wings, & Outer Wings	34	2 Shots	10 Hours
L	Inner Wing Hinge Greased through bushings	4	2 Shots	10 Hours



Lubrication Points (continued)

ITEM	DESCRIPTION	POINT	QTY	HOURS
M	Gauge Wheel Hubs	2	1 Shots	200 Hours / Annually
N	Truss Blocks	4	2 Shots	2 zerks each block - 50 Hours



Purging Hydraulic System

WARNING

- RELIEVE THE HYDRAULIC SYSTEM OF ALL PRESSURE BEFORE ADJUSTING OR SERVICING. SEE THE HYDRAULIC POWER UNIT OPERATOR'S MANUAL FOR PROPER PROCEDURES.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

Purge air from system as follows:

- A. Clear all personnel and objects from the area, including where the machine will have full range of motion during the hydraulic movement. Remove transport locks from the machine.
- B. Pressurize the system and maintain the system at full pressure for at least 5 seconds after the cylinder rods stop moving. Check that all cylinders have fully extended or retracted.
- C. Check oil reservoir in the hydraulic power source and refill as needed.
- D. Pressurize the system again to reverse the motion of step B. Maintain pressure on the system for at least 5 seconds after the cylinder rods stop moving. Check that all cylinders have fully extended or retracted.
- E. Check for hydraulic oil leaks using cardboard or wood. Tighten connections according to directions in the Torque Specifications in the MAINTENANCE section.
- F. Repeat steps in B, C, D, and E 10-12 times.

HYDRAULIC SYSTEM CHECKS ON ALL UNITS -- CHECK THE FOLLOWING:

ROUTING OF ALL HYDRAULIC HOSES: Hoses should not be kinked, twisted, or rubbing against sharp edges.

FITTINGS AND CONNECTIONS: Check for leaks. Refer to "Torque Chart" in MAINTENANCE section.

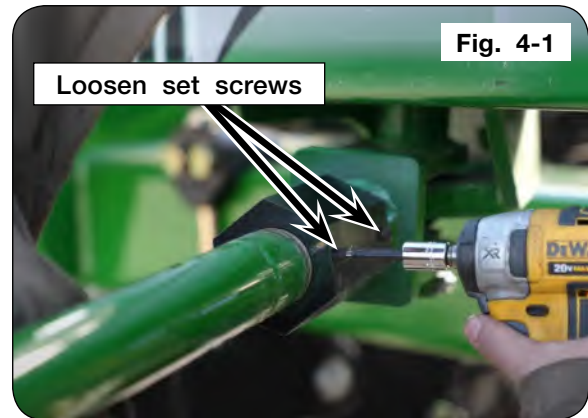
HOSES: Be sure hoses have room to "FLEX" (for folding) in hinge areas. Hoses must be secured with cable ties.

Truss Rod Adjustment

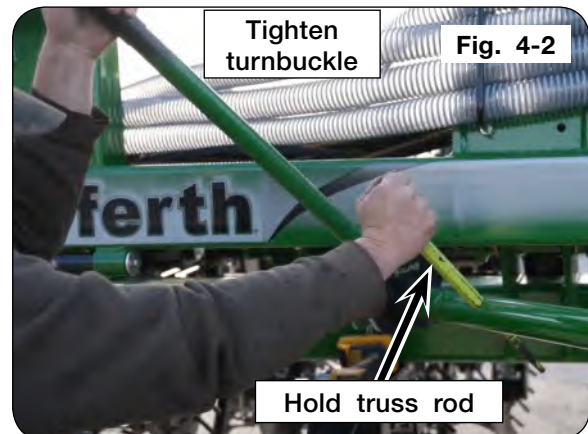
1. Park the empty Raptor machine on a firm, level surface. Completely unfold the wings. Block the tires on the unit to keep it from moving. Set the towing vehicle's parking brake, shut off the engine and remove the ignition key.



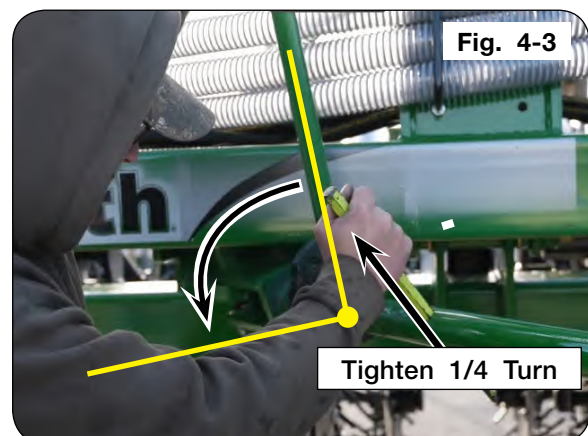
2. Using a 3/16" hex wrench, loosen the set screws securing the turnbuckles to the truss rod. There are two set screws per turnbuckle. (Fig. 4-1)



3. With the wings completely unfolded, attempt to tighten the turnbuckles while holding the truss rod stationary. (Fig. 4-2) If a turnbuckle is already tight, reinstall the set screws, torque the screws to 25-28 Ft.-Lbs. and no further action is required. If a turnbuckle is loose, tighten until it cannot be turned and continue to step 4.
4. With the turnbuckles tightened, fold in the wings of the machine slightly. Folding the wings in will release pressure from the wing truss rods. Turn off the tractor and remove the key from the ignition.



5. Tighten the turnbuckle(s) 1/4 of a turn. (Fig. 4-3)
6. Lock the turnbuckles by tightening all the set screws loosened in step 2. Torque the set screws to 25-28 Ft.-Lbs.
7. Fold and unfold the machine. As the machine locks into the fully unfolded position, watch the hitch. If the machine fully unfolds and the hitch does not shift to one side, no further action is required. If the hitch shifts to one side, perform this procedure again.



Roller Assembly Replacement

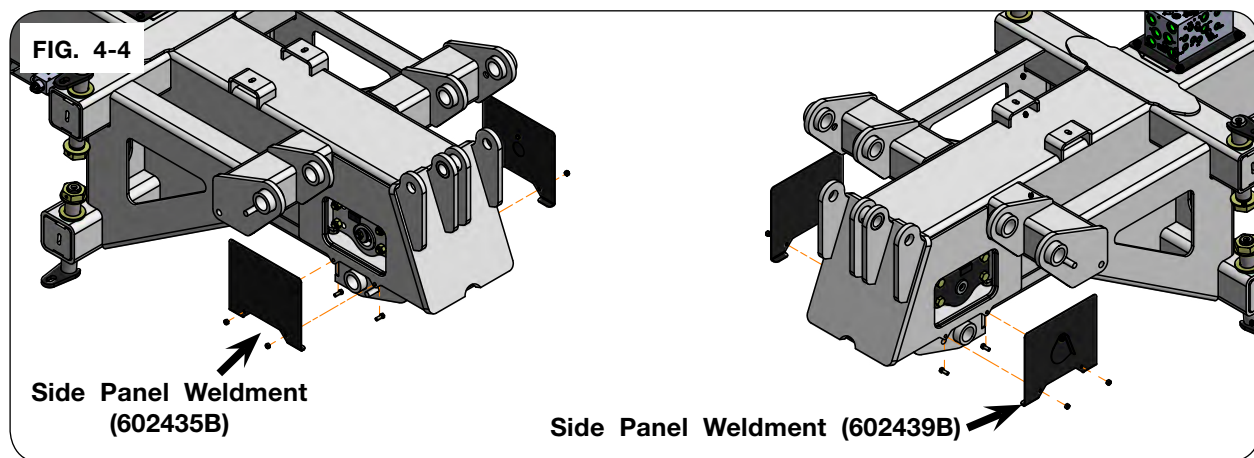
WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 6,000 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

With the Raptor implement attached to a tractor, find a firm, level surface and unfold the wings. Lower the machine completely. Shut off the tractor engine, set the parking brake, and remove the ignition key.

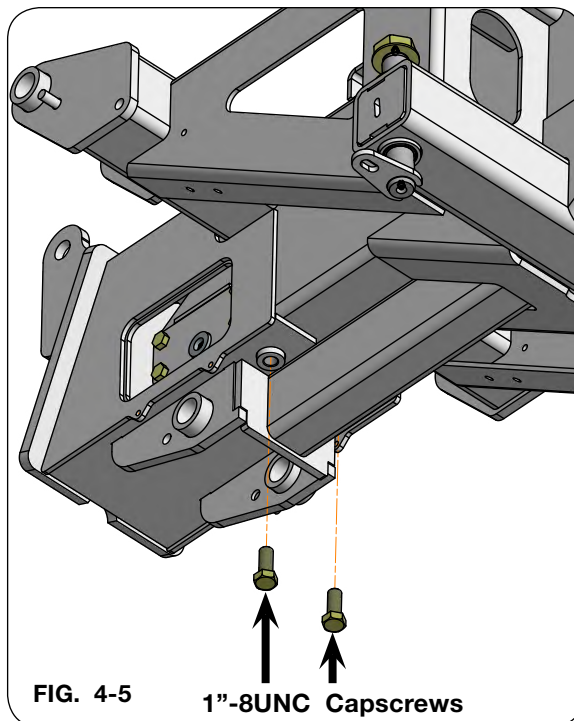
Rear Roller Assembly Replacement

1. Remove and save the 3/8"-16UNC x 1" capscrews (9390-055) and 3/8"-16UNC locknuts (9928) retaining the side panel weldments (602435B and 602439B). (FIG. 4-4)

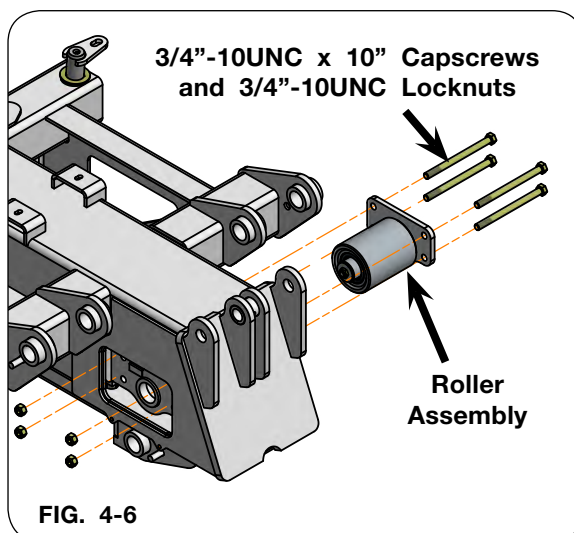


Roller Assembly Replacement (continued)

2. Using two 1"-8UNC capscrews at least 2 1/2" long, insert them into the threaded bushings as shown in FIG. 4-5. Tighten capscrews equally and evenly to release the pressure on the roller assembly.

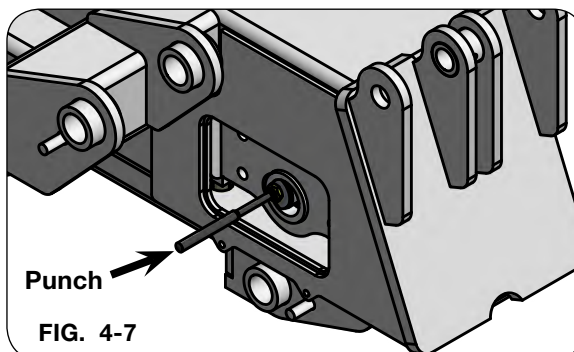


3. Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-6)



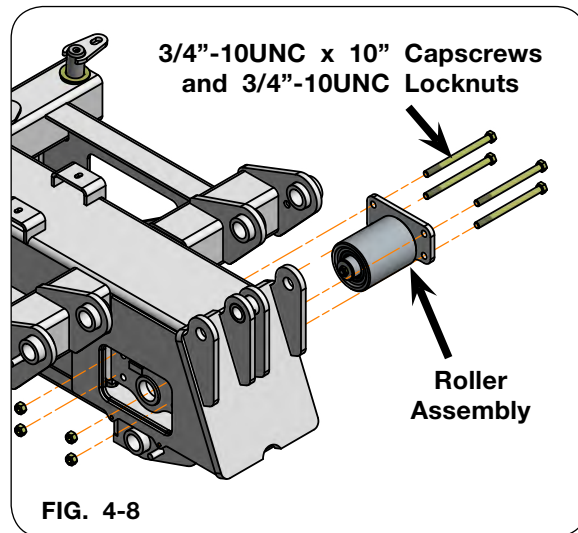
NOTE: If necessary, use a punch on the end of the spindle to help drive the assembly. (FIG. 4-7)

NOTE: If replacing roller assembly components, refer to "Roller Component Replacement".

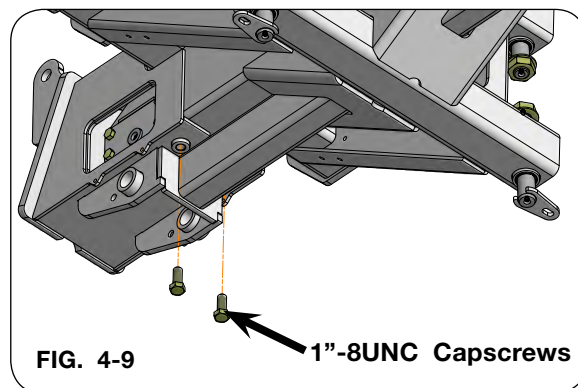


Roller Assembly Replacement (continued)

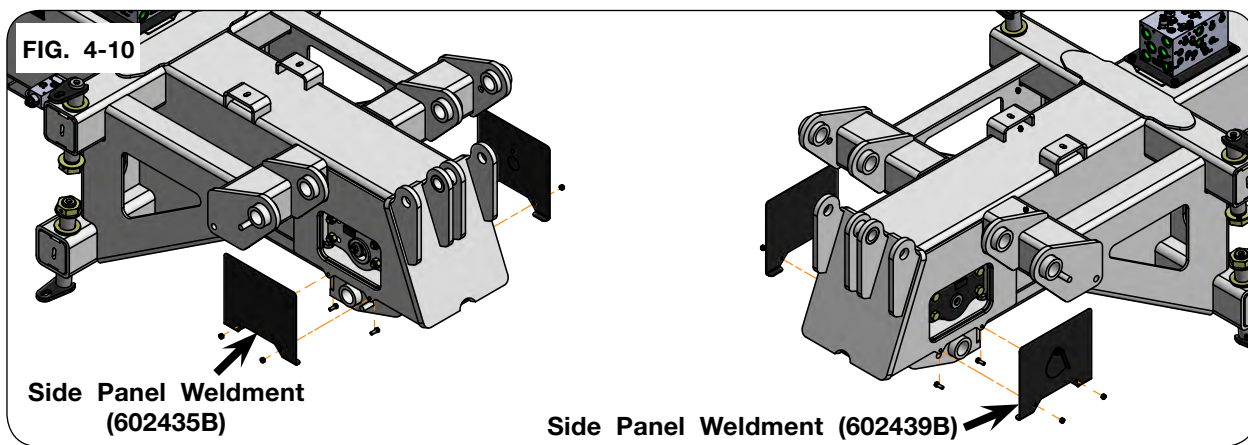
4. Replace roller assembly (602186B) and retain into position with the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) previously removed. (FIG. 4-8)



5. Remove the two 1"-8UNC capscrews used to relieve the pressure on the roller assembly. (FIG. 4-9)



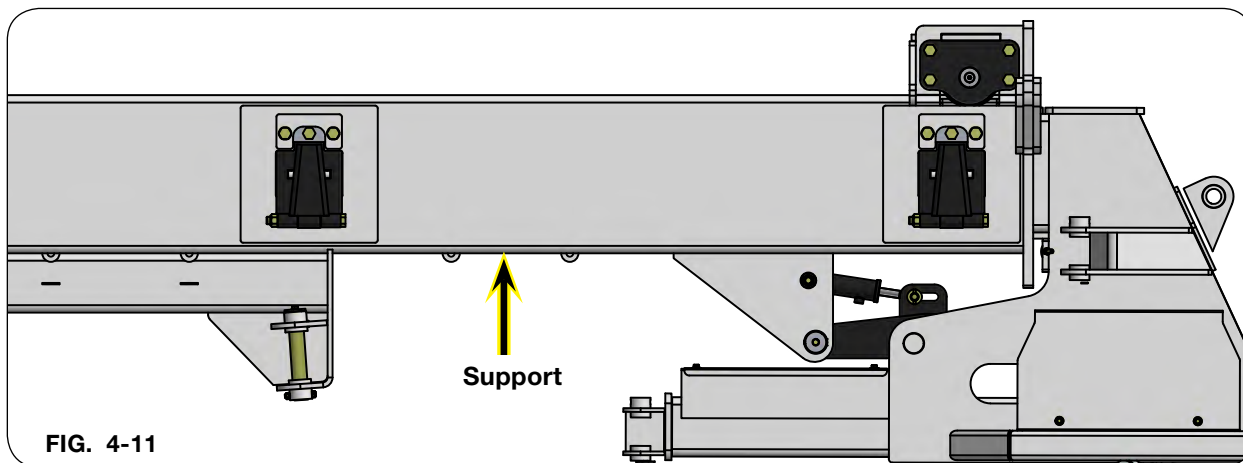
6. Reattach the side panel weldments (602435B and 602439B) with the 3/8"-16UNC x 1" capscrews (9390-055) and 3/8"-16UNC locknuts (9928) previously removed. (FIG. 4-10)



Roller Assembly Replacement (continued)

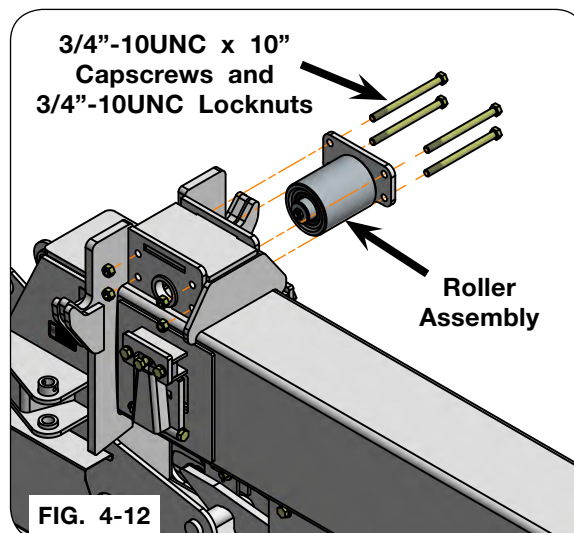
Front Roller Assembly Replacement

1. Using the hydraulic jack, raise the tongue a few inches off the tractor drawbar. Place a support stand rated at a minimum of 6,000 lbs. under the main frame weldment. Lower the hydraulic jack allowing the support stand to fully carry the main frame. Ensure there is no weight remaining on the roller. Shut off the tractor engine, set the parking brake, and remove the ignition key. (FIG. 4-11)



NOTE: Avoid pinching hydraulic hoses when adding support under main frame weldment.

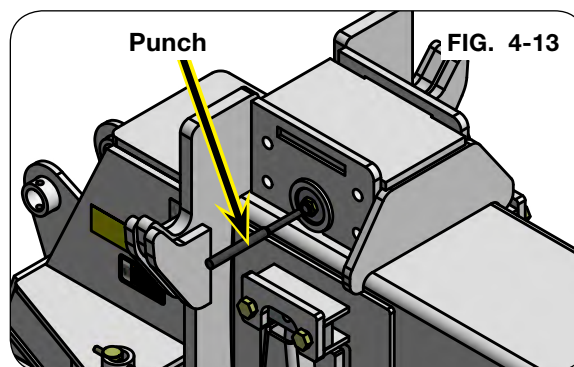
2. Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-12)



NOTE: If necessary, use a punch on the end of the spindle to help drive the assembly. (FIG. 4-13)

NOTE: If replacing roller assembly components, refer to "Roller Component Replacement".

3. Replace roller assembly (602186B) and retain into position with the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) previously removed. (FIG. 4-12)



Roller Assembly Replacement (continued)

Roller Component Replacement

1. Pack bearing and cavity. Fill with high quality extreme pressure grease (NLGI Grade 2).
2. Use grease to lubricate the seal lip. (FIG. 4-14)
3. Place the roller onto the roller spindle weldment. Rotate the roller while doing this so the seal lip does not fold under as the lip goes on the seal lip of the roller spindle weldment. (FIG. 4-14)
4. Be sure the outer bearing cone slides on the roller spindle weldment and into the bearing cup. (FIG. 4-14)
5. While rotating the roller, tighten the elastic jam nut to remove all play. (FIG. 4-14)
6. Turn the elastic jam nut 1/6" turn to seat. (FIG. 4-14)

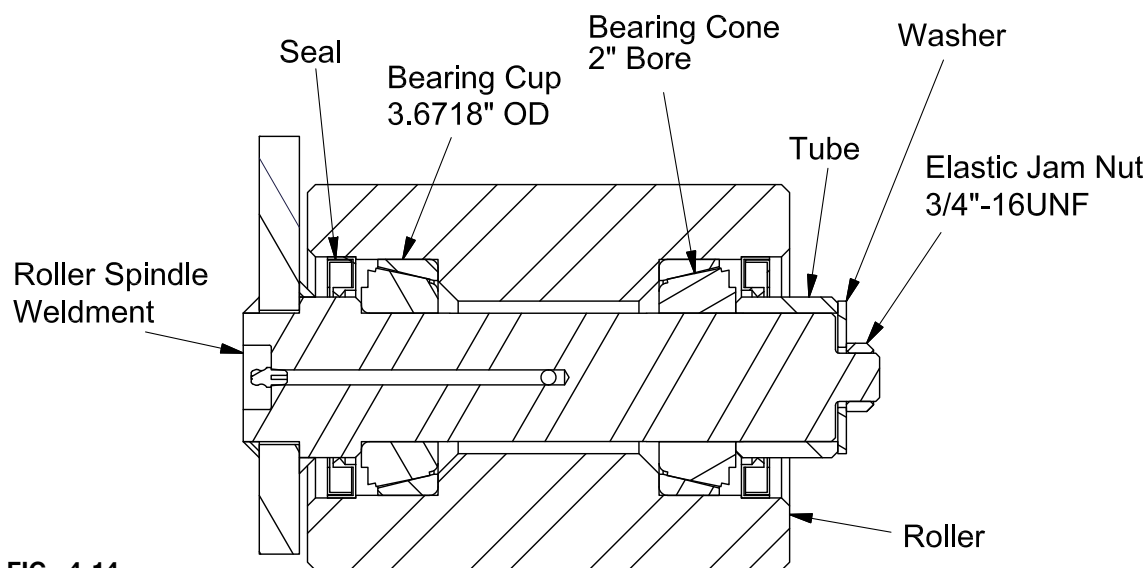


FIG. 4-14

TerrainPro2 Row Unit

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

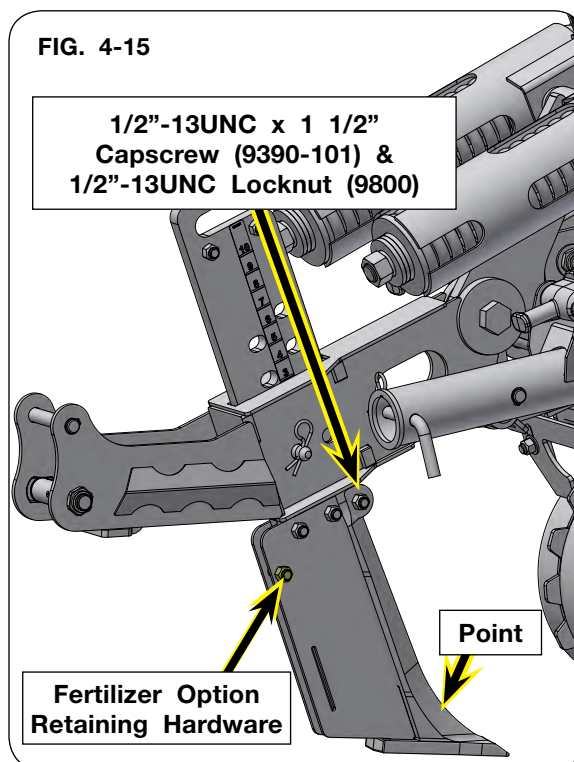
CAUTION

- SHARP EDGES ON THE MACHINE CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND THE MACHINE.

The shank has replaceable wear plates and point, which after a period of time will need to be replaced (FIG. 4-10). To replace these components on your machine, refer to the following guidelines:

Point & Wear Plates Replacement

1. With the Raptor implement attached to a tractor, find a firm, level surface and unfold the wings. Lower the machine until the points are 1"-2" off ground. Shut off the tractor engine, set the parking brake, and remove the ignition key.
2. If applicable, remove and save the fertilizer option 1/2"-13UNC x 1 1/2" capscrew (9390-101) and 1/2"-13UNC locknut (9800). (FIG. 4-15)
3. Loosen the center wear plates 1/2"-13UNC x 1 1/2" capscrews (9390-101) and 1/2"-13UNC locknuts (9800). (FIG. 4-15)
4. Remove and save the 1/2"-13UNC x 1 1/2" capscrew (9390-101) and 1/2"-13UNC locknut (9800). (FIG. 4-15)
5. Remove the point (601983B). (FIG. 4-15)



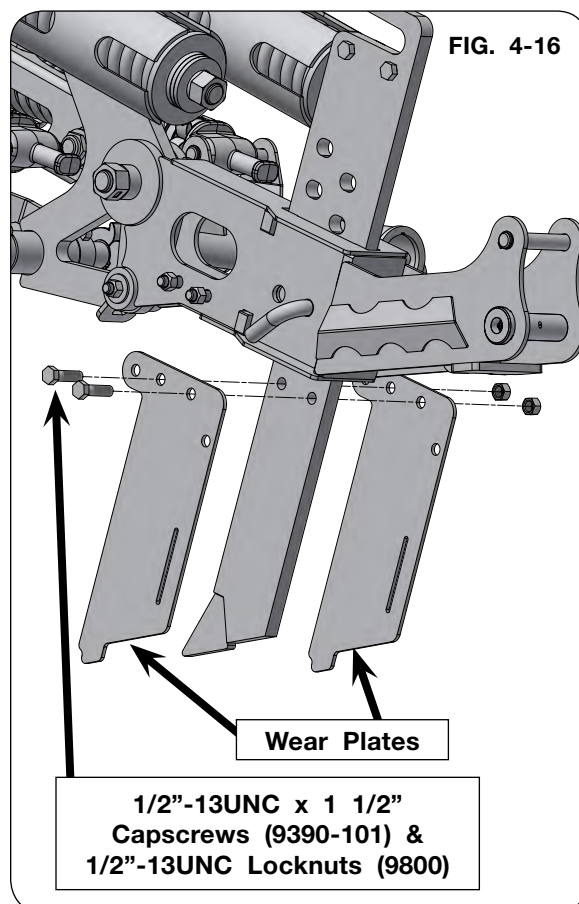
TerrainPro2 Row Unit (continued)

6. If replacing wear plates, continue with step 7 otherwise skip to step 9.

7. Remove the wear plate 1/2"-13UNC x 1 1/2" capscrews (9390-101) and 1/2"-13UNC locknuts (9800). (FIG. 4-16)

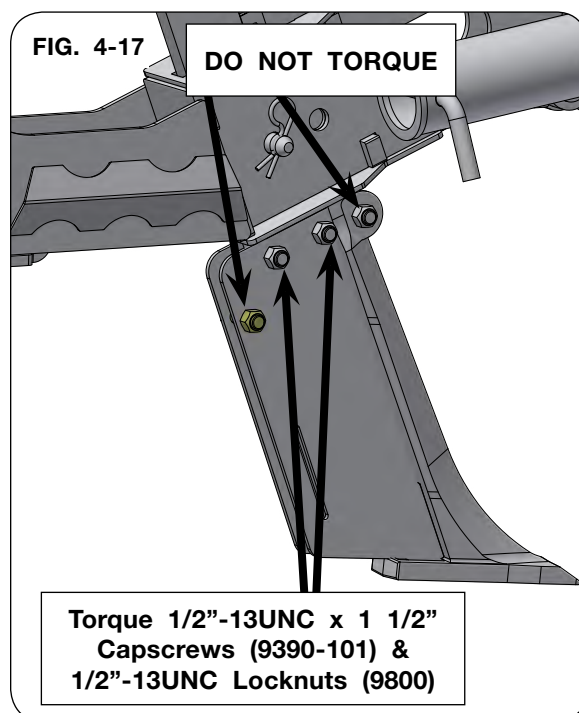
8. Replace wear plates (604842B) and loosely secure with previously removed 1/2"-13UNC x 1 1/2" capscrews (9390-101) and 1/2"-13UNC locknuts (9800). (FIG. 4-16)

9. Install point (601983B) and secure with previously removed 1/2"-13UNC x 1 1/2" capscrew (9390-101) and 1/2"-13UNC locknut (9800) (FIG. 4-16). **DO NOT TORQUE HARDWARE.**



10. If applicable, install the fertilizer option and secure with 1/2"-13UNC x 1 1/2" capscrew (9390-101) and 1/2"-13UNC locknut (9800) (FIG. 4-17). **DO NOT TORQUE HARDWARE.**

11. Torque the center wear plates 1/2"-13UNC x 1 1/2" capscrews (9390-101) and 1/2"-13UNC locknuts (9800) according to "Torque Chart" in MAINTENANCE section. (FIG. 4-17)



TerrainPro2 Row Unit (continued)

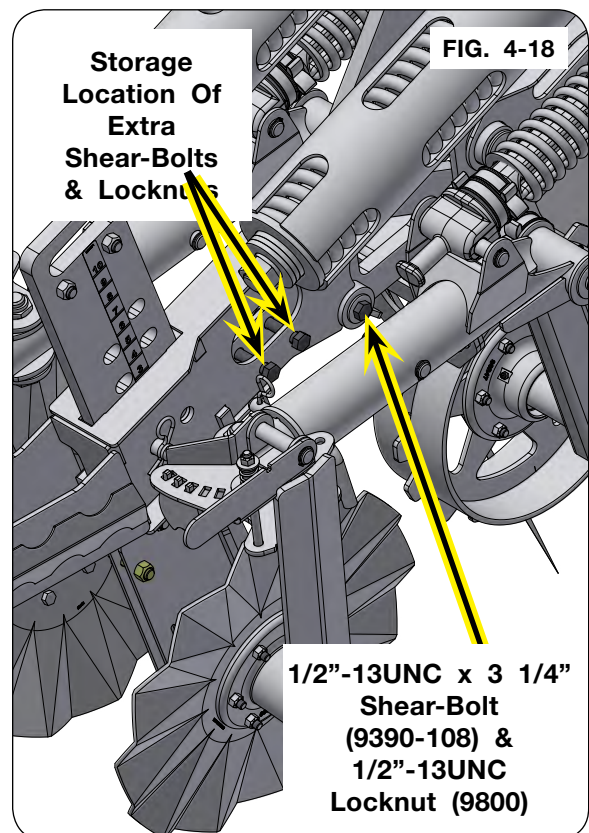
Shear-Bolt Replacement

The shear-bolt should shear only when the shank encounters an obstacle.

