



LT MODELS

RAPTOR STRIP-TILLAGE TOOL



MODEL 2115LT & 2130LT LIQUID CART MAINTENANCE

MODEL 2015LT & 2030LT LIQUID CART MAINTENANCE

MODEL 2115 & 2130 PULL-TYPE TILLAGE TOOL MAINTENANCE

MODEL 2015 & 2030 PULL-TYPE TILLAGE TOOL MAINTENANCE

**INNOVATING
THE FUTURE OF
AGRICULTURE**

STRIP-TILLAGE

UNVERFERTH MFG. CO., INC.
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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.

IMPORTANT

- *Inspect mast pins for any wear or damage. Replace any worn or damaged pins.*

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.

Seasonal Storage

Always open all valves to remove any fluids and to allow moisture to dry.

Immediately after season is finished, completely wash machine to remove corrosive fertilizer inside and out before storing. When using pressure washers maintain an adequate distance so not to force water into bearings, hydraulic seals, or electrical connections.

1200 GALLON LIQUID FERTILIZER CART — Maintenance

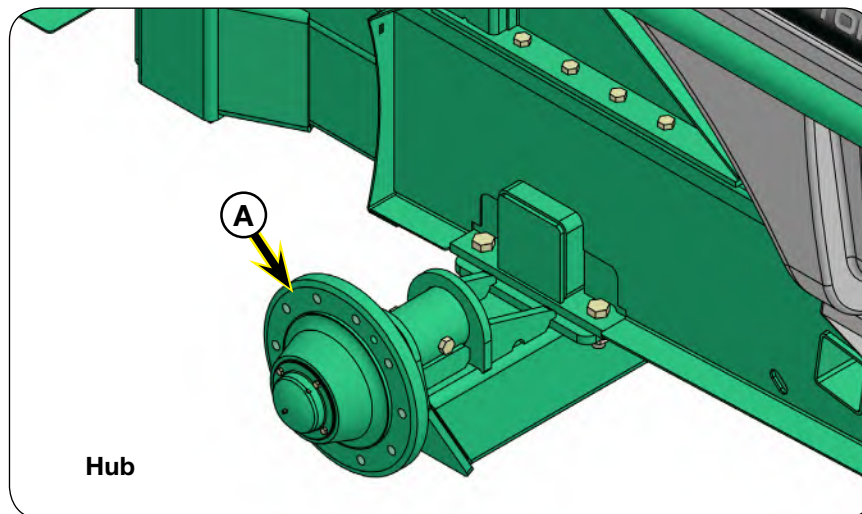
Lubrication Points

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.

The lubrication locations and recommended schedule are as follows:

ITEM	DESCRIPTION	POINT	QTY	HOURS
A	Hubs	2	1 Shot	Weekly



1200 GALLON LIQUID FERTILIZER CART — Maintenance

Troubleshooting

Problem	Possible Cause	Corrective Action
Pressure too Low	Valve has an obstruction	Open all valves to pump and check for obstruction.
	Filter plugged	Clean or replace filters
	Hydraulic flow on tractor set too low	Increase hydraulic flow on tractor.
	Agitation is not set properly	Close agitation completely and slightly open the valve so the pump pressure decreases by 5 psi.
	Impeller has obstruction	Separate pump housing. Remove and clean the impeller.
	Impeller is not turning	Separate pump housing. Verify that shaft and impeller turn together.
Pressure too High	Hydraulic flow on tractor set too high	Decrease hydraulic flow on tractor.
	Improper nozzle size	Verify Nozzle Size.
Rate control console will not turn on	No power coming to the console	Check power source connections.
	Bad console	Check for 12 volts of power on Pin #16 with Pin #1 being ground on the cable coming into the console if equipped with 450 controller.
Do not have a rate	Not getting a speed	Press the speed button on the console to see if there is a speed.
	Not getting a flow	Press the vol/min button on the console to see if there is a flow.
Do not have a speed	Orange wire is unplugged	Verify the orange wire is plugged in to the speed sensor.
	Defective cable or sensor	Program a self test into the console and then check for a rate.
Speed is inaccurate	Loosen cable connection	Wiggle the connections for the speed cable. If accurate speed is displayed tighten connection.
	Cut in cable	Check speed cable for cuts in the cable. Fix the cable or replace the cable.
Do not have a flow	Regulating valve is not operating or PWM cartridge is not functioning	Check and remove debris from valve or PWM cartridge.
	Defective cable	Unplug the flow meter. With the plug keyway at the 12 o'clock position, check voltage between pins at the 2 o'clock and 6 o'clock positions (2 o'clock is ground). Should have 5 volts. Also check voltage between pins at the 2 o'clock and 10 o'clock positions (2 o'clock is ground). Should have 5 volts.
	Defective flow meter	Unplug the flow meter. Check for 5 volts across the 2 wires and getting voltage.
Rate is Unstable	Console is in manual	Put console into either rate 1 or rate 2 and check to see if rate becomes stable.
	Speed is inaccurate	Refer to "Speed is Inaccurate Section".
	Console is not programmed	Verify all numbers programed into console are correct.
Cannot adjust pressure when console is in manual	Defective cable or console	Unplug regulating valve or PWM cartridge. Check for 12 volts across the two wires.
	Defective Valve	Unplug regulating valve or PWM cartridge. Check for 12 volts across the two wires.

Hydraulically Driven Centrifugal Pump

ACE HYD 750/755 Barrier Fluid Charge

IMPORTANT

- Inflation valve must be assembled in the “IN” port of the regulating valve.

1. Turn regulating valve adjusting knob counterclockwise until it is at the minimum pressure setting. (FIG. 4-1)
2. Attach air chuck to air valve.
3. Turn adjusting knob on regulating valve clockwise until gauge reads 30 psi. (FIG. 4-1)
4. Remove the air pressure before disconnecting the hose. To add barrier fluid to the fluid chamber, disconnect the hose from the fitting on top of the hydraulically driven centrifugal pump. Remove the fitting on top of the pump. (FIG. 4-2)
5. Fill the fluid chamber by attaching a 1/8” hose to the barrier fluid bottle (9005518) to ease filling of the sight gauge. (FIG. 4-3)
6. Add fluid until level is half-way up the sight gauge and then pressurize.

NOTE: Any 1/8” hose will attach to the nipple of the barrier fluid bottle (9005518) to ease filling of the sight gauge. (FIG. 4-3)

At the end of each season, it is recommended to change/check the barrier fluid and seal. Follow the guidelines below.

- The pump requires pressure and/or fluid more frequently. Change barrier fluid and seal.
- The barrier fluid becomes cloudy, discolored, or water mixes with barrier fluid. Change barrier fluid and seal.
- The barrier fluid is clear. No service needed. Refill and store for the winter.

Refer to ACE pump manual and operating instructions.



FIG. 4-1

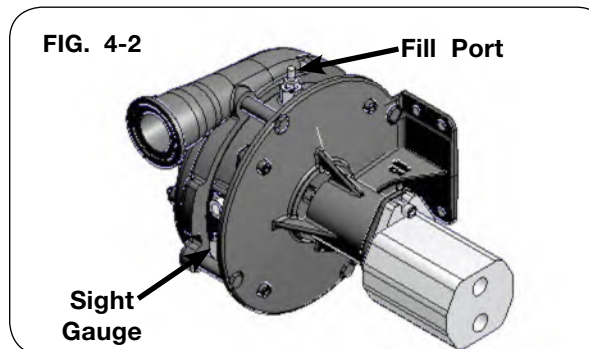


FIG. 4-2



FIG. 4-3

Filters

This applicator uses two filters to help ensure proper operation. These filters will need to be cleaned periodically during use and prior to applicator storage.

WARNING

- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- RESIDUAL PRESSURE MAY EXIST IN APPLICATOR PLUMBING EVEN WHEN UNIT IS NOT IN USE. RELIEVE PRESSURE BEFORE SERVICING ANY PLUMBING.

Primary Filter

To clean the filter located towards the front of the frame underneath the tongue, (FIG. 4-4):

1. Rotate the pump inlet valve to <OFF>.
2. Drain the strainer.
3. Unscrew the filter housing by turning counter-clockwise and remove the filter screen.
4. Clean filter by flushing strainer element with water.
5. Reassemble filter, open pump inlet valve, and check for leaks.

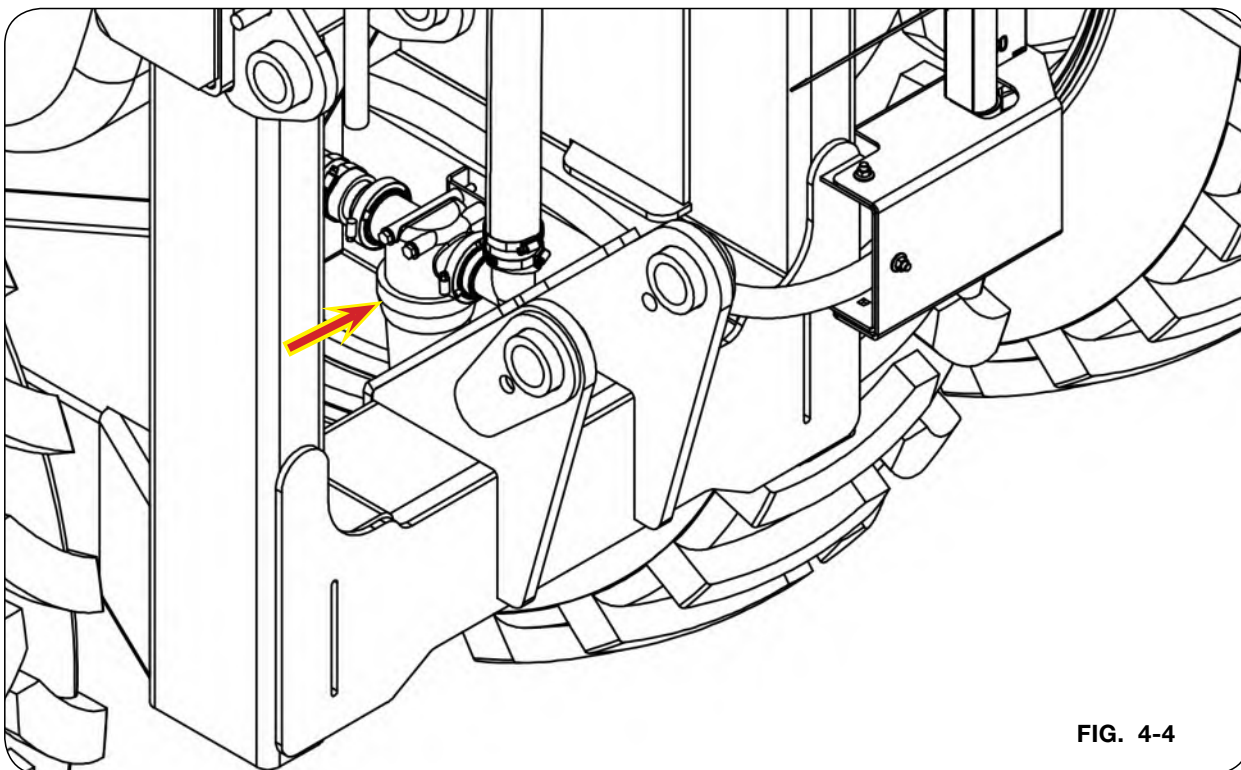


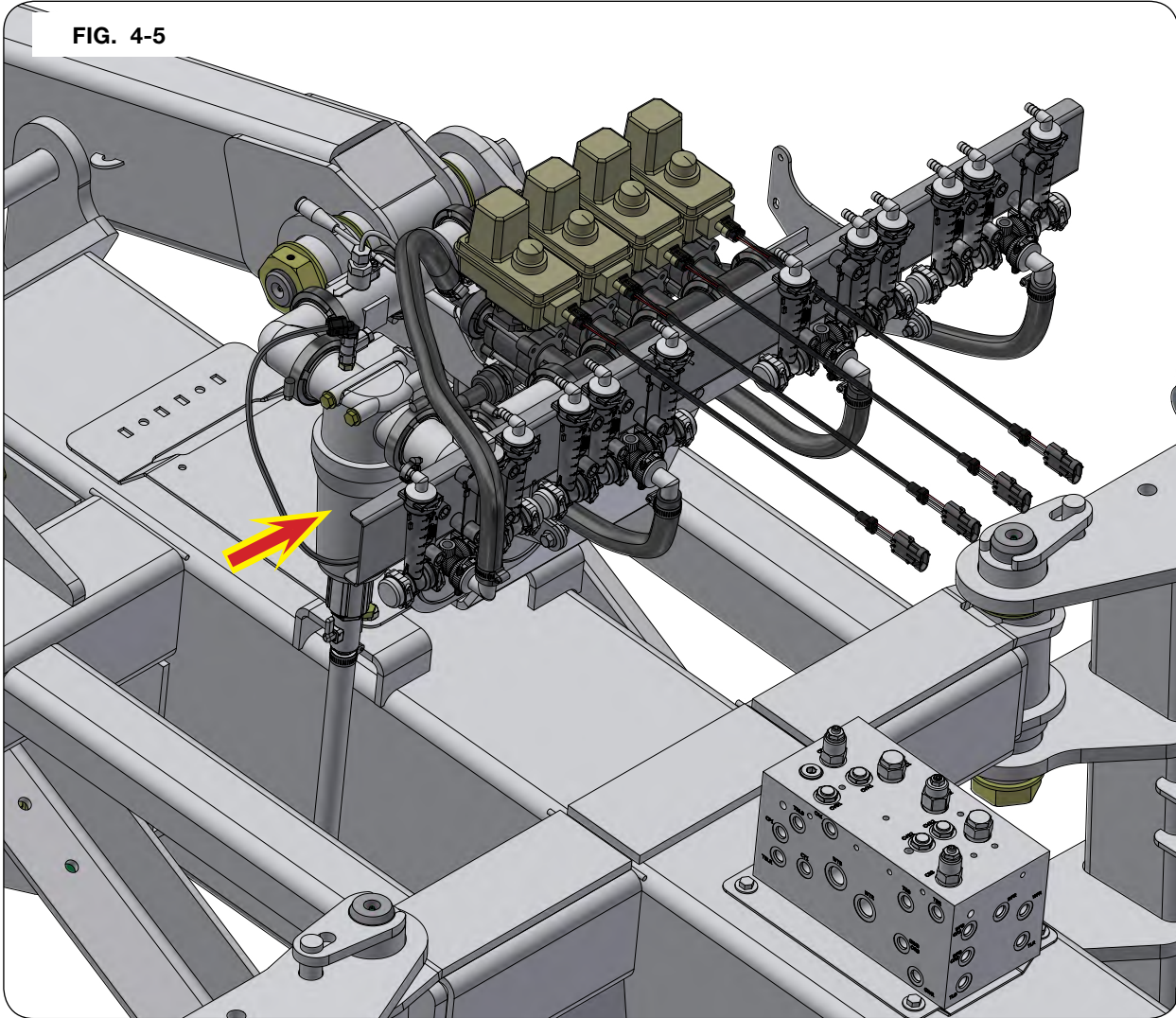
FIG. 4-4

Filters (continued)

Secondary Filter

A secondary filter is located on near the electric valves. This filter, similar in construction to the primary filter, is used to eliminate the need for strainers at the tips. To clean this filter, first drain the filter housing. Then unscrew the filter housing and remove the screen. Flush the strainer element with water. After cleaning, reassemble filter and check for leaks. (FIG. 4-5)

FIG. 4-5



Winterizing

WARNING

- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.

IMPORTANT

- *Do not allow pump to run dry. Pump damage will result.*

Before storing the tank in freezing climates, perform the following winterizing procedure:

1. Perform a complete system rinse using procedure in the “OPERATION SECTION, INDUCTOR - Chemical Container and Inductor Tank Rinsing” of this manual.
2. Wash the applicator thoroughly inside and out with a high-pressure washer.
3. Remove as much solution from the main tank as possible. Close drain valve on main tank after draining.
4. Pour approximately 50 gallons of R.V. antifreeze into main tank.

NOTE: If equipped with an inductor, the applicator can circulate the R.V. antifreeze.

5. Loosen diaphragm caps on nozzle bodies to relieve pressure and allow excess antifreeze to drain from wings.
6. Repaint any exposed metal. Coat ground engaging parts with a rust preventative.

Wheel, Hub & Spindle Disassembly and Assembly

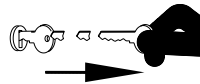
WARNING

- 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 8,000 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.

1. Hitch unit to tractor. Park the empty unit on a firm, level surface. Block the tires to keep the machine from moving. Set the tractor's parking brake, shut off engine and remove key from tractor.



2. Use a safe lifting device rated at 8,000 lbs. to support the weight of your empty liquid applicator cart. Place the safe lifting device under the axle closest to the tire.
3. Use a minimum of 1,500 lbs. safe lifting device to support the wheel and tire during removal.

WARNING

- ON UNITS WITH DUAL WHEELS, INNER WHEEL AND TIRE MAY FALL FROM HUB CAUSING SERIOUS INJURY OR DEATH. ALWAYS SUPPORT INNER WHEEL WHEN REMOVING OUTER WHEEL AND/OR THE WHEEL EXTENSION.

4. If only changing wheel and tire, skip to Step 8; otherwise continue with Step 4.

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

Wheel, Hub & 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 safe lifting device rated for 150 lbs., replace the old spindle with a new spindle. Coat axle contact length of spindle shaft with anti-seize lubricant prior to installation. Reuse bolt and lock nut to retain spindle to axle. Tighten 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 approved grease and reinstall inner bearing. Install new seal in hub with garter spring facing 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 nut while spinning the hub until drag causes the hub to stop freely spinning. Turn castle nut counterclockwise until the hole in the spindle aligns with the next notch in castle nut. Hub should spin smoothly with little 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 of castle nut. Spin and check again. Install bolt and nut. 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 Wheel and Tire section of this manual.
9. Raise dry applicator cart, remove lifting device and lower unit to the ground.

Wheels and Tires

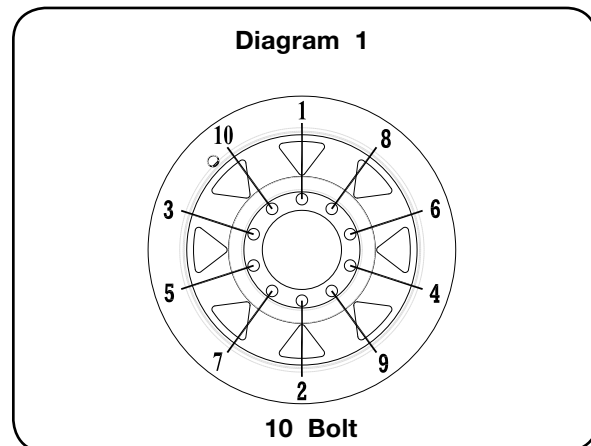
Wheel Nut Torque

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 1.

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

Continental/Mitas

www.mitas-tires.com
Phone 704-542-3422
Fax 704-542-3474

Titan

or

Goodyear

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

Carlisle/Ironman

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

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 - Stainless Steel Capscrews

IMPORTANT

- Stainless steel fasteners tend to gall, especially with long run downs, prevailing torque fasteners, impact drivers, and lack of lubrication. It is highly encouraged to use a lubricant such as graphite-based anti-seize or molybdenum disulfide based anti-seize or other commercially available anti-galling compounds and assemble with a slow and continuously applied torque to avoid galling.