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.

1. With the Raptor implement attached to a tractor, find a firm, level surface and unfold the wings. Lower the machine until the points are 1"-2" off ground. Shut off the tractor engine, set the parking brake, and remove the ignition key.
2. Remove any remaining portions of the shear-bolt from the assembly. Inspect shear-bolt holes. Severely distorted holes will result in shorter shear-bolt life and should be repaired or replaced.
3. Remove a new shear-bolt from the storage location. (FIG. 4-18)
4. Align the hole in the shank mount bracket to the hole in the shank trip bracket.
5. Insert the new shear-bolt. Tighten nut on the shear-bolt until snug. Do not torque to specification. Tightening the shear-bolt will prevent proper trip function."



TerrainPro2 Row Unit (continued)

Lead Coulter Spring Replacement

The following guidelines are for replacing the spring on the coulters.

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

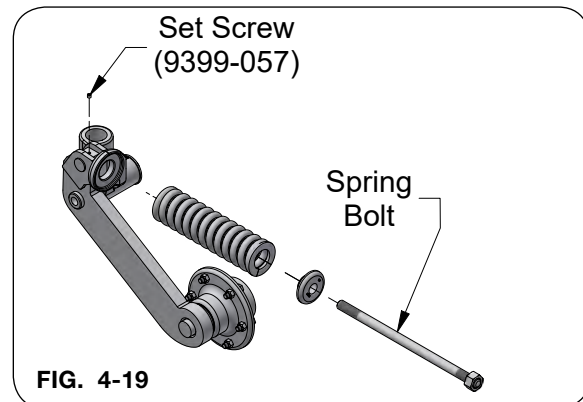
CAUTION

- SHARP EDGES ON COULTER BLADES CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND COULTER BLADES.

IMPORTANT

- *The spring should only be adjusted when repairs are being made. The springs have been preset before leaving the factory.*

1. Loosen the set screw retaining the spring bolt on the coulters arm (FIG. 4-19).
2. Slowly unscrew the spring bolt which will relieve spring pressure (FIG. 4-19).
3. Once the bolt is removed, replace with new spring and re-insert bolt.

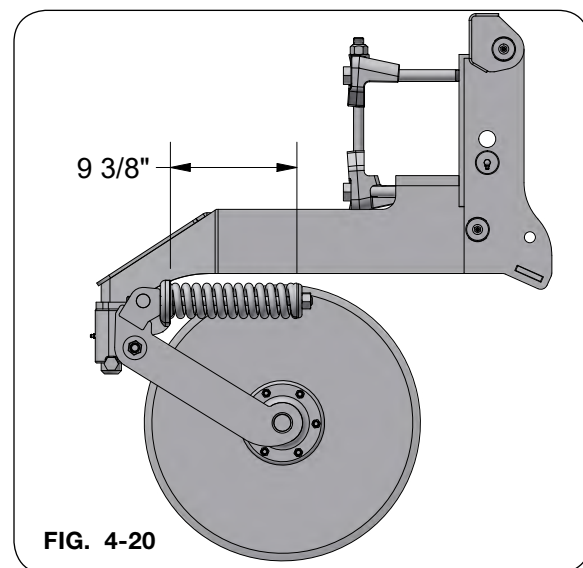


4. Tighten bolt until the spring is compressed to 9 3/8" (FIG. 4-20).

The coulters springs are preset at the factory to 9 3/8". This measurement is the total amount of exposed spring.

NOTE: Adjusting the spring below 9 3/8" could cause premature part failure and void any warranty considerations.

5. Tighten set screw to secure bolt.



Hub Adjustment and Replacement For Lead Coulters and Closing Coulters

Park the unit on a firm, level surface. Block the wheels on the machine to keep it from moving. Set the vehicle parking brake, lower parking stands, shut-off the engine, and remove the ignition key.

After the first 100 acres, the hubs should be checked for tightness and wear.

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

CAUTION

- SHARP EDGES ON COULTER BLADES CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND COULTER BLADES.

IMPORTANT

- Do not allow dirt and debris to contaminate the hub and its internal components. Neglecting to do so could result in failure of the hub and its components due to excessive wear.

1. Remove the blade.
2. Attach a C-clamp and apply pressure to both sides of the coultter hub (FIG. 4-21).



FIG. 4-21

3. Remove the retaining ring and hub cap. Refer to FIG. 4-22.

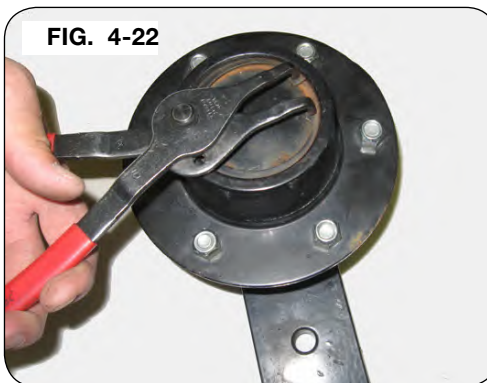


FIG. 4-22

Hub Adjustment and Replacement For Lead Coulters and Closing Coulters (continued)

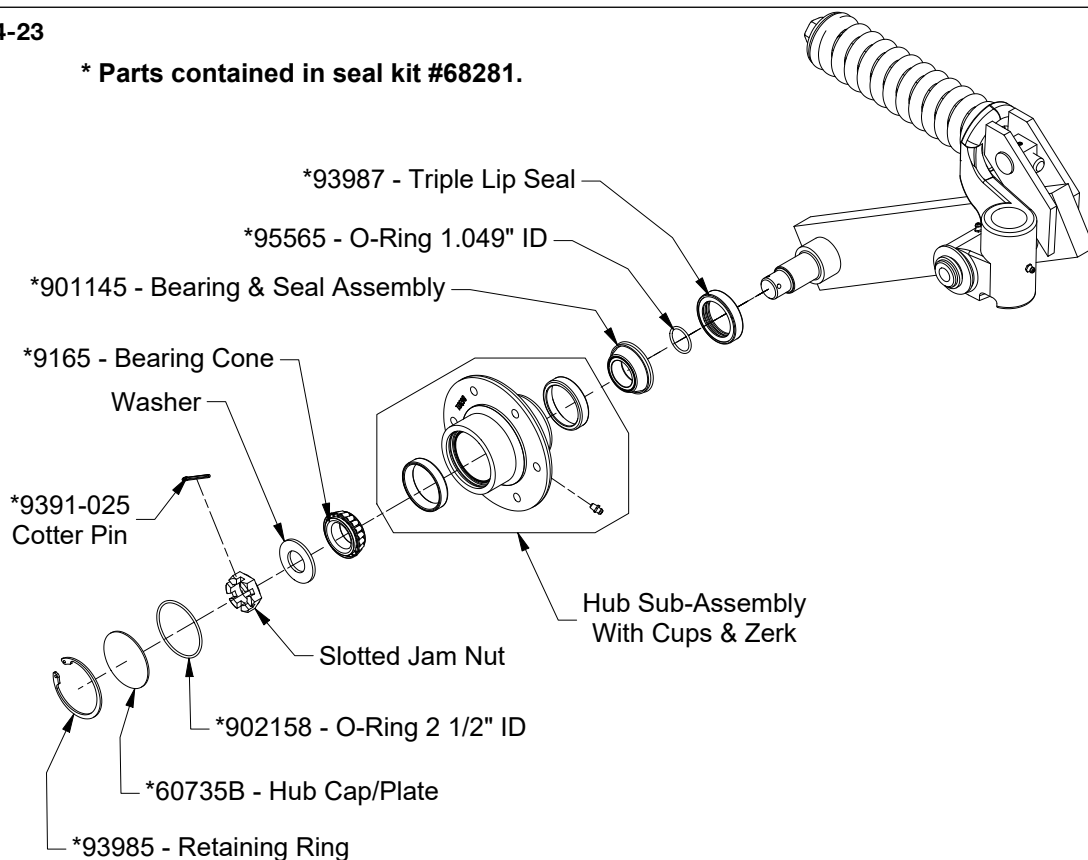
4. Remove the cotter pin securing the slotted nut.
5. Unscrew the nut and carefully remove the hub from the spindle.
6. Remove the components, clean and inspect for any damage or wear. If even the slightest imperfection exists, replace the component(s). Once the hub is dismantled, always replace the bearing and seal assembly, O-ring, and triple lip seal.

IMPORTANT

- Always replace the O-rings and seals if dismantling the hub. Failure to do so could result in premature failure of the hub and its components.

FIG. 4-23

* Parts contained in seal kit #68281.



Hub Adjustment and Replacement For Lead Coulters and Closing Coulters (continued)

7. Replace any damaged parts before reassembling the components. Be sure to remove any debris or dirt and repack the bearings with an SAE approved hub grease.
8. Slide the O-ring onto the spindle first.
9. Use grease to lubricate seal.
10. While rotating hub, slide the hub, seal, and bearing onto spindle. Make sure not to damage seal. Be sure outer bearing and washer slide on the spindle and bearing seats in the cup.
11. Assemble nut to spindle. While rotating hub, tighten nut to 40 Ft.-Lbs. Do not rotate hub again until step 15.

IMPORTANT

- *Rotate the coultter hub when torquing the slotted nut. Doing this will prevent flats from forming on the bearings.*

12. Back off nut until it becomes loose without rotating hub.
13. Finger tighten nut without rotating hub.
14. Tighten nut to align the next notch with hole in the spindle.
15. Check for looseness in the hub. It should not wiggle. If it does, tighten the nut one more slot and repeat this step.
16. Check hub rotation for excessive drag. There should be slight resistance. If there is excessive drag, repeat procedure starting at step 11.
17. Install cotter pin and verify it has clearance to the hub cap. Cotter Pin should be tight to nut/spindle.
18. Add moly scent 2 grease through hub zerk until grease extends above the washer all around the cavity.
19. Reinstall the hub cap and blade. Use a C-clamp to compress dust cap and then seat retaining ring.

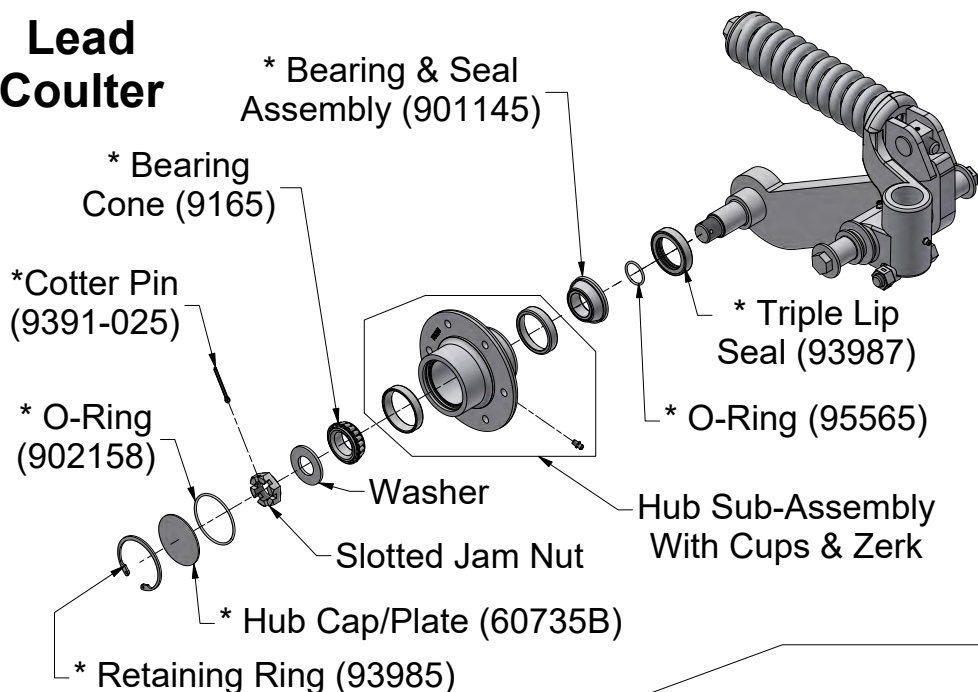


Hub Adjustment and Replacement For Lead Coulters and Closing Coulters (continued)

NOTE: Be sure to re-pack bearings with an SAE approved grease and keep it and its components free of dust and debris.

* Parts contained in seal kit #68281

Lead Coulters



Closing Coulters

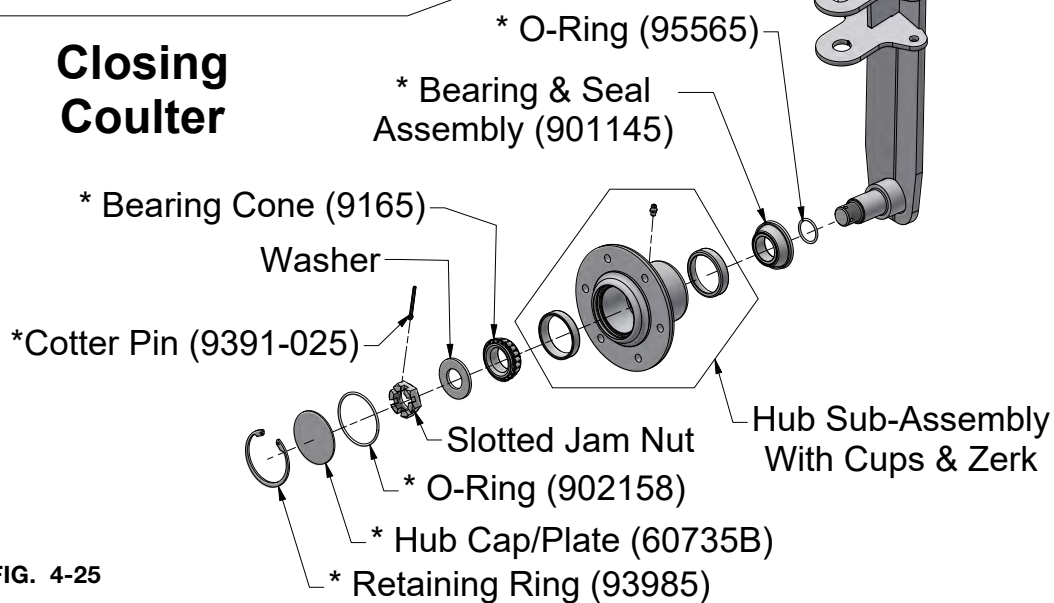


FIG. 4-25

Row Cleaner Wheel Hub Adjustment

After the first 100 acres, the hubs should be checked for tightness and wear.

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING THE IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

CAUTION

- SHARP EDGES ON COULTER BLADES CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND COULTER BLADES.

IMPORTANT

- *Do not allow dirt and debris to contaminate the hub and its internal components. Neglecting to do so could result in failure of the hub and its components due to excessive wear.*
1. Check the row cleaner wheel hub and bearing for looseness or wobble. Rotate and laterally push and pull on the row cleaner wheel. A tight hub will have no wobble and will rotate smoothly with a slight resistance.
 2. If there is wobble in the hub, the hub must be tightened to the spindle. To do this, remove hub cap/plate (60735B). Remove the cotter pin (9391-025) and torque nut (94795) to 40 ft.-lbs.
 3. After tightening, retest the hub for wobble by repeating Step #1. If no wobble exists, reattach the cotter pin (9391-025) and hub cap/plate (60735B). If wobble still exists, continue with the following steps.
 - a. Remove the slotted jam nut (94795) and washer/bushing (94800) from the spindle.

IMPORTANT

- *When removing the hub and its components, be sure to keep them free of debris and dirt. Failure to do so will result in contamination of hub and bearing failure.*
- b. Remove the bearing cones, hub with sawtooth blade, O-ring and seals from the spindle.
 - c. Remove the components, clean, and inspect for any damage or wear. If even the slightest imperfection exists, replace the component(s). Once the hub is dismantled, always replace the bearing and seal assembly, o-ring, and triple lip seal.

IMPORTANT

- *Always replace the seal if dismantling the hub. Failure to do so could result in premature failure of hub and its components.*
- d. Replace any damaged parts before reassembling the components. Be sure to remove any debris or dirt and repack bearings with an SAE approved hub grease.
 - e. Assemble O-ring (95565) onto spindle.
 - f. Apply grease to lubricate the seal (901145).

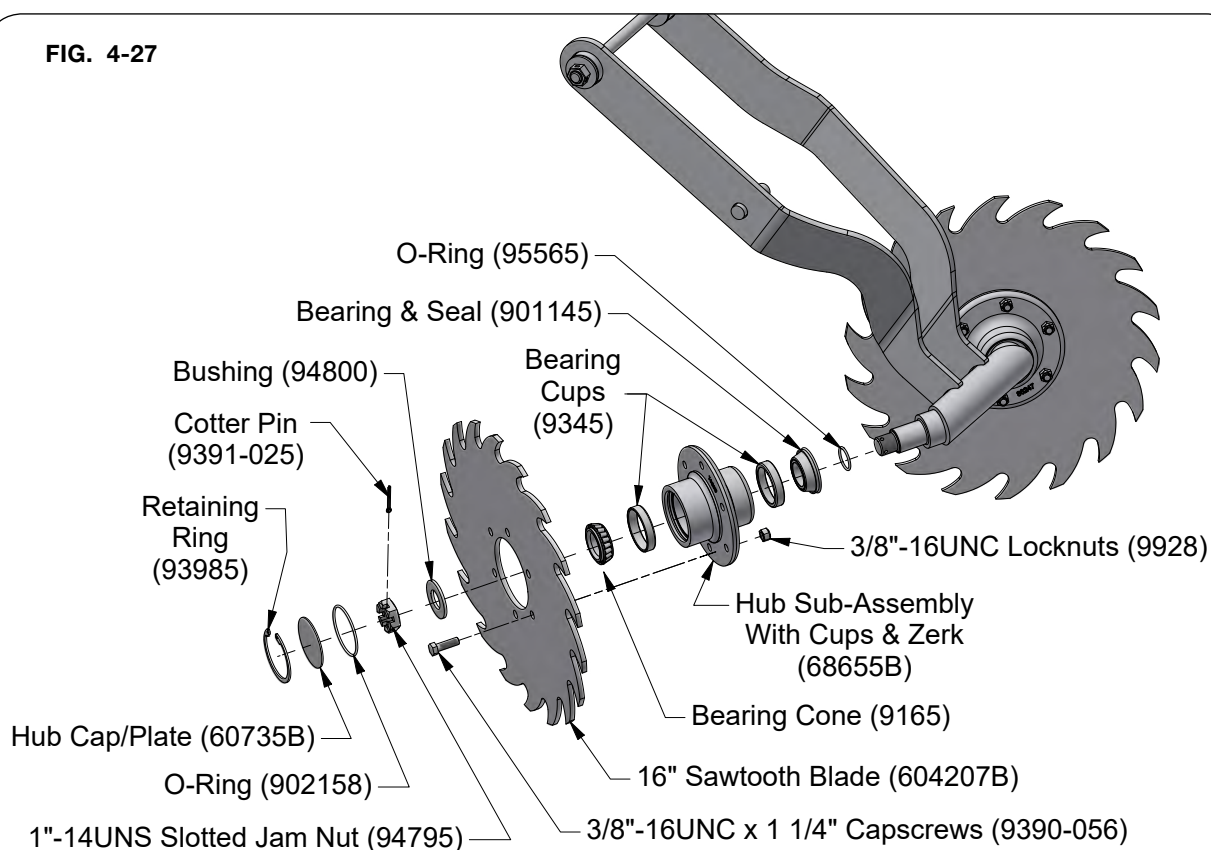
Row Cleaner Wheel Hub Adjustment (continued)

- g. While rotating the hub, slide the hub, seal, and bearing onto the spindle. Make sure not to damage the seal. Be sure the outer bearing and washer/bushing slide on the spindle and bearing seats in the cup.

IMPORTANT

- Rotate coultter hub when torquing jam nut. Doing this will prevent flats from forming on bearings.
- h. Assemble slotted jam nut (94795) to spindle. While rotating hub, tighten nut to 40 Ft.-Lbs. DO NOT rotate hub again until step l.
- i. Back-off slotted jam nut (94795) until it becomes loose without rotating hub.
- j. Finger tighten slotted jam nut without rotating hub.
- k. Tighten slotted jam nut to align the next notch with hole in the spindle.
- l. Check for looseness in the hub. It should not wiggle. If it does, tighten the slotted jam nut one more slot and repeat this step.
- m. Check hub rotation for excessive drag. There should be a slight resistance. If there is excessive drag, repeat procedures starting with step h.
- n. Install cotter pin (9391-025). It should be tight to nut/washer.
- o. Add grease through hub zerk until grease extends above the washer all around cavity.
- p. Install O-ring (902158), hub cap (60735B), and retaining ring (93985).
- q. Paint hub cap and retaining ring.

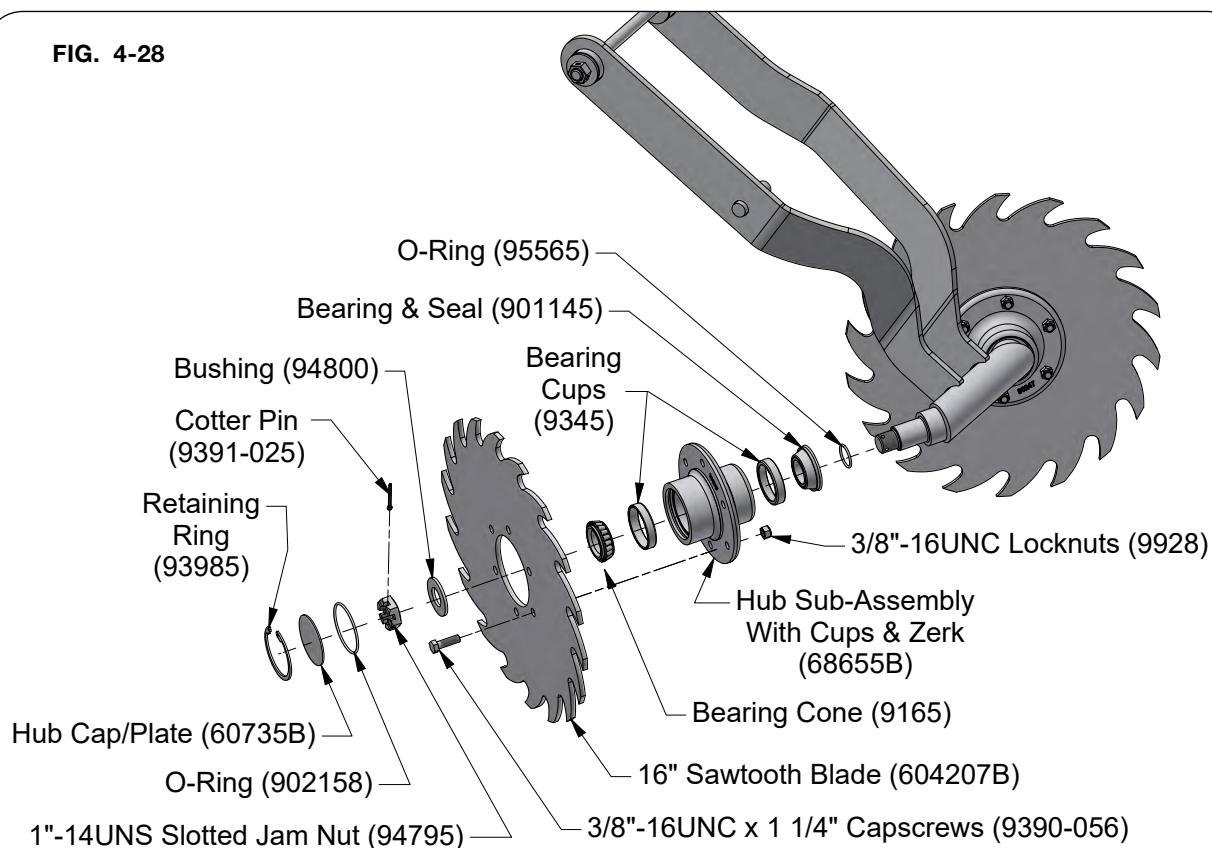
FIG. 4-27



Row Cleaner Wheel Replacement

1. To replace a worn sawtooth blade (604207B), remove and save the 3/8"-16UNC locknuts (9928) and 3/8"-16UNC x 1 1/4" capscrews (9390-056). (FIG. 4-28)
2. Replace and reinstall sawtooth blade (604207B) and hardware. (FIG. 4-28)

FIG. 4-28



Daily Service

Beginning of Day

NOTE: Before initial use, ensure all lubrication points have been greased.

Check all U-bolts and bolts for tightness. This is especially important during the first days of operation. See “Torque Chart” in this section.

Perform any daily lubrication outlined in “Lubrication” in this section.

Check stabilizer tire air pressure and inflate to correct pressure, if necessary.

IMPORTANT

- *To assure level penetration of shanks, both tires must be inflated to the same pressure.*

End of Day

Clean off dirt and residue which may have accumulated on implement during operation.

Check implement for damage which could have occurred during operation, and repair.

Annual Service

Beginning of Season



- **READ AND UNDERSTAND SAFETY RULES BEFORE OPERATING OR SERVICING THIS MACHINE. REVIEW "SAFETY" SECTION IN THIS MANUAL IF NECESSARY.**

Check all bolts, U-bolts, and wheel bolts for tightness. Refer to “Torque Chart” in this section.

Lubricate implement (see “Lubrication” in this section).

Check air pressure in tires and inflate to correct pressure if necessary (see “Daily Service” in this section).

End of Season

Your implement is an important investment. Spend a little time to protect it from destructive rust and corrosion. You will be repaid in longer service life and better performance.

Perform the following before placing the implement in storage:

1. Remove dirt and residue which could cause rusting.
2. Repaint any chipped or scraped areas.
3. Lubricate implement (see “Lubrication” in this section).
4. Coat all earth moving surfaces with grease or suitable rust preventatives.
5. Inspect for damaged parts. Replace before next season.
6. Store implement inside, away from livestock.
7. Use support stands to keep implement tires and points up off bare ground.
8. Replace all worn, torn or faded decals and reflectors.

PULL-TYPE RAPTOR — Maintenance

Troubleshooting

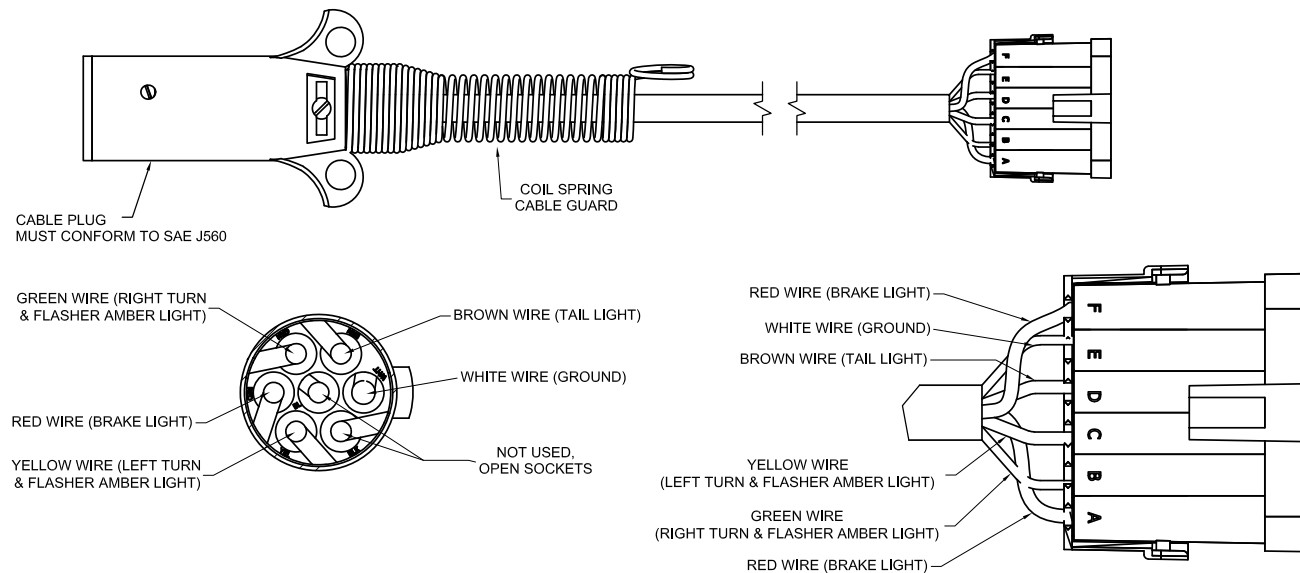
PROBABLE CAUSE	CORRECTION
Poor Penetration	
Frame is not level	See the OPERATION section "Leveling Frame" for instructions
Ground is too hard for hitch control setting	Adjust the hitch control position. See the OPERATION section "Load and Depth control"
Worn or dull tool points	Replace with new tool points
Plugging	
Poor field conditions	Wait until the field is dry enough to till properly without excessive slippage
Machine not level	Level Machine
Coulter blades not cutting residue	Wait until the field is dry enough to allow blades to cut through residue
Implement Running Crooked In Field	
Shanks are not spaced correctly	See "Overhead Layouts" for correct spacing of the shanks
Stabilizer wheels are not adjusted equally from side-to-side	Check the side-to-side adjustment and tire pressure
Tractor tires are not properly spaced or equally inflated	Find the cause and correct. See OPERATION section "Wheel Spacing"

Troubleshooting (continued)

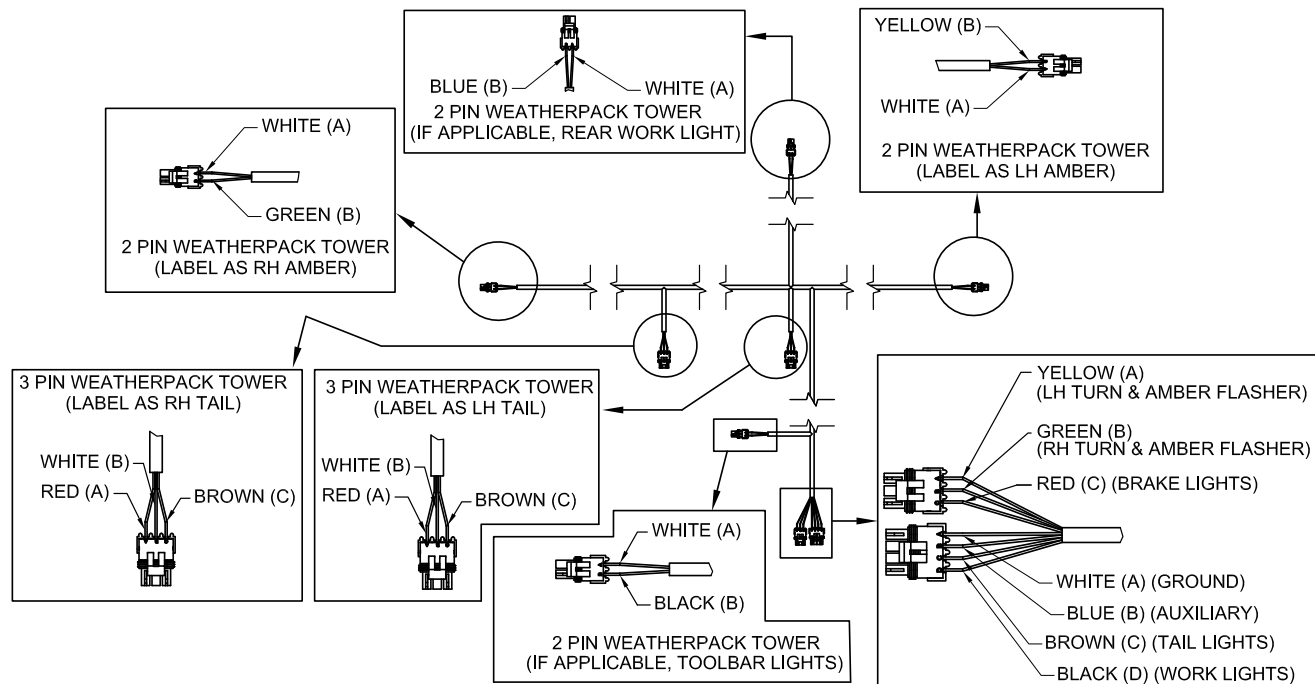
PROBABLE CAUSE	CORRECTION
Shanks Not Resetting Into Ground After Tripping	
Ground conditions hard or the unit is being operated very deep	While moving, raise Raptor slightly to reset, then lower and resume operation
Excessive Soil Disturbance	
Main frame not level, running downhill	Level main frame
Dry soil conditions	Wait for additional rain
Running implement too fast	Slower speeds create less disturbances
Too much sealing	Decrease closing down pressure, decrease coulters angle or move coulters apart
Not enough sealing	Increase closing down pressure, increase coulters angle or move coulters closer
Folding	
Toolbars will not fold up	Adjust cam valve (Normally Closed) striker plate/bracket
Toolbars will not fold down	Fold up then fold down
Wings will not fold to transport position	Completely unfold the unit and then fold
Lift cylinders lower when folding wings into cradle	Adjust cam valve (Normally Open) striker plate/bracket

Schematics - Electrical

Electrical Harness - Main 480" (45000)

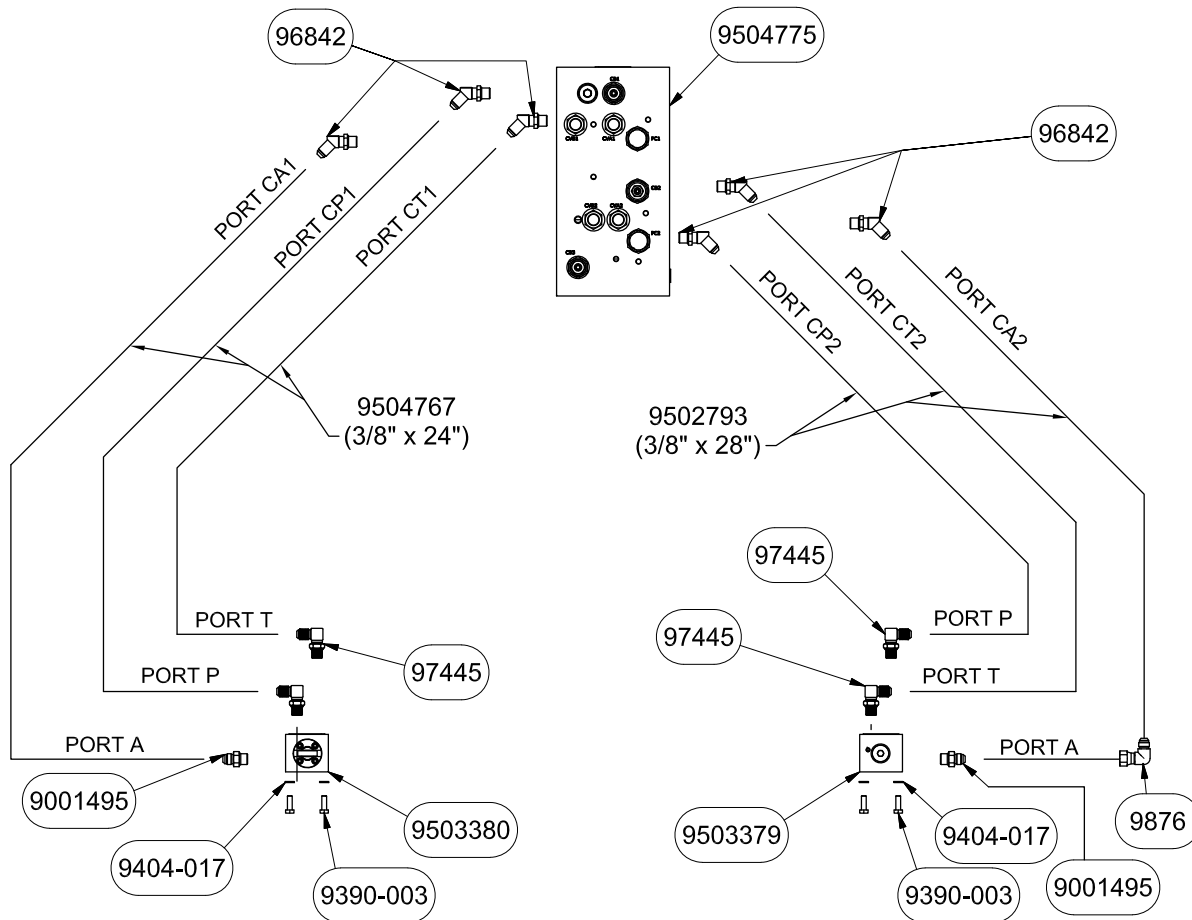


Electrical Harness - Light 418" (44999)



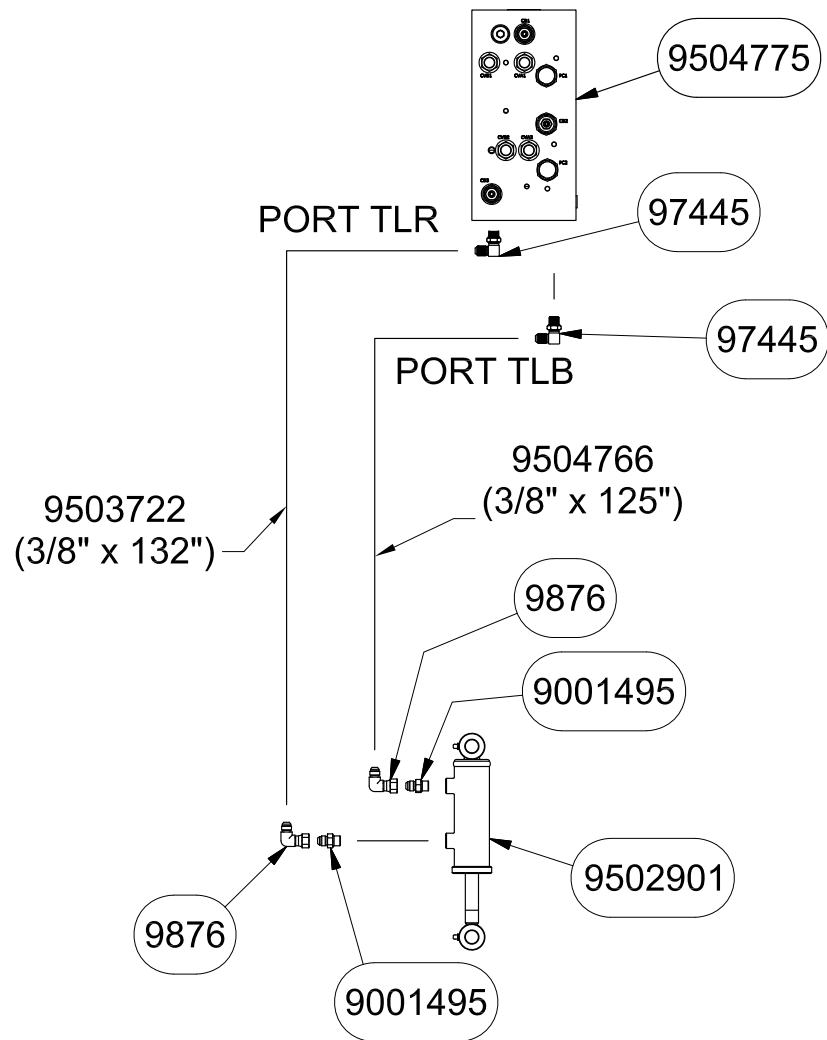
Schematics - Hydraulic (continued)

Supply Valve Assembly To Sequence Valves



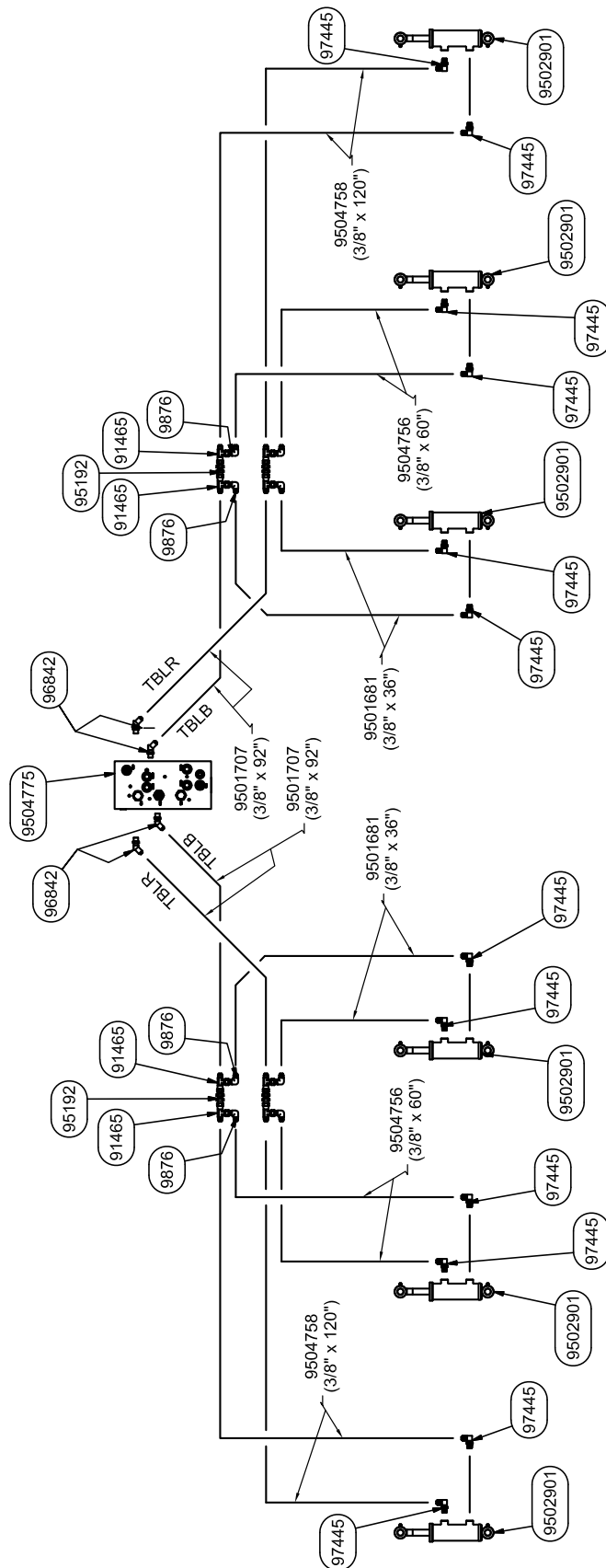
Schematics - Hydraulic (continued)

Supply Valve Assembly to Tongue Latch



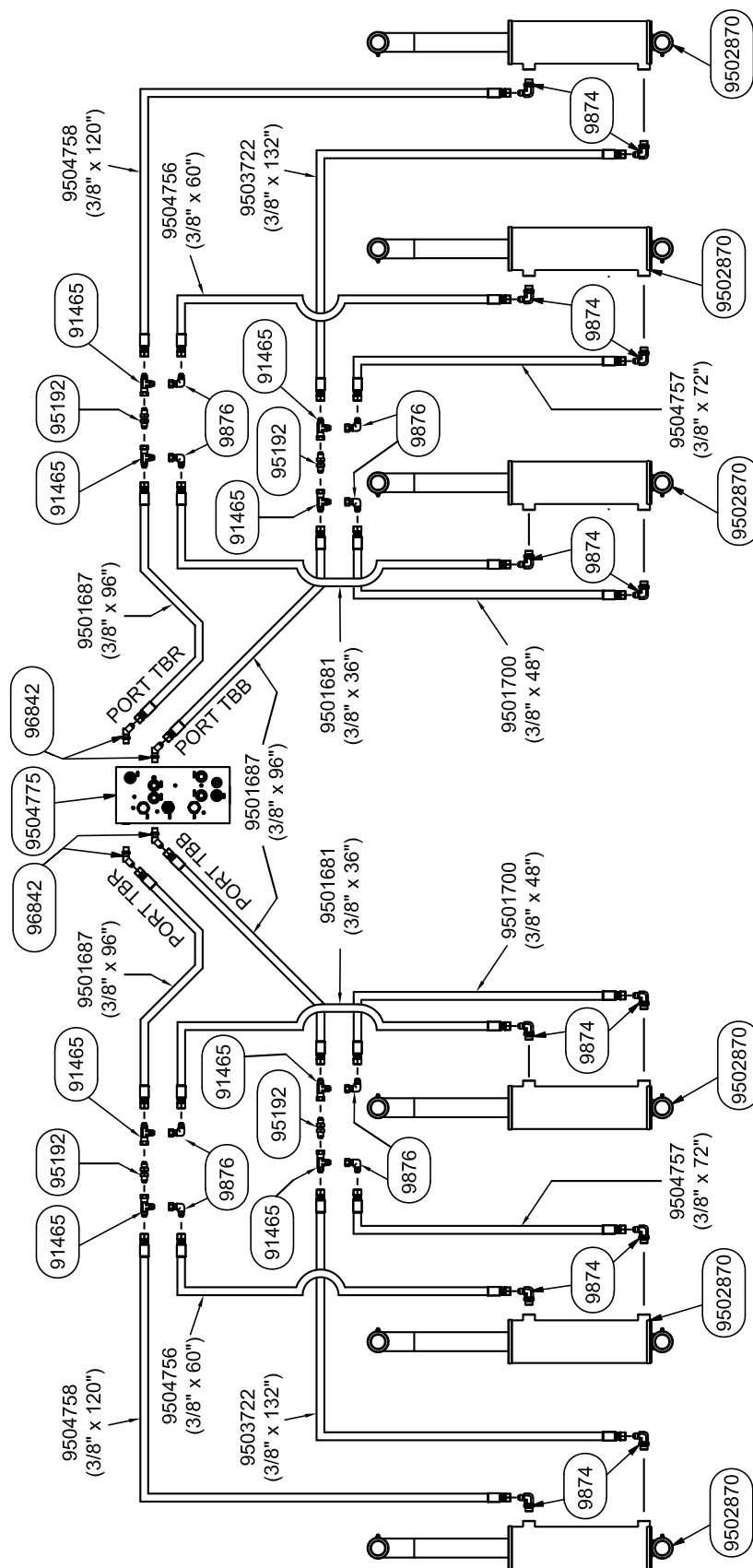
Schematics - Hydraulic (continued)

Supply Valve Assembly to Toolbar Latch



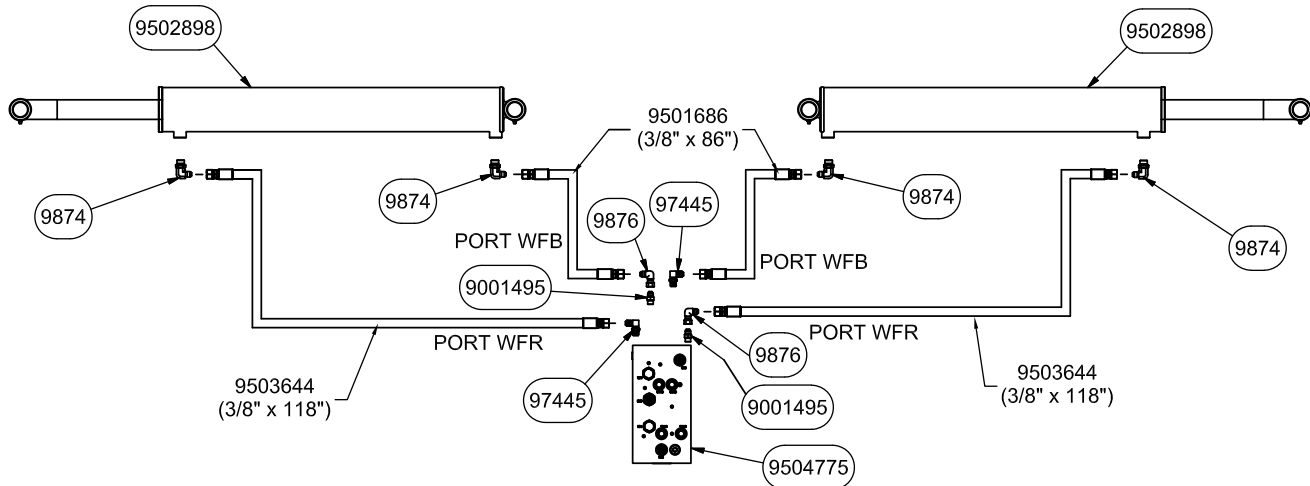
Schematics - Hydraulic (continued)

Supply Valve Assembly to Toolbar Fold



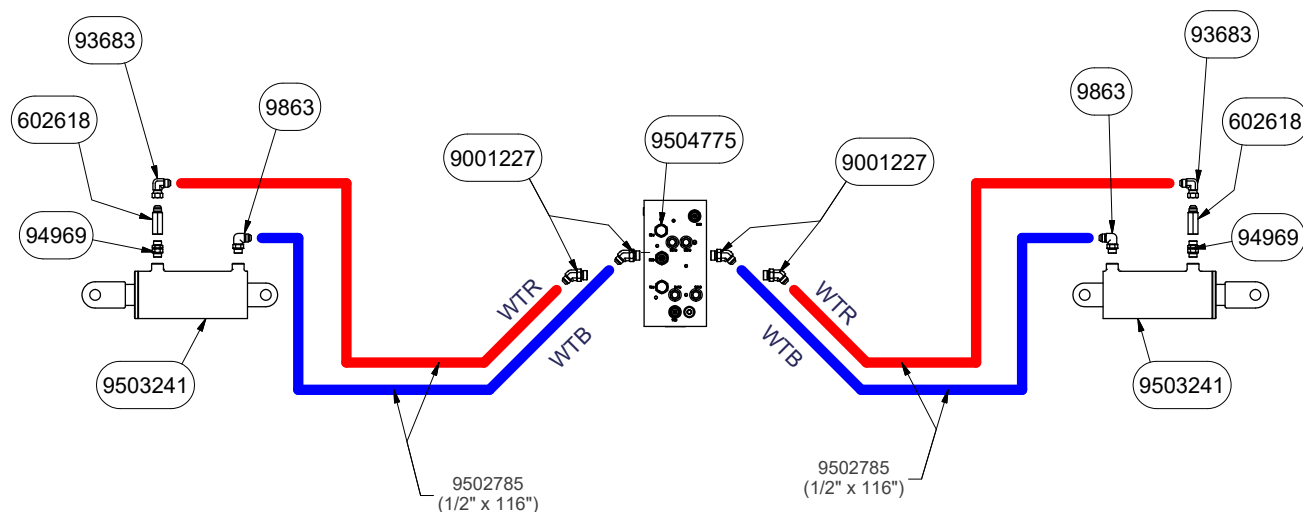
Schematics - Hydraulic (continued)

Supply Valve Assembly to Wings

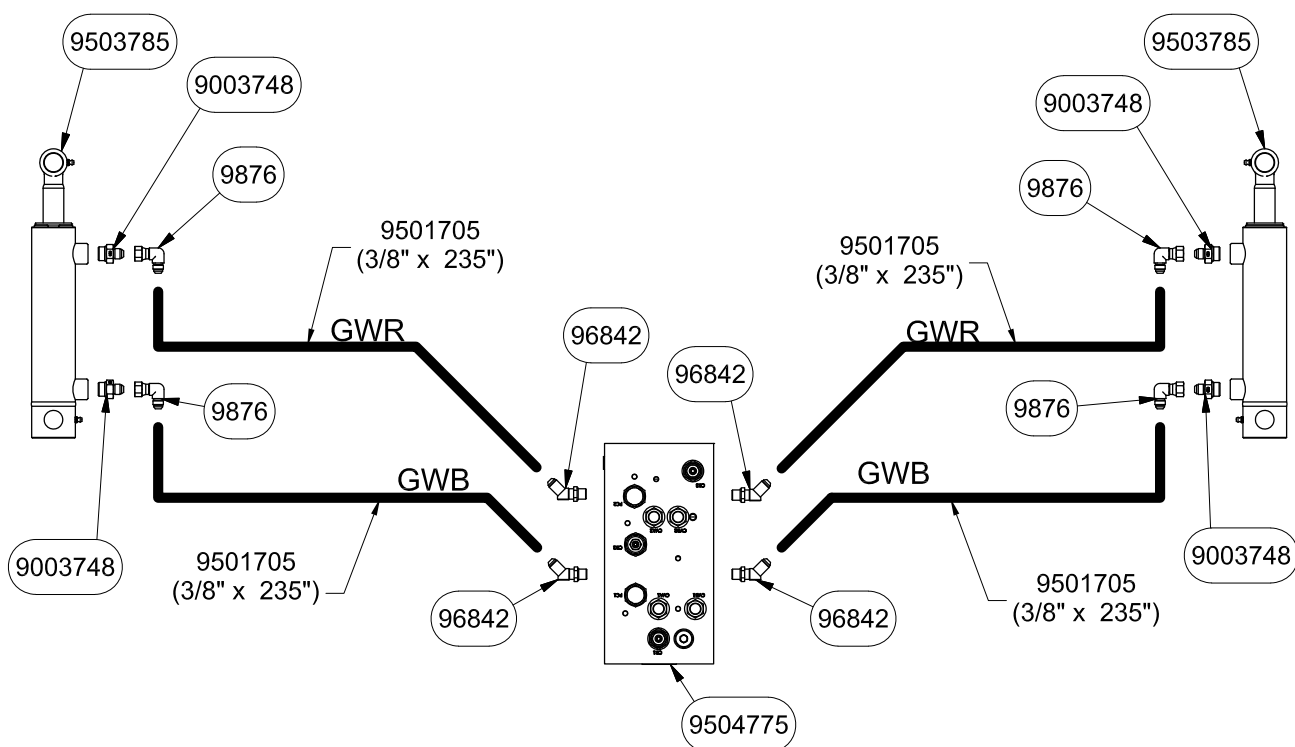


Schematics - Hydraulic (continued)

Supply Valve Assembly to Wing Tilt

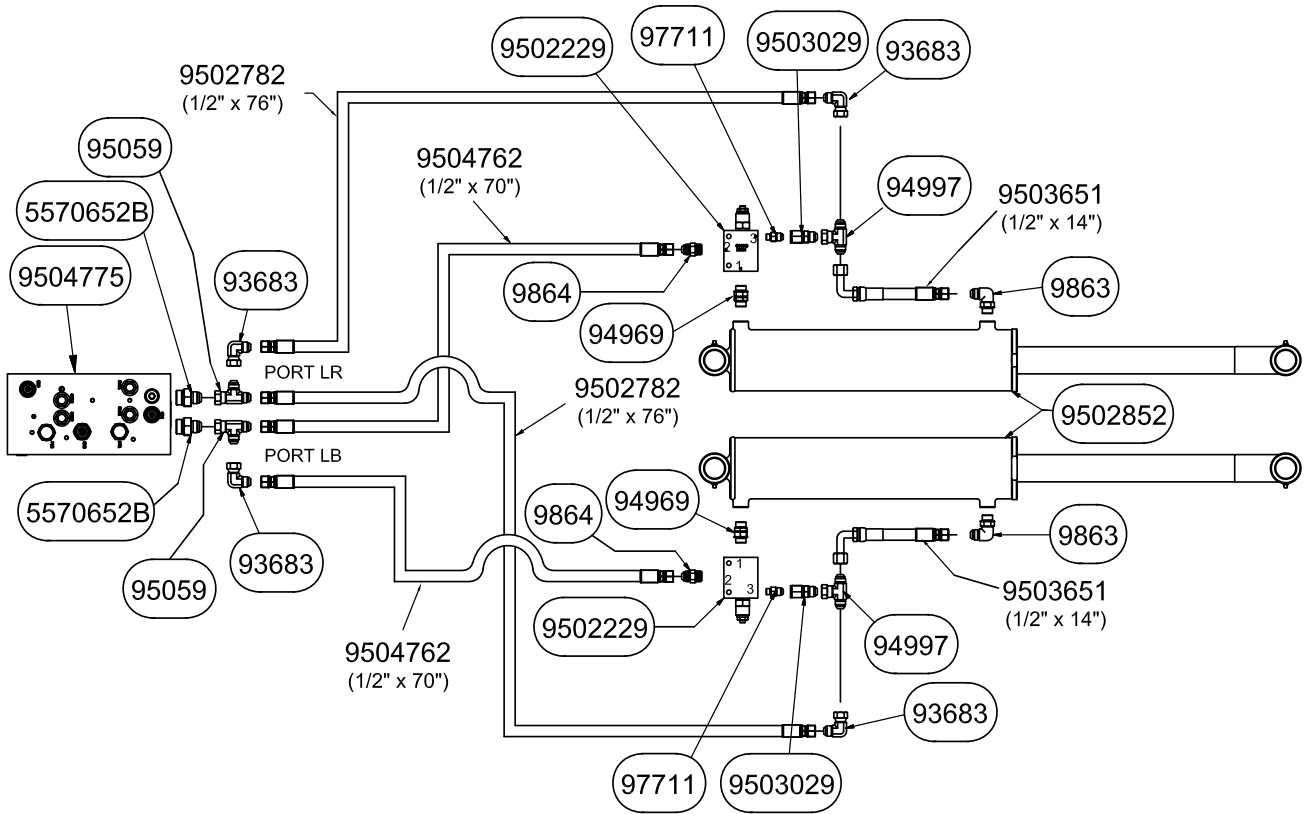


Supply Valve Assembly to Gauge Wheels



Schematics - Hydraulic (continued)

Supply Valve Assembly to Parallel Link/Main Lift-Lower



Wheel, Hub and Spindle Disassembly and Assembly

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 30,000 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

CAUTION

- IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. TORQUE WHEEL NUTS/BOLTS TO VALUES IN TABLE. CHECK TORQUE BEFORE USE, AFTER ONE HOUR OF UNLOADED USE OR AFTER FIRST LOAD, AND EACH LOAD UNTIL WHEEL NUTS/BOLTS MAINTAIN TORQUE VALUE. CHECK TORQUE EVERY 10 HOURS OF USE THERE-AFTER. AFTER EACH WHEEL REMOVAL START TORQUE PROCESS FROM BEGINNING. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.