SIZE	INCH POUNDS	NEWTON METERS
1/4-20	62	7
1/4-28	71	8
5/16-18	128	15
5/16-24	142	16
3/8-16	19	26
3/8-24	21	29
7/16-14	30	41
7/16-20	34	46
1/2-13	46	63
1/2-20	52	71
9/16-12	67	91
9/16-18	74	100
5/8-11	92	125
5/8-18	104	141
3/4-10	113	153
3/4-16	126	171
7/8-9	182	247
7/8-14	201	273
1-8	273	370
1-14	306	415
1 1/4-7	545	739
1 1/4-12	604	819
1 3/8-6	715	970
1 3/8-12	813	1102
1 1/2-6	949	1287
1 1/2-12	1067	1447

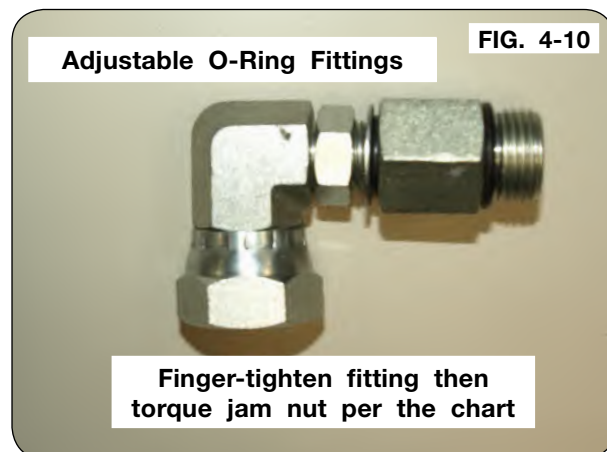
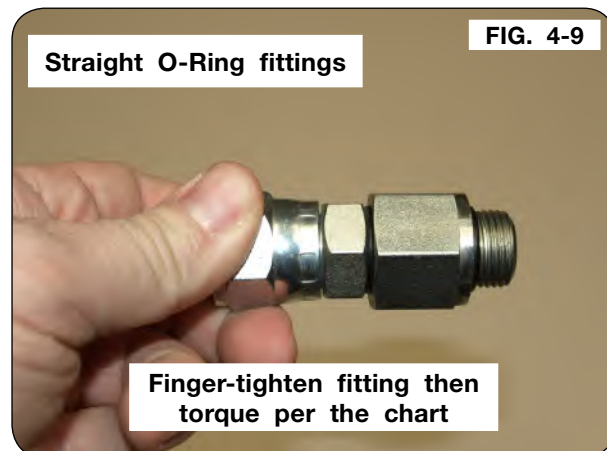
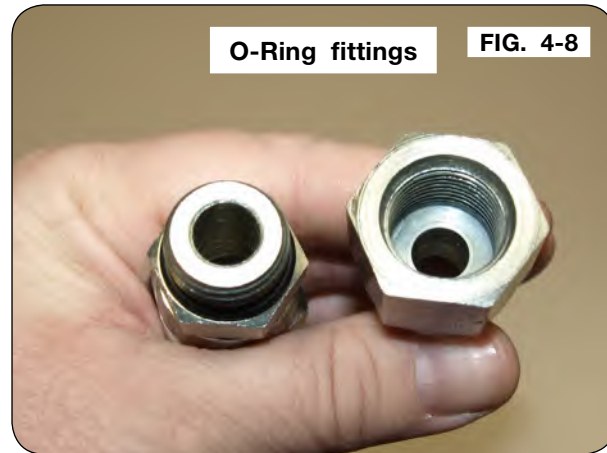
Hydraulic Fittings - Torque and Installation

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

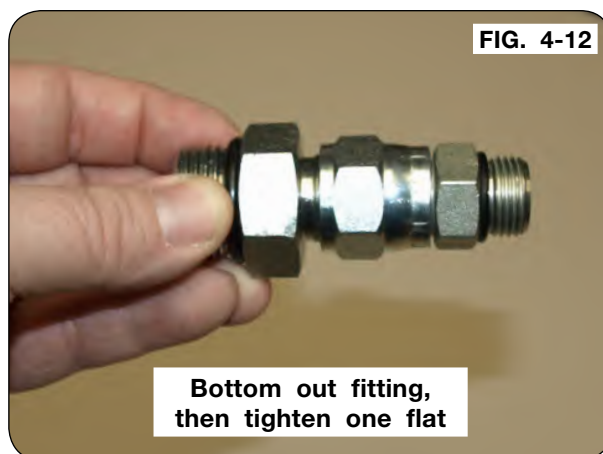
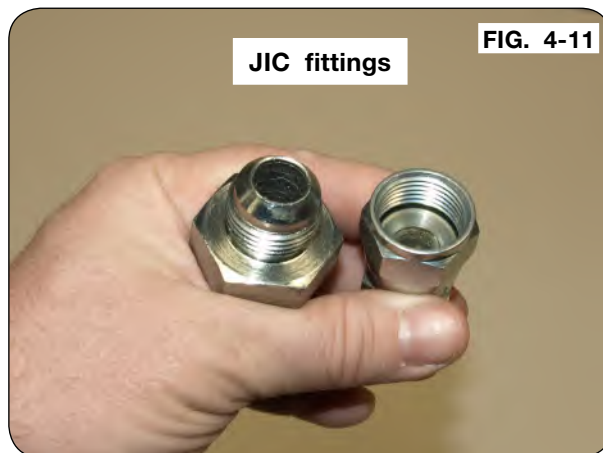


Hydraulic Fittings - Torque and Installation (continued)

Tightening JIC Fittings

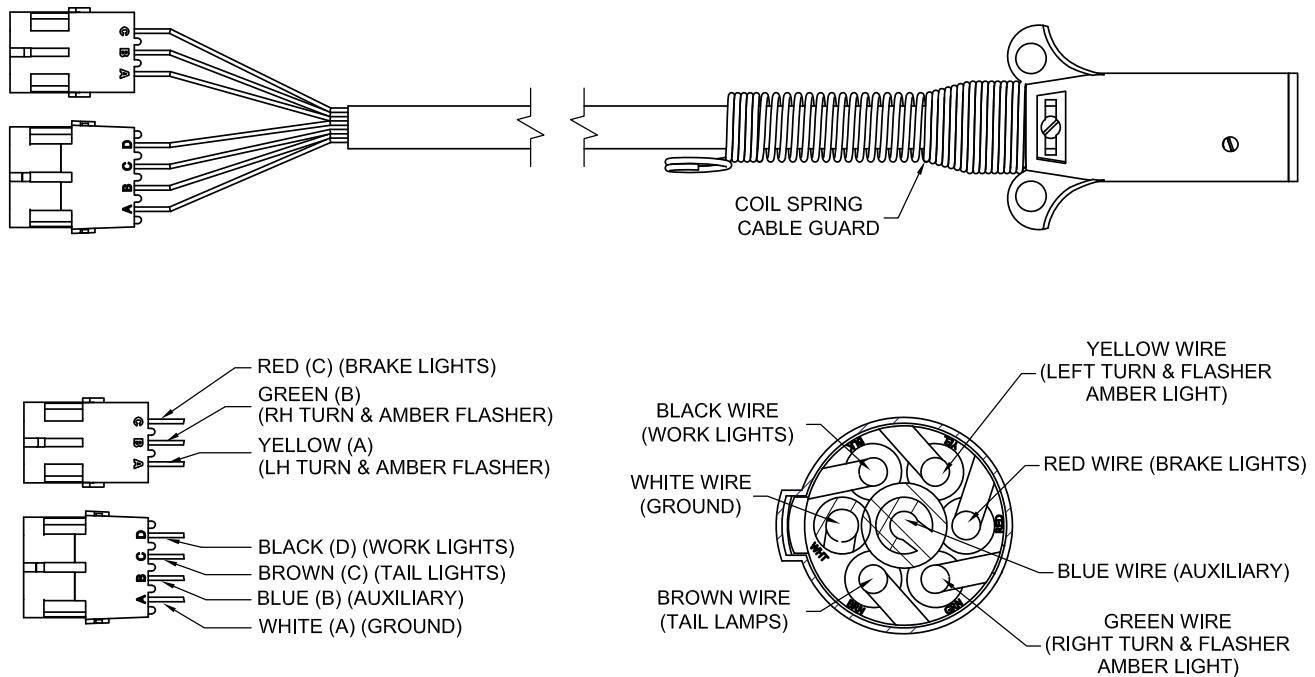
1. Inspect all components for damage or contamination. Do not connect any other type of fitting to a JIC fitting.
2. Lubricate the threads.
3. Turn the fitting into the port until it bottoms out.
4. Use one wrench on the fixed hex on the hose to prevent twisting and a second on the swivel. Tighten the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

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

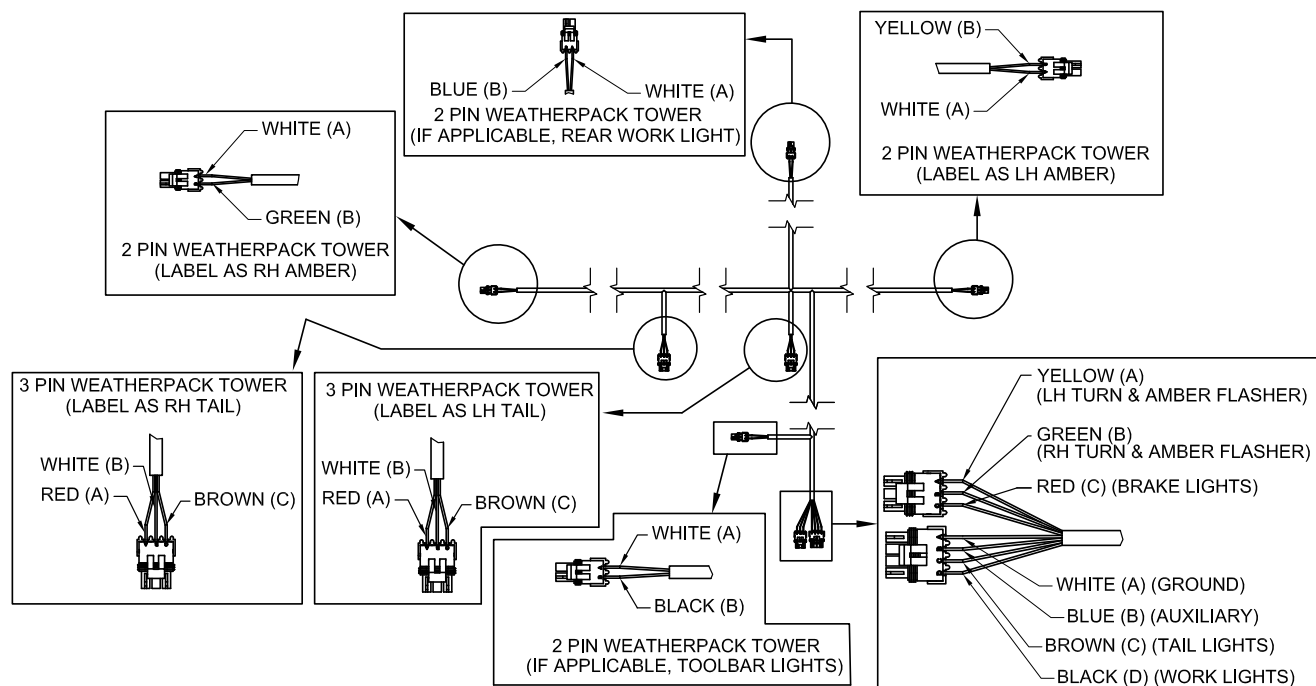


Schematics - Electrical

Electrical Harness - Main 480" (45000)

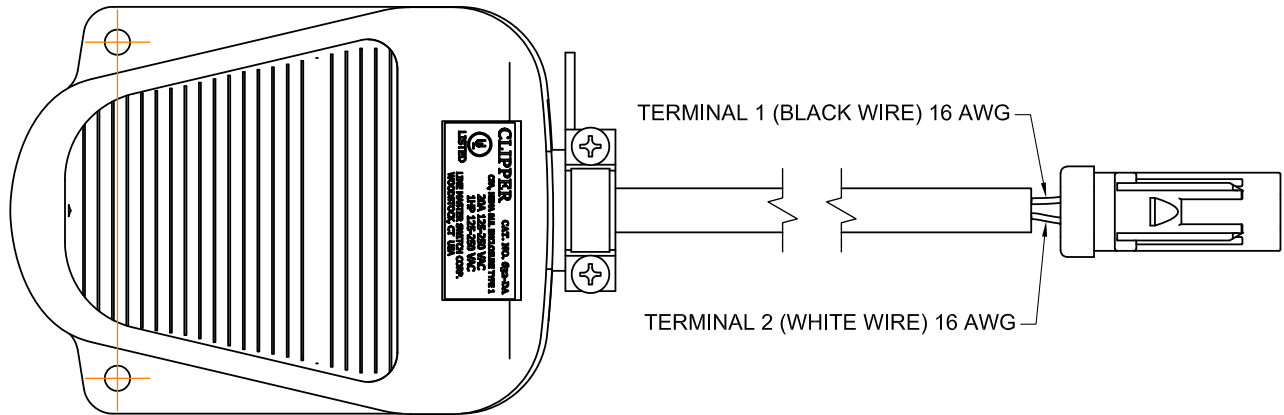


Electrical Harness - Light 418" (44999)



Schematics - Electrical

Foot Switch (9005916)



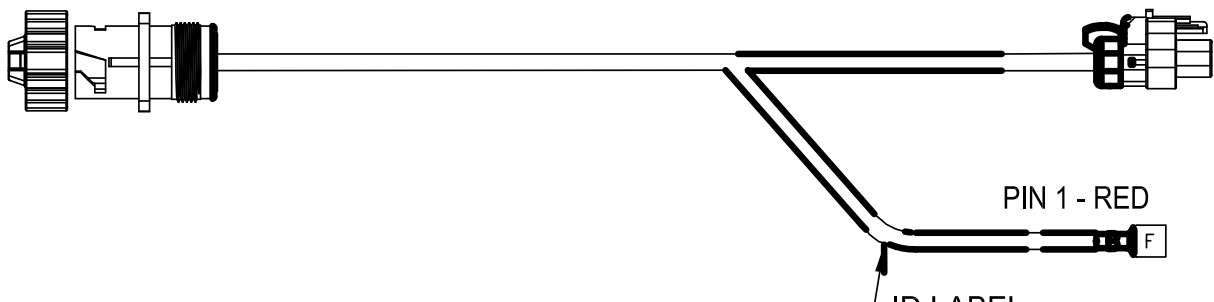
Foot Switch Cable (9503390)

PIN A - BLACK
PIN B - RED
PIN C - BLUE

PIN 1 - BLACK
PIN 2 - BLUE

PIN 1 - RED

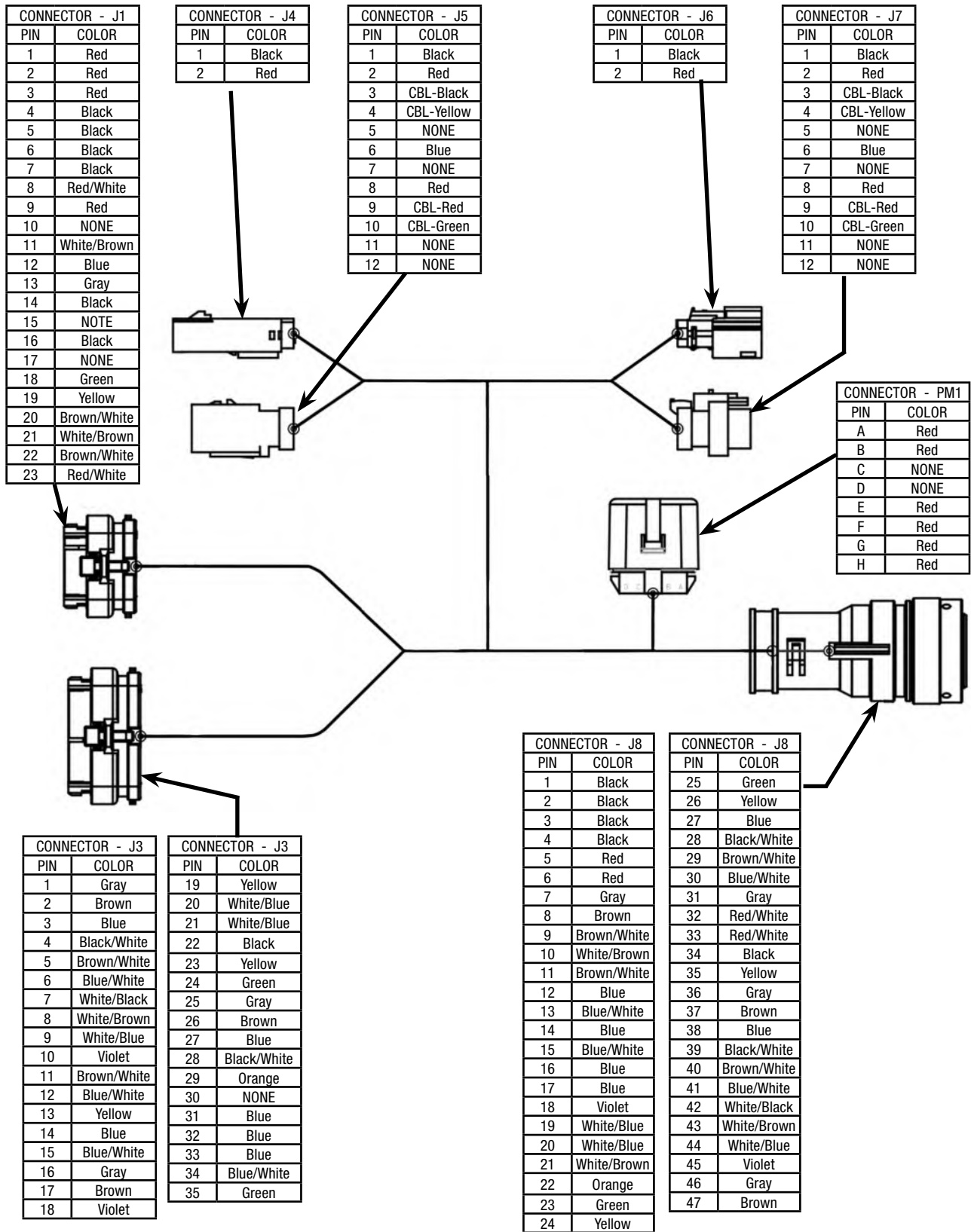
ID LABEL:
 "IMPLEMENT STEER
 12VDC CONSTANT POWER"



1200 GALLON LIQUID FERTILIZER CART — Maintenance

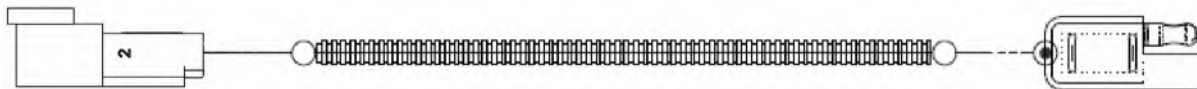
Schematics - Electrical

Node Cable, RCM ECU (9008095)

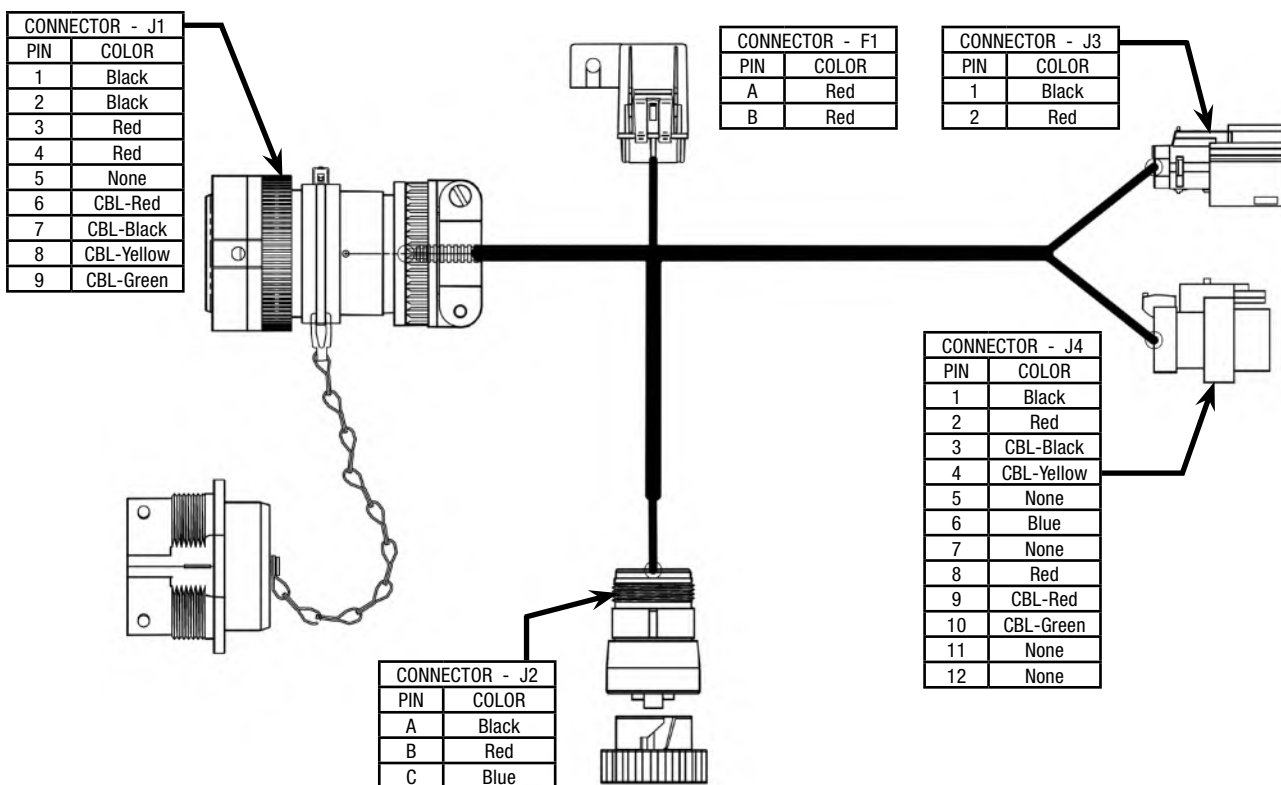


Schematics - Electrical

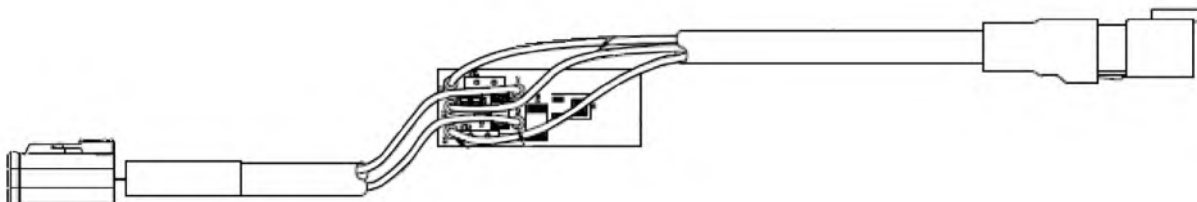
Extension Cable (9007524)



GEN 1 ISO To IBIC Hitch Cable (9503926)



Boost Box Harness (9007550)



Schematics - Electrical

Product Flow & Rate Harness (9009175)

AMP CPC RECEPTACLE CAP
(208680-1) PROVIDED &
TETHERED TO HARNESS

DEUTSCH CAP (HDC34-24)
PROVIDED & TETHERED
TO HARNESS

4 PIN DEUTSCH PLUG (DT06-4S) COMPLETE
WITH W4S WEDGE LOCK

PIN #	WIRE COLOR	FUNCTION
1	BLACK	GROUND
2	YELLOW	FLOW INCREASE
3	GREEN	FLOW DECREASE
4	RED	POWER

4 PIN DEUTSCH RECEPTACLE (DT04-4P) COMPLETE
WITH W4P WEDGE LOCK, PIN CONTACTS

PIN #	WIRE COLOR	FUNCTION
1	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
2	YELLOW	FLOW INCREASE
3	GREEN	FLOW DECREASE
4	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)