IMPORTANT

- *Remove only one wheel and tire from a side at any given time in the following procedure.*
1. Hitch implement to tractor. Park on a firm, level surface. Set the tractor's parking brake, shut off engine and remove key.
 2. Use a safe lifting device rated at 30,000 lbs. to support the weight of your implement. Place the safe lifting device under the axle closest to the tire.
 3. Use a 300 lbs. safe lifting device to support the wheel and tire during removal.
 4. If only removing wheel and tire, skip to Step 8; otherwise continue with Step 4.



Remove the hardware retaining the hubcap. Next, remove the hubcap, gasket, cotter pin, castle nut and spindle washer. Remove hub with bearings from old spindle using a 200 lbs. lifting device.

Wheel, Hub and Spindle Disassembly and Assembly (continued)

5. Inspect the spindle and replace if necessary. If spindle does not need to be replaced, skip to Step 6; otherwise continue with Step 5.

Remove the bolt and lock nut that retain the spindle to the axle. Using a lifting device rated for 200 lbs., remove the old spindle. Coat spindle shaft with anti-seize lubricant prior to installation. Reuse bolt and lock nut to retain spindle to axle. Torque as outlined in Maintenance Section.

6. Remove seal and inspect bearings, spindle washer, castle nut and cotter pin. Replace if necessary. Pack both bearings with Extreme Pressure NLGI #2 grease and reinstall inner bearing. Install new seal in hub with garter spring facing inward to the hub by tapping on flat plate that completely covers seal while driving it square to hub. Install until flush with back face of hub. Using a 200 lb. rated lifting device, install hub assembly onto spindle. Install outer bearing, spindle washer and castle nut.

IMPORTANT

- *Do not use an impact wrench!*

7. Slowly tighten castle/slotted nut while spinning the hub until hub stops rotating. Turn castle nut counterclockwise until the hole in the spindle aligns with the next notch in castle nut. Hub should spin smoothly with minimal drag and no end play. If play exists, tighten to next notch of castle nut. If drag exists, then back castle nut to next notch. Spin and check again. Install cotter pin. Clean face for hub cap gasket and install gasket, grease- filled hub cap and retain hubcap with hardware removed. Tighten hubcap hardware in alternating pattern.
8. Attach the wheel(s) and tire(s) to the hub using the same rated safe lifting device for removal. Tighten wheel nuts to appropriate requirements and recheck as outlined in the Wheels and Tires section of this manual.
9. Raise implement, remove lifting device and lower tire to the ground.

Wheels and Tires

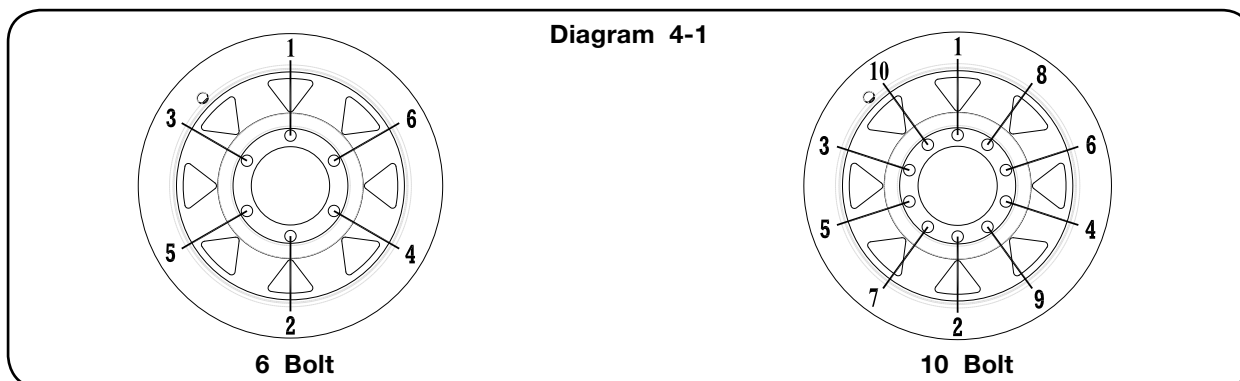
Wheel Nut Torque

CAUTION

- IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. TORQUE WHEEL NUTS/BOLTS TO VALUES IN TABLE. CHECK TORQUE BEFORE USE, AFTER ONE HOUR OF USE, AND EACH HOUR UNTIL WHEEL NUTS/BOLTS MAINTAIN TORQUE VALUE. CHECK TORQUE EVERY 10 HOURS OF USE THERE-AFTER. AFTER EACH WHEEL REMOVAL START TORQUE PROCESS FROM BEGINNING. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.

Failure to check torque before first use may damage wheel nut/bolt seats. Once seats are damaged, it will become impossible to keep nuts/bolts tight. Tighten nuts/bolts to applicable torque value shown in table. Start all nuts/bolts by hand to prevent cross threading. Torque nuts/bolts in the recommended sequence as shown in Diagram 4-1.

WHEEL HARDWARE	
SIZE	FOOT-POUNDS
9/16"-18 (UNF)	110 Ft.-Lbs.
7/8"-14 (UNF)	450 Ft.-Lbs.
M22-2.5P	450 Ft.-Lbs.



Tire Pressure

- The following is to be used as a general guide for tire inflation and figures can vary depending on specific brand of tire used. It is important that tires are inspected after unit is loaded. Start with minimum pressure indicated. The tire should stand up with no side-wall buckling or distress as tire rolls. Record the pressure needed to support the full load and maintain this pressure to achieve proper tire life. Do not exceed maximum recommended tire pressure.

TIRE	INFLATION
240/80R15F - 121D	max. 46 PSI
380/90R46 R-1W - 159A8	max. 58 PSI

(All tire pressures in psi)

Wheels and Tires

Tire Warranty

For questions regarding new tire warranty, please contact your local original equipment tire dealer. Used tires carry no warranty. Following are phone numbers and Websites for your convenience:

Firestone www.firestoneag.com
Phone 800-847-3364

Titan www.titan-intl.com
or Phone 800-USA-BEAR
Goodyear Fax 515-265-9301

Carlisle www.carlisletire.com
Phone 800-260-7959
Fax 800-352-0075

Greenball www.greenball.com
Phone nearest location:
California 800-937-5204
Georgia 800-283-4569
Florida 800-935-0200
Indiana 800-426-4068
Tennessee 800-946-9412
Ohio 800-840-7295
Pennsylvania 800-869-6787

Complete Torque Chart

Capscrews - Grade 5

NOTE:

- Grade 5 capscrews can be identified by three radial dashes on the head.
- For wheel torque requirements, refer to Wheels and Tires.
- Tighten U-bolts evenly and equally to have the same number of threads exposed on each end.



SIZE	FOOT POUNDS	NEWTON METERS
1/4-20 1/4-28	8-10 9-11	11-13 12-15
5/16-18 5/16-24	15-17 17-19	20-23 23-26
3/8-16 3/8-24	25-28 28-31	34-38 38-42
7/16-14 7/16-20	40-45 45-50	54-61 61-68
1/2-13 1/2-20	62-68 68-75	84-92 92-102
9/16-12 9/16-18	90-98 100-110	122-133 134-148
5/8-11 5/8-18	120-135 124-137	162-183 168-186
3/4-10 3/4-16	200-220 210-230	270-300 285-310
7/8-9 7/8-14	330-350 360-380	425-475 460-515
1-8 1-14	500-525 540-560	675-710 730-760
1 1/8-7 1 1/8-12	600-635 665-700	815-860 920-950
1 1/4-7 1 1/4-12	850-895 940-990	1150-1215 1275-1340
1 3/8-6 1 3/8-12	1125-1175 1280-1335	1525-1590 1735-1810
1 1/2-6 1 1/2-12	1500-1560 1685-1755	2035-2115 2285-2380

IMPORTANT

- Follow these torque recommendations except when specified in text.

Complete Torque Chart

Capscrews - Grade 8

NOTE:

- Grade 8 capscrews can be identified by six radial dashes on the head.
- For wheel torque requirements, refer to Wheels and Tires.
- Tighten U-bolts evenly and equally to have the same number of threads exposed on each end.



SIZE	FOOT POUNDS	NEWTON METERS
5/16-18	20-22	27-30
5/16-24	21-23	28-31
3/8-16	35-39	47-53
3/8-24	36-41	49-55
7/16-14	54-58	73-78
7/16-20	55-60	75-80
1/2-13	82-88	110-120
1/2-20	94-99	125-135
9/16-12	127-134	170-180
9/16-18	147-155	199-210
5/8-11	160-170	215-230
5/8-18	165-175	225-235
3/4-10	280-295	380-400
3/4-16	330-365	445-495
7/8-9	410-430	555-580
7/8-14	420-440	570-595
1-8	630-650	850-880
1-14	680-700	920-950
1 1/8-7	900-930	1220-1260
1 1/8-12	930-950	1260-1290
1 1/4-7	1250-1300	1695-1760
1 1/4-12	1280-1320	1735-1790

IMPORTANT

- Follow these torque recommendations except when specified in text.

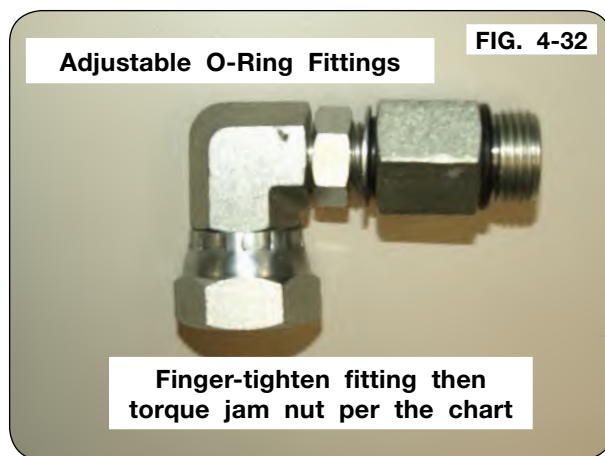
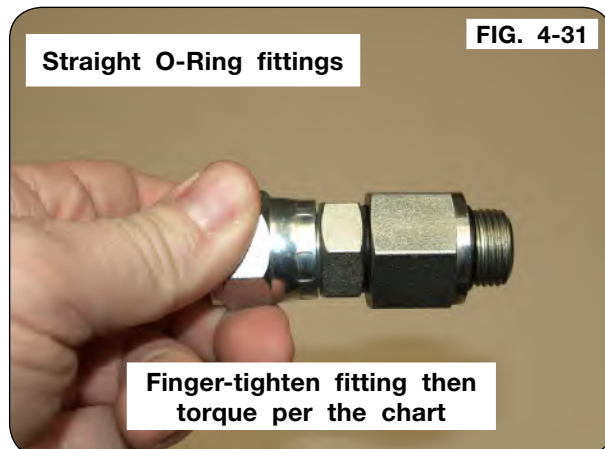
Hydraulic Fittings - Torque and Installation

Tightening O-Ring Fittings

1. Inspect components for damage or contamination. Do not connect any other type of fitting to an O-ring fitting.
2. For adjustable fittings, insure the jam nut and washer are fully backed up.
3. Lubricate the O-ring and threads on the fitting.
4. Turn the fitting into the port until it is finger tight.
5. For adjustable fittings, set in the desired position.
6. Using a wrench, torque the fitting to the value in the below table. For adjustable fittings the jam nut will be tightened.

NOTE: Never use a power tool to install a fitting.

Dash Size	Thread Size	Straight Stud Torque (Ft-Lbs)	Adjustable Stud Torque (Ft-Lbs)
-5	1/2-20	14-19	10-14
-6	9/16-18	18-24	12-16
-8	3/4-16	27-43	20-30
-10	7/8-14	36-48	30-36
-12	1-1/16-12	65-75	44-54
-14	1-3/16-12	75-99	53-70
-16	1-5/16-12	85-123	59-80
-20	1-5/8"-12	115-161	75-100
-24	1-7/8"-12	125-170	105-125

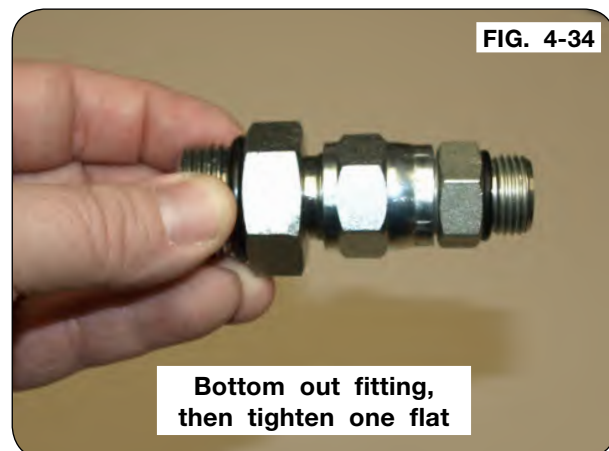


Hydraulic Fittings - Torque and Installation (continued)

Tightening JIC Fittings

1. Inspect all components for damage or contamination. Do not connect any other type of fitting to a JIC fitting.
2. Lubricate the threads.
3. Turn the fitting into the port until it bottoms out.
4. Use one wrench on the fixed hex on the hose to prevent twisting and a second on the swivel. Tighten the fitting another 60 degrees (or one flat)

NOTE: Never use a power tool to install a fitting.



SECTION IV

Maintenance

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PULL-TYPE RAPTOR — Maintenance

Lubrication Points

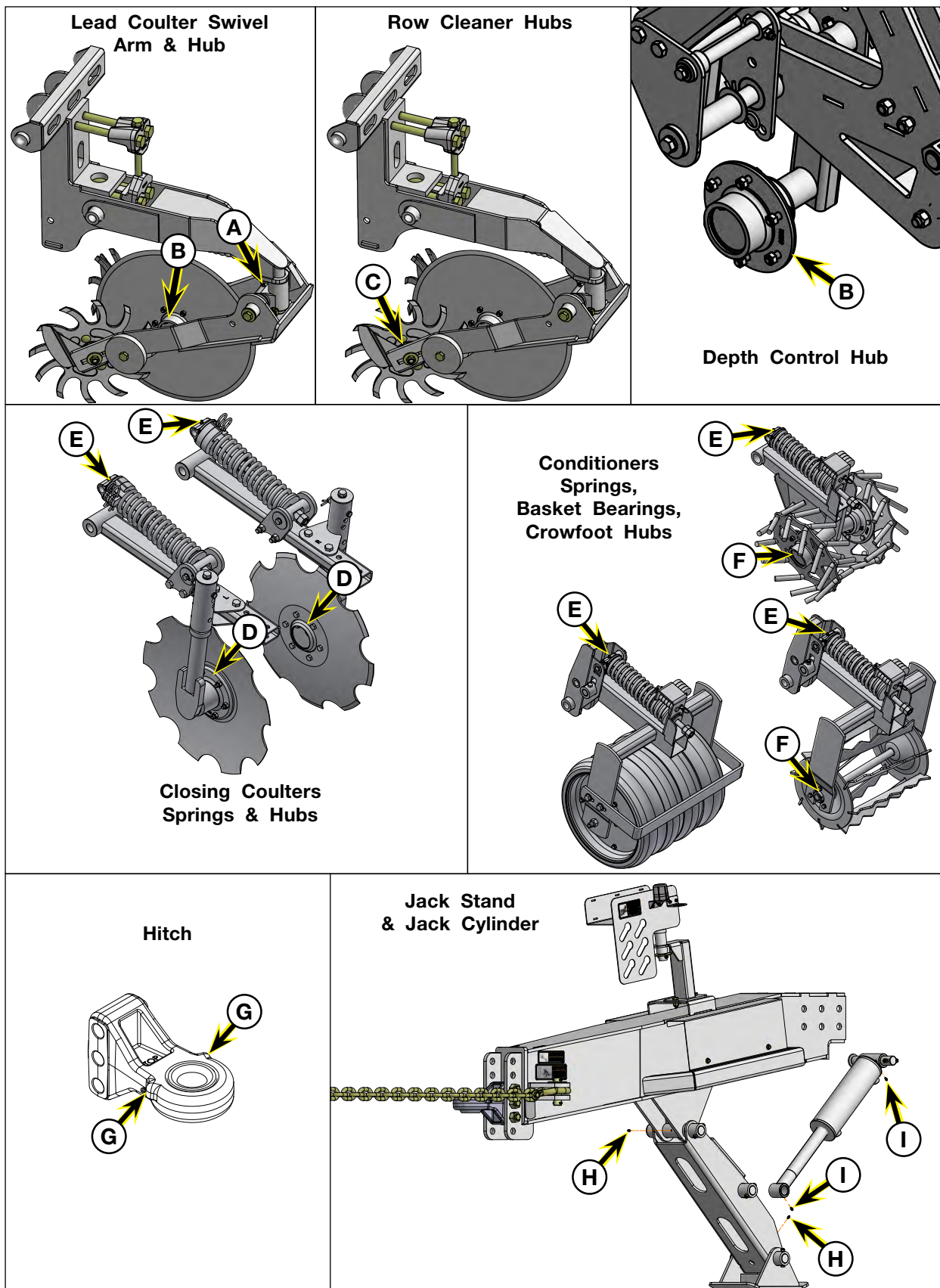
To keep your implement in top operating condition and to assure its proper performance and reliability for a long period of time, periodic inspection and lubrication is a must.

Use EP-2 lubricant at the locations described in the chart. All exposed cylinder rods should be coated with grease before seasonal storage to prevent rusting. After seasonal storage, check wing latch for freedom of movement.

The lubrication locations and recommended schedule are as follows:

ITEM	DESCRIPTION	POINT	QTY	HOURS
A	Lead Coulter Swivel Arms	1	1 Shot	100 Hours
B	Lead Coulter Hubs & Depth Control Hubs	1	2 Shots	200 Hours/Annually
C	Row Cleaner Hubs	1	2 Shots	200 Hours/Annually
D	Closing Coulter Hubs	1	2 Shots	200 Hours./Annually
E	Closing Coulter & Conditioner Springs	3	2 Shots	100 Hours
F	Conditioner Hubs/Bearings	1	2 Shots	200 Hours/Annually
G	Hitch	2	1 Shot	10 Hours
H	Jack Stand	2	2 Shots	200 Hours/Annually
I	Jack Cylinder	2	1 Shot	200 Hours/Annually

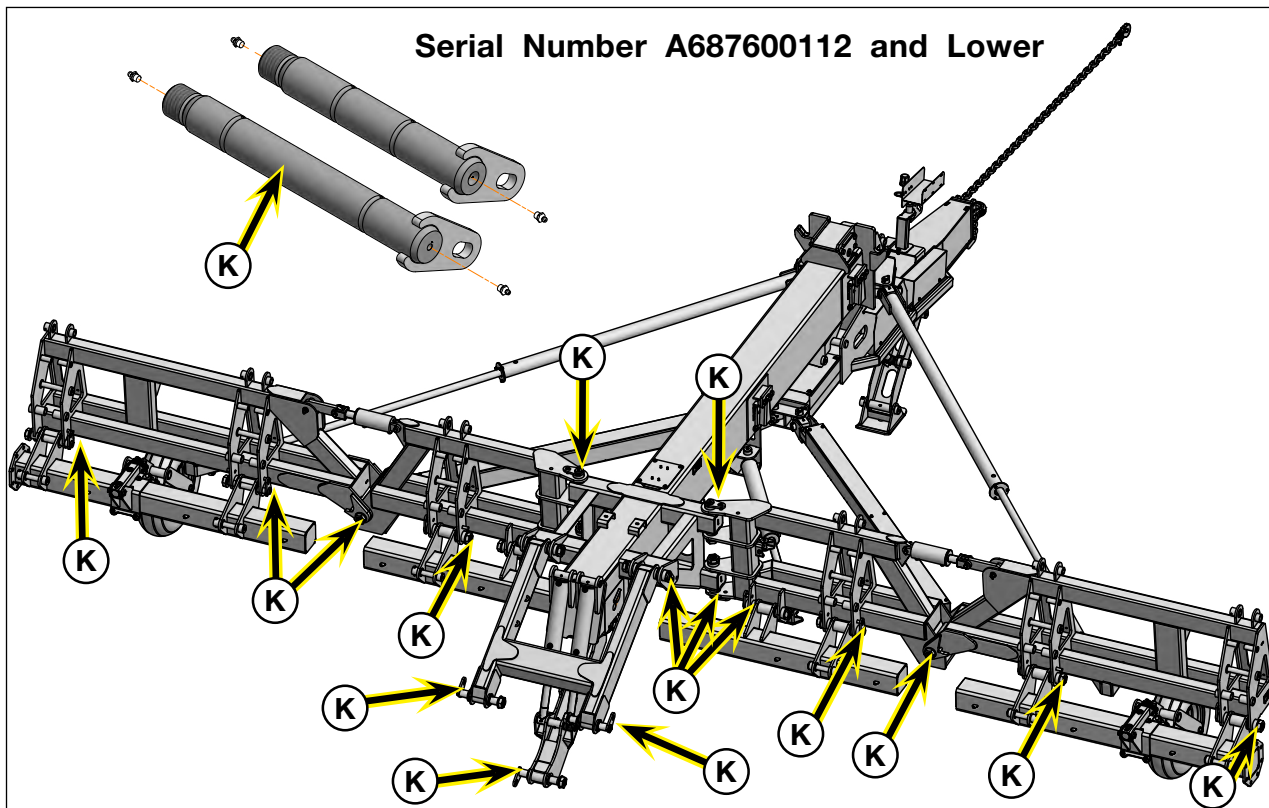
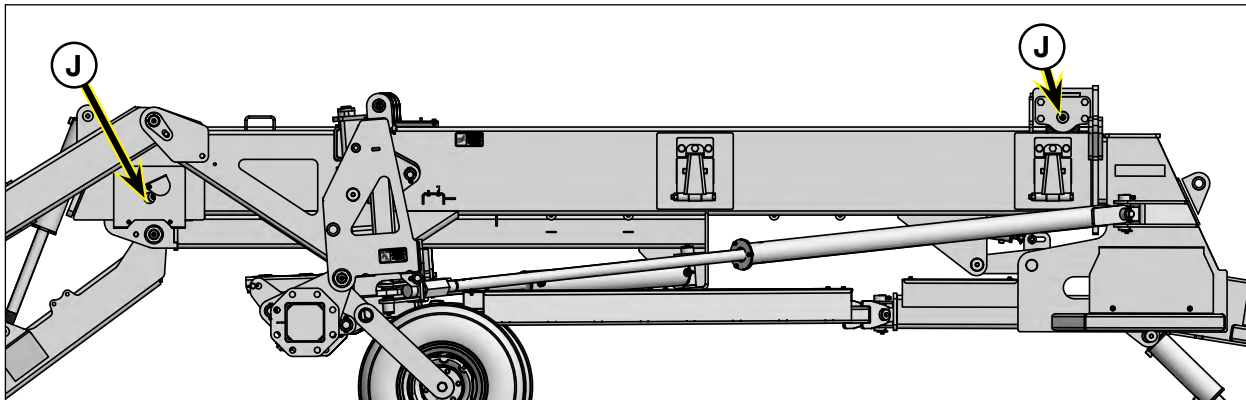
Lubrication Points (continued)



PULL-TYPE RAPTOR — Maintenance

Lubrication Points (continued)

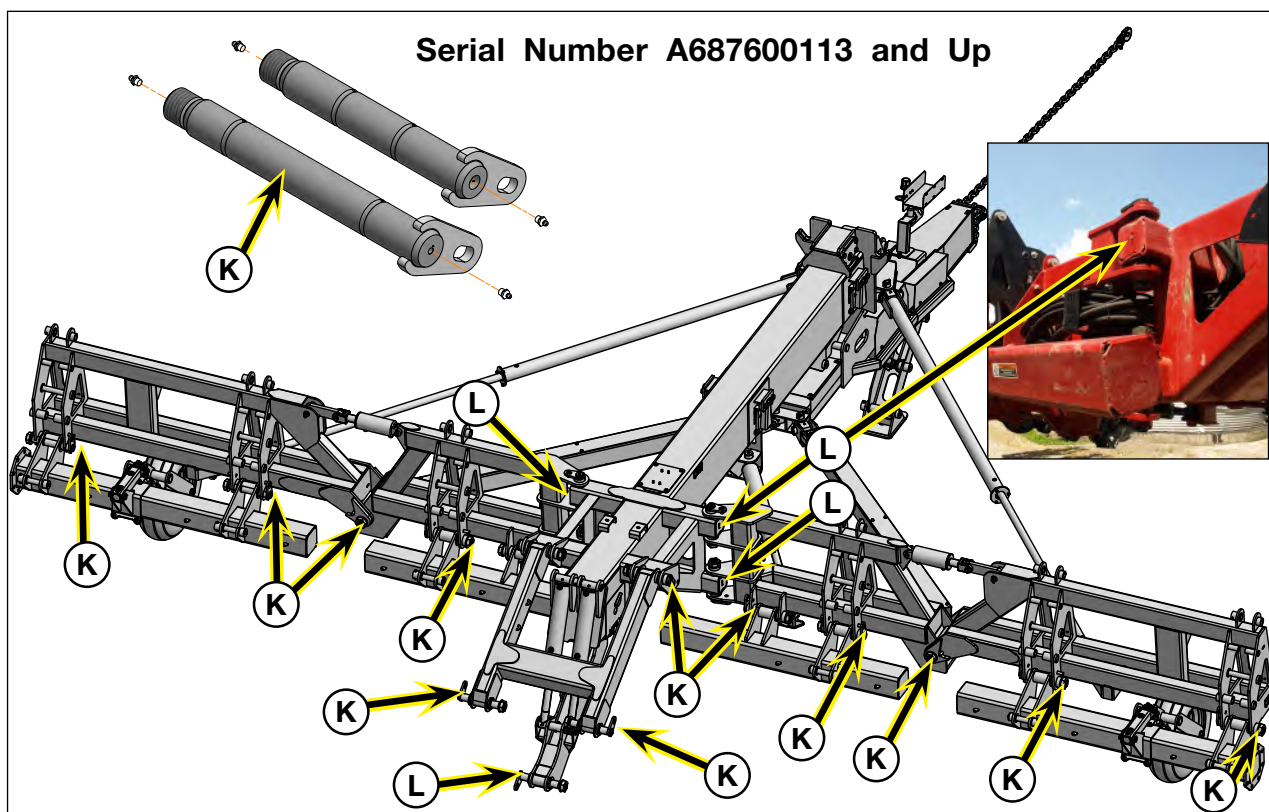
ITEM	DESCRIPTION	POINT	QTY	HOURS
J	Roller Assembly	2	1 Shot	50 Hours
K	Pin Weldments (Qty - 20; 2 Points Each) Parallel Arms, Inner Wings, & Outer Wings Serial Number A687600112 & Lower	40	2 Shots	10 Hours



PULL-TYPE RAPTOR — Maintenance

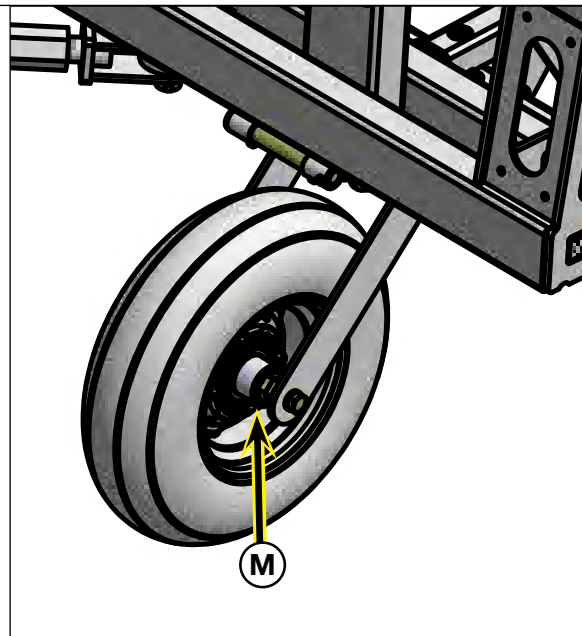
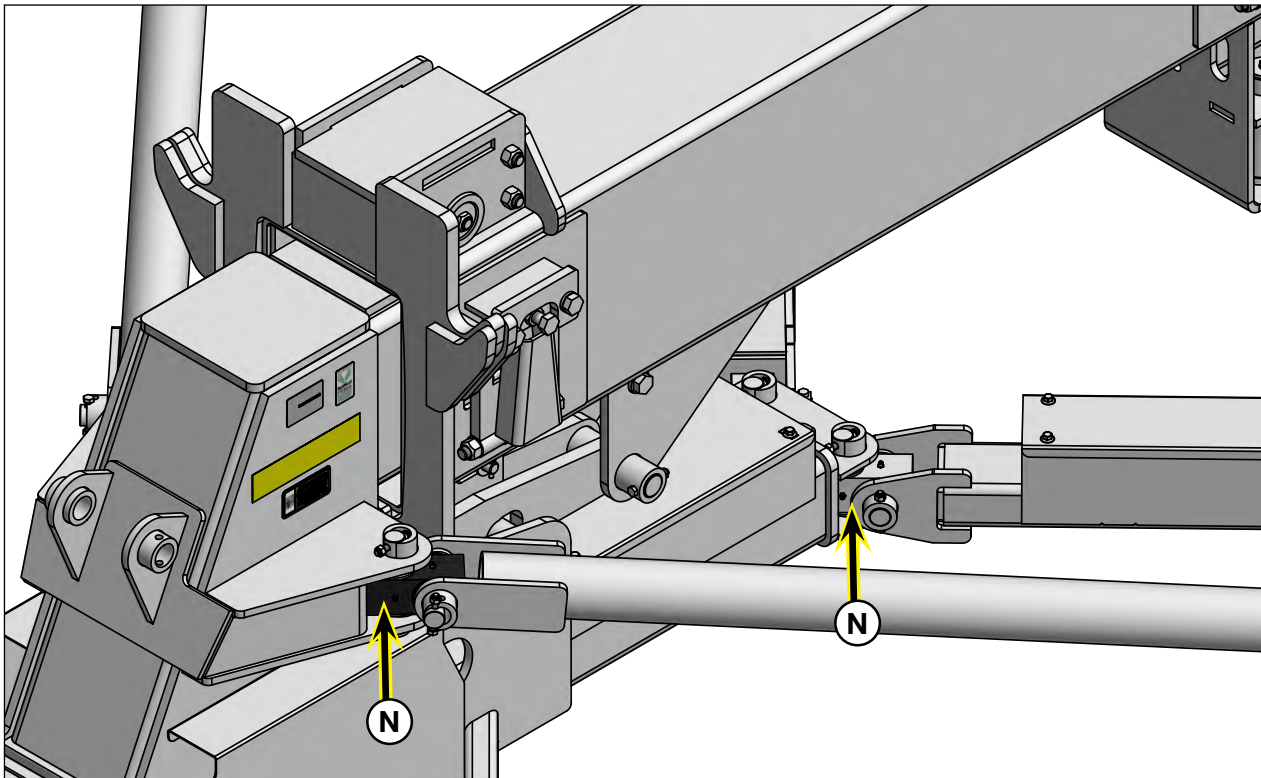
Lubrication Points (continued)

ITEM	DESCRIPTION	POINT	QTY	HOURS
K	Pin Weldments (Qty - 20; 2 Points Each) Parallel Arms, Inner Wings, & Outer Wings Serial Number A687600113 & Up	34	2 Shots	10 Hours
L	Inner Wing Hinge Greased through bushings Serial Number A687600113 & Up	4	2 Shots	10 Hours



Lubrication Points (continued)

ITEM	DESCRIPTION	POINT	QTY	HOURS
M	Gauge Wheel Hubs	2	1 Shots	200 Hours / Annually
N	Truss Blocks	4	2 Shots	2 zerks each block - 50 Hours



Purging Hydraulic System

WARNING

- RELIEVE THE HYDRAULIC SYSTEM OF ALL PRESSURE BEFORE ADJUSTING OR SERVICING. SEE THE HYDRAULIC POWER UNIT OPERATOR'S MANUAL FOR PROPER PROCEDURES.
- HIGH-PRESSURE FLUIDS CAN PENETRATE THE SKIN AND CAUSE SERIOUS INJURY OR DEATH. LEAKS OF HIGH-PRESSURE FLUIDS MAY NOT BE VISIBLE. USE CARDBOARD OR WOOD TO DETECT LEAKS IN THE HYDRAULIC SYSTEM. SEEK MEDICAL TREATMENT IMMEDIATELY IF INJURED BY HIGH-PRESSURE FLUIDS.

Purge air from system as follows:

- A. Clear all personnel and objects from the area, including where the machine will have full range of motion during the hydraulic movement. Remove transport locks from the machine.
- B. Pressurize the system and maintain the system at full pressure for at least 5 seconds after the cylinder rods stop moving. Check that all cylinders have fully extended or retracted.
- C. Check oil reservoir in the hydraulic power source and refill as needed.
- D. Pressurize the system again to reverse the motion of step B. Maintain pressure on the system for at least 5 seconds after the cylinder rods stop moving. Check that all cylinders have fully extended or retracted.
- E. Check for hydraulic oil leaks using cardboard or wood. Tighten connections according to directions in the Torque Specifications in the MAINTENANCE section.
- F. Repeat steps in B, C, D, and E 10-12 times.

HYDRAULIC SYSTEM CHECKS ON ALL UNITS -- CHECK THE FOLLOWING:

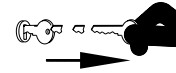
ROUTING OF ALL HYDRAULIC HOSES: Hoses should not be kinked, twisted, or rubbing against sharp edges.

FITTINGS AND CONNECTIONS: Check for leaks. Refer to "Torque Chart" in MAINTENANCE section.

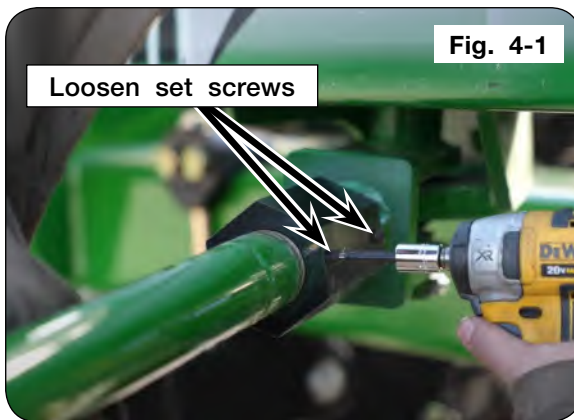
HOSES: Be sure hoses have room to "FLEX" (for folding) in hinge areas. Hoses must be secured with cable ties.

Truss Rod Adjustment

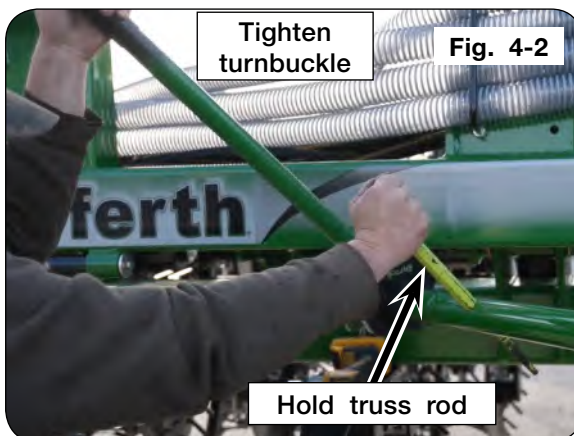
1. Park the empty Raptor on a firm, level surface. Completely unfold the wings. Block the tires on the unit to keep it from moving. Set the towing vehicle's parking brake, shut off the engine and remove the ignition key.



2. Using a 3/16" hex wrench, loosen the set screws securing the turnbuckles to the truss rod. There are two set screws per turnbuckle. (Fig. 4-1)

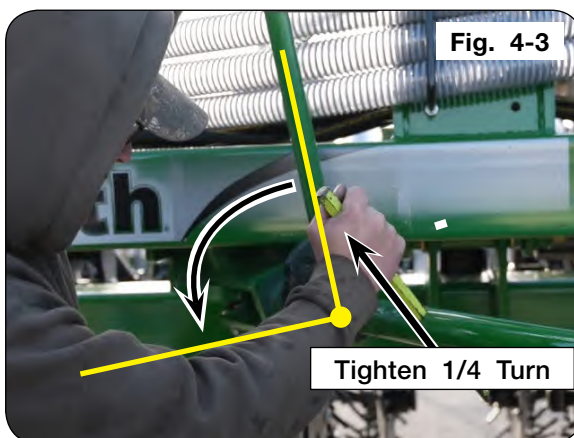


3. With the wings completely unfolded, attempt to tighten the turnbuckles while holding the truss rod stationary. (Fig. 4-2) If a turnbuckle is already tight, reinstall the set screws, torque the screws to 25-28 Ft.-Lbs. and no further action is required. If a turnbuckle is loose, tighten until it cannot be turned and continue to step 4.



4. With the turnbuckles tightened, fold in the wings of the machine slightly. Folding the wings in will release pressure from the wing truss rods. Turn off the tractor and remove the key from the ignition.

5. Tighten the turnbuckle(s) 1/4 of a turn. (Fig. 4-3)



6. Lock the turnbuckles by tightening all the set screws loosened in step 2. Torque the set screws to 25-28 Ft.-Lbs.

7. Fold and unfold the machine. As the machine locks into the fully unfolded position, watch the hitch. If the machine fully unfolds and the hitch does not shift to one side, no further action is required. If the hitch shifts to one side, perform this procedure again.

Roller Assembly Replacement

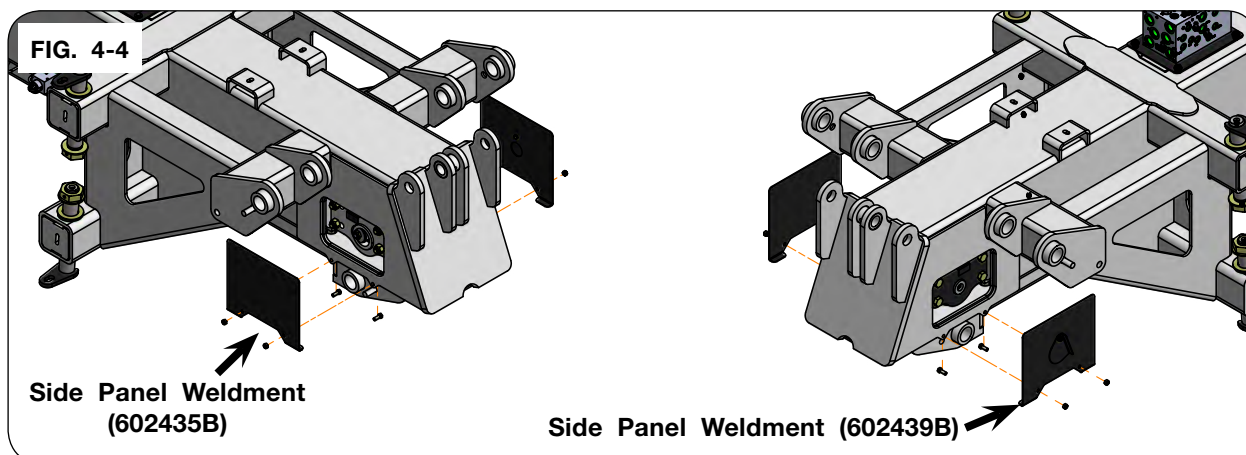
WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 6,000 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

With the Raptor implement attached to a tractor, find a firm, level surface and unfold the wings. Lower the machine completely. Shut off the tractor engine, set the parking brake, and remove the ignition key.

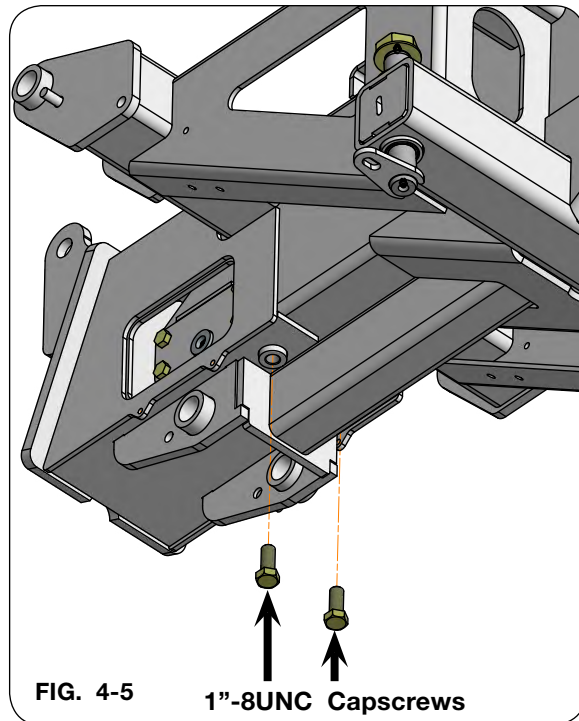
Rear Roller Assembly Replacement

1. Remove and save the 3/8"-16UNC x 1" capscrews (9390-055) and 3/8"-16UNC locknuts (9928) retaining the side panel weldments (602435B and 602439B). (FIG. 4-4)

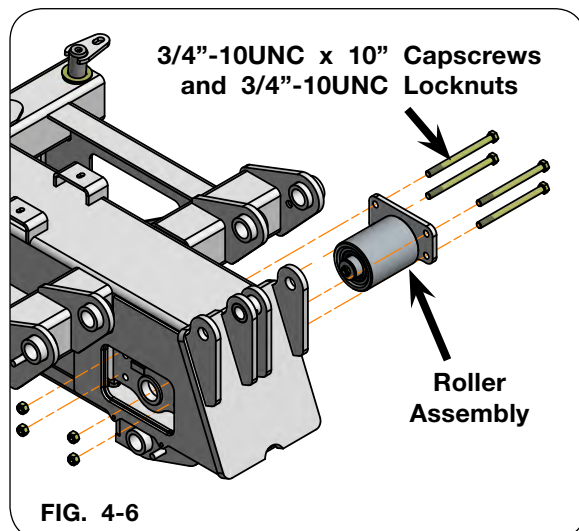


Roller Assembly Replacement (continued)

- Using two 1"-8UNC capscrews at least 2 1/2" long, insert them into the threaded bushings as shown in FIG. 4-5. Tighten capscrews equally and evenly to release the pressure on the roller assembly.

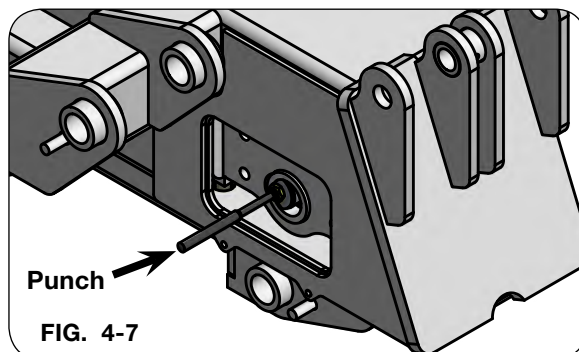


- Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-6)



NOTE: If necessary, use a punch on the end of the spindle to help drive the assembly. (FIG. 4-7)

NOTE: If replacing roller assembly components, refer to "Roller Component Replacement".



Roller Assembly Replacement (continued)

4. Replace roller assembly (602186B) and retain into position with the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) previously removed. (FIG. 4-8)

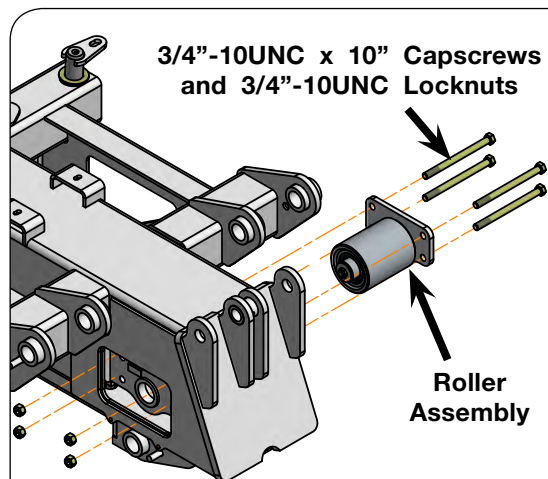


FIG. 4-8

5. Remove the two 1"-8UNC capscrews used to relieve the pressure on the roller assembly. (FIG. 4-9)

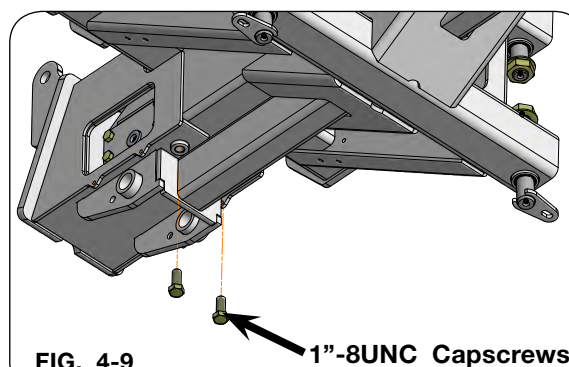
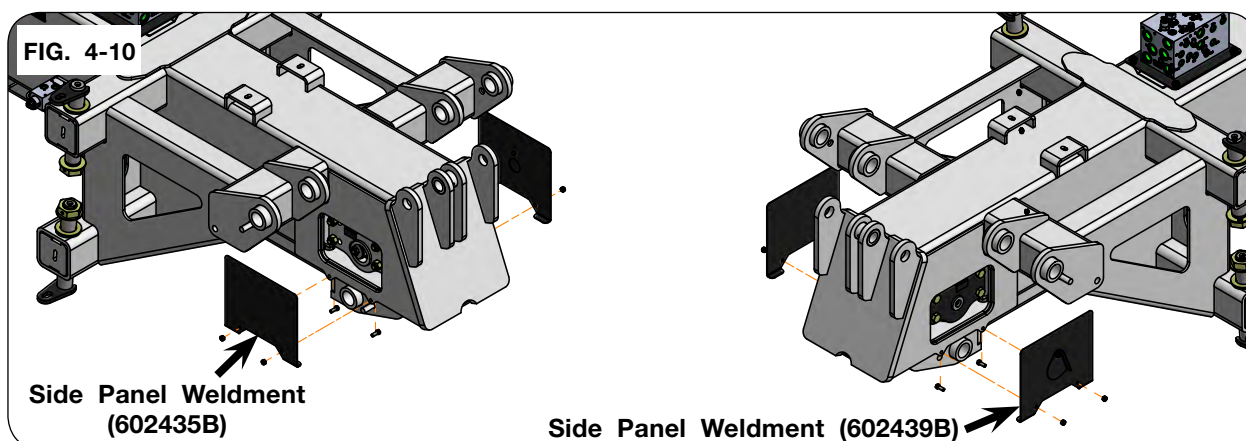


FIG. 4-9

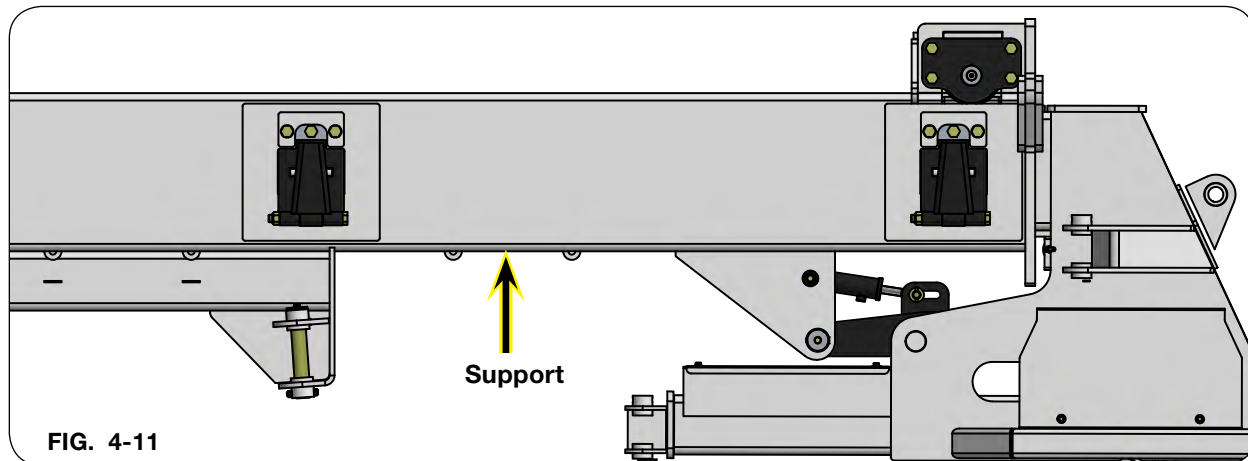
6. Reattach the side panel weldments (602435B and 602439B) with the 3/8"-16UNC x 1" capscrews (9390-055) and 3/8"-16UNC locknuts (9928) previously removed. (FIG. 4-10)



Roller Assembly Replacement (continued)

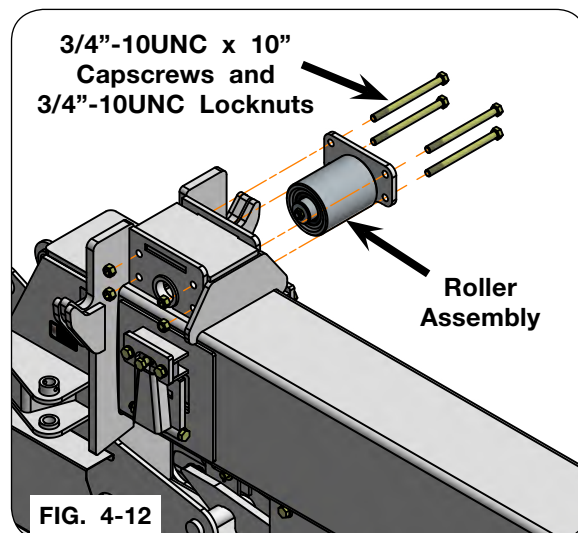
Front Roller Assembly Replacement

1. Using the hydraulic jack, raise the tongue a few inches off the tractor drawbar. Place a support stand rated at a minimum of 6,000 lbs. under the main frame weldment. Lower the hydraulic jack allowing the support stand to fully carry the main frame. Ensure there is no weight remaining on the roller. Shut off the tractor engine, set the parking brake, and remove the ignition key. (FIG. 4-11)



NOTE: Avoid pinching hydraulic hoses when adding support under main frame weldment.

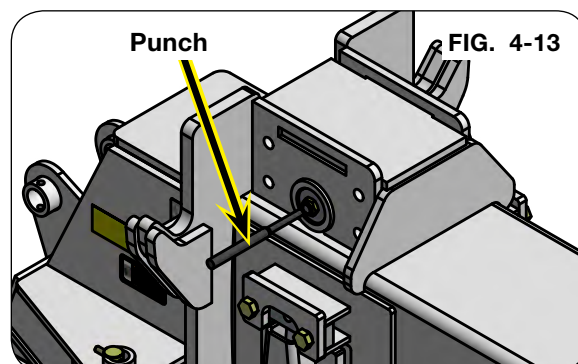
2. Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-12)



NOTE: If necessary, use a punch on the end of the spindle to help drive the assembly. (FIG. 4-13)

NOTE: If replacing roller assembly components, refer to "Roller Component Replacement".

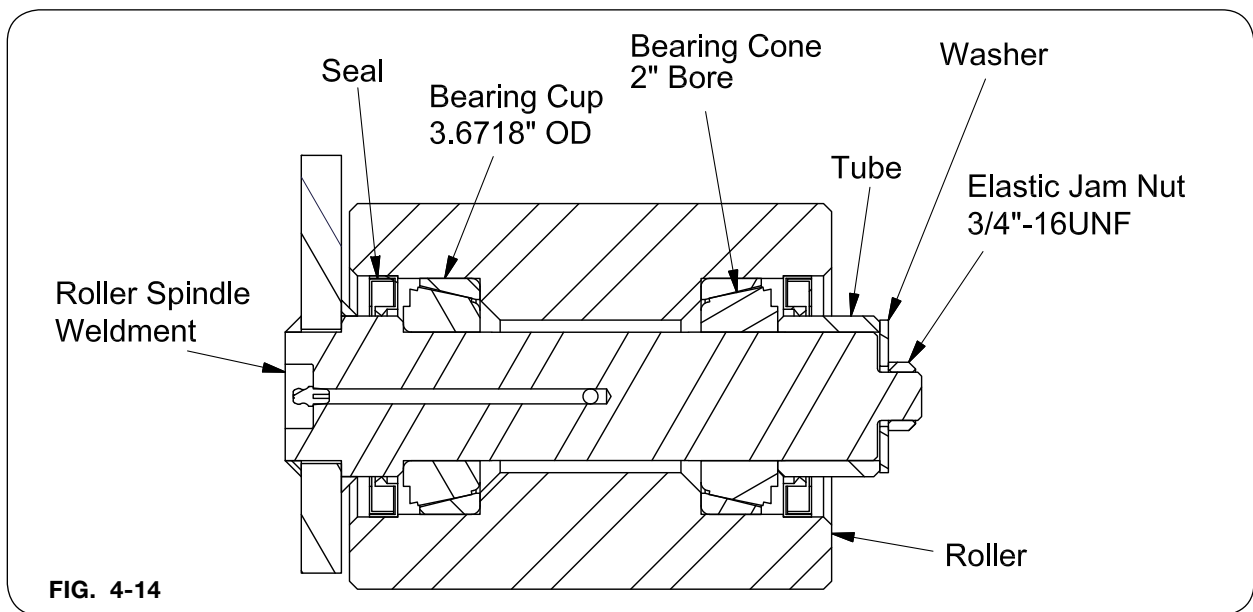
3. Replace roller assembly (602186B) and retain into position with the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) previously removed. (FIG. 4-12)



Roller Assembly Replacement (continued)

Roller Component Replacement

1. Pack bearing and cavity. Fill with high quality extreme pressure grease (NLGI Grade 2).
2. Use grease to lubricate the seal lip. (FIG. 4-14)
3. Place the roller onto the roller spindle weldment. Rotate the roller while doing this so the seal lip does not fold under as the lip goes on the seal lip of the roller spindle weldment. (FIG. 4-14)
4. Be sure the outer bearing cone slides on the roller spindle weldment and into the bearing cup. (FIG. 4-14)
5. While rotating the roller, tighten the elastic jam nut to remove all play. (FIG. 4-14)
6. Turn the elastic jam nut 1/6" turn to seat. (FIG. 4-14)



TerrainPro Row Unit

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 100 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.

CAUTION

- SHARP EDGES ON THE MACHINE CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND THE MACHINE.