47 PIN DEUTSCH PLUG (HDP26-24-47SE-L024)

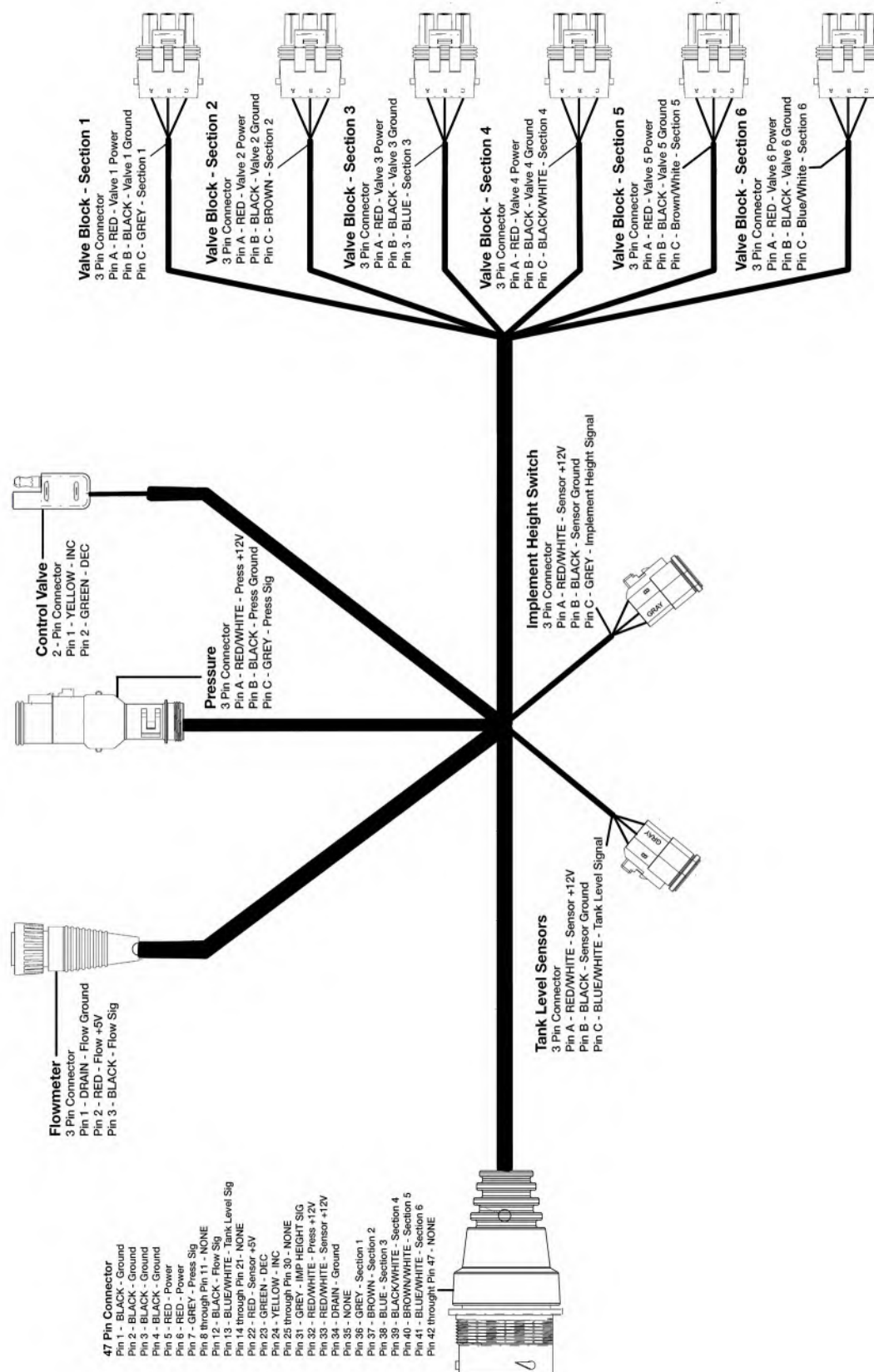
PIN #	WIRE COLOR	FUNCTION
1	BLACK	GROUND
2	BLACK	PRESSURE TRANSDUCER GROUND
3	BLACK	GROUND
4	BLACK	GROUND
5	RED	POWER
6	RED	POWER
7	ORANGE	PRESSURE TRANSDUCER SIGNAL
8	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
9	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
10	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
11	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
12	VIOLET	FLOW METER SIGNAL
13	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
14	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
15	RED	POWER
16	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
17	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
18	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
19	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
20	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
21	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
22	RED	FLOW METER +5V POWER
23	GREEN	FLOW DECREASE
24	YELLOW	FLOW INCREASE
25	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
26	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
27	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
28	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
29	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
30	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
31	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
32	RED	PRESSURE TRANSDUCER POWER
33	RED	POWER
34	BLACK	FLOW METER GROUND
35	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
36	GRAY	BOOM 1
37	BROWN	BOOM 2
38	BLUE	BOOM 3
39	BLACK/WHITE STRIPE	BOOM 4
40	BROWN/WHITE STRIPE	BOOM 5
41	BLUE/WHITE STRIPE	BOOM 6
42	WHITE/BLACK STRIPE	BOOM 7
43	WHITE/BROWN STRIPE	BOOM 8
44	WHITE/BLUE STRIPE	BOOM 9
45	PINK	BOOM 10
46	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)
47	NOT USED	NOT USED (SEAL WITH CIRCUIT PLUG)

37 PIN AMP CPC RECEPTACLE (206151-2)

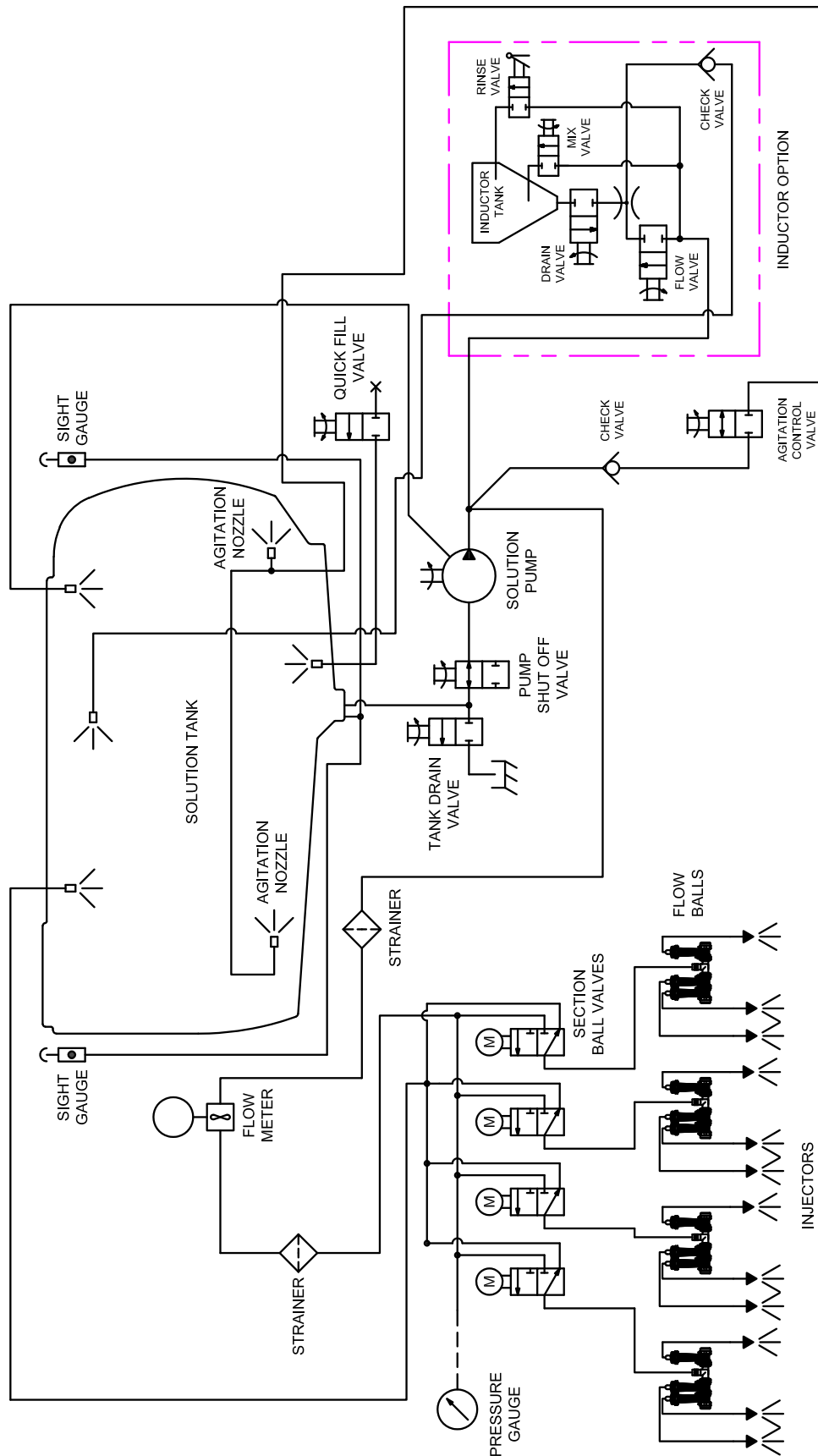
PIN #	WIRE COLOR	FUNCTION
1	BLACK	GROUND
2	BLACK	GROUND
3	NOT USED	NOT USED
4	GRAY	BOOM 1
5	BROWN	BOOM 2
6	BLUE	BOOM 3
7	BLACK/WHITE STRIPE	BOOM 4
8	BROWN/WHITE STRIPE	BOOM 5
9	BLUE/WHITE STRIPE	BOOM 6
10	WHITE/BLACK STRIPE	BOOM 7
11	WHITE/BROWN STRIPE	BOOM 8
12	WHITE/BLUE STRIPE	BOOM 9
13	PINK	BOOM 10
14	NOT USED	NOT USED
15	GREEN	FLOW DECREASE
16	YELLOW	FLOW INCREASE
17	NOT USED	NOT USED
18	NOT USED	NOT USED
19	NOT USED	NOT USED
20	NOT USED	NOT USED
21	BLACK	FLOW METER GROUND
22	NOT USED	NOT USED
23	NOT USED	NOT USED
24	NOT USED	NOT USED
25	RED	FLOW METER +5V POWER
26	NOT USED	NOT USED
27	NOT USED	NOT USED
28	VIOLET	FLOW METER SIGNAL
29	BLACK	PRESSURE TRANSDUCER GROUND
30	RED	PRESSURE TRANSDUCER POWER
31	ORANGE	PRESSURE TRANSDUCER SIGNAL
32	NOT USED	NOT USED
33	NOT USED	NOT USED
34	NOT USED	NOT USED
35	NOT USED	NOT USED
36	RED	POWER
37	RED	POWER

Schematics - Electrical

Flow Cable, 6 Section (9503472)



Schematics - Plumbing



SECTION IV

Maintenance

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1200 GALLON LIQUID FERTILIZER CART — Maintenance

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.

IMPORTANT

- *Inspect mast pins for any wear or damage. Replace any worn or damaged pins.*

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.

Seasonal Storage

Always open all valves to remove any fluids and to allow moisture to dry.

Immediately after season is finished, completely wash machine to remove corrosive fertilizer inside and out before storing. When using pressure washers maintain an adequate distance so not to force water into bearings, hydraulic seals, or electrical connections.

1200 GALLON LIQUID FERTILIZER CART — Maintenance

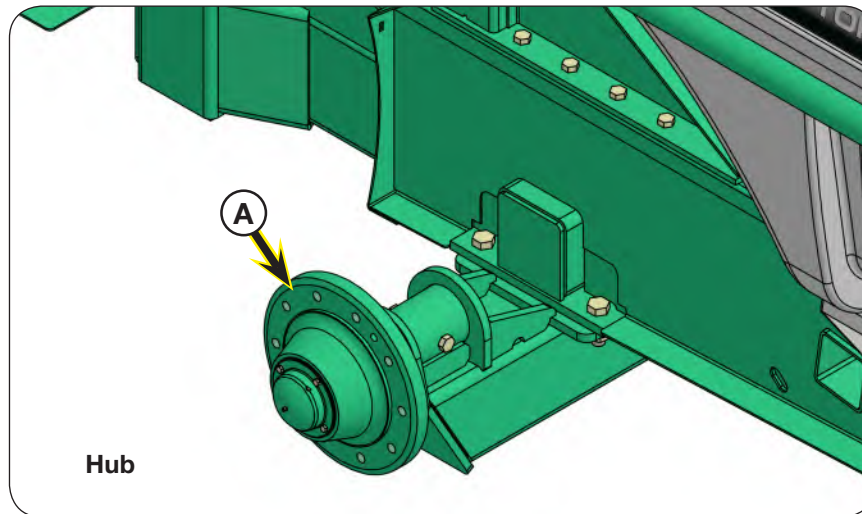
Lubrication Points

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.

The lubrication locations and recommended schedule are as follows:

ITEM	DESCRIPTION	POINT	QTY	HOURS
A	Hubs	2	1 Shot	Weekly



1200 GALLON LIQUID FERTILIZER CART — Maintenance

Troubleshooting

Problem	Possible Cause	Corrective Action
Pressure too Low	Valve has an obstruction	Open all valves to pump and check for obstruction.
	Filter plugged	Clean or replace filters
	Hydraulic flow on tractor set too low	Increase hydraulic flow on tractor.
	Agitation is not set properly	Close agitation completely and slightly open the valve so the pump pressure decreases by 5 psi.
	Impeller has obstruction	Separate pump housing. Remove and clean the impeller.
	Impeller is not turning	Separate pump housing. Verify that shaft and impeller turn together.
Pressure too High	Hydraulic flow on tractor set too high	Decrease hydraulic flow on tractor.
	Improper nozzle size	Verify Nozzle Size.
Rate control console will not turn on	No power coming to the console	Check power source connections.
	Bad console	Check for 12 volts of power on Pin #16 with Pin #1 being ground on the cable coming into the console if equipped with 450 controller.
Do not have a rate	Not getting a speed	Press the speed button on the console to see if there is a speed.
	Not getting a flow	Press the vol/min button on the console to see if there is a flow.
Do not have a speed	Orange wire is unplugged	Verify the orange wire is plugged in to the speed sensor.
	Defective cable or sensor	Program a self test into the console and then check for a rate.
Speed is inaccurate	Loosen cable connection	Wiggle the connections for the speed cable. If accurate speed is displayed tighten connection.
	Cut in cable	Check speed cable for cuts in the cable. Fix the cable or replace the cable.
Do not have a flow	Regulating valve is not operating or PWM cartridge is not functioning	Check and remove debris from valve or PWM cartridge.
	Defective cable	Unplug the flow meter. With the plug keyway at the 12 o'clock position, check voltage between pins at the 2 o'clock and 6 o'clock positions (2 o'clock is ground). Should have 5 volts. Also check voltage between pins at the 2 o'clock and 10 o'clock positions (2 o'clock is ground). Should have 5 volts.
	Defective flow meter	Unplug the flow meter. Check for 5 volts across the 2 wires and getting voltage.
Rate is Unstable	Console is in manual	Put console into either rate 1 or rate 2 and check to see if rate becomes stable.
	Speed is inaccurate	Refer to "Speed is Inaccurate Section".
	Console is not programmed	Verify all numbers programed into console are correct.
Cannot adjust pressure when console is in manual	Defective cable or console	Unplug regulating valve or PWM cartridge. Check for 12 volts across the two wires.
	Defective Valve	Unplug regulating valve or PWM cartridge. Check for 12 volts across the two wires.

Hydraulically Driven Centrifugal Pump

ACE HYD 750/755 Barrier Fluid Charge

IMPORTANT

- Inflation valve must be assembled in the “IN” port of the regulating valve.

1. Turn regulating valve adjusting knob counterclockwise until it is at the minimum pressure setting. (FIG. 4-1)
2. Attach air chuck to air valve.
3. Turn adjusting knob on regulating valve clockwise until gauge reads 30 psi. (FIG. 4-1)
4. Remove the air pressure before disconnecting the hose. To add barrier fluid to the fluid chamber, disconnect the hose from the fitting on top of the hydraulically driven centrifugal pump. Remove the fitting on top of the pump. (FIG. 4-2)
5. Fill the fluid chamber by attaching a 1/8” hose to the barrier fluid bottle (9005518) to ease filling of the sight gauge. (FIG. 4-3)
6. Add fluid until level is half-way up the sight gauge and then pressurize.

NOTE: Any 1/8” hose will attach to the nipple of the barrier fluid bottle (9005518) to ease filling of the sight gauge. (FIG. 4-3)

At the end of each season, it is recommended to change/check the barrier fluid and seal. Follow the guidelines below.

- The pump requires pressure and/or fluid more frequently. Change barrier fluid and seal.
- The barrier fluid becomes cloudy, discolored, or water mixes with barrier fluid. Change barrier fluid and seal.
- The barrier fluid is clear. No service needed. Refill and store for the winter.

Refer to ACE pump manual and operating instructions.



FIG. 4-1

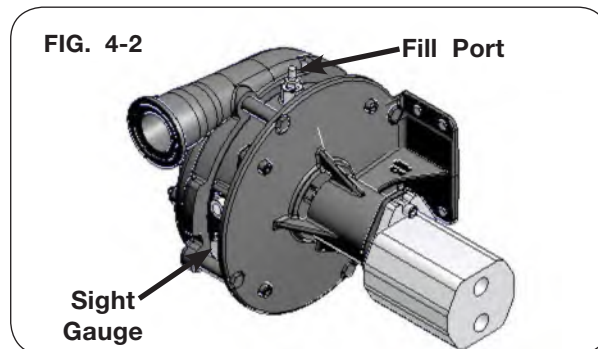


FIG. 4-2



FIG. 4-3

Filters

This applicator uses two filters to help ensure proper operation. These filters will need to be cleaned periodically during use and prior to applicator storage.

WARNING

- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.
- RESIDUAL PRESSURE MAY EXIST IN APPLICATOR PLUMBING EVEN WHEN UNIT IS NOT IN USE. RELIEVE PRESSURE BEFORE SERVICING ANY PLUMBING.

Primary Filter

To clean the filter located towards the front of the frame underneath the tongue, (FIG. 4-4):

1. Rotate the pump inlet valve to <OFF>.
2. Drain the strainer.
3. Unscrew the filter housing by turning counter-clockwise and remove the filter screen.
4. Clean filter by flushing strainer element with water.
5. Reassemble filter, open pump inlet valve, and check for leaks.

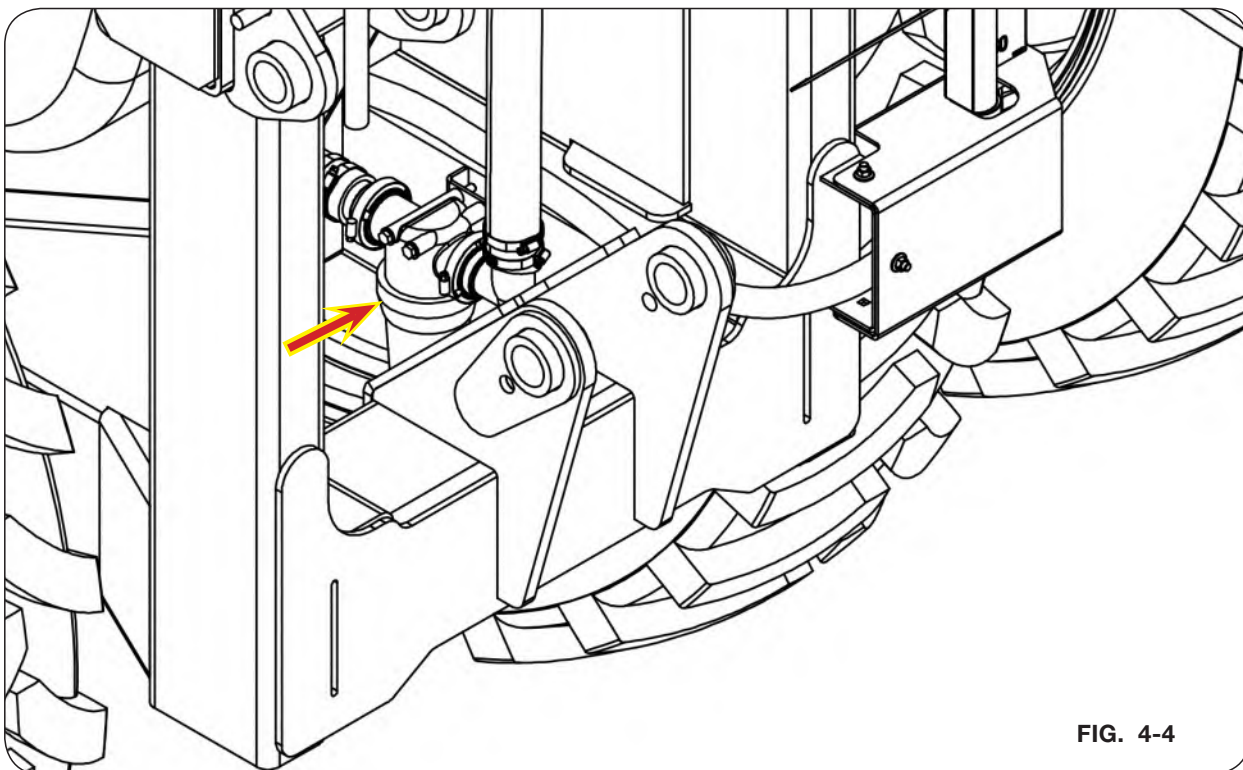
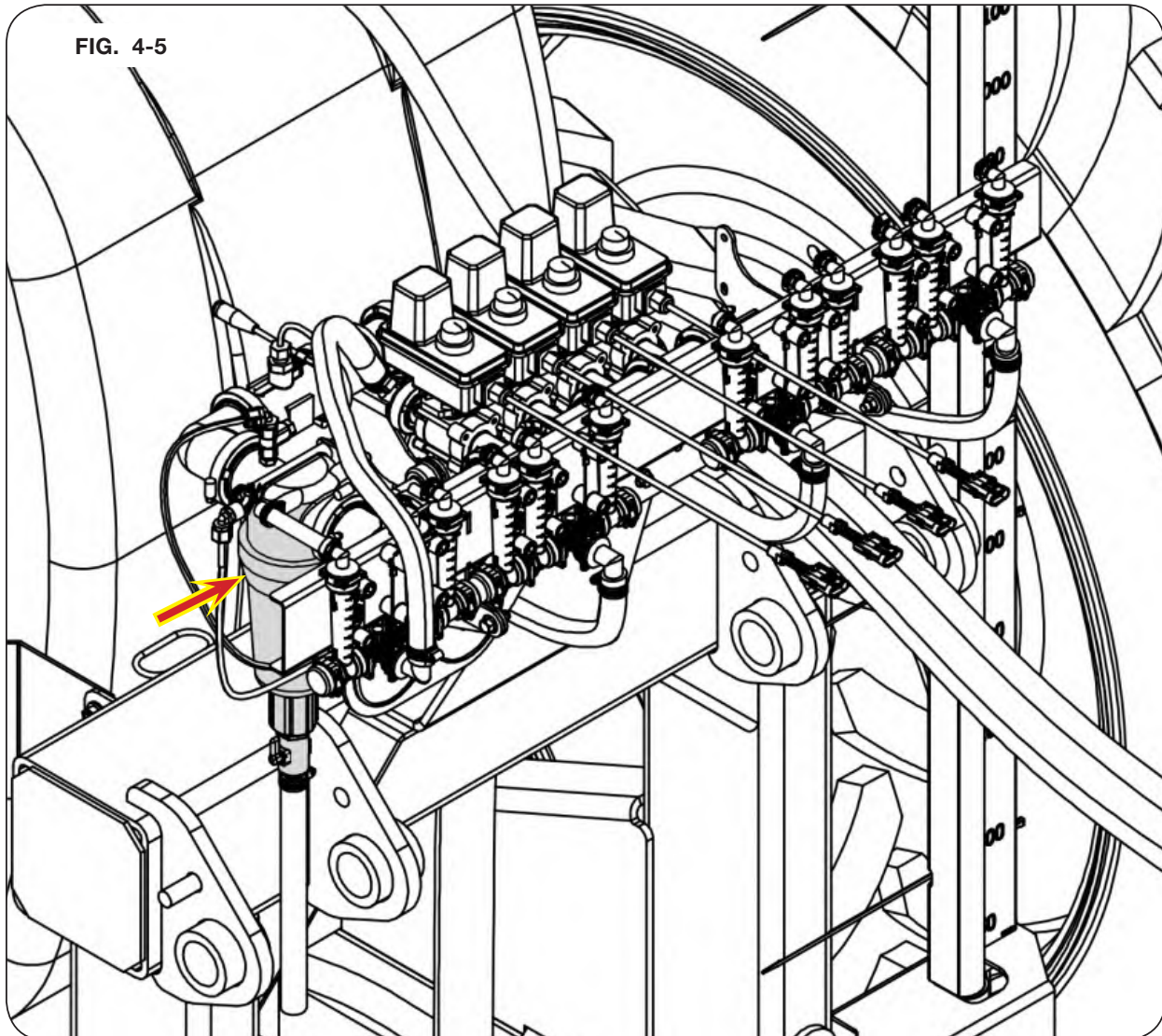


FIG. 4-4

Filters (continued)

Secondary Filter

A secondary filter is located on near the electric valves. This filter, similar in construction to the primary filter, is used to eliminate the need for strainers at the tips. To clean this filter, first drain the filter housing. Then unscrew the filter housing and remove the screen. Flush the strainer element with water. After cleaning, reassemble filter and check for leaks. (FIG. 4-5)



Winterizing

WARNING

- ALWAYS WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING WITH OR NEAR CHEMICALS. THIS EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO: PROTECTIVE EYE WEAR, GLOVES, SHOES, SOCKS, LONG-SLEEVED SHIRT, AND LONG PANTS. ADDITIONAL PROTECTION MAY BE REQUIRED FOR MANY TYPES OF CHEMICALS.