The shank has replaceable wear plates and point, which after a period of time will need to be replaced (FIG. 4-10). To replace these components on your machine, refer to the following guidelines:

Point & Wear Plates Replacement

1. With the Raptor implement attached to a tractor, find a firm, level surface and unfold the wings. Lower the machine until the points are 1"-2" off ground. Shut off the tractor engine, set the parking brake, and remove the ignition key.
2. If applicable, remove and save the fertilizer option 1/2"-13UNC x 1 3/4" capscrew (9390-102) and 1/2"-13UNC locknut (9800). (FIG. 4-15)
3. Loosen the center wear plates 1/2"-13UNC x 1 3/4" capscrews (9390-102) and 1/2"-13UNC locknuts (9800). (FIG. 4-15)
4. Remove and save the 1/2"-13UNC x 1 3/4" capscrew (9390-102) and 1/2"-13UNC locknut (9800). (FIG. 4-15)
5. Remove the point (601983B). (FIG. 4-15)

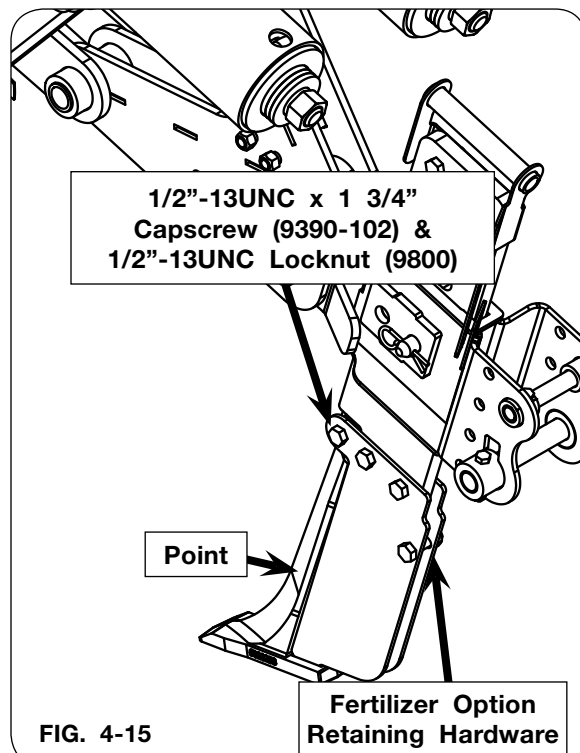


FIG. 4-15

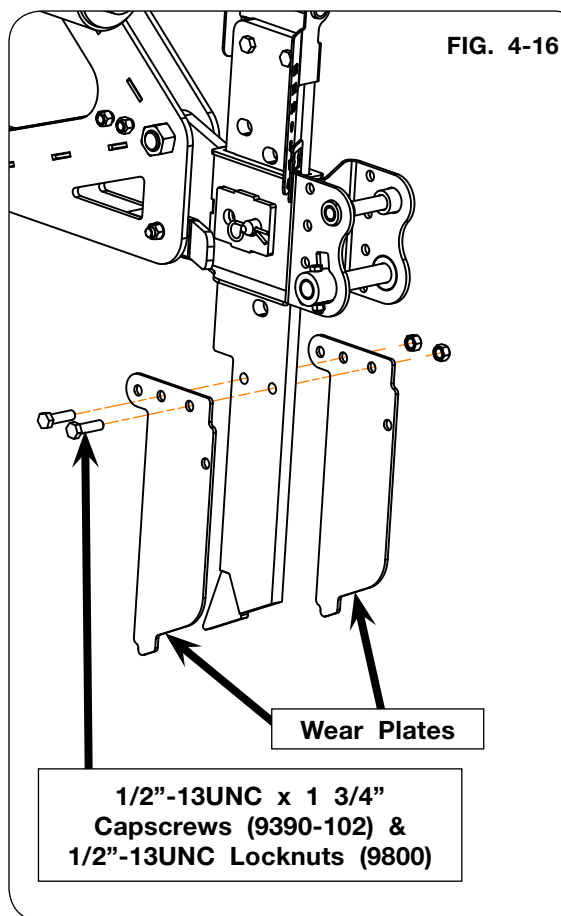
TerrainPro Row Unit (continued)

6. If replacing wear plates, continue with step 7 otherwise skip to step 9.

7. Remove the wear plate 1/2"-13UNC x 1 3/4" capscrews (9390-102) and 1/2"-13UNC locknuts (9800). (FIG. 4-16)

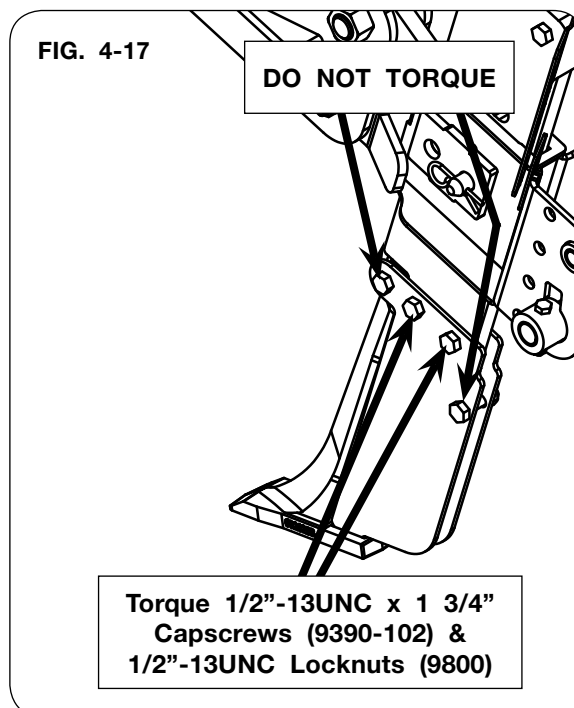
8. Replace wear plates (603758B) and loosely secure with previously removed 1/2"-13UNC x 1 3/4" capscrews (9390-102) and 1/2"-13UNC locknuts (9800). (FIG. 4-16)

9. Install point (601983B) and secure with previously removed 1/2"-13UNC x 1 3/4" capscrew (9390-102) and 1/2"-13UNC locknut (9800) (FIG. 4-16). **DO NOT TORQUE HARDWARE.**



10. If applicable, install the fertilizer option and secure with 1/2"-13UNC x 1 3/4" capscrew (9390-102) and 1/2"-13UNC locknut (9800) (FIG. 4-17). **DO NOT TORQUE HARDWARE.**

11. Torque the center wear plates 1/2"-13UNC x 1 3/4" capscrews (9390-102) and 1/2"-13UNC locknuts (9800) according to "Torque Chart" in MAINTENANCE section. (FIG. 4-17)



TerrainPro Row Unit (continued)

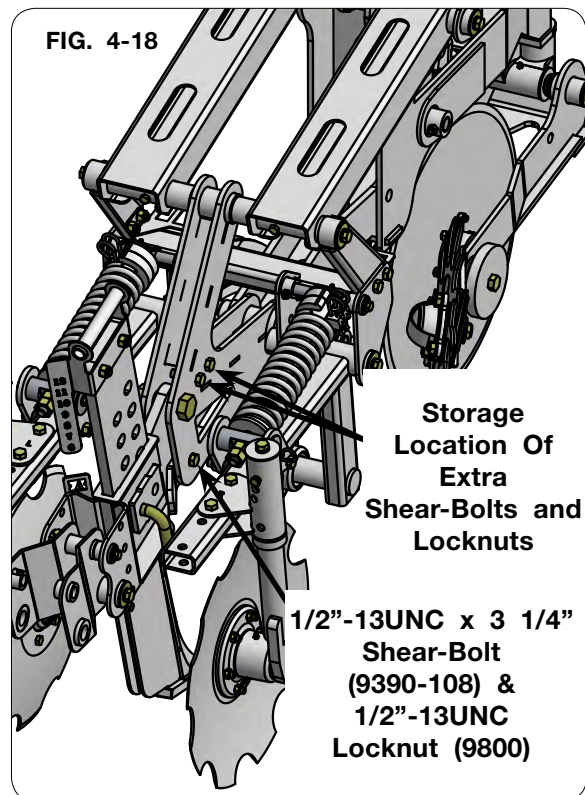
Shear-Bolt Replacement

The shear-bolt should shear only when the shank encounters an obstacle.

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.

1. With the Raptor implement attached to a tractor, find a firm, level surface and unfold the wings. Lower the machine until the points are 1"-2" off ground. Shut off the tractor engine, set the parking brake, and remove the ignition key.
2. Remove any remaining portions of the shear-bolt from the assembly. Inspect shear-bolt holes. Severely distorted holes will result in shorter shear-bolt life and should be repaired or replaced.
3. Remove a new shear-bolt from the storage location. (FIG. 4-18)
4. Align the hole in the shank mount bracket to the hole in the shank trip bracket.
5. Insert the new shear-bolt. Tighten nut on the shear-bolt until snug. Do not torque to specification. Tightening the shear-bolt will prevent proper trip function."



TerrainPro Row Unit (continued)

Lead Coulter Spring Replacement

The following guidelines are for replacing the spring on the coulters.

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN INJURY OR DEATH.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

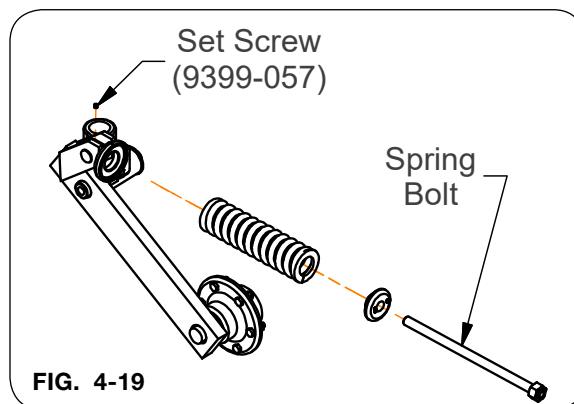
CAUTION

- SHARP EDGES ON COULTER BLADES CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND COULTER BLADES.

IMPORTANT

- *The spring should only be adjusted when repairs are being made. The springs have been preset before leaving the factory.*

1. Loosen the set screw retaining the spring bolt on the coulters arm (FIG. 4-19).
2. Slowly unscrew the spring bolt which will relieve spring pressure (FIG. 4-19).
3. Once the bolt is removed, replace with new spring and re-insert bolt.

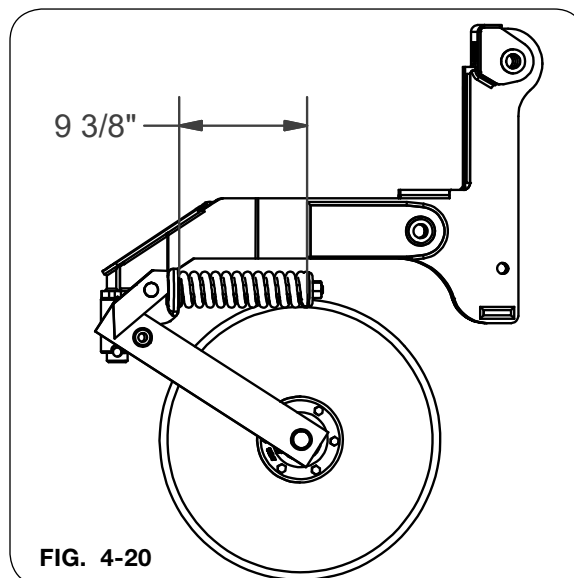


4. Tighten bolt until the spring is compressed to 9 3/8" (FIG. 4-20).

The coulters springs are preset at the factory to 9 3/8". This measurement is the total amount of exposed spring.

NOTE: Adjusting the spring below 9 3/8" could cause premature part failure and void any warranty considerations.

5. Tighten set screw to secure bolt.



Hub Adjustment and Replacement For Lead Coulters and Closing Coulters

Park the unit on a firm, level surface. Block the wheels on the machine to keep it from moving. Set the vehicle parking brake, lower parking stands, shut-off the engine, and remove the ignition key.

After the first 100 acres, the hubs should be checked for tightness and wear.

WARNING

- BE SURE THAT THE IMPLEMENT IS SECURELY BLOCKED TO PREVENT FALLING. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

CAUTION

- SHARP EDGES ON COULTER BLADES CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND COULTER BLADES.

IMPORTANT

- *Do not allow dirt and debris to contaminate the hub and its internal components. Neglecting to do so could result in failure of the hub and its components due to excessive wear.*

1. Remove the blade.
2. Attach a C-clamp and apply pressure to both sides of the coultter hub (FIG. 4-21).



FIG. 4-21

3. Remove the retaining ring and hub cap. Refer to FIG. 4-22.

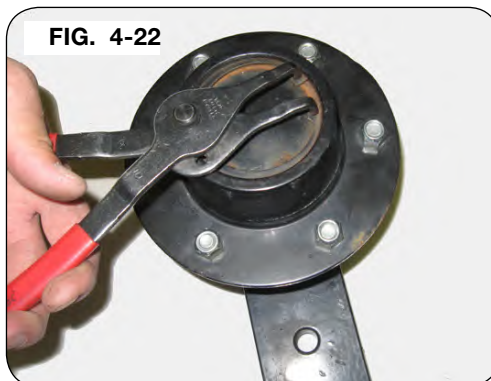


FIG. 4-22

Hub Adjustment and Replacement For Lead Coulters and Closing Coulters (continued)

4. Remove the retainer securing the slotted nut.

IMPORTANT

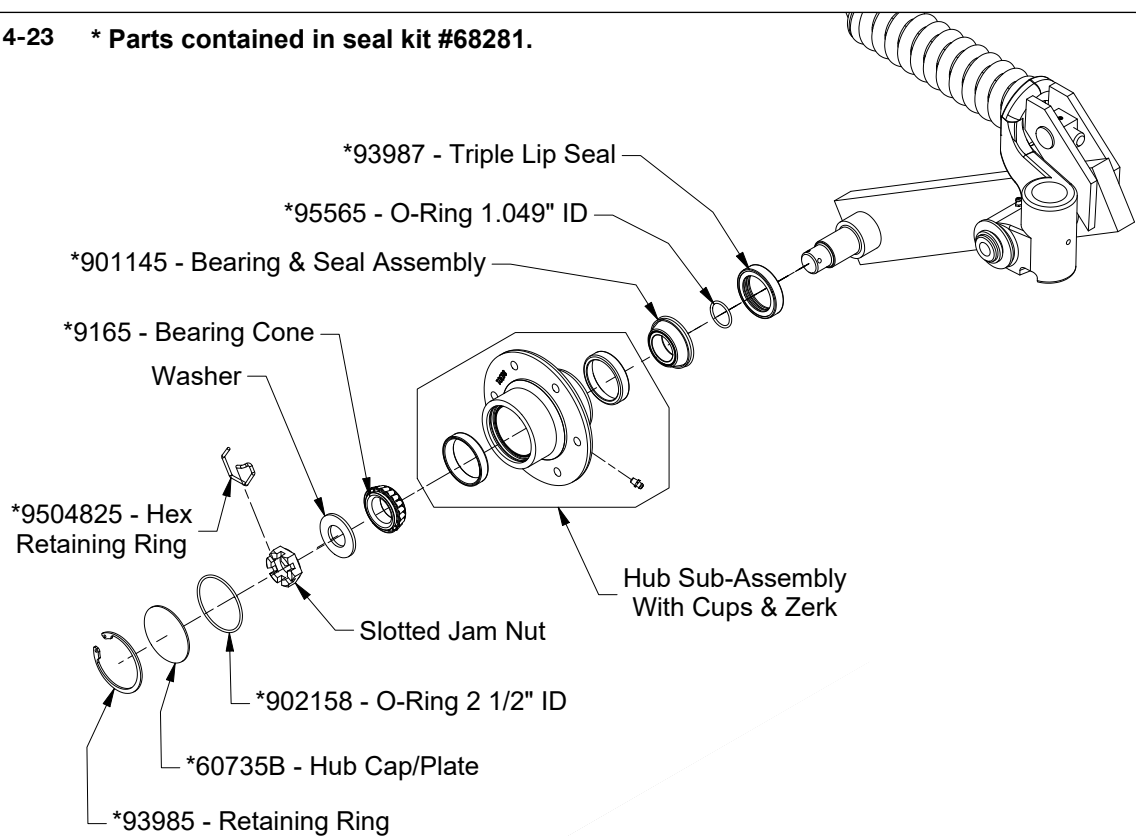
- Removal of the C-ring is best accomplished by using two screwdrivers or similar tools and prying on the outside ends to spread the ring. If the ring is damaged discard and replace.
- When removing the hub and its components, be sure to keep them free of debris and dirt. Failure to do so will result in contamination of the hub and bearing failure.

5. Unscrew the nut and carefully remove the hub from the spindle.
6. Remove the components, clean and inspect for any damage or wear. If even the slightest imperfection exists, replace the component(s). Once the hub is dismantled, always replace the bearing and seal assembly, O-ring, and triple lip seal.

IMPORTANT

- Always replace the O-rings and seals if dismantling the hub. Failure to do so could result in premature failure of the hub and its components.

FIG. 4-23 * Parts contained in seal kit #68281.



Hub Adjustment and Replacement For Lead Coulters and Closing Coulters (continued)

7. Replace any damaged parts before reassembling the components. Be sure to remove any debris or dirt and repack the bearings with an SAE approved hub grease.
8. Slide the O-ring onto the spindle first.
9. Use grease to lubricate seal.
10. While rotating hub, slide the hub, seal, and bearing onto spindle. Make sure not to damage seal. Be sure outer bearing and washer slide on the spindle and bearing seats in the cup.
11. Assemble nut to spindle. While rotating hub, tighten nut to 40 Ft.-Lbs. Do not rotate hub again until step 15.

IMPORTANT

- *Rotate the coulters hub when torquing the slotted nut. Doing this will prevent flats from forming on the bearings.*

12. Back off nut until it becomes loose without rotating hub.
13. Finger tighten nut without rotating hub.
14. Tighten nut to align the next notch with hole in the spindle.
15. Check for looseness in the hub. It should not wiggle. If it does, tighten the nut one more slot and repeat this step.
16. Check hub rotation for excessive drag. There should be slight resistance. If there is excessive drag, repeat procedure starting at step 11.
17. Install hex retaining ring and verify it has clearance to the hub cap. Ring should be tight to nut/spindle.

IMPORTANT

- *Assembly of the C-ring is best accomplished by the use of a hog ring type pliers or similar tool. After the installation be sure the C-ring will lay flat against the spindle retaining the nut to allow for proper installation of the hub cap.*
18. Add moly scent 2 grease through hub zerk until grease extends above the washer all around the cavity.
 19. Reinstall the hub cap and blade. Use a C-clamp to compress dust cap and then seat retaining ring.



FIG. 4-24

Hub Adjustment and Replacement For Lead Coulters and Closing Coulters (continued)

NOTE: Be sure to re-pack bearings with an SAE approved grease and keep it and its components free of dust and debris.

* Parts contained in seal kit #68281.

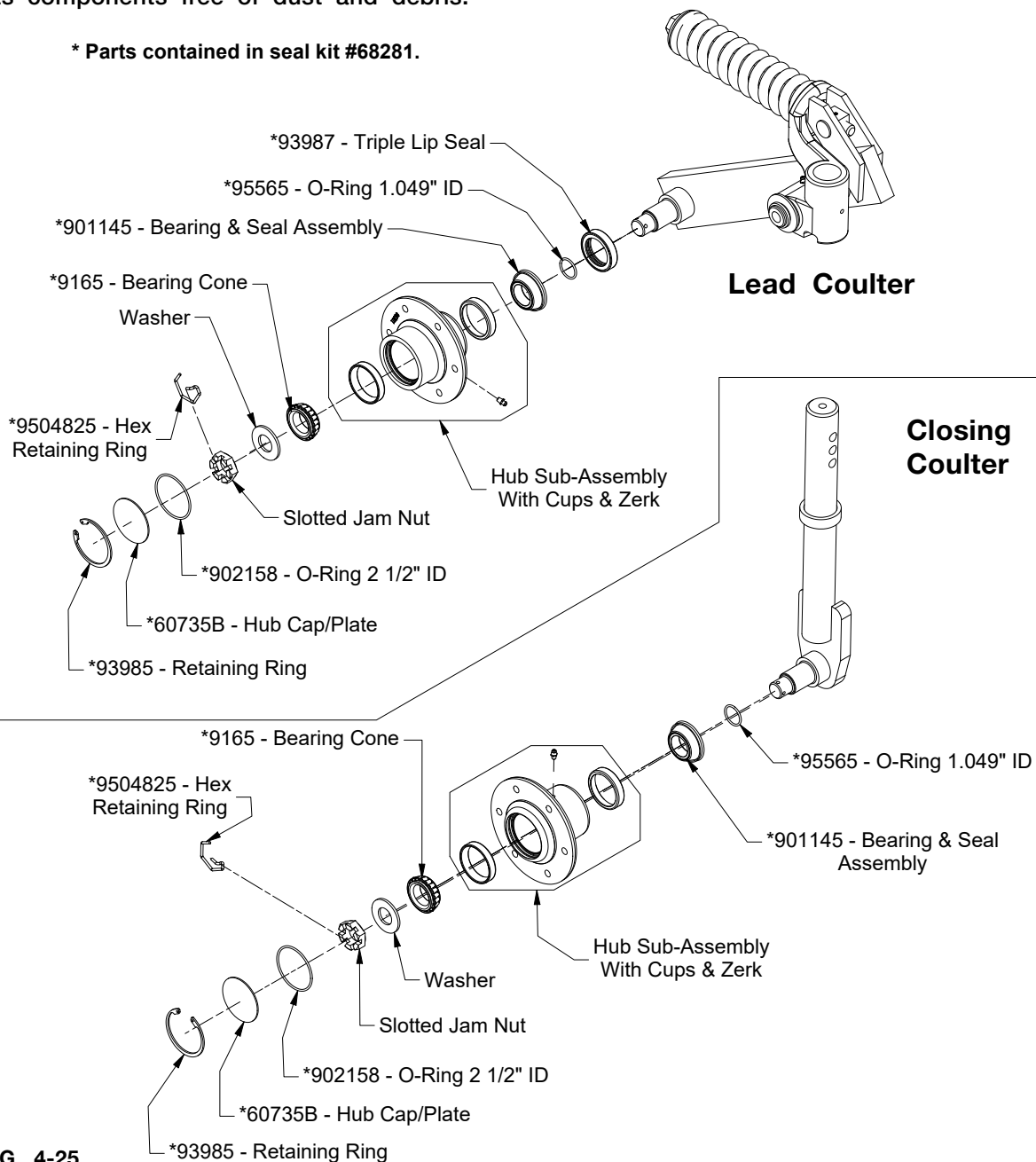


FIG. 4-25

Replacing Bearings In Conditioner Rolling Harrow Baskets

WARNING

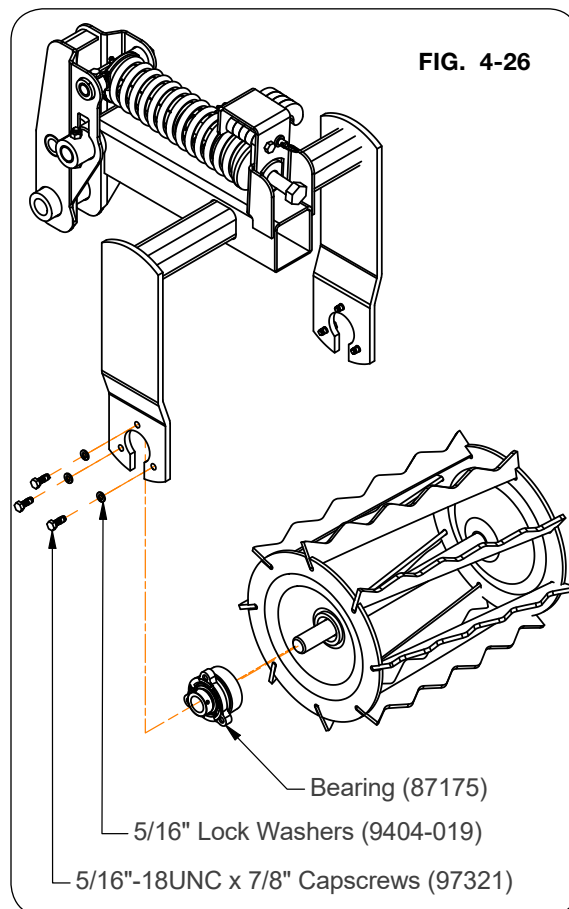
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING THE IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

1. Lower support stand and implement to the ground and securely block to prevent tipping, or moving. Shut off tractor, set parking brake, and remove ignition key.
2. Install block under each basket to support weight of basket.
3. Remove the three 5/16"-18UNC carriage bolts which hold the bearing to the frame.
4. Use a crowbar or similar to pry the end of the basket out of the basket frame slot.
5. Loosen the set screw in the lock collar. Loosen lock collar by turning with punch in direction of basket travel.
6. Remove the bearing.
7. File off any burrs left on the shaft. Finish with a strip of emery cloth. Make sure bearing will slide on the shaft.
8. Slide a new bearing (87175) on the shaft with the lock collar on the outside (FIG. 4-26).
9. Pry the end of the basket into the slot of the frame (FIG. 4-26).
10. Assemble the new 5/16"-18UNC capscrews through the holes in the frame and into the bearing housing (FIG. 4-24). Tighten screws according to Torque Chart, in this section.

IMPORTANT

- *Tighten screws in bearing before tightening setscrew in lock collar.*
11. Tighten lock collar on shaft in direction of rotation.

Use UNVERFERTH bearing repair kit (87181) with triple lip seals for maximum life.



Row Cleaner Wheel Hub Adjustment

After the first 100 acres, the hubs should be checked for tightness and wear.

WARNING

- **TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.**
- **EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING THE IMPLEMENT.**
- **KEEP HANDS CLEAR OF PINCH POINT AREAS.**

CAUTION

- **SHARP EDGES ON COULTER BLADES CAN CAUSE INJURY. BE CAREFUL WHEN WORKING AROUND COULTER BLADES.**

IMPORTANT

- *Do not allow dirt and debris to contaminate the hub and its internal components. Neglecting to do so could result in failure of the hub and its components due to excessive wear.*
1. Check the row cleaner wheel hub and bearing for looseness or wobble. Rotate and laterally push and pull on the row cleaner wheel. A tight hub will have no wobble and will rotate smoothly with a slight resistance.
 2. If there is wobble in the hub, the hub must be tightened to the spindle. To do this, remove hub cap (9501381). Torque nut (9397-016) to 20 ft.-lbs. and back off 1/4 of a turn. Apply a light coating of thread sealant to the O.D. of the hub cap and tighten onto the hub.
 3. After tightening, retest the hub for wobble by repeating Step #1. If wobble still exists, continue with the following steps.
 - a. Remove the strap, hub cap, jam nut, and washer from the spindle.

IMPORTANT

- *When removing the hub and its components, be sure to keep them free of debris and dirt. Failure to do so will result in contamination of hub and bearing failure.*
- b. Remove the bearing cones, hub with tooth wheel, O-ring and seals from the spindle.
 - c. Remove the components, clean, and inspect for any damage or wear. If even the slightest imperfection exists, replace the component(s). Once the hub is dismantled, always replace the bearing and seal assembly, o-ring, and triple lip seal.

IMPORTANT

- *Always replace the seal if dismantling the hub. Failure to do so could result in premature failure of hub and its components.*
- d. Replace any damaged parts before reassembling the components. Be sure to remove any debris or dirt and repack bearings with an SAE approved hub grease.

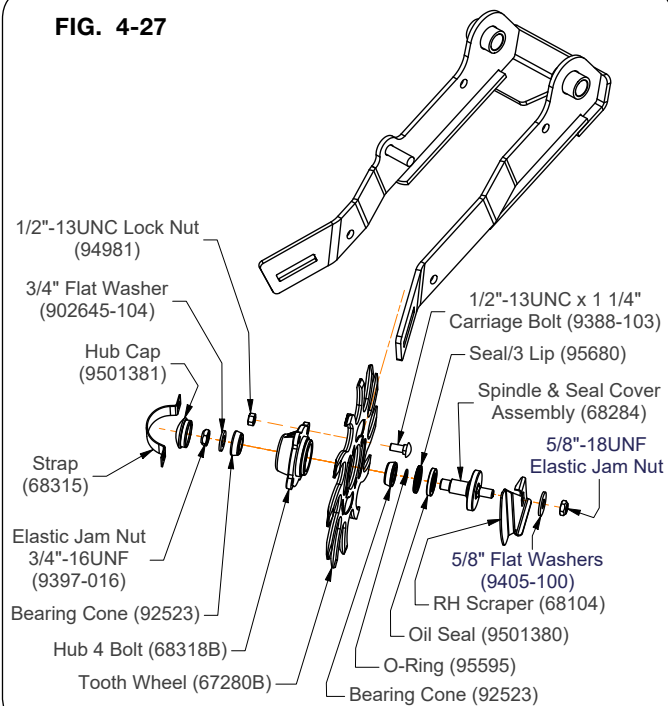
Row Cleaner Wheel Hub Adjustment (continued)

- e. Assemble seal and bearings into hub and position onto spindle.
- f. Apply grease to the I.D. of the seal (95680). While rotating the hub, place the hub on the spindle and seal cover (68284) making sure not to damage the seal. Assemble the washer and nut. Torque the jam nut (9397-016) to 20 ft.-lbs. and back off 1/4 of a turn. Apply a light coating of thread sealant to the O.D. of the hub cap and tighten onto the hub.