IMPORTANT

- *Do not allow pump to run dry. Pump damage will result.*

Before storing the tank in freezing climates, perform the following winterizing procedure:

1. Perform a complete system rinse using procedure in the “OPERATION SECTION, INDUCTOR - Chemical Container and Inductor Tank Rinsing” of this manual.
2. Wash the applicator thoroughly inside and out with a high-pressure washer.
3. Remove as much solution from the main tank as possible. Close drain valve on main tank after draining.
4. Pour approximately 50 gallons of R.V. antifreeze into main tank.

NOTE: If equipped with an inductor, the applicator can circulate the R.V. antifreeze.

5. Loosen diaphragm caps on nozzle bodies to relieve pressure and allow excess antifreeze to drain from wings.
6. Repaint any exposed metal. Coat ground engaging parts with a rust preventative.

Wheel, Hub & Spindle Disassembly and Assembly

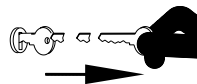
WARNING

- 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 8,000 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.

1. Hitch unit to tractor. Park the empty unit on a firm, level surface. Block the tires to keep the machine from moving. Set the tractor's parking brake, shut off engine and remove key from tractor.



2. Use a safe lifting device rated at 8,000 lbs. to support the weight of your liquid applicator cart. Place the safe lifting device under the axle closest to the tire.
3. Use a minimum of 1,500 lbs. safe lifting device to support the wheel and tire during removal.

WARNING

- ON UNITS WITH DUAL WHEELS, INNER WHEEL AND TIRE MAY FALL FROM HUB CAUSING SERIOUS INJURY OR DEATH. ALWAYS SUPPORT INNER WHEEL WHEN REMOVING OUTER WHEEL AND/OR THE WHEEL EXTENSION.

4. If only changing wheel and tire, skip to Step 8; otherwise continue with Step 4.

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

Wheel, Hub & 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 safe lifting device rated for 150 lbs., replace the old spindle with a new spindle. Coat axle contact length of spindle shaft with anti-seize lubricant prior to installation. Reuse bolt and lock nut to retain spindle to axle. Tighten 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 approved grease and reinstall inner bearing. Install new seal in hub with garter spring facing 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 nut while spinning the hub until drag causes the hub to stop freely spinning. Turn castle nut counterclockwise until the hole in the spindle aligns with the next notch in castle nut. Hub should spin smoothly with little 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 of castle nut. Spin and check again. Install bolt and nut. 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 Wheel and Tire section of this manual.
9. Raise dry applicator cart, remove lifting device and lower unit to the ground.

Wheels and Tires

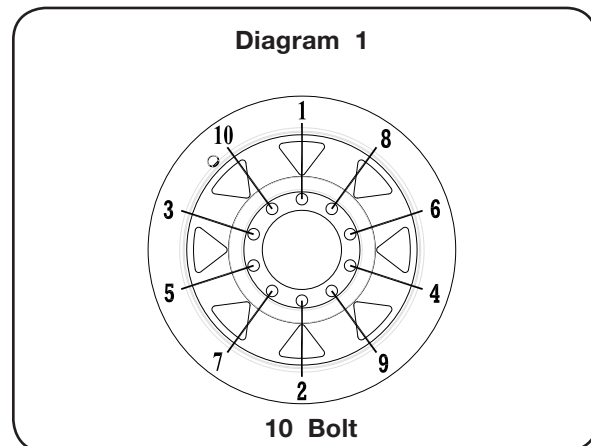
Wheel Nut Torque

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 1.

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

Continental/Mitas

www.mitas-tires.com
Phone 704-542-3422
Fax 704-542-3474

Titan

or

Goodyear

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

Carlisle/Ironman

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

Complete Torque Chart - Capscrews - Grade 5

NOTE: Grade 5 capscrews can be identified by three radial dashes on head.

NOTE: For wheel torque requirements, refer to **Wheels and Tires**.

NOTE: Tighten U-bolts 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

Complete Torque Chart - Stainless Steel Capscrews

IMPORTANT

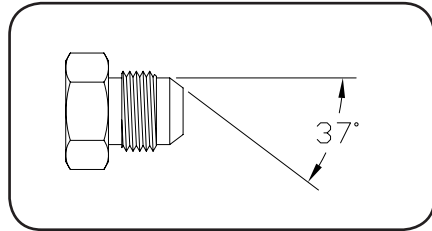
- Stainless steel fasteners tend to gall, especially with long run downs, prevailing torque fasteners, impact drivers, and lack of lubrication. It is highly encouraged to use a lubricant such as graphite-based anti-seize or molybdenum disulfide based anti-seize or other commercially available anti-galling compounds and assemble with a slow and continuously applied torque to avoid galling.

SIZE	INCH POUNDS	NEWTON METERS
1/4-20	62	7
1/4-28	71	8
5/16-18	128	15
5/16-24	142	16
3/8-16	19	26
3/8-24	21	29
7/16-14	30	41
7/16-20	34	46
1/2-13	46	63
1/2-20	52	71
9/16-12	67	91
9/16-18	74	100
5/8-11	92	125
5/8-18	104	141
3/4-10	113	153
3/4-16	126	171
7/8-9	182	247
7/8-14	201	273
1-8	273	370
1-14	306	415
1 1/4-7	545	739
1 1/4-12	604	819
1 3/8-6	715	970
1 3/8-12	813	1102
1 1/2-6	949	1287
1 1/2-12	1067	1447

Hydraulic Fittings - Torque and Installation

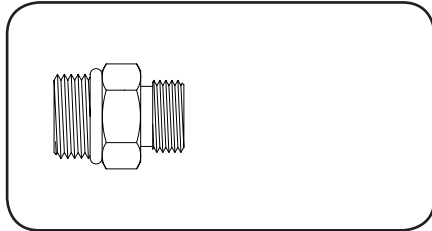
SAE FLARE CONNECTION (J. I. C.)

1. Tighten nut with finger until it bottoms the seat.
2. Using a wrench, rotate nut to tighten. Turn nut 1/3 turn to apply proper torque.



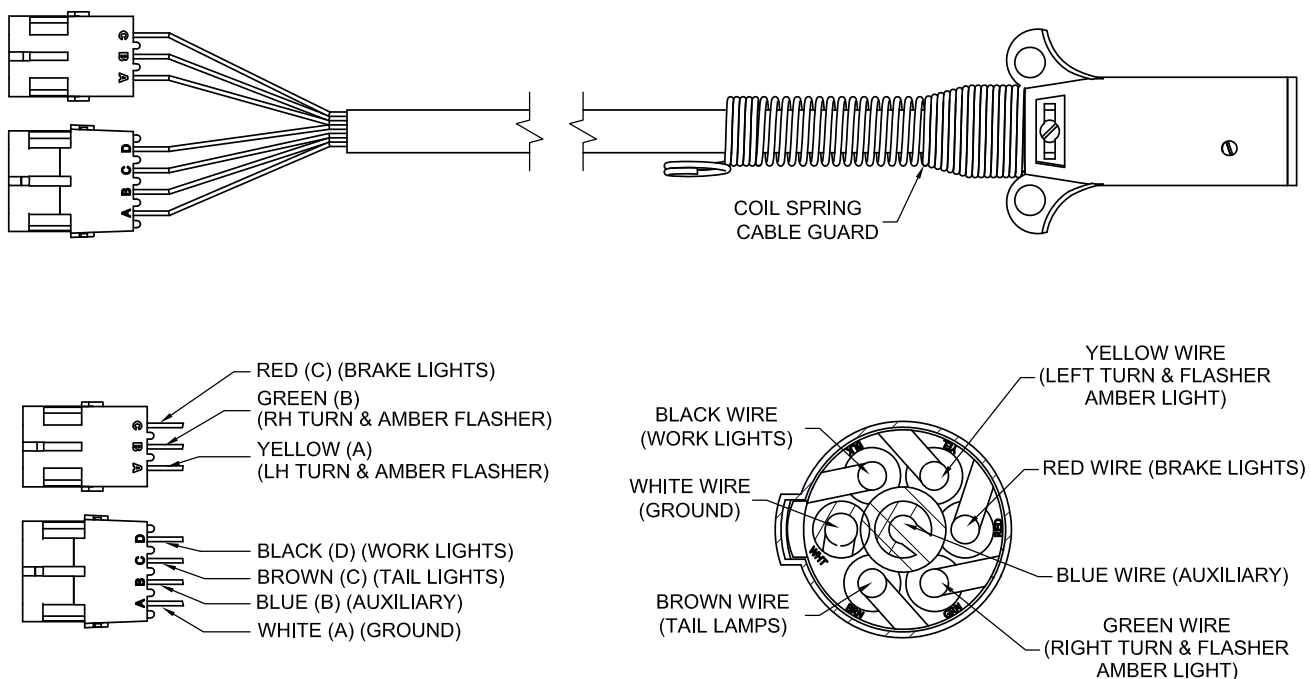
SAE STRAIGHT THREAD O-RING SEAL

1. Insure jam nut and washer are backed up to the back side of smooth portion of elbow adapter.
2. Lubricate o-ring -- VERY IMPORTANT!
3. Thread into port until washer bottoms onto spot face.
4. Position elbows by backing up adapter.
5. Tighten jam nut.

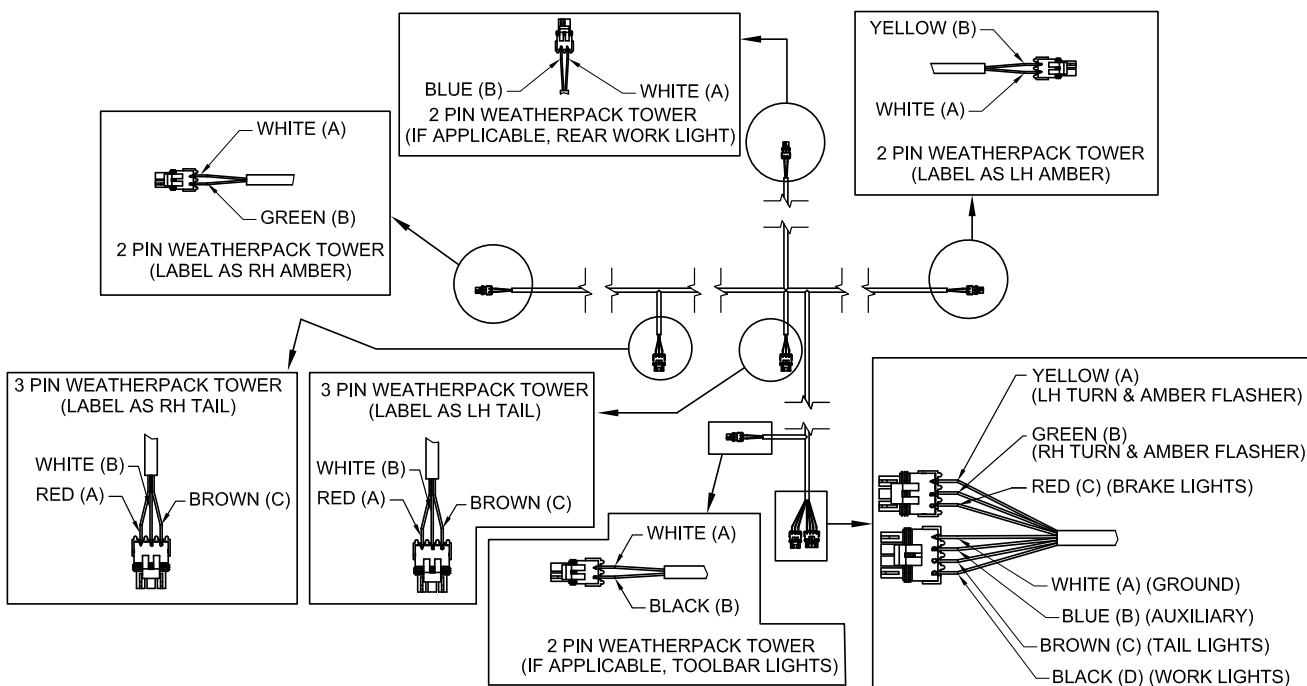


Schematics - Electrical

Electrical Harness - Main 480" (45000)

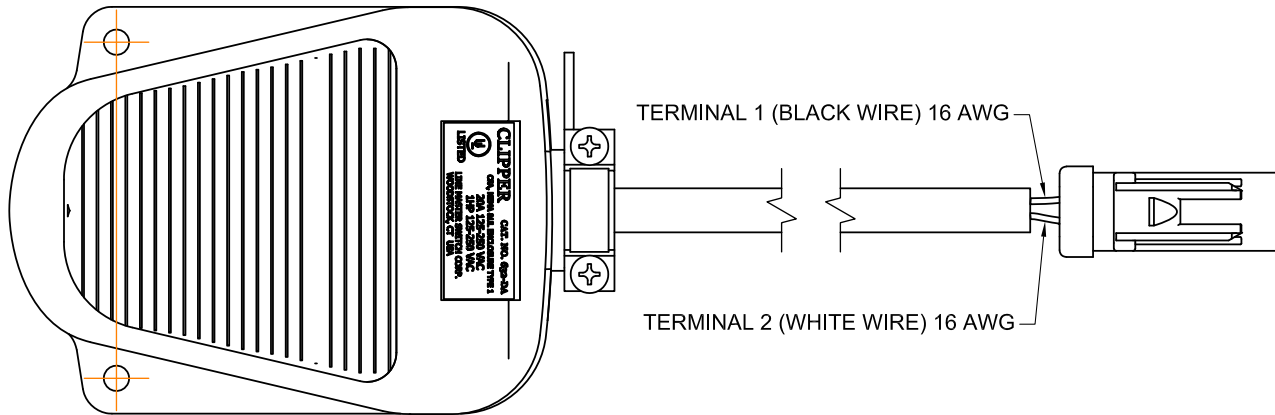


Electrical Harness - Light 418" (44999)

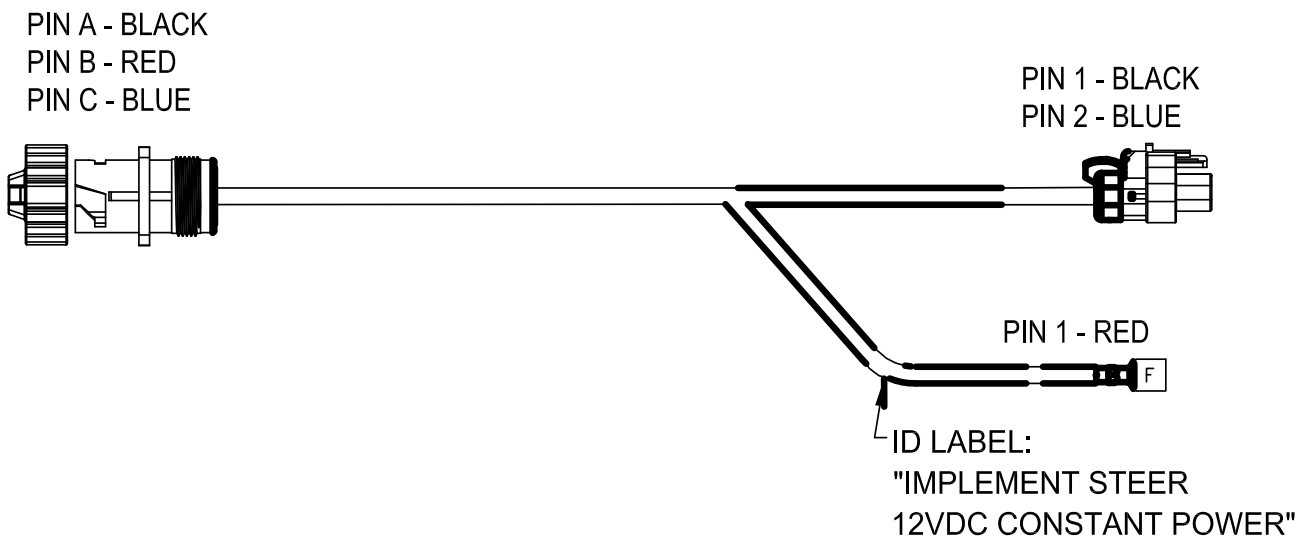


Schematics - Electrical

Foot Switch (9005916)

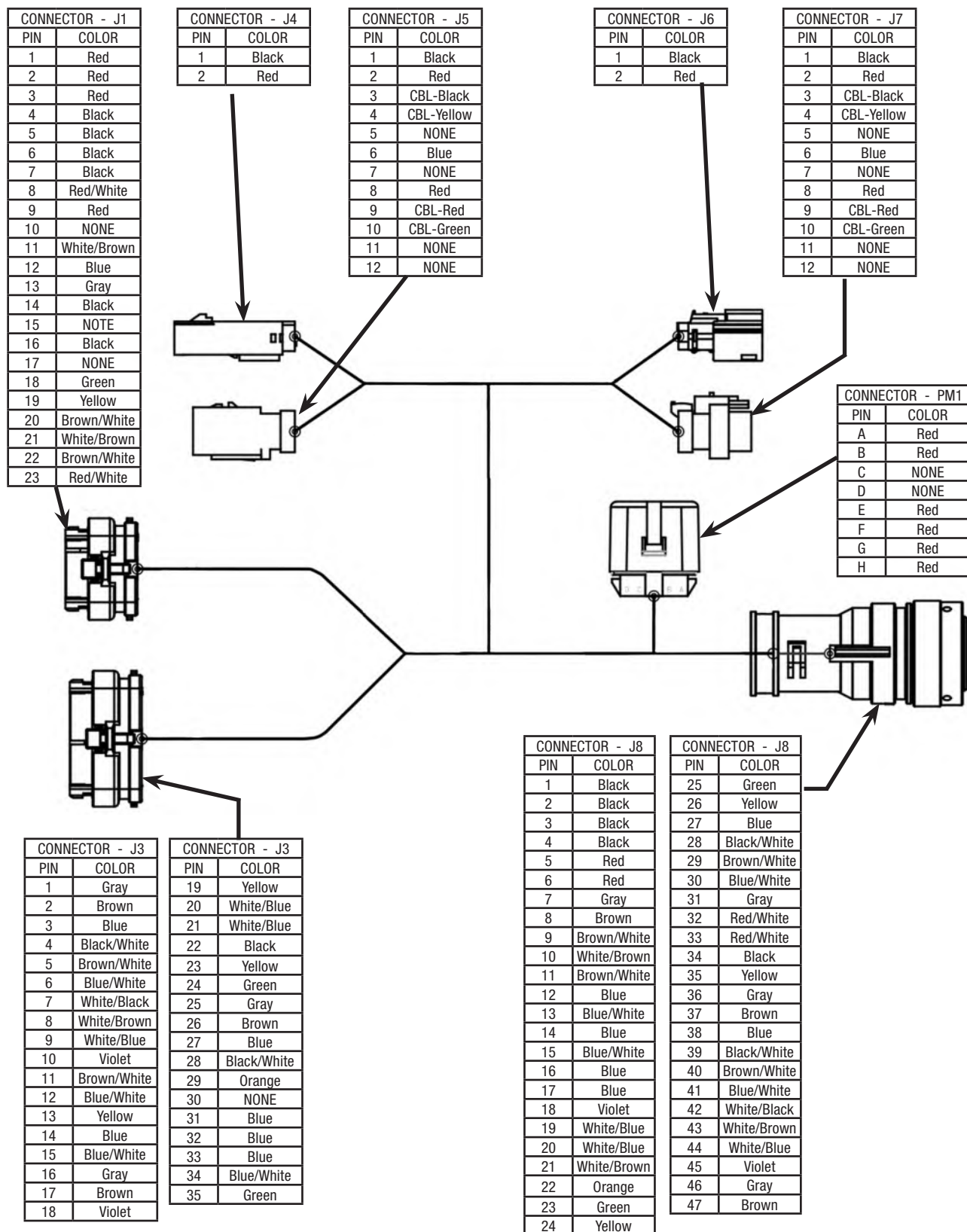


Foot Switch Cable (9503390)