IMPORTANT

- *Rotate coulter hub when torquing jam nut. Doing this will prevent flats from forming on bearings.*

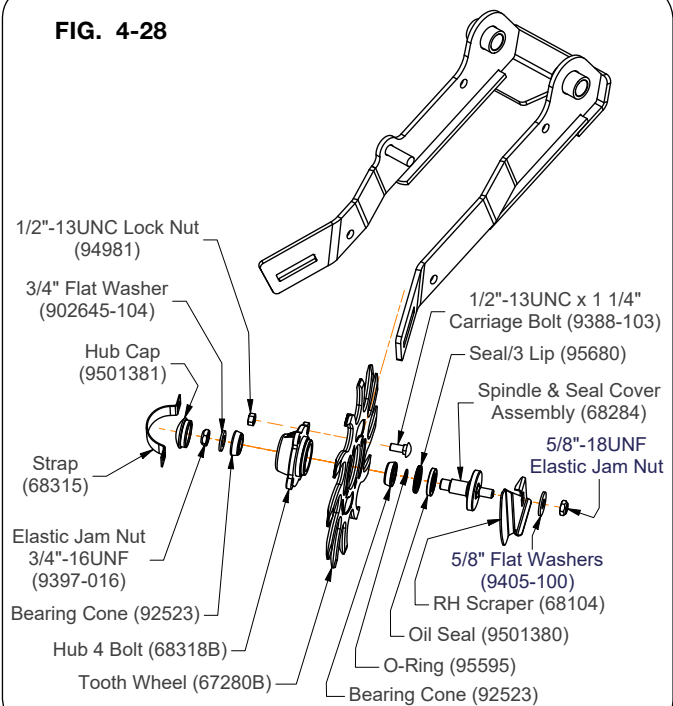
FIG. 4-27



Row Cleaner Wheel Replacement

1. To replace a worn tooth wheel (67280B), remove and save the 5/8"-18UNF elastic jam nut (9397-015), 5/8" flat washer (9405-100), scraper and the hub/spindle assembly from the mounting arm. (FIG. 4-28)
2. Remove the four locknuts (94981) and carriage bolts (9388-103). Replace and reinstall tooth wheel (67280B) and hardware.
3. Reinstall the hub/spindle assembly onto the mounting plate and secure with scraper, 5/8" flat washer (9405-100), and 5/8"-18UNF elastic jam nut (9397-015). (FIG. 4-28)

FIG. 4-28



Daily Service

Beginning of Day

NOTE: Before initial use, ensure all lubrication points have been greased.

Check all U-bolts and bolts for tightness. This is especially important during the first days of operation. See “Torque Chart” in this section.

Perform any daily lubrication outlined in “Lubrication” in this section.

Check stabilizer tire air pressure and inflate to correct pressure, if necessary.

IMPORTANT

- *To assure level penetration of shanks, both tires must be inflated to the same pressure.*

End of Day

Clean off dirt and residue which may have accumulated on implement during operation.

Check implement for damage which could have occurred during operation, and repair.

Annual Service

Beginning of Season



- **READ AND UNDERSTAND SAFETY RULES BEFORE OPERATING OR SERVICING THIS MACHINE. REVIEW "SAFETY" SECTION IN THIS MANUAL IF NECESSARY.**

Check all bolts, U-bolts, and wheel bolts for tightness. Refer to “Torque Chart” in this section.

Lubricate implement (see “Lubrication” in this section).

Check air pressure in tires and inflate to correct pressure if necessary (see “Daily Service” in this section).

End of Season

Your implement is an important investment. Spend a little time to protect it from destructive rust and corrosion. You will be repaid in longer service life and better performance.

Perform the following before placing the implement in storage:

1. Remove dirt and residue which could cause rusting.
2. Repaint any chipped or scraped areas.
3. Lubricate implement (see “Lubrication” in this section).
4. Coat all earth moving surfaces with grease or suitable rust preventatives.
5. Inspect for damaged parts. Replace before next season.
6. Store implement inside, away from livestock.
7. Use support stands to keep implement tires and points up off bare ground.
8. Replace all worn, torn or faded decals and reflectors.

PULL-TYPE RAPTOR — Maintenance

Troubleshooting

PROBABLE CAUSE	CORRECTION
Poor Penetration	
Frame is not level	See the OPERATION section "Leveling Frame" for instructions
Ground is too hard for hitch control setting	Adjust the hitch control position. See the OPERATION section "Load and Depth control"
Worn or dull tool points	Replace with new tool points
Plugging	
Poor field conditions	Wait until the field is dry enough to till properly without excessive slippage
Machine not level	Level Machine
Coulter blades not cutting residue	Wait until the field is dry enough to allow blades to cut through residue
Implement Running Crooked In Field	
Shanks are not spaced correctly	See "Overhead Layouts" for correct spacing of the shanks
Stabilizer wheels are not adjusted equally from side-to-side	Check the side-to-side adjustment and tire pressure
Tractor tires are not properly spaced or equally inflated	Find the cause and correct. See OPERATION section "Wheel Spacing"

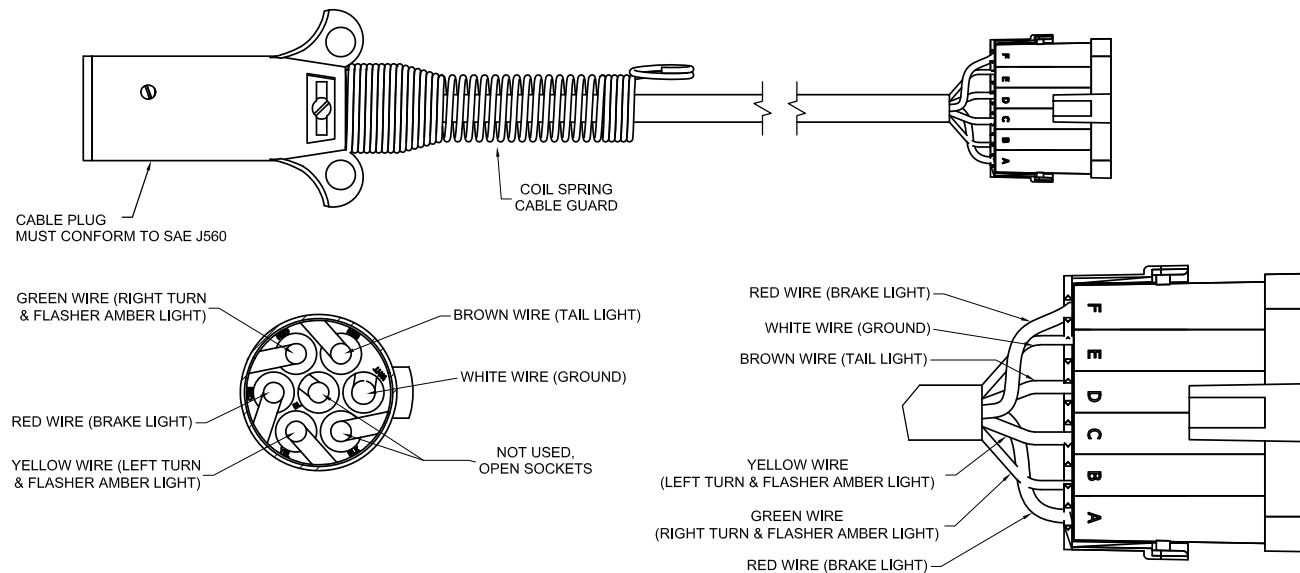
PULL-TYPE RAPTOR — Maintenance

Troubleshooting (continued)

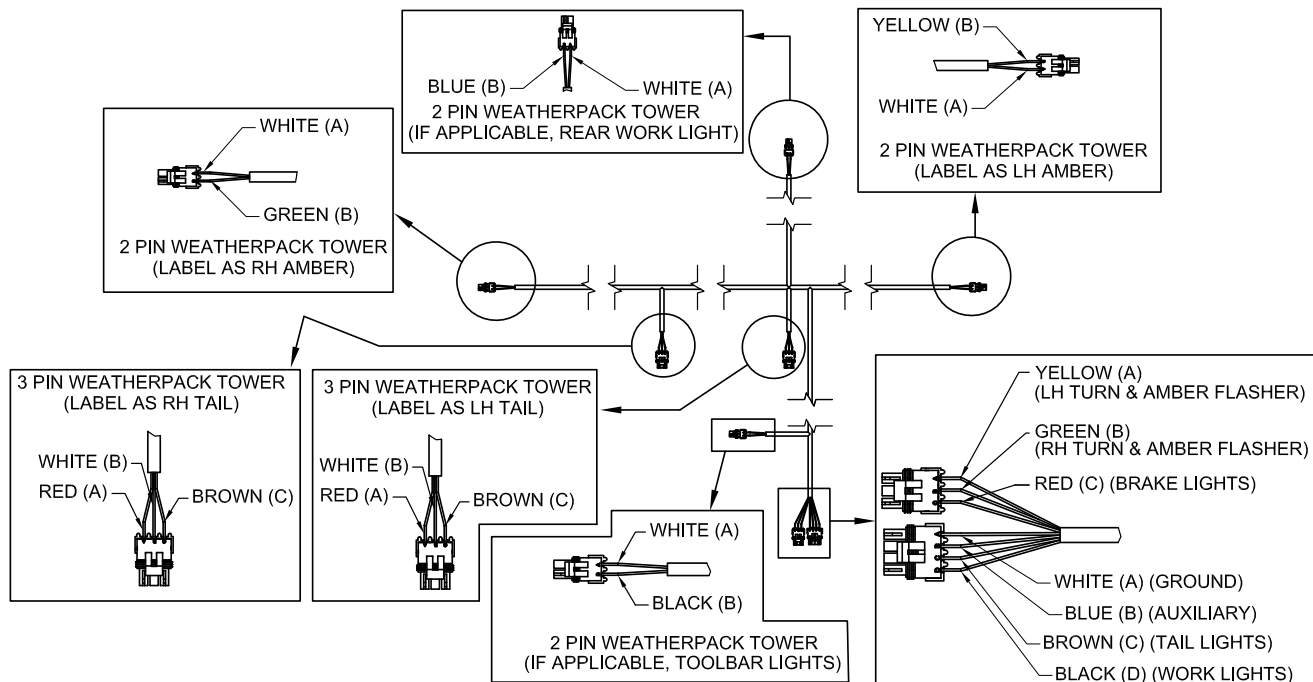
PROBABLE CAUSE	CORRECTION
Shanks Not Resetting Into Ground After Tripping	
Ground conditions hard or the unit is being operated very deep	While moving, raise Raptor slightly to reset, then lower and resume operation
Excessive Soil Disturbance	
Main frame not level, running downhill	Level main frame
Dry soil conditions	Wait for additional rain
Running implement too fast	Slower speeds create less disturbances
Too much sealing	Decrease closing down pressure, decrease coulters angle or move coulters apart
Not enough sealing	Increase closing down pressure, increase coulters angle or move coulters closer
Folding	
Toolbars will not fold up	Adjust cam valve (Normally Closed) striker plate/bracket
Toolbars will not fold down	Fold up then fold down
Wings will not fold to transport position	Completely unfold the unit and then fold
Lift cylinders lower when folding wings into cradle	Adjust cam valve (Normally Open) striker plate/bracket

Schematics - Electrical

Electrical Harness - Main 480" (45000)

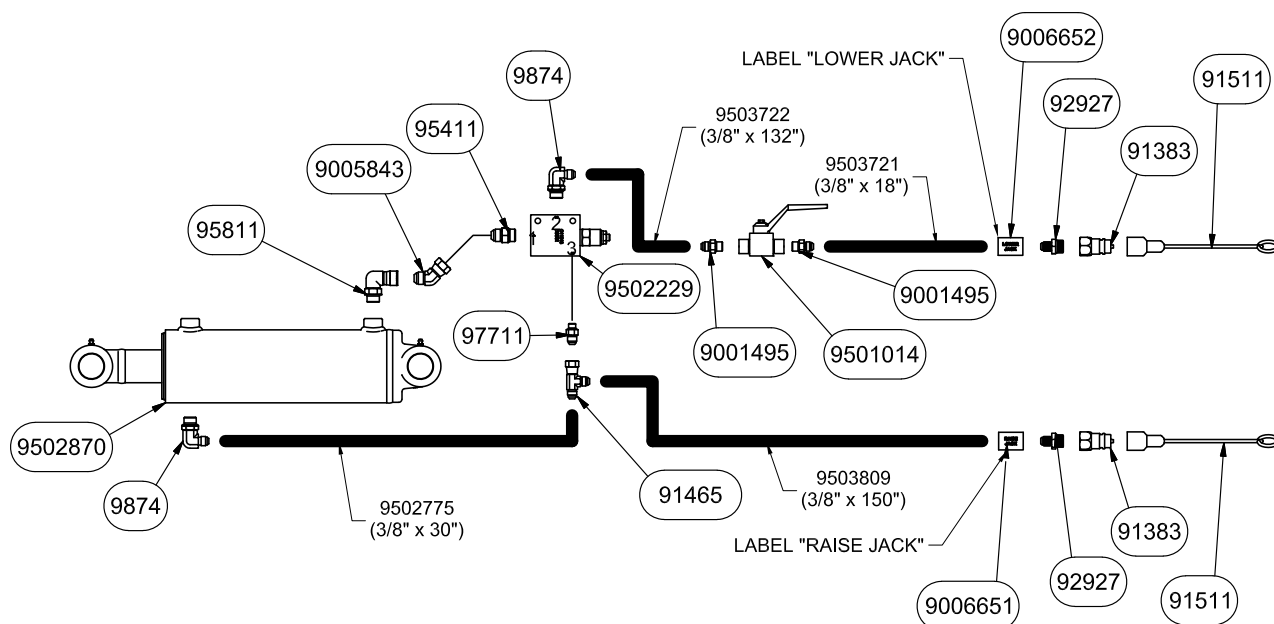


Electrical Harness - Light 418" (44999)

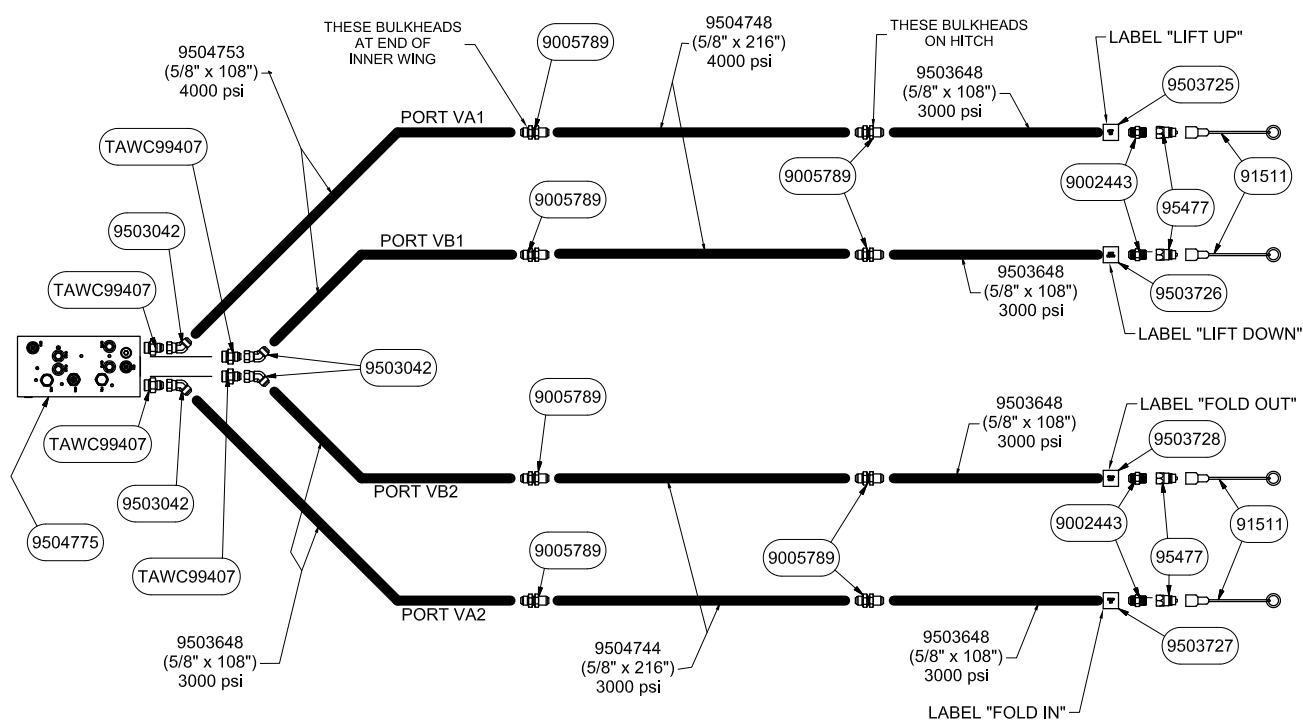


Schematics - Hydraulic

Tractor To Hydraulic Jack

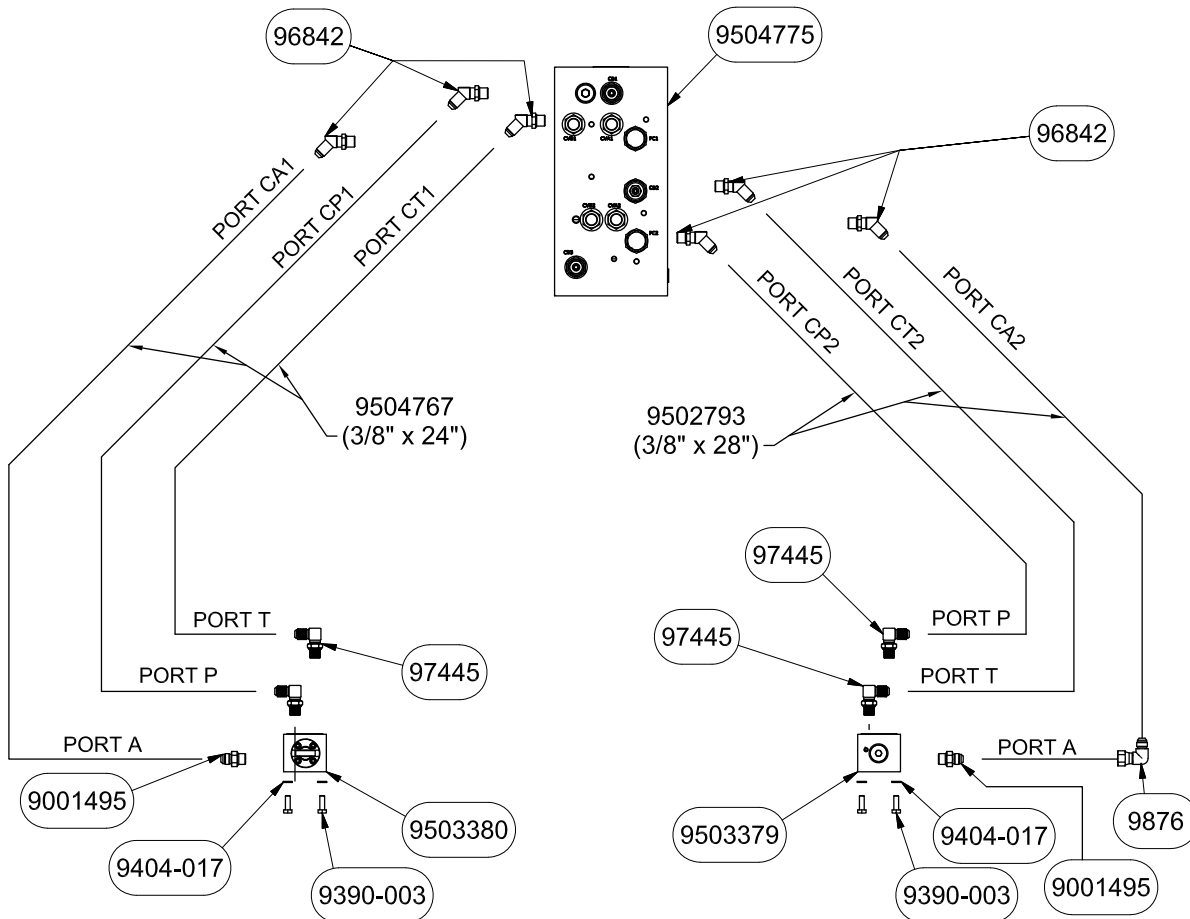


Tractor To Supply Valve - Serial Number A70040100 & Up



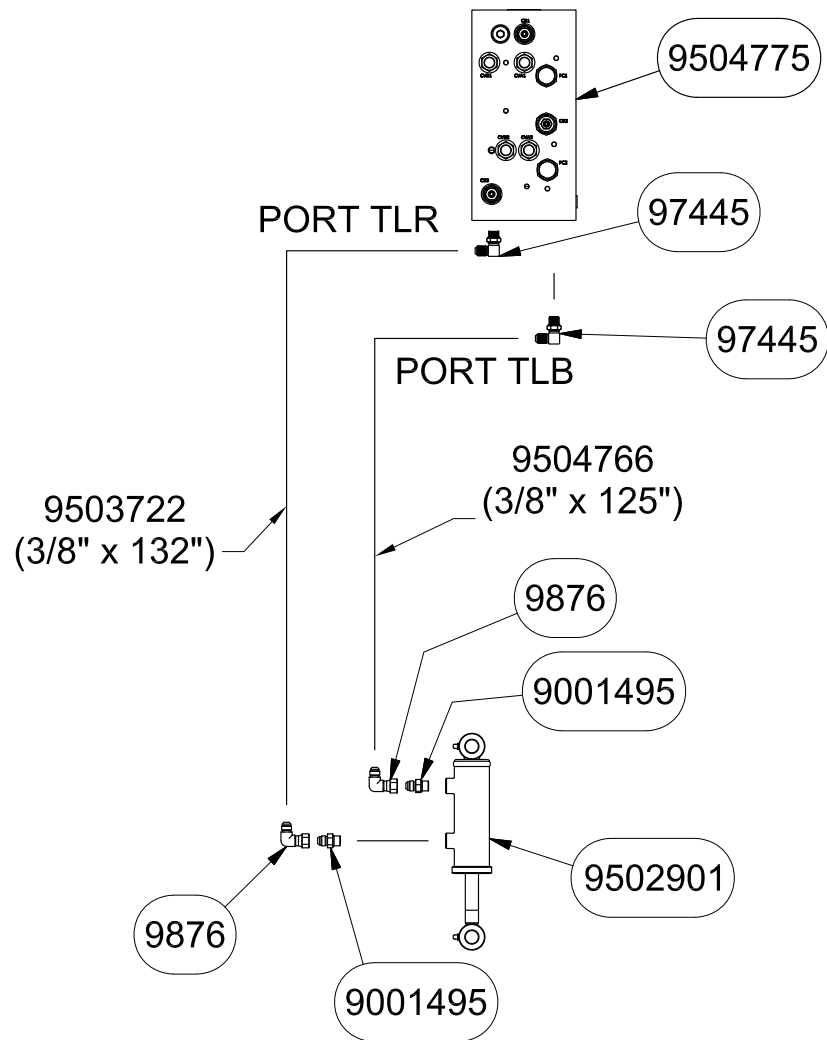
Schematics - Hydraulic (continued)

Supply Valve Assembly To Sequence Valves Serial Number A70040100 & Up



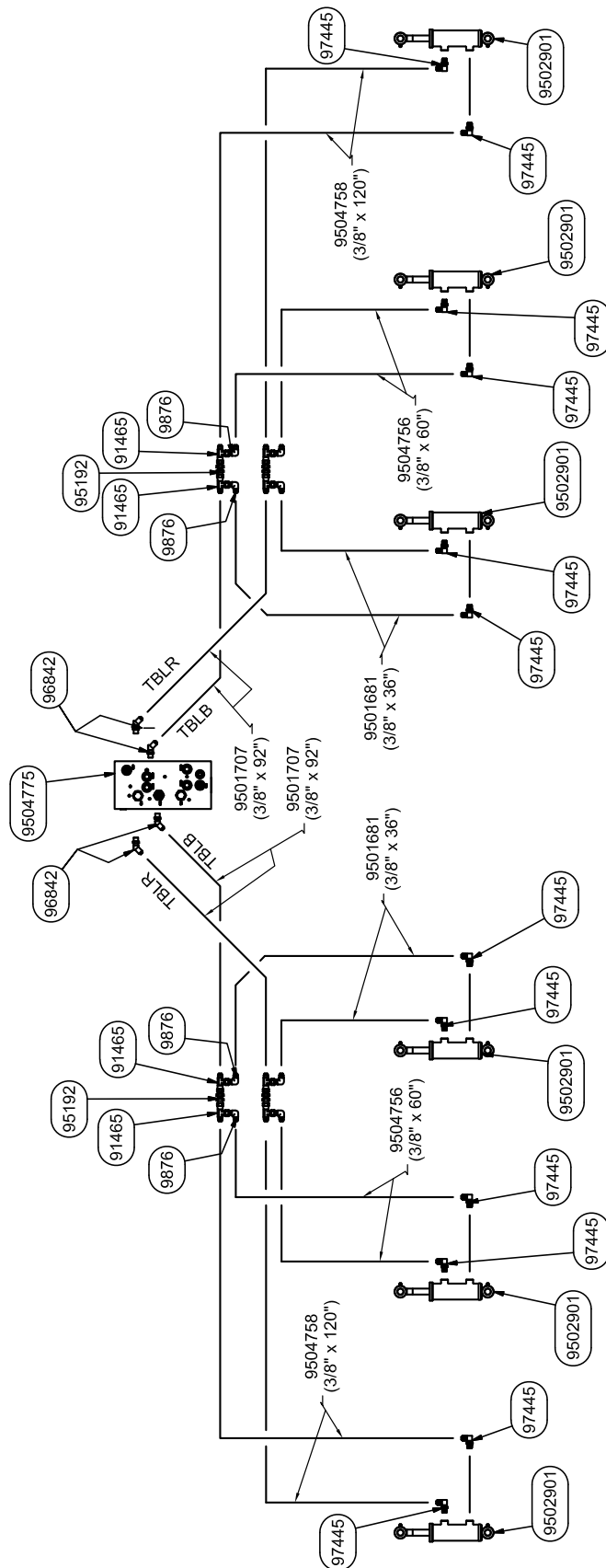
Schematics - Hydraulic (continued)

Supply Valve Assembly to Tongue Latch Serial Number A70040100 & Up



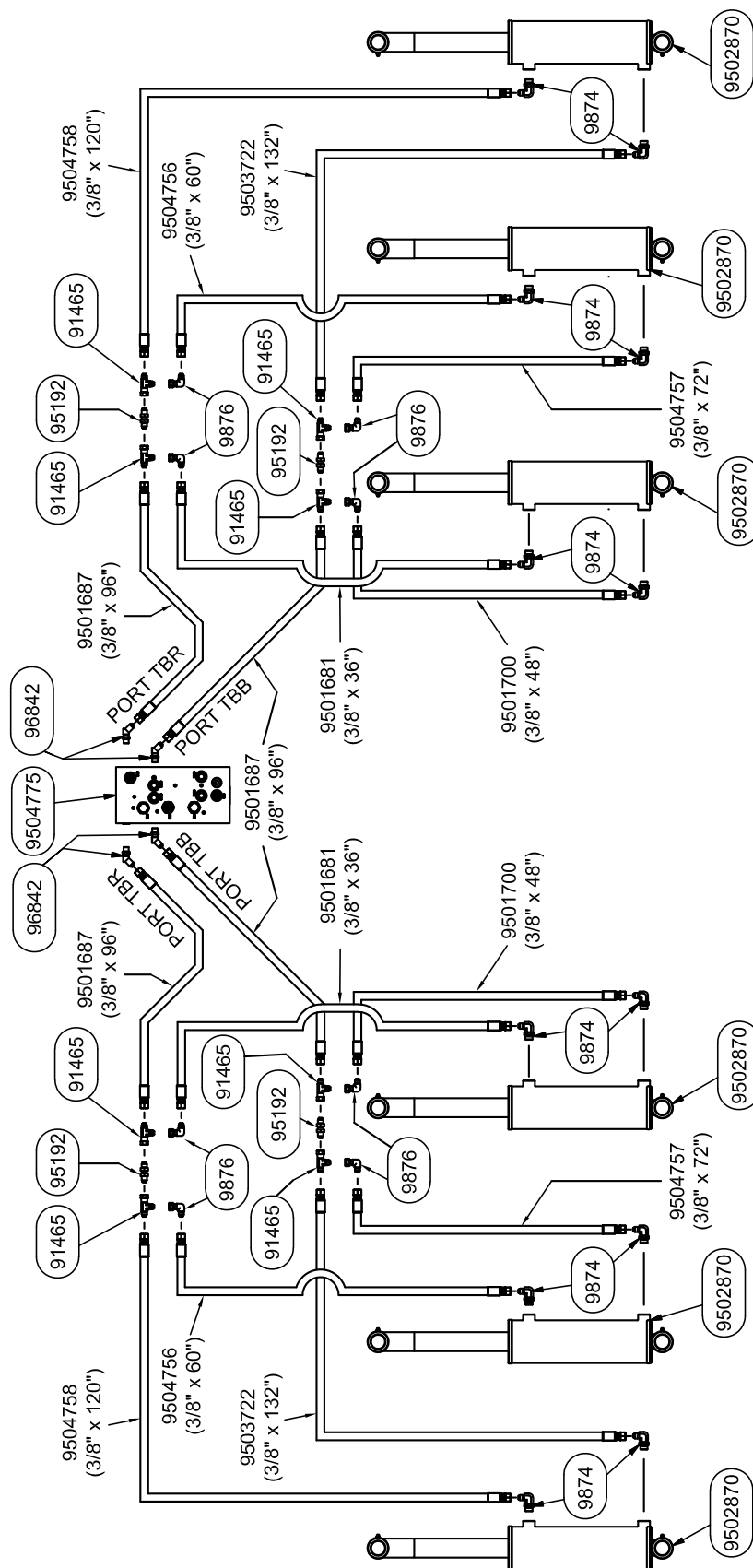
Schematics - Hydraulic (continued)