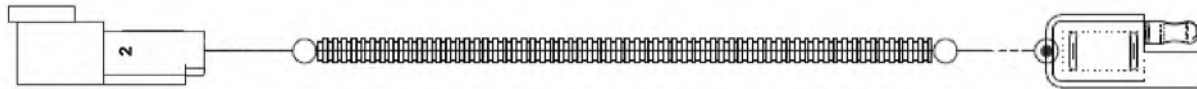
Schematics - Electrical

Node Cable, RCM ECU (9008095)

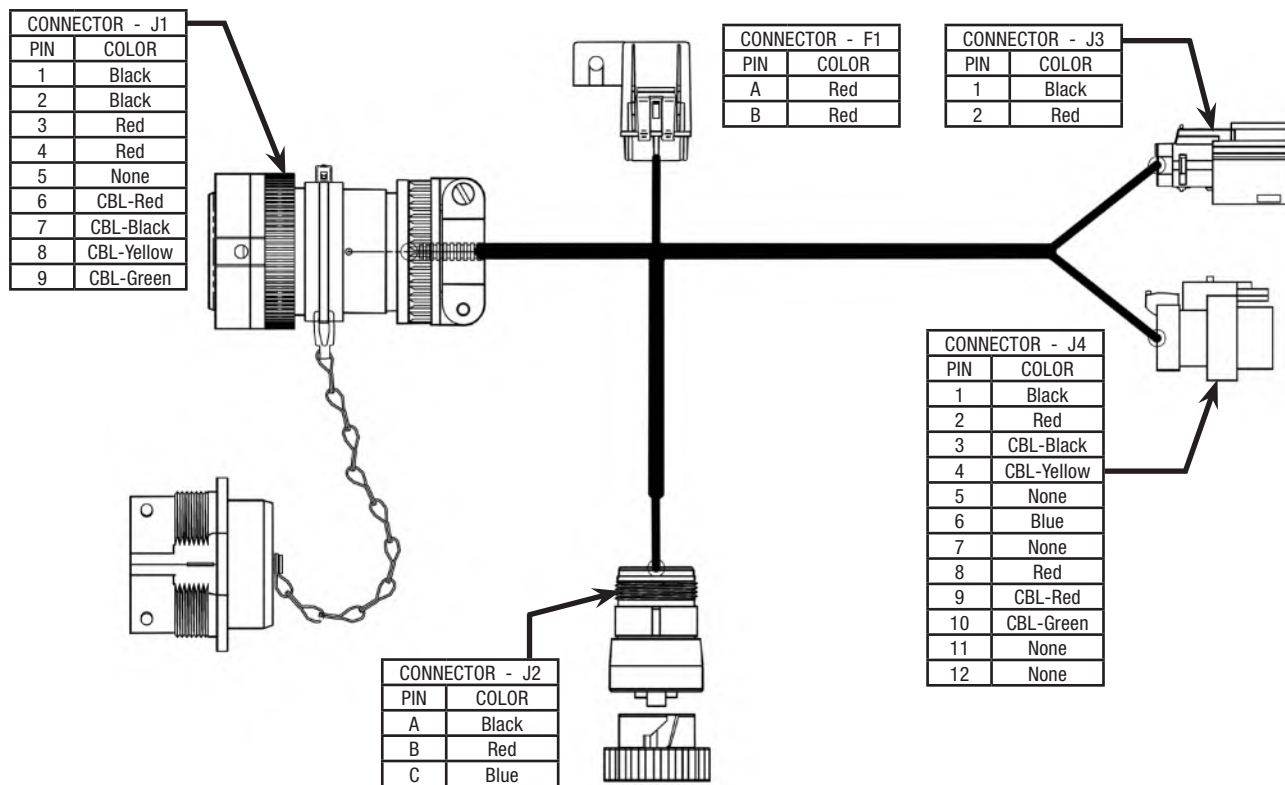


Schematics - Electrical

Extension Cable (9007524)

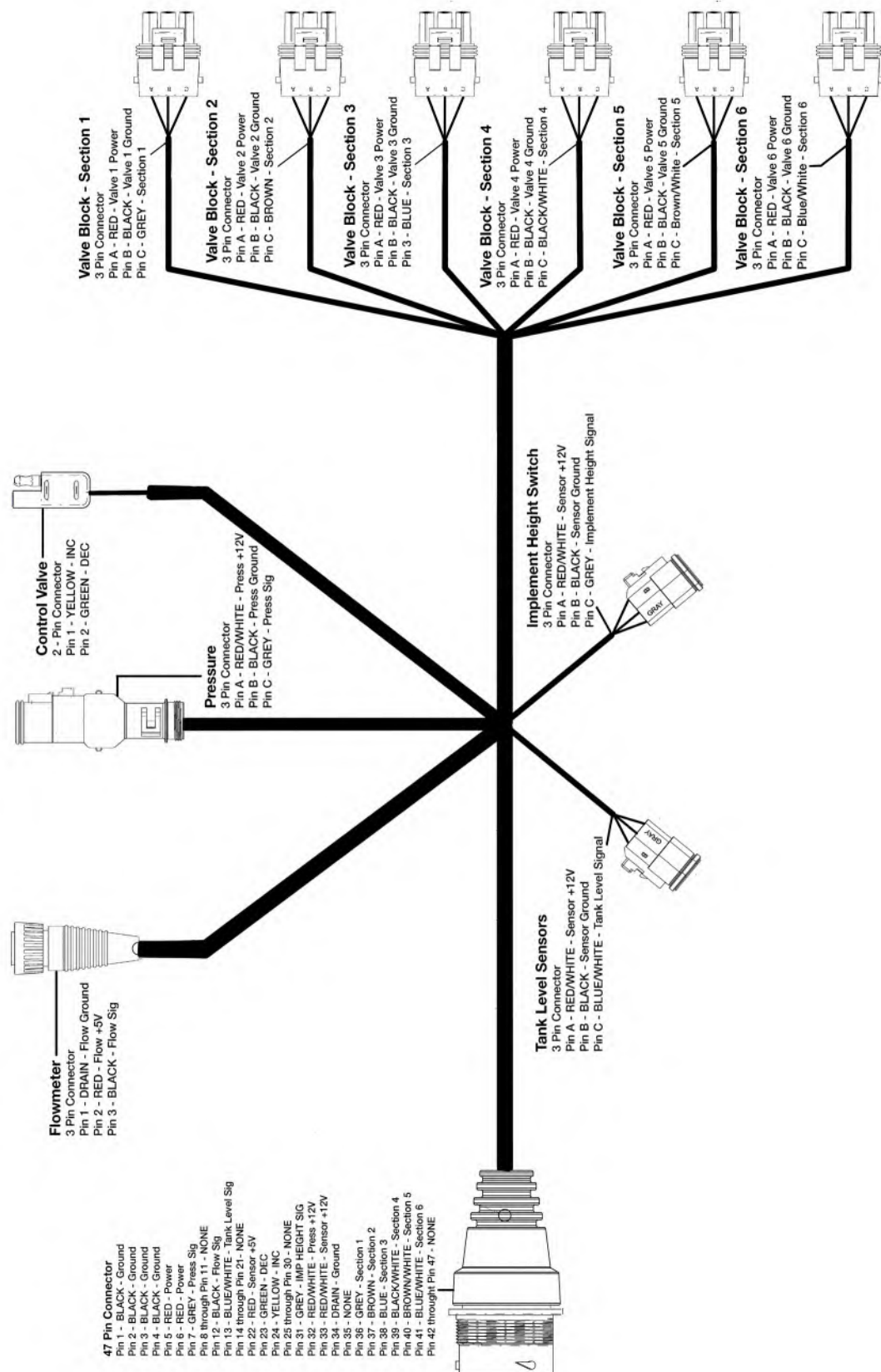


GEN 1 ISO To IBIC Hitch Cable (9503926)



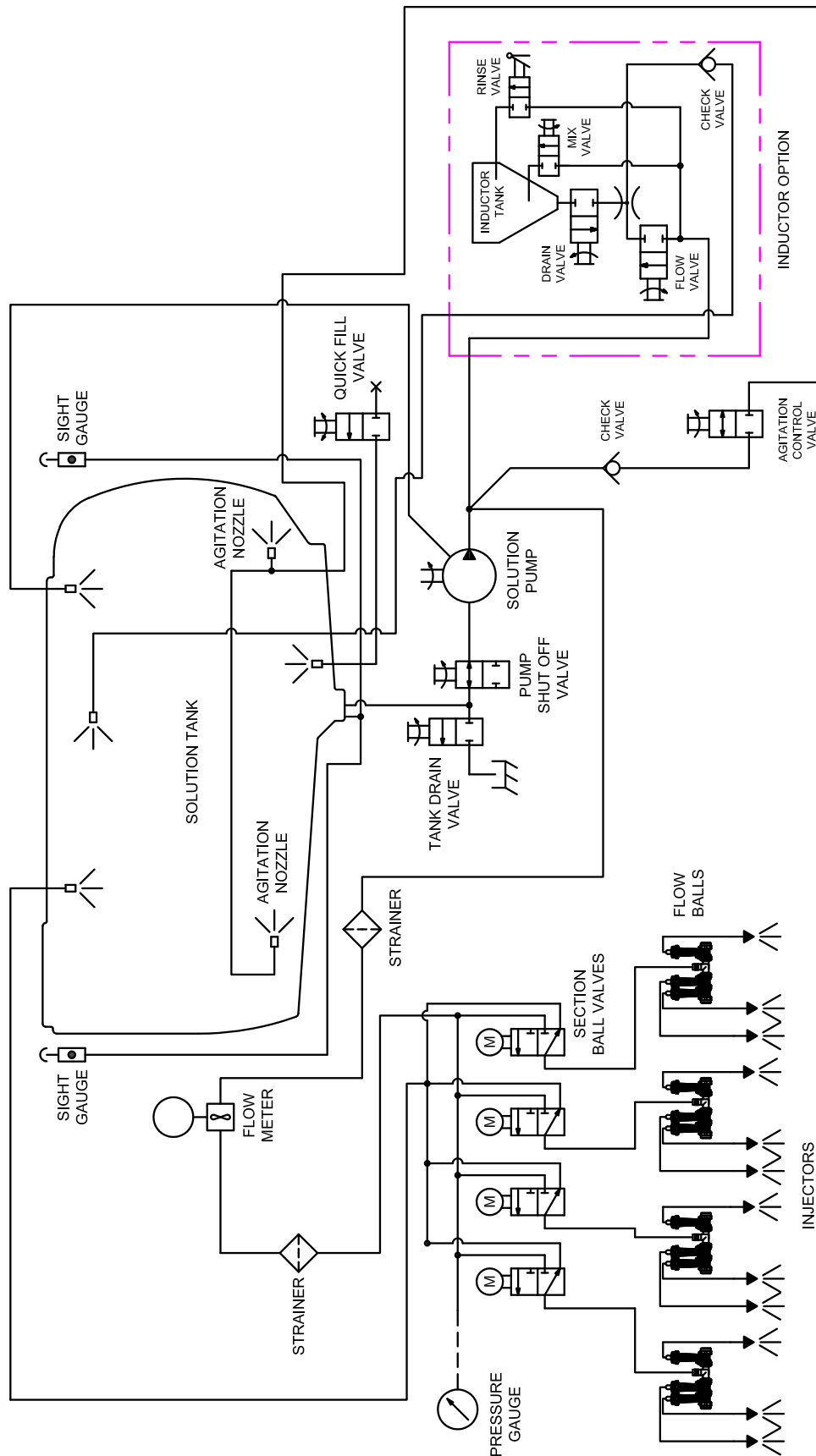
Schematics - Electrical

Flow Cable, 6 Section (9503472)



1200 GALLON LIQUID FERTILIZER CART — Maintenance

Schematics - Plumbing



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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.

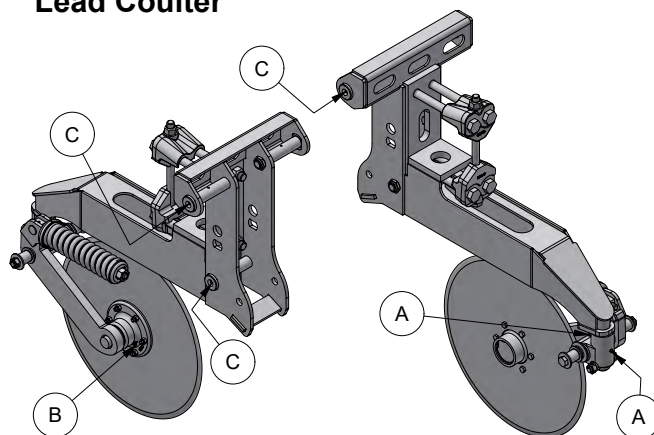
Use EP-2 lubricant at the locations described in the chart. All exposed cylinder rods should be coated with grease before seasonal storage to prevent rusting. After seasonal storage, check wing latch for freedom of movement.

The lubrication locations and recommended schedule are as follows:

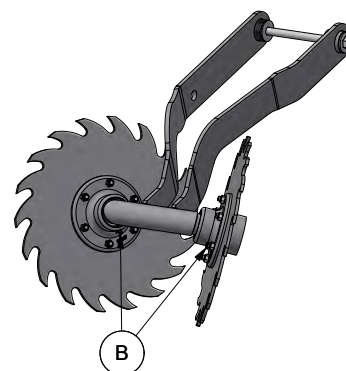
ITEM	DESCRIPTION	POINT	QTY	HOURS
A	Lead Coulter Swivel Arms	2	1 Shot	100 Hours
B	All Hubs	8	2 Shots	200 Hours/Annually
C	Lead Coulter Pivots	3	2 Shots	200 Hours/Annually
D	Depth Control Pivots	2	2 Shots	200 Hours./Annually
E	Closing Coulter Pivots	2	2 Shots	100 Hours
F	Conditioner Pivot	1	2 Shots	200 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)

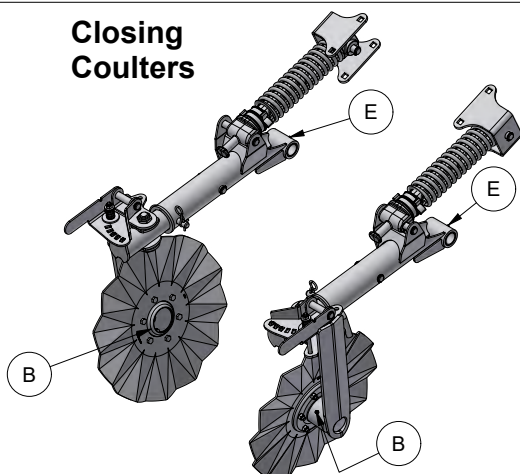
Lead Coulter



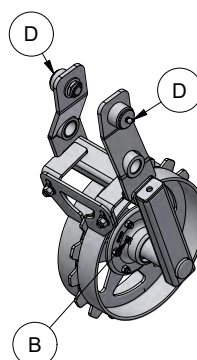
Row Cleaner



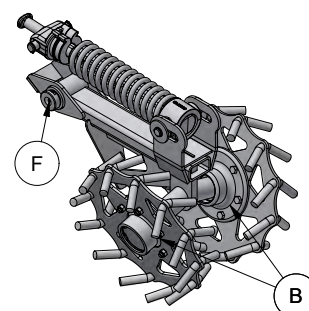
Closing Coulters



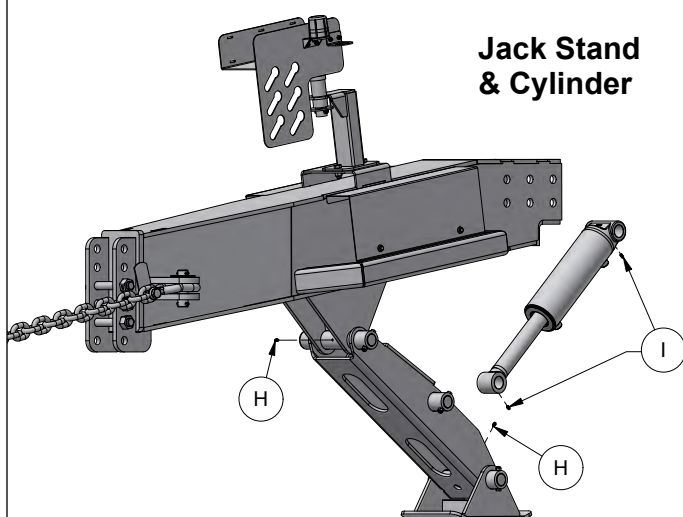
Depth Control



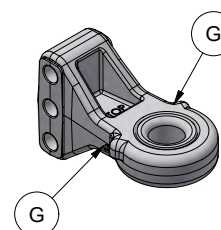
Conditioner



Jack Stand & Cylinder

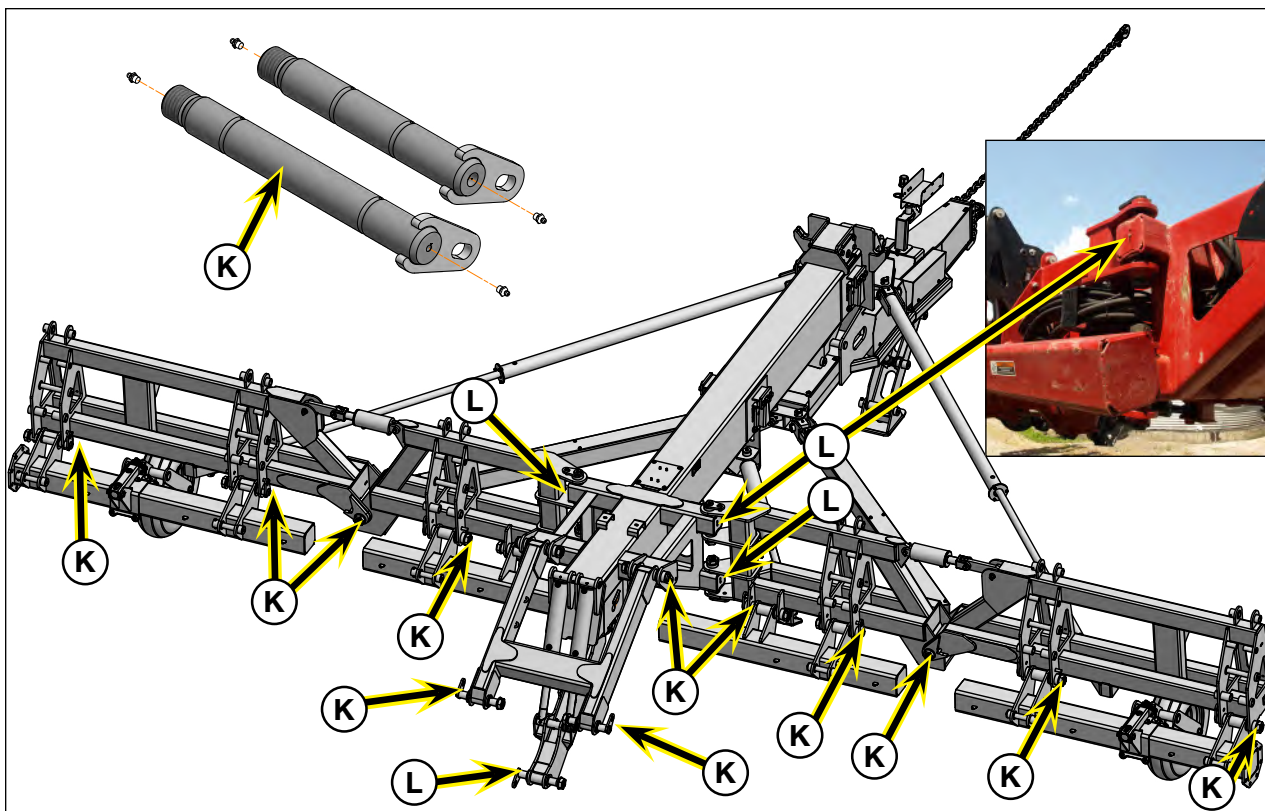
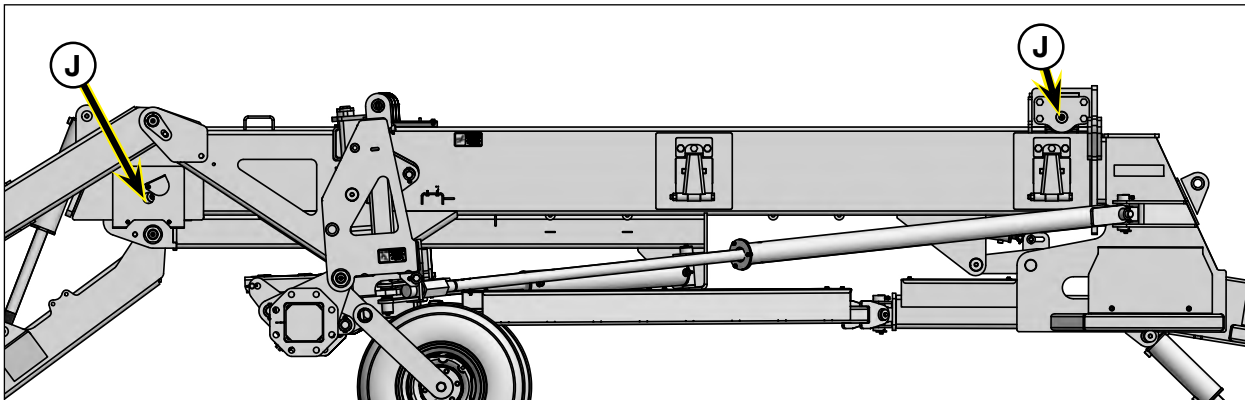


Hitch



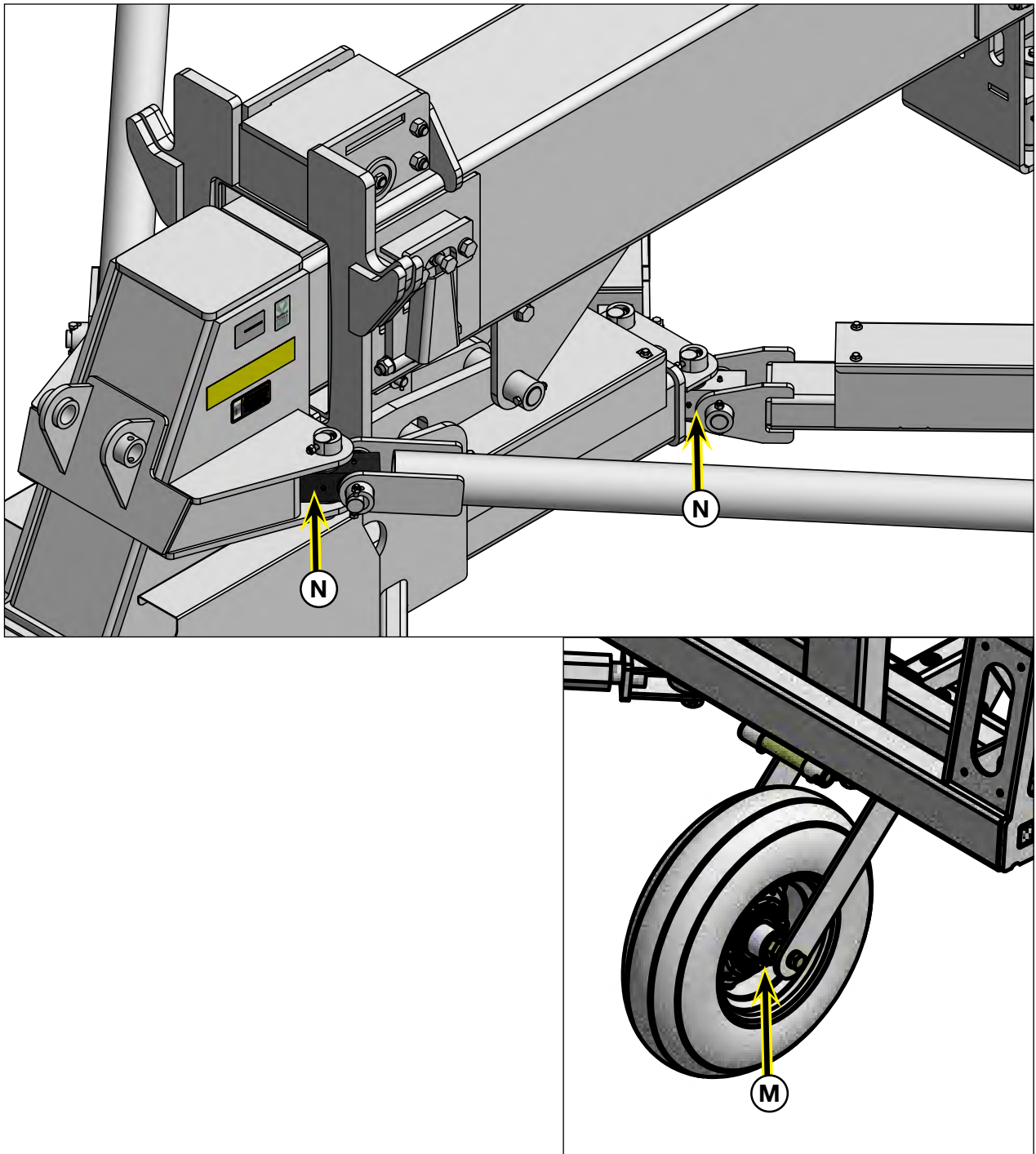
Lubrication Points (continued)

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.

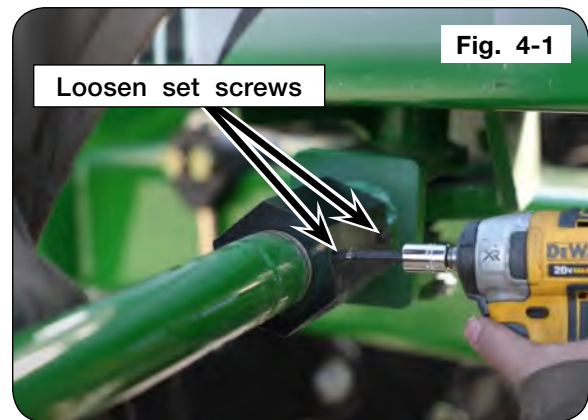
HOSES: Be sure hoses have room to "FLEX" (for folding) in hinge areas. Hoses must be secured with cable ties.

Truss Rod Adjustment

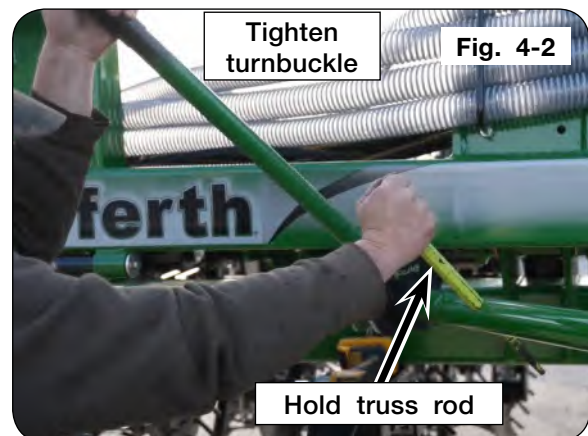
1. Park the empty Raptor machine on a firm, level surface. Completely unfold the wings. Block the tires on the unit to keep it from moving. Set the towing vehicle's parking brake, shut off the engine and remove the ignition key.



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)

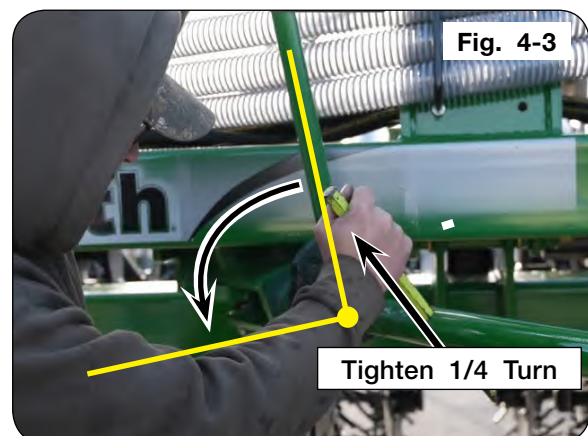


3. With the wings completely unfolded, attempt to tighten the turnbuckles while holding the truss rod stationary. (Fig. 4-2) If a turnbuckle is already tight, reinstall the set screws, torque the screws to 25-28 Ft.-Lbs. and no further action is required. If a turnbuckle is loose, tighten until it cannot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

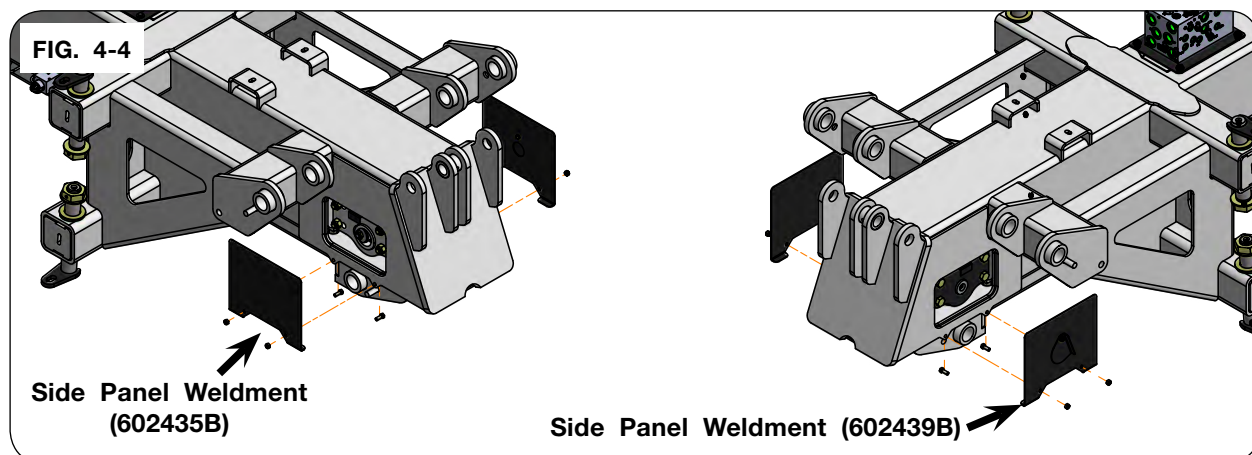
WARNING

- 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.

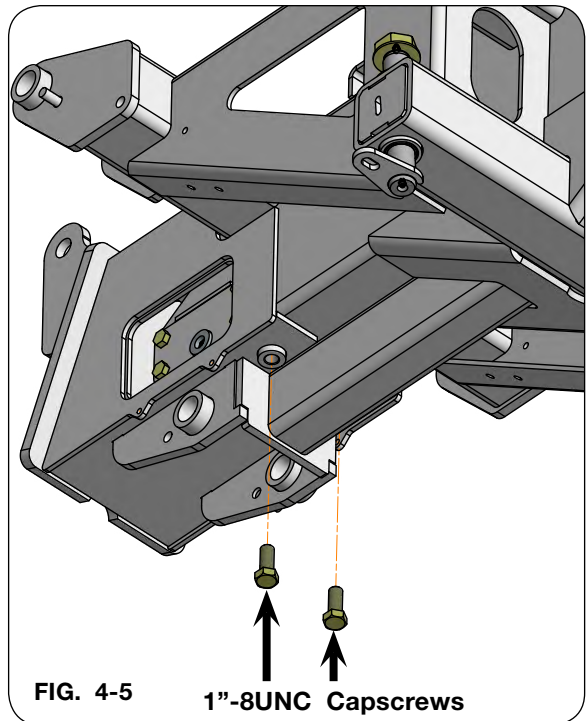
Rear Roller Assembly Replacement

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)

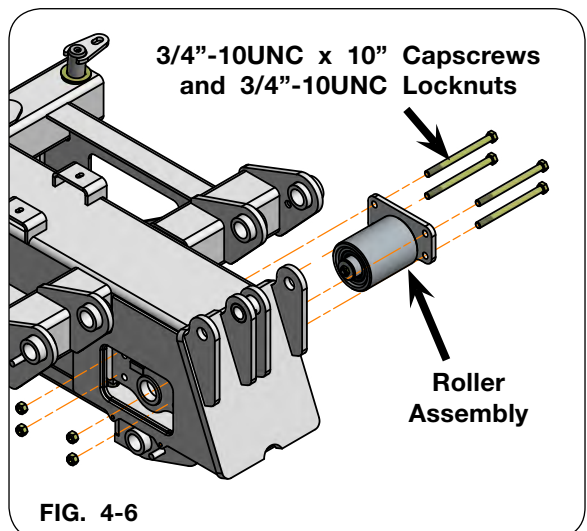


Roller Assembly Replacement (continued)

- 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.

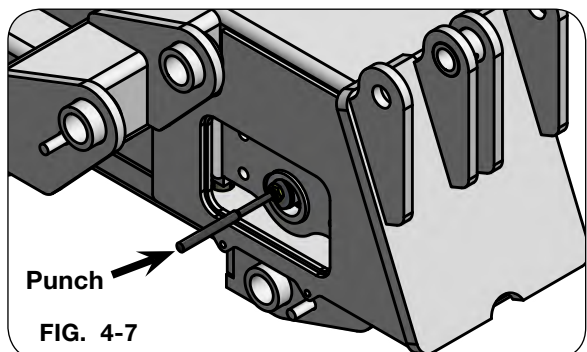


- Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-6)



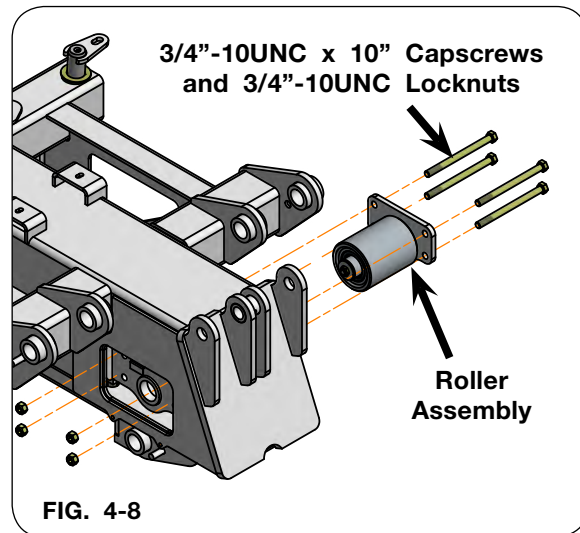
NOTE: If necessary, use a punch on the end of the spindle to help drive the assembly. (FIG. 4-7)

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

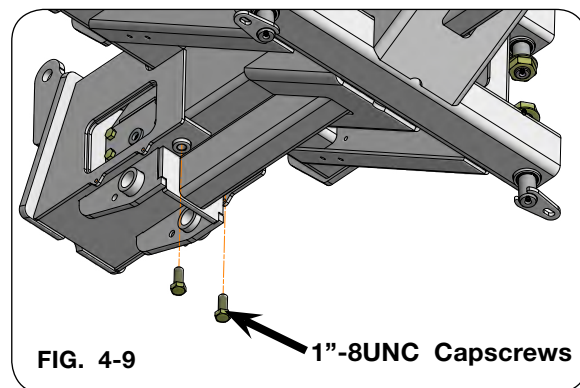


Roller Assembly Replacement (continued)

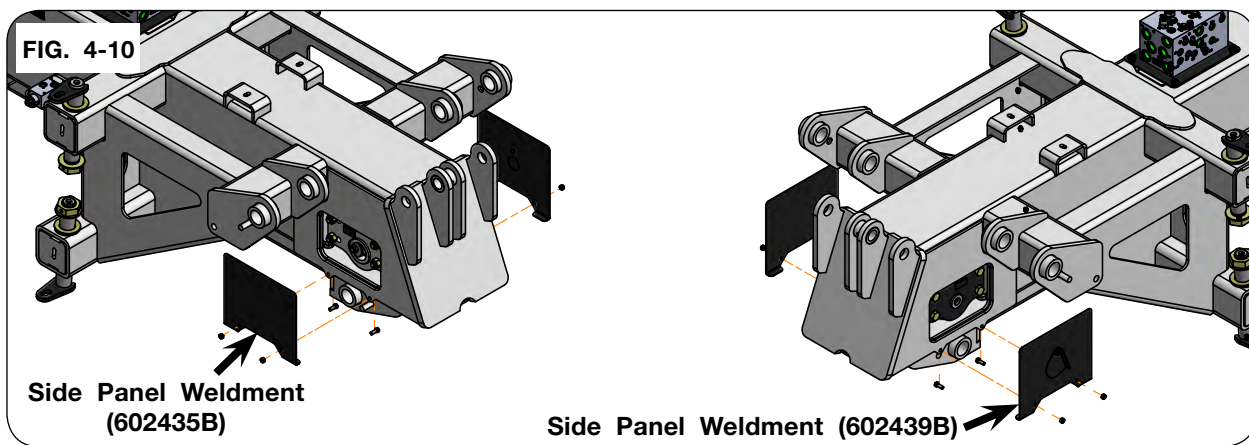
4. Replace roller assembly (602186B) and retain into position with the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) previously removed. (FIG. 4-8)



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



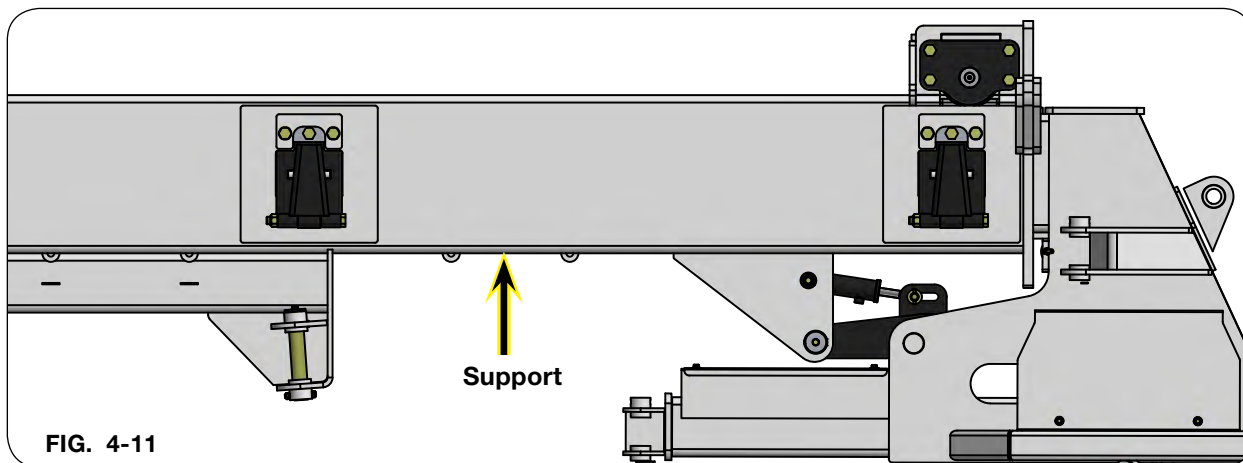
6. Reattach the side panel weldments (602435B and 602439B) with the 3/8"-16UNC x 1" capscrews (9390-055) and 3/8"-16UNC locknuts (9928) previously removed. (FIG. 4-10)



Roller Assembly Replacement (continued)

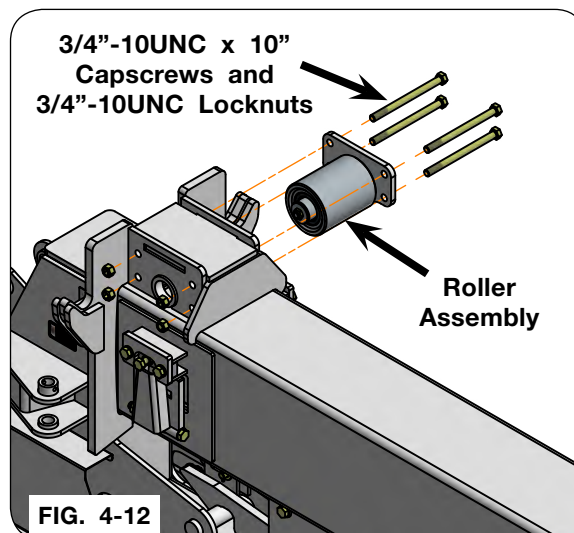
Front Roller Assembly Replacement

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.

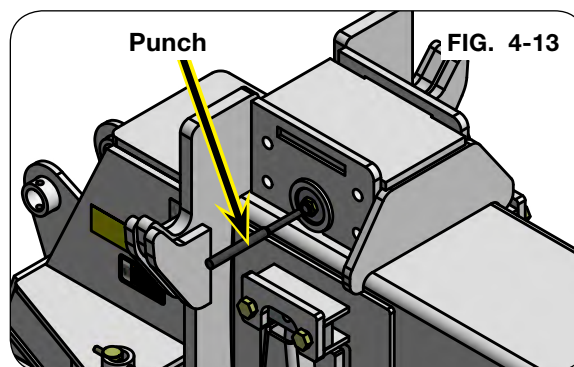
2. Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-12)



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".

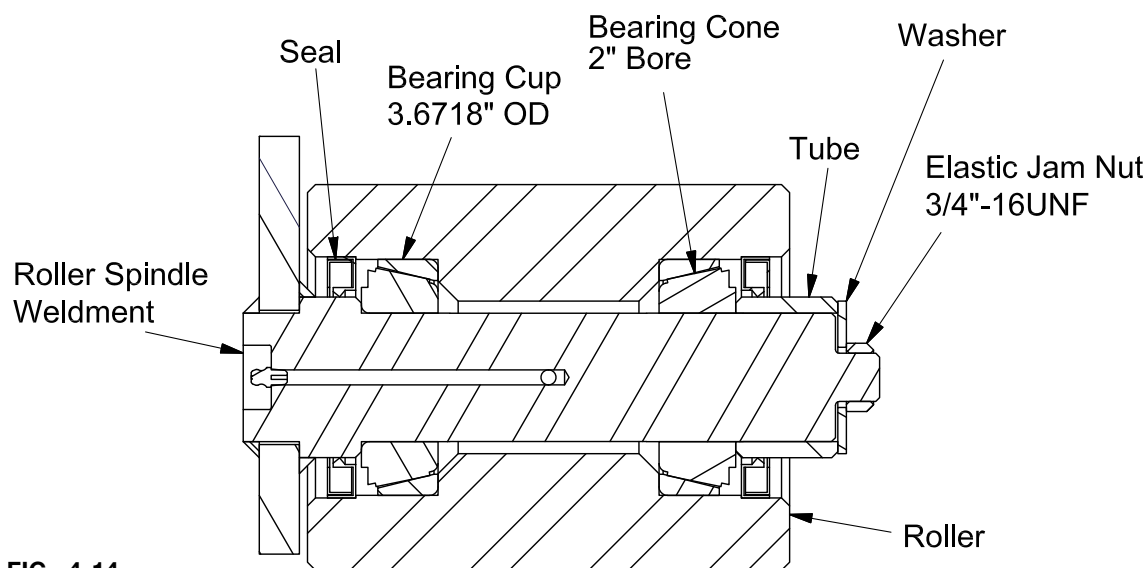
3. Replace roller assembly (602186B) and retain into position with the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) previously removed. (FIG. 4-12)



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)



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.