Supply Valve Assembly to Toolbar Latch - Serial Number A70040100 & Up



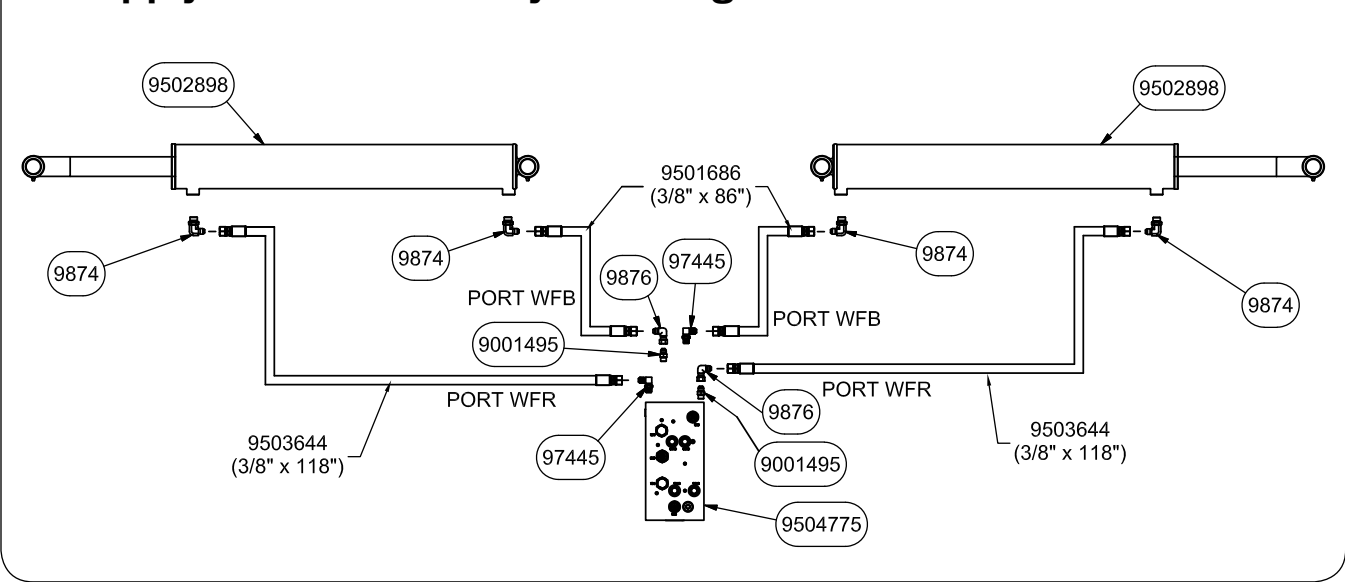
Schematics - Hydraulic (continued)

Supply Valve Assembly to Toolbar Fold - Serial Number A70040100 & Up



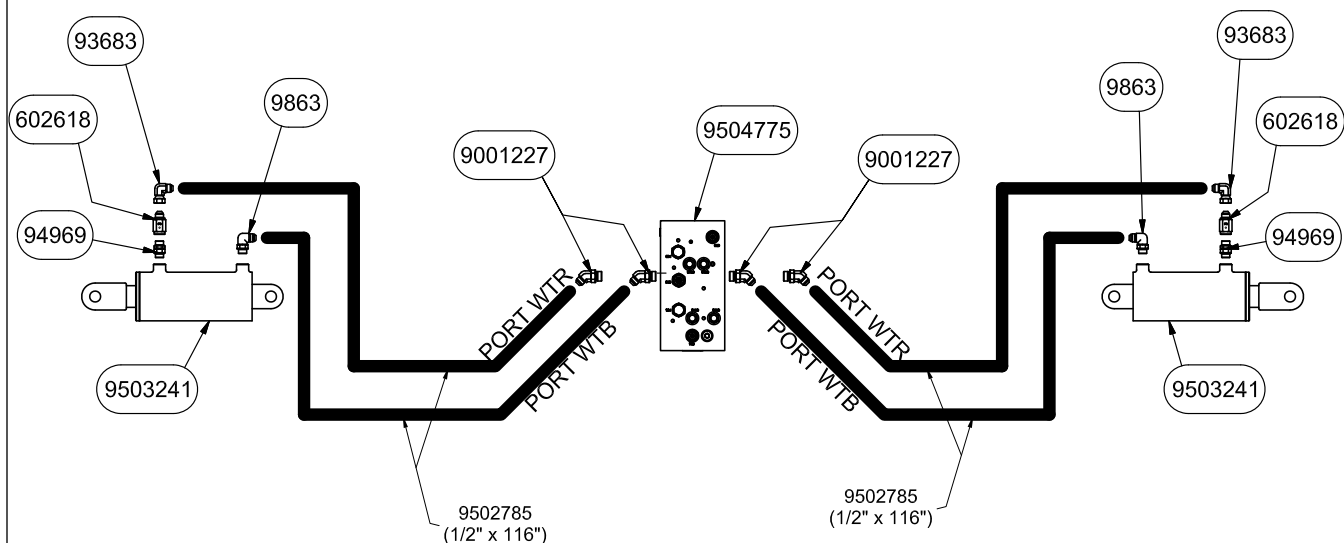
Schematics - Hydraulic (continued)

Supply Valve Assembly to Wings

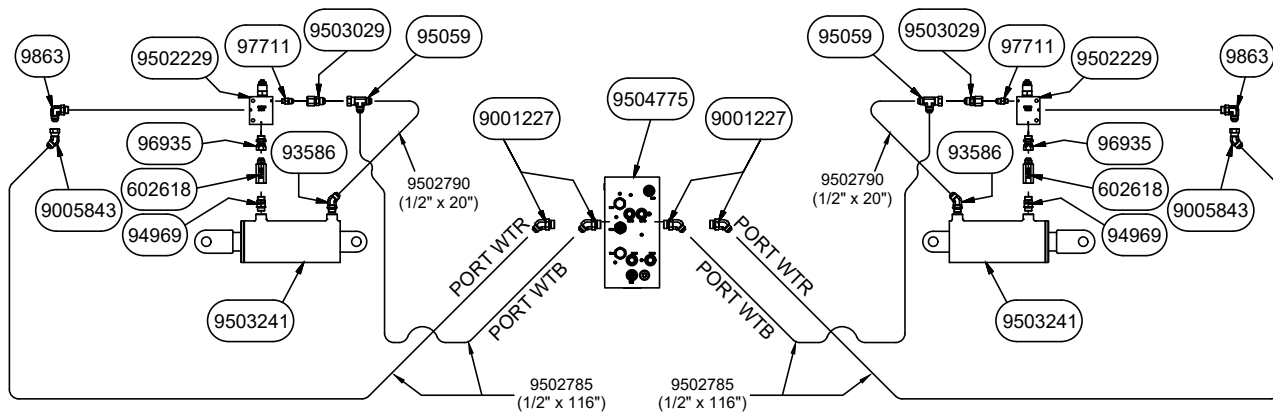


Schematics - Hydraulic (continued)

Supply Valve Assembly to Wing Tilt

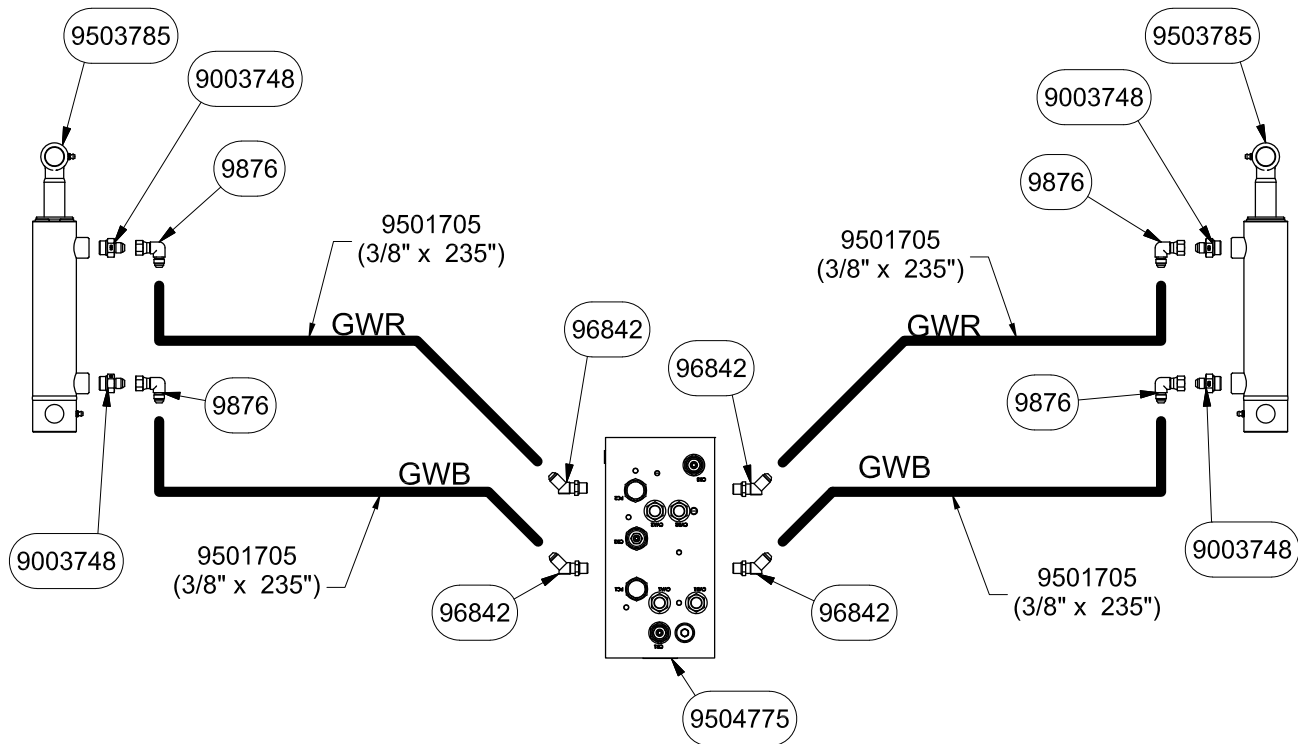


Supply Valve Assembly to Wing Tilt with Counterbalance Kit



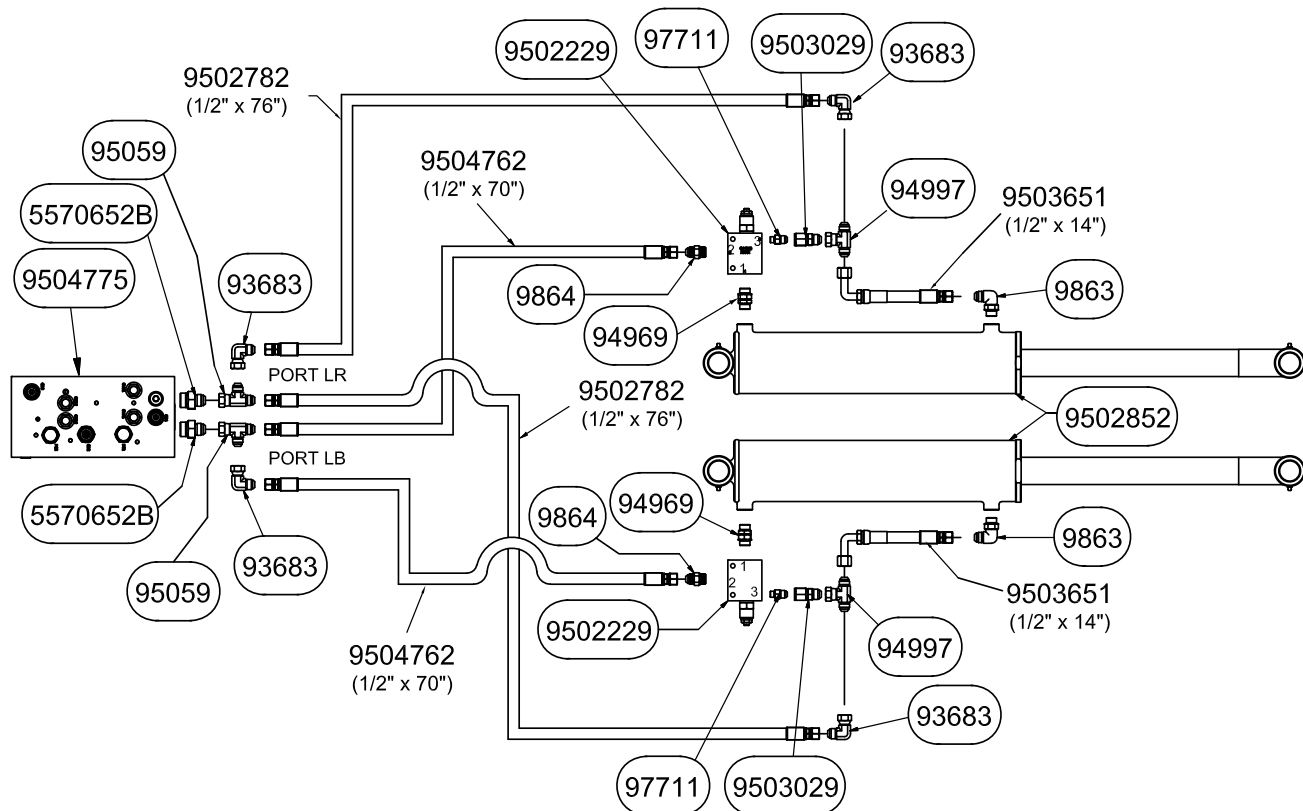
Schematics - Hydraulic (continued)

Supply Valve Assembly to Gauge Wheels Serial Number A70040100 & Up



Schematics - Hydraulic (continued)

Supply Valve Assembly to Parallel Link/Main Lift-Lower Serial Number A70040100 & Up



Wheel, Hub and Spindle Disassembly and Assembly

WARNING

- TIPPING OR MOVEMENT OF THE MACHINE CAN CAUSE SERIOUS INJURY OR DEATH. BE SURE MACHINE IS SECURELY BLOCKED.
- FALLING OBJECTS CAN CAUSE SERIOUS INJURY OR DEATH. DO NOT WORK UNDER THE MACHINE AT ANY TIME WHILE BEING HOISTED. BE SURE ALL LIFTING DEVICES AND SUPPORTS ARE RATED FOR THE LOADS BEING HOISTED. THESE ASSEMBLY INSTRUCTIONS WILL REQUIRE SAFE LIFTING DEVICES UP TO 30,000 LBS. SPECIFIC LOAD RATINGS FOR INDIVIDUAL LOADS WILL BE GIVEN AT THE APPROPRIATE TIME IN THE INSTRUCTIONS.
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

CAUTION

- IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. TORQUE WHEEL NUTS/BOLTS TO VALUES IN TABLE. CHECK TORQUE BEFORE USE, AFTER ONE HOUR OF UNLOADED USE OR AFTER FIRST LOAD, AND EACH LOAD UNTIL WHEEL NUTS/BOLTS MAINTAIN TORQUE VALUE. CHECK TORQUE EVERY 10 HOURS OF USE THERE-AFTER. AFTER EACH WHEEL REMOVAL START TORQUE PROCESS FROM BEGINNING. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.

IMPORTANT

- *Remove only one wheel and tire from a side at any given time in the following procedure.*
1. Hitch implement to tractor. Park on a firm, level surface. Set the tractor's parking brake, shut off engine and remove key.
 2. Use a safe lifting device rated at 30,000 lbs. to support the weight of your implement. Place the safe lifting device under the axle closest to the tire.
 3. Use a 300 lbs. safe lifting device to support the wheel and tire during removal.
 4. If only removing wheel and tire, skip to Step 8; otherwise continue with Step 4.

Remove the hardware retaining the hubcap. Next, remove the hubcap, gasket, cotter pin, castle nut and spindle washer. Remove hub with bearings from old spindle using a 200 lbs. lifting device.

Wheel, Hub and Spindle Disassembly and Assembly (continued)

5. Inspect the spindle and replace if necessary. If spindle does not need to be replaced, skip to Step 6; otherwise continue with Step 5.

Remove the bolt and lock nut that retain the spindle to the axle. Using a lifting device rated for 200 lbs., remove the old spindle. Coat spindle shaft with anti-seize lubricant prior to installation. Reuse bolt and lock nut to retain spindle to axle. Torque as outlined in Maintenance Section.

6. Remove seal and inspect bearings, spindle washer, castle nut and cotter pin. Replace if necessary. Pack both bearings with Extreme Pressure NLGI #2 grease and reinstall inner bearing. Install new seal in hub with garter spring facing inward to the hub by tapping on flat plate that completely covers seal while driving it square to hub. Install until flush with back face of hub. Using a 200 lb. rated lifting device, install hub assembly onto spindle. Install outer bearing, spindle washer and castle nut.

IMPORTANT

- *Do not use an impact wrench!*
7. Slowly tighten castle/slotted nut while spinning the hub until hub stops rotating. Turn castle nut counterclockwise until the hole in the spindle aligns with the next notch in castle nut. Hub should spin smoothly with minimal drag and no end play. If play exists, tighten to next notch of castle nut. If drag exists, then back castle nut to next notch. Spin and check again. Install cotter pin. Clean face for hub cap gasket and install gasket, grease- filled hub cap and retain hubcap with hardware removed. Tighten hubcap hardware in alternating pattern.
 8. Attach the wheel(s) and tire(s) to the hub using the same rated safe lifting device for removal. Tighten wheel nuts to appropriate requirements and recheck as outlined in the Wheels and Tires section of this manual.
 9. Raise implement, remove lifting device and lower tire to the ground.

Wheels and Tires

Wheel Nut Torque

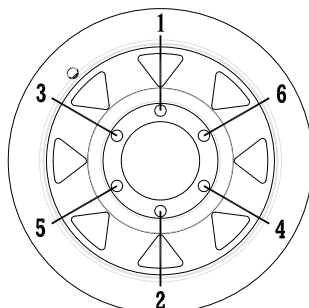
CAUTION

- IMPROPERLY TORQUED WHEEL NUTS/BOLTS CAN CAUSE A LOSS OF IMPLEMENT CONTROL AND MACHINE DAMAGE. TORQUE WHEEL NUTS/BOLTS TO VALUES IN TABLE. CHECK TORQUE BEFORE USE, AFTER ONE HOUR OF USE, AND EACH HOUR UNTIL WHEEL NUTS/BOLTS MAINTAIN TORQUE VALUE. CHECK TORQUE EVERY 10 HOURS OF USE THERE-AFTER. AFTER EACH WHEEL REMOVAL START TORQUE PROCESS FROM BEGINNING. WARRANTY DOES NOT COVER FAILURES CAUSED BY IMPROPERLY TORQUED WHEEL NUTS/BOLTS.

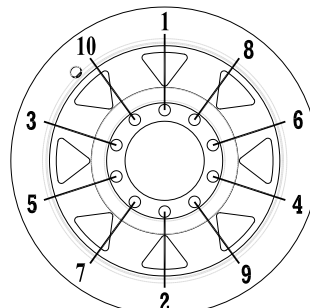
Failure to check torque before first use may damage wheel nut/bolt seats. Once seats are damaged, it will become impossible to keep nuts/bolts tight. Tighten nuts/bolts to applicable torque value shown in table. Start all nuts/bolts by hand to prevent cross threading. Torque nuts/bolts in the recommended sequence as shown in Diagram 4-1.

WHEEL HARDWARE	
SIZE	FOOT-POUNDS
9/16"-18 (UNF)	110 Ft.-Lbs.
7/8"-14 (UNF)	450 Ft.-Lbs.
M22-2.5P	450 Ft.-Lbs.

Diagram 4-1



6 Bolt



10 Bolt

Tire Pressure

- The following is to be used as a general guide for tire inflation and figures can vary depending on specific brand of tire used. It is important that tires are inspected after unit is loaded. Start with minimum pressure indicated. The tire should stand up with no side-wall buckling or distress as tire rolls. Record the pressure needed to support the full load and maintain this pressure to achieve proper tire life. Do not exceed maximum recommended tire pressure.

TIRE	INFLATION
240/80R15F - 121D	max. 46 PSI
380/90R46 R-1W - 159A8	max. 58 PSI

(All tire pressures in psi)

Wheels and Tires

Tire Warranty

For questions regarding new tire warranty, please contact your local original equipment tire dealer. Used tires carry no warranty. Following are phone numbers and Websites for your convenience:

Firestone www.firestoneag.com
Phone 800-847-3364

Titan www.titan-intl.com
or Phone 800-USA-BEAR
Goodyear Fax 515-265-9301

Carlisle www.carlisletire.com
Phone 800-260-7959
Fax 800-352-0075

Greenball www.greenball.com
Phone nearest location:
California 800-937-5204
Georgia 800-283-4569
Florida 800-935-0200
Indiana 800-426-4068
Tennessee 800-946-9412
Ohio 800-840-7295
Pennsylvania 800-869-6787

Complete Torque Chart

Capscrews - Grade 5

NOTE:

- Grade 5 capscrews can be identified by three radial dashes on the head.
- For wheel torque requirements, refer to Wheels and Tires.
- Tighten U-bolts evenly and equally to have the same number of threads exposed on each end.



SIZE	FOOT POUNDS	NEWTON METERS
1/4-20 1/4-28	8-10 9-11	11-13 12-15
5/16-18 5/16-24	15-17 17-19	20-23 23-26
3/8-16 3/8-24	25-28 28-31	34-38 38-42
7/16-14 7/16-20	40-45 45-50	54-61 61-68
1/2-13 1/2-20	62-68 68-75	84-92 92-102
9/16-12 9/16-18	90-98 100-110	122-133 134-148
5/8-11 5/8-18	120-135 124-137	162-183 168-186
3/4-10 3/4-16	200-220 210-230	270-300 285-310
7/8-9 7/8-14	330-350 360-380	425-475 460-515
1-8 1-14	500-525 540-560	675-710 730-760
1 1/8-7 1 1/8-12	600-635 665-700	815-860 920-950
1 1/4-7 1 1/4-12	850-895 940-990	1150-1215 1275-1340
1 3/8-6 1 3/8-12	1125-1175 1280-1335	1525-1590 1735-1810
1 1/2-6 1 1/2-12	1500-1560 1685-1755	2035-2115 2285-2380

IMPORTANT

- Follow these torque recommendations except when specified in text.

Complete Torque Chart

Capscrews - Grade 8

NOTE:

- Grade 8 capscrews can be identified by six radial dashes on the head.
- For wheel torque requirements, refer to Wheels and Tires.
- Tighten U-bolts evenly and equally to have the same number of threads exposed on each end.



SIZE	FOOT POUNDS	NEWTON METERS
5/16-18	20-22	27-30
5/16-24	21-23	28-31
3/8-16	35-39	47-53
3/8-24	36-41	49-55
7/16-14	54-58	73-78
7/16-20	55-60	75-80
1/2-13	82-88	110-120
1/2-20	94-99	125-135
9/16-12	127-134	170-180
9/16-18	147-155	199-210
5/8-11	160-170	215-230
5/8-18	165-175	225-235
3/4-10	280-295	380-400
3/4-16	330-365	445-495
7/8-9	410-430	555-580
7/8-14	420-440	570-595
1-8	630-650	850-880
1-14	680-700	920-950
1 1/8-7	900-930	1220-1260
1 1/8-12	930-950	1260-1290
1 1/4-7	1250-1300	1695-1760
1 1/4-12	1280-1320	1735-1790

IMPORTANT

- Follow these torque recommendations except when specified in text.

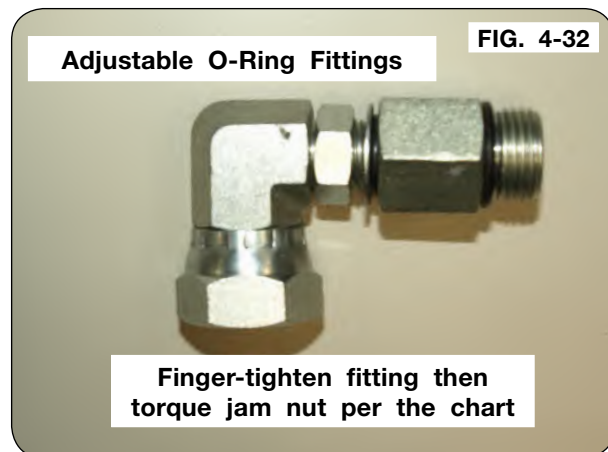
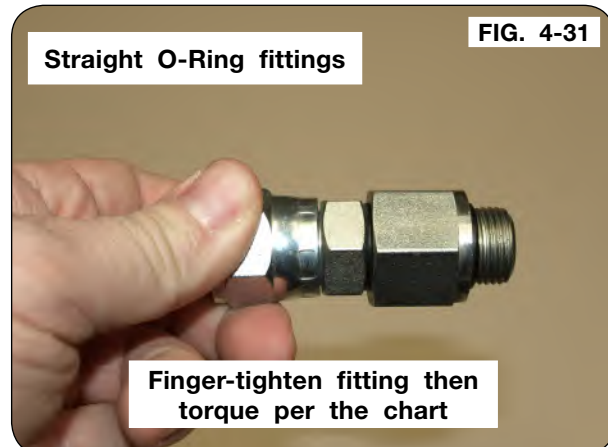
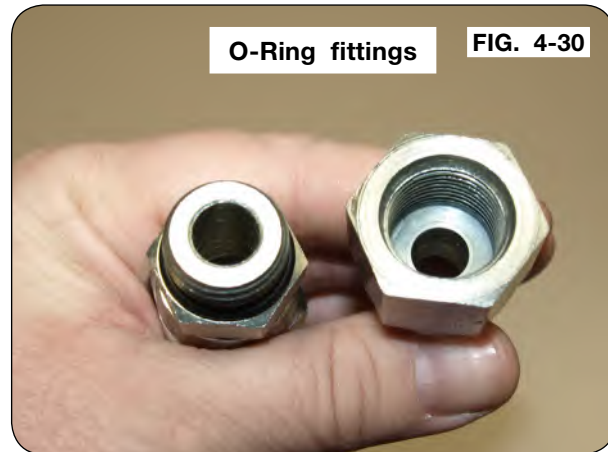
Hydraulic Fittings - Torque and Installation

Tightening O-Ring Fittings

1. Inspect components for damage or contamination. Do not connect any other type of fitting to an O-ring fitting.
2. For adjustable fittings, insure the jam nut and washer are fully backed up.
3. Lubricate the O-ring and threads on the fitting.
4. Turn the fitting into the port until it is finger tight.
5. For adjustable fittings, set in the desired position.
6. Using a wrench, torque the fitting to the value in the below table. For adjustable fittings the jam nut will be tightened.

NOTE: Never use a power tool to install a fitting.

Dash Size	Thread Size	Straight Stud Torque (Ft-Lbs)	Adjustable Stud Torque (Ft-Lbs)
-5	1/2-20	14-19	10-14
-6	9/16-18	18-24	12-16
-8	3/4-16	27-43	20-30
-10	7/8-14	36-48	30-36
-12	1-1/16-12	65-75	44-54
-14	1-3/16-12	75-99	53-70
-16	1-5/16-12	85-123	59-80
-20	1-5/8"-12	115-161	75-100
-24	1-7/8"-12	125-170	105-125



Hydraulic Fittings - Torque and Installation (continued)

Tightening JIC Fittings

1. Inspect all components for damage or contamination. Do not connect any other type of fitting to a JIC fitting.
2. Lubricate the threads.
3. Turn the fitting into the port until it bottoms out.
4. Use one wrench on the fixed hex on the hose to prevent twisting and a second on the swivel. Tighten the fitting another 60 degrees (or one flat)

NOTE: Never use a power tool to install a fitting.