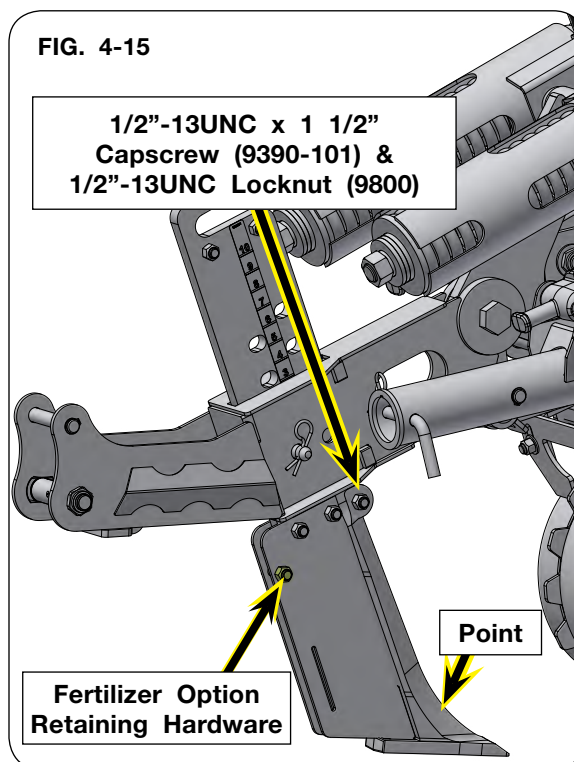
CAUTION

- 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)



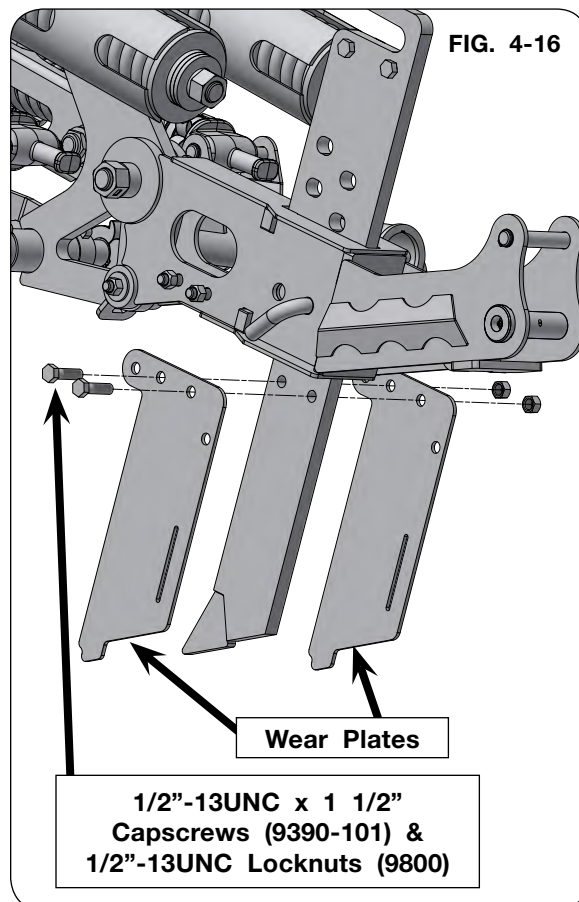
TerrainPro2 Row Unit (continued)

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)

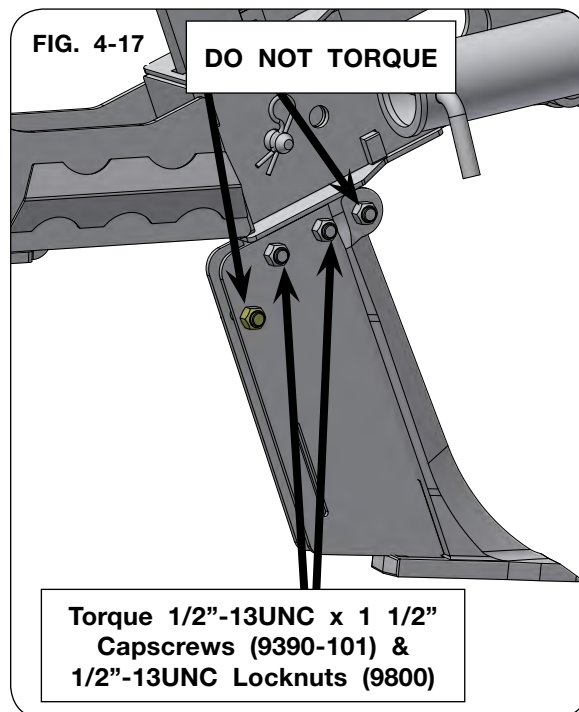
8. Replace wear plates (604842B) and loosely secure with previously removed 1/2"-13UNC x 1 1/2" capscrews (9390-101) and 1/2"-13UNC locknuts (9800). (FIG. 4-16)

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)

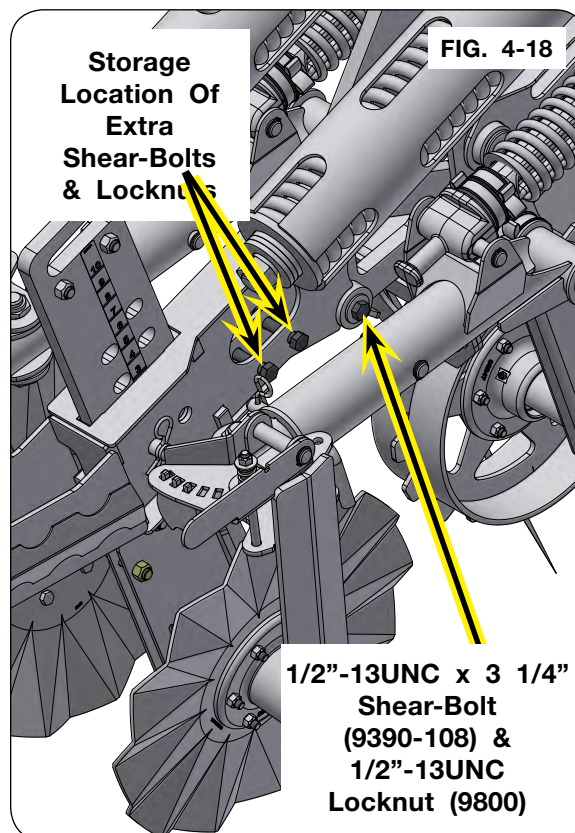
Shear-Bolt Replacement

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.

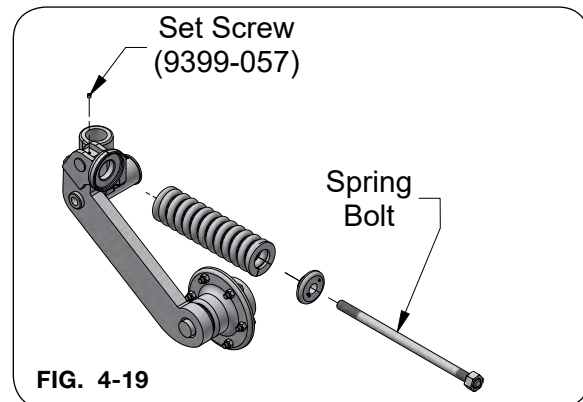
CAUTION

- 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.

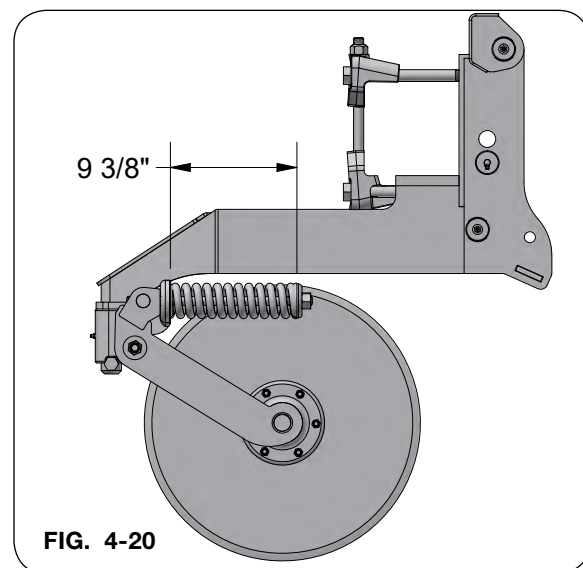


4. Tighten bolt until the spring is compressed to 9 3/8" (FIG. 4-20).

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.

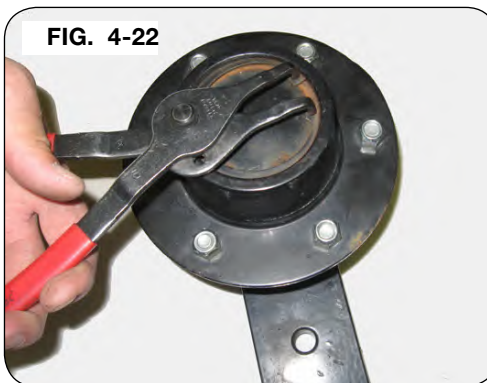


FIG. 4-22

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

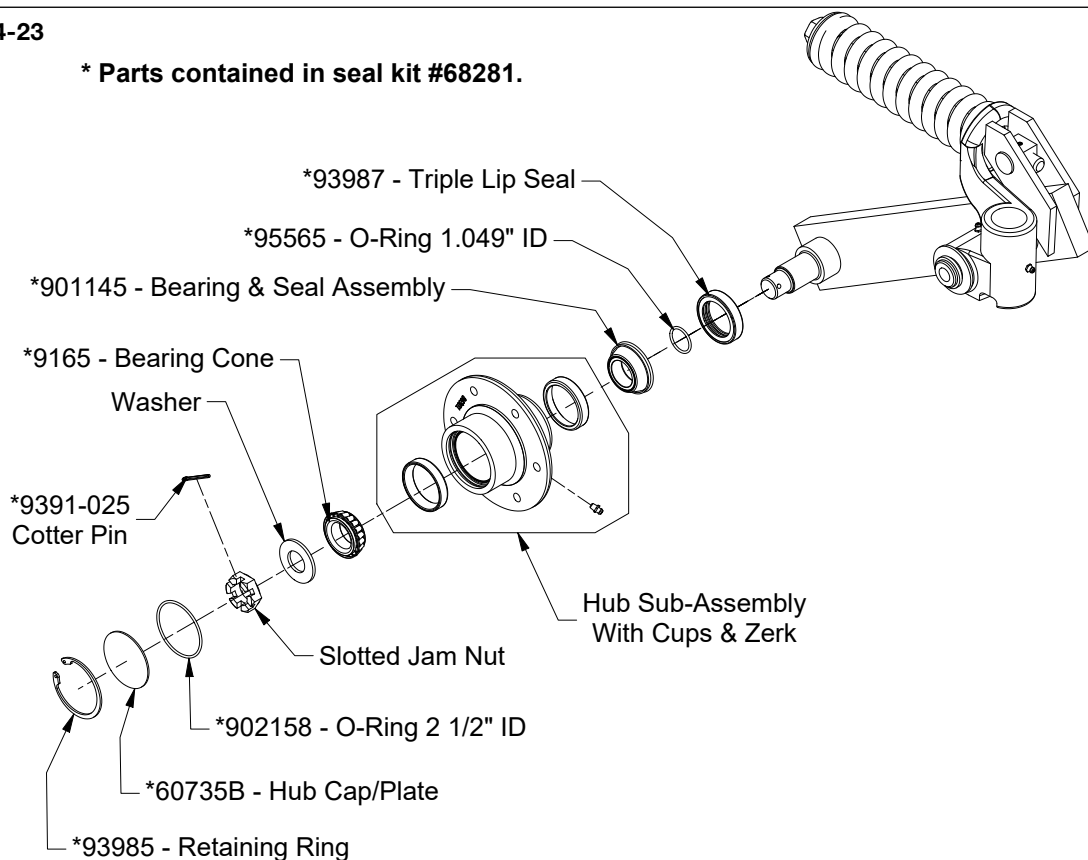
4. Remove the cotter pin securing the slotted nut.
5. Unscrew the nut and carefully remove the hub from the spindle.
6. Remove the components, clean and inspect for any damage or wear. If even the slightest imperfection exists, replace the component(s). Once the hub is dismantled, always replace the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



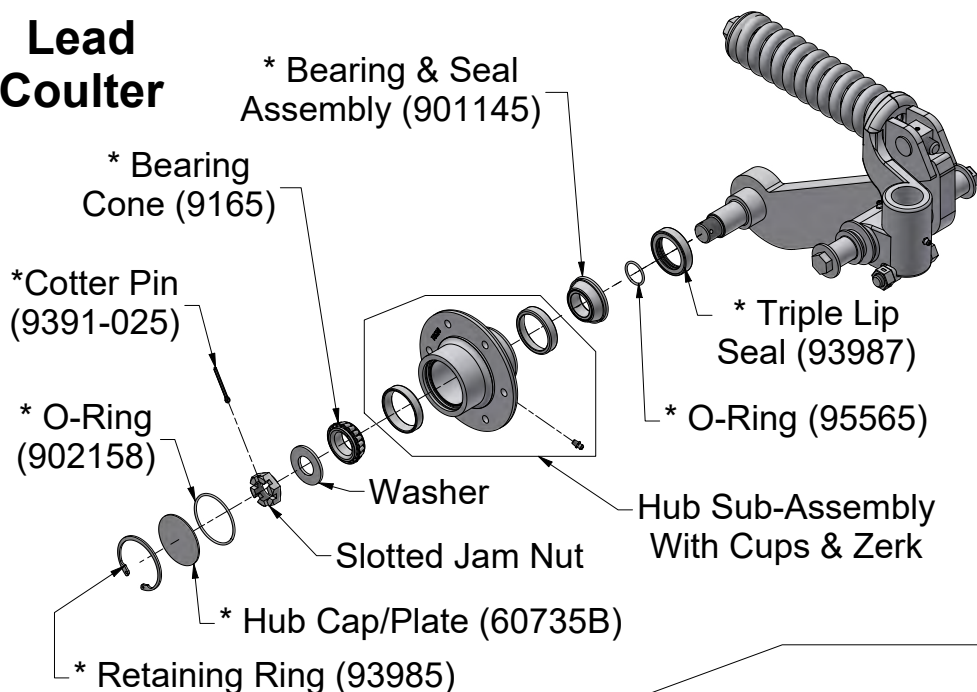
FIG. 4-24

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

Lead Coulter



Closing Coulter

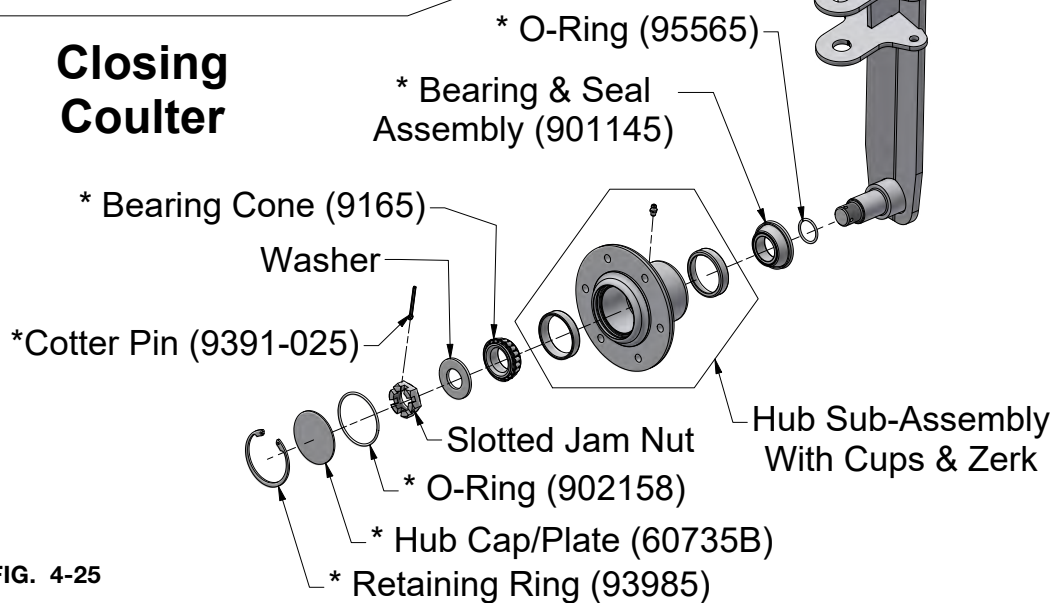


FIG. 4-25

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).

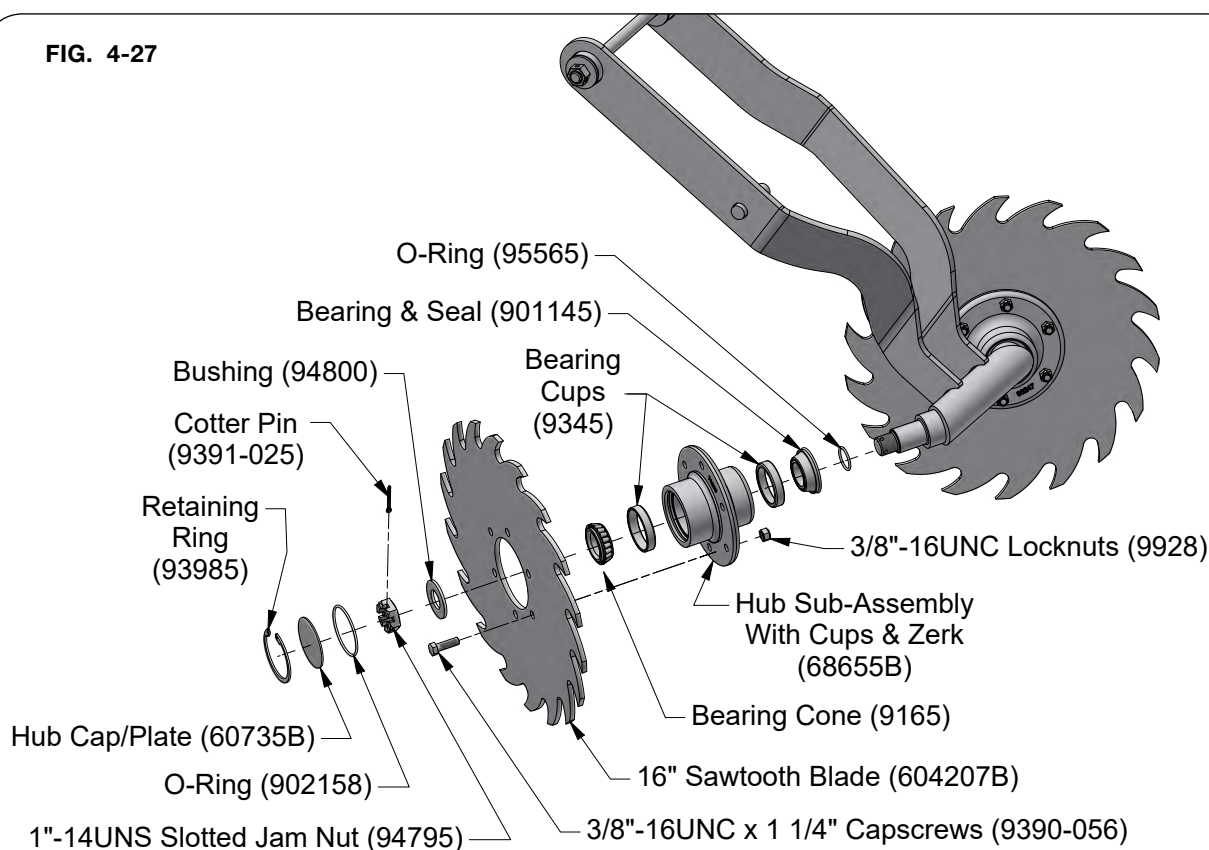
Row Cleaner Wheel Hub Adjustment (continued)

- 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.

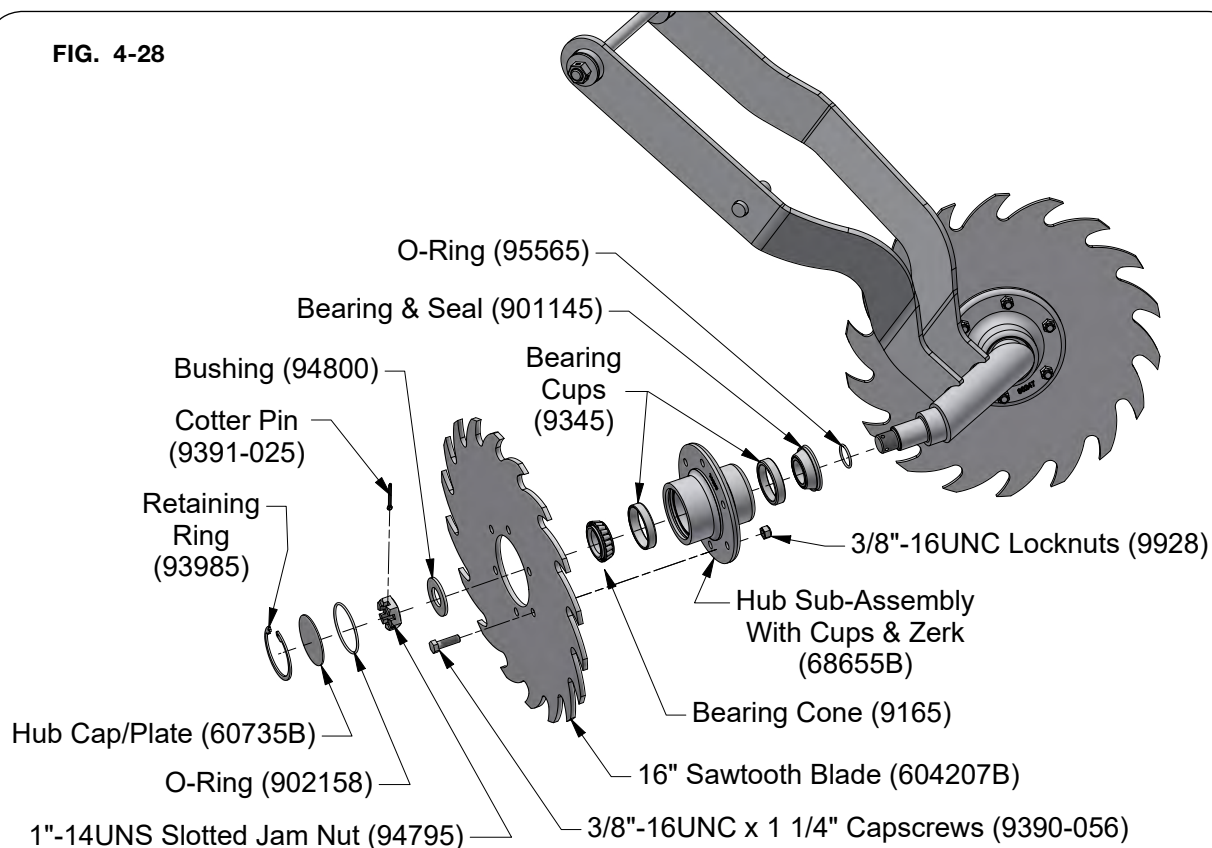
FIG. 4-27



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

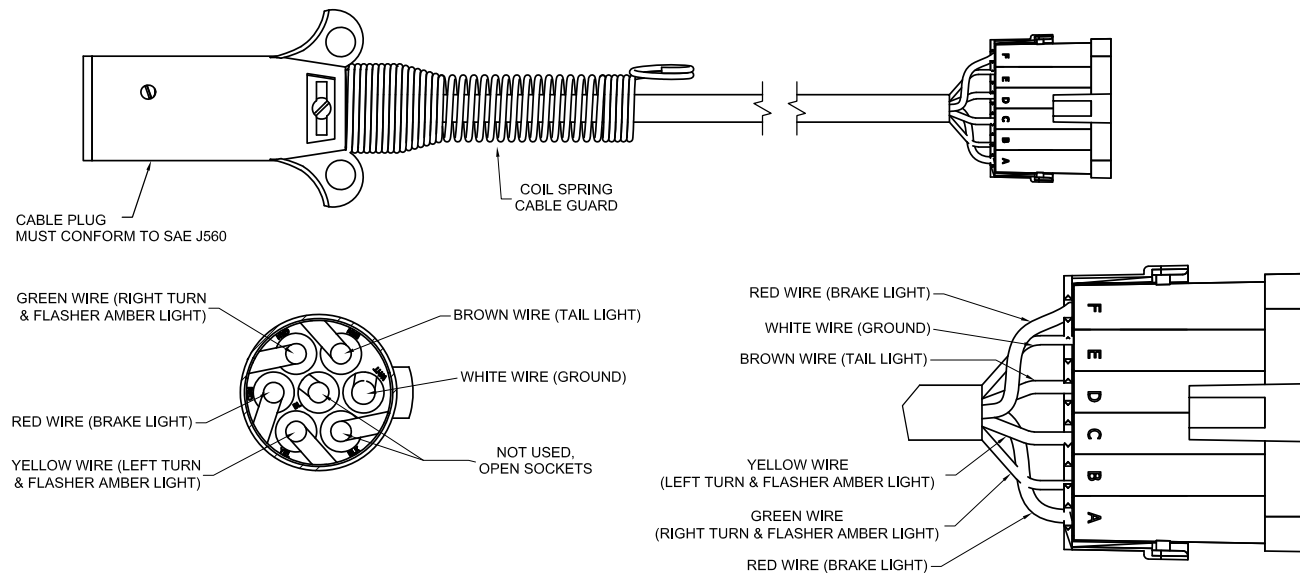
PROBABLE CAUSE	CORRECTION
Poor Penetration	
Frame is not level	See the OPERATION section "Leveling Frame" for instructions
Ground is too hard for hitch control setting	Adjust the hitch control position. See the OPERATION section "Load and Depth control"
Worn or dull tool points	Replace with new tool 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)

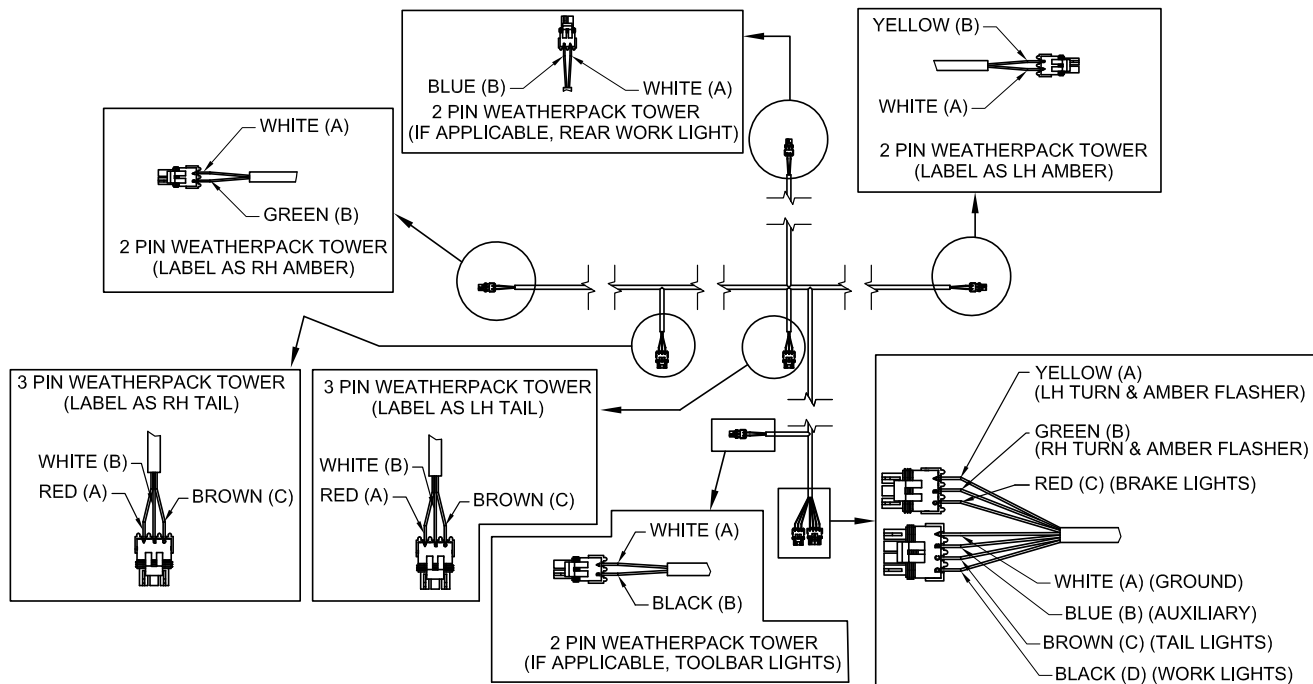
PROBABLE CAUSE	CORRECTION
Shanks Not Resetting Into Ground After Tripping	
Ground conditions hard or the unit is being operated very deep	While moving, raise Raptor slightly to reset, then lower and resume operation
Excessive Soil Disturbance	
Main frame not level, running downhill	Level main frame
Dry 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)

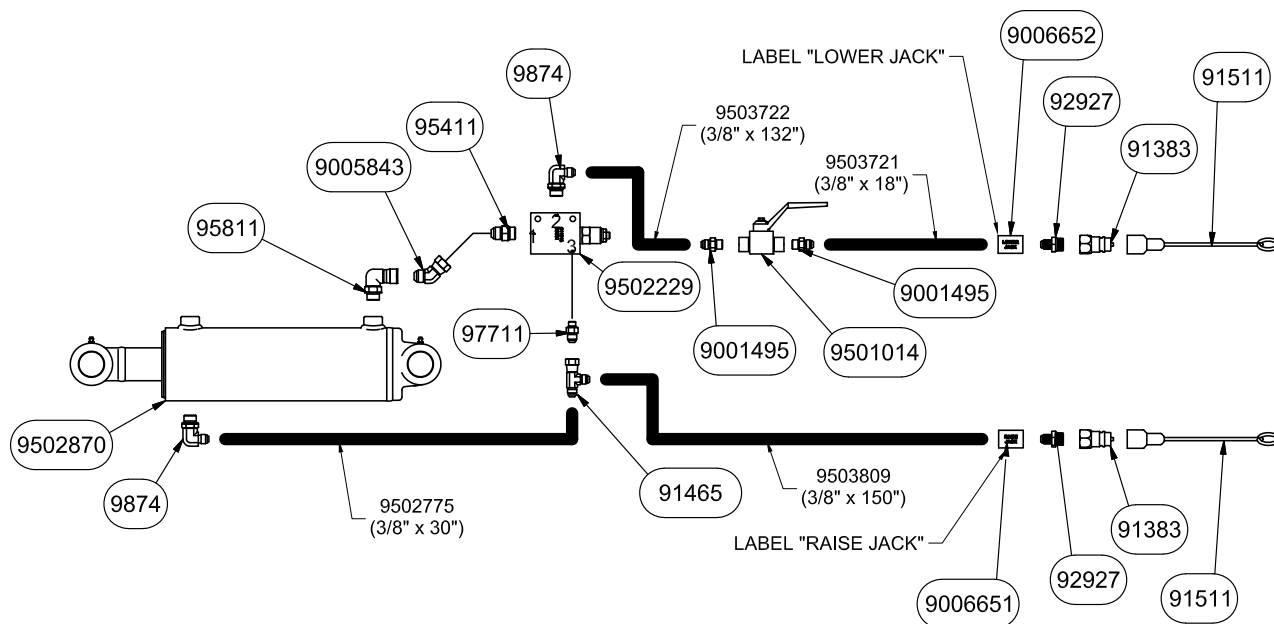


Electrical Harness - Light 418" (44999)

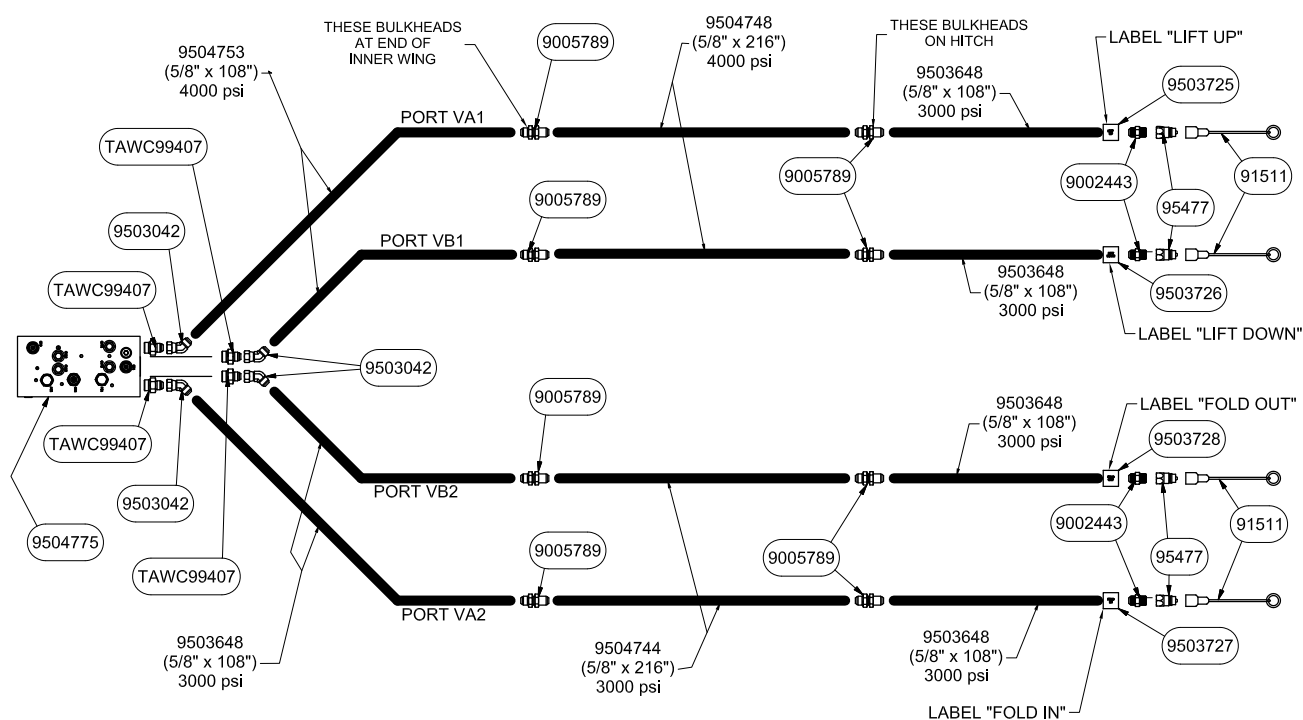


Schematics - Hydraulic

Tractor To Hydraulic Jack

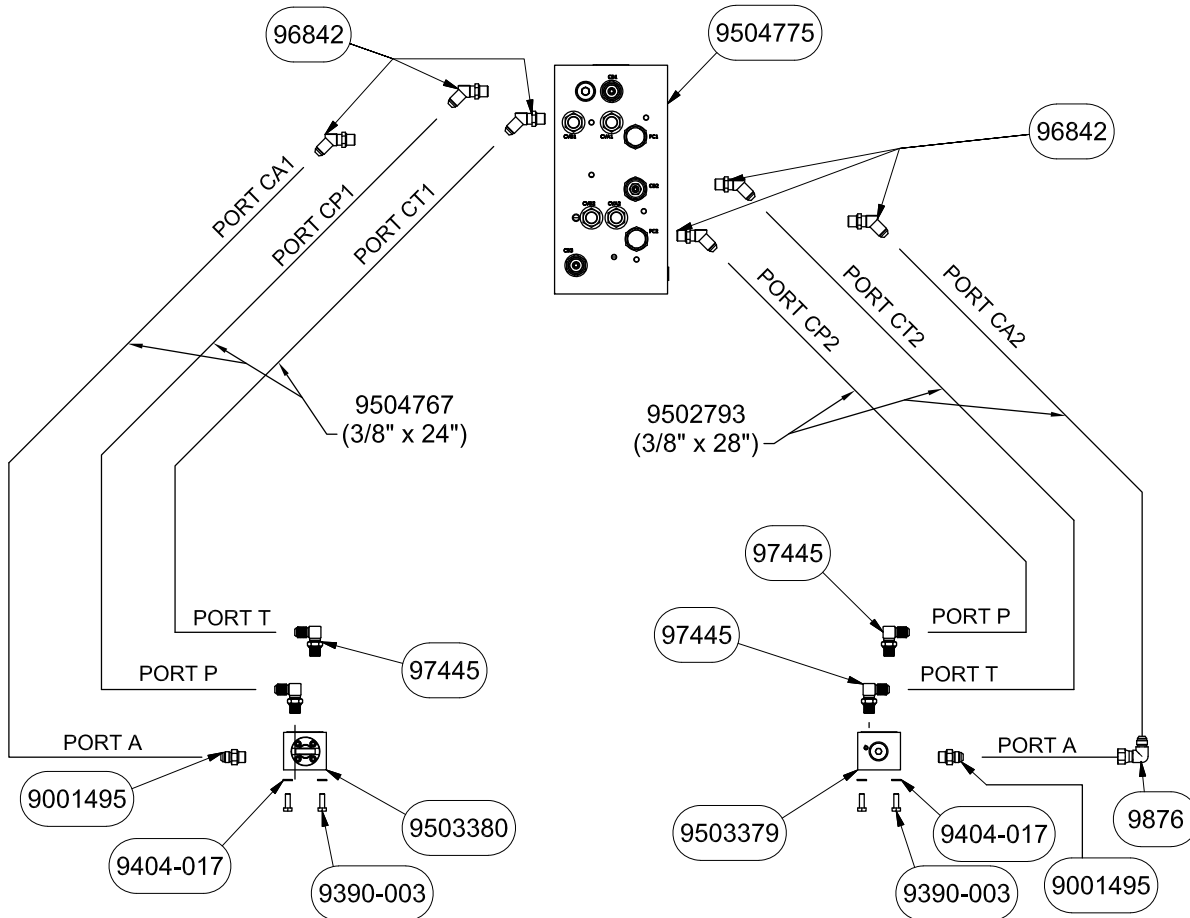


Tractor To Supply Valve



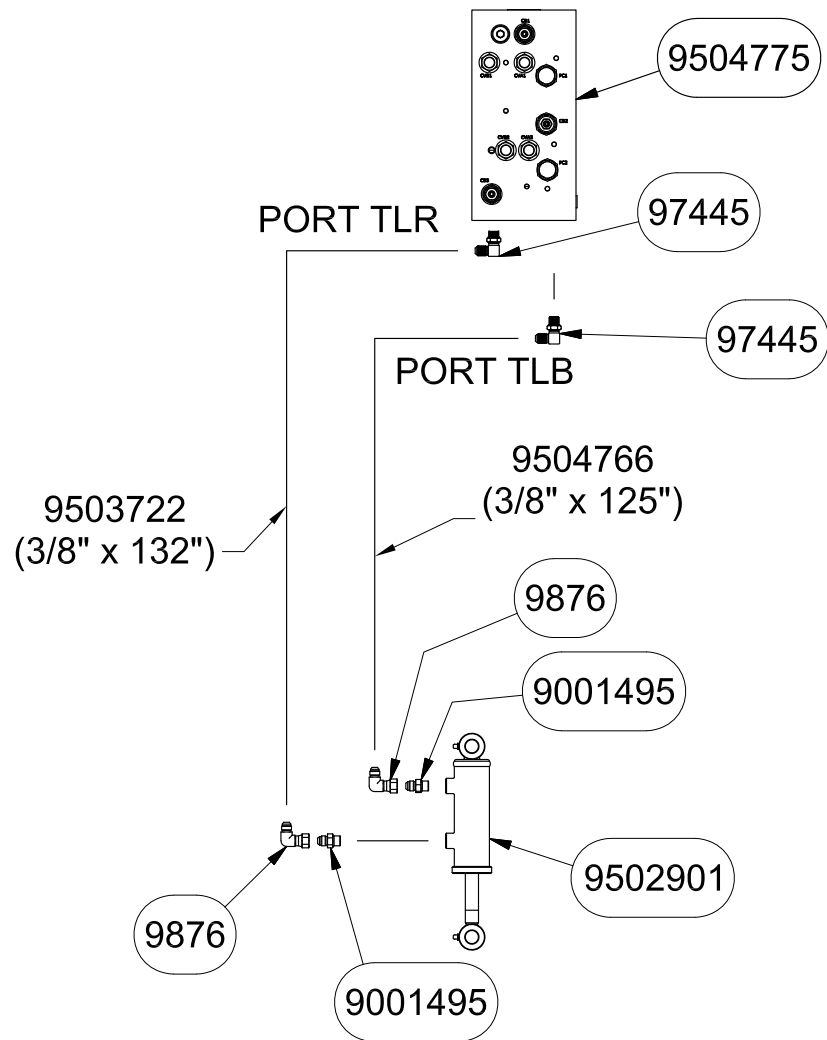
Schematics - Hydraulic (continued)

Supply Valve Assembly To Sequence Valves



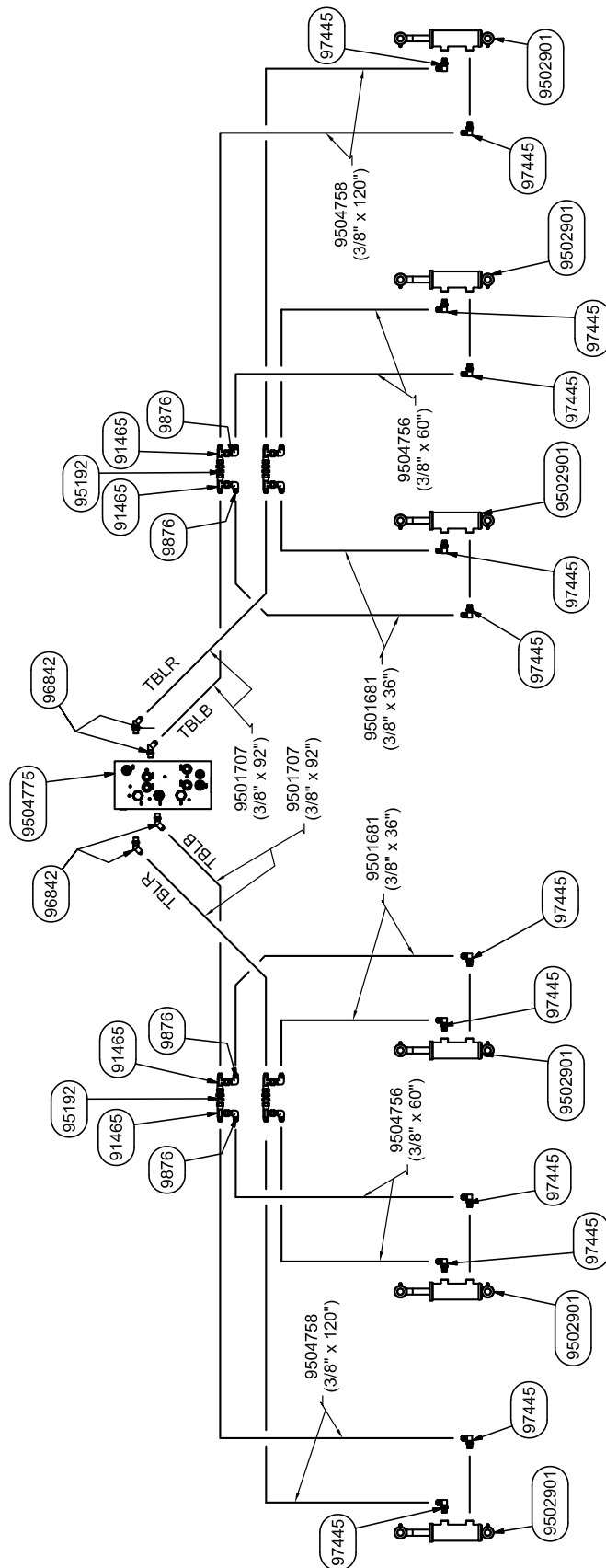
Schematics - Hydraulic (continued)

Supply Valve Assembly to Tongue Latch



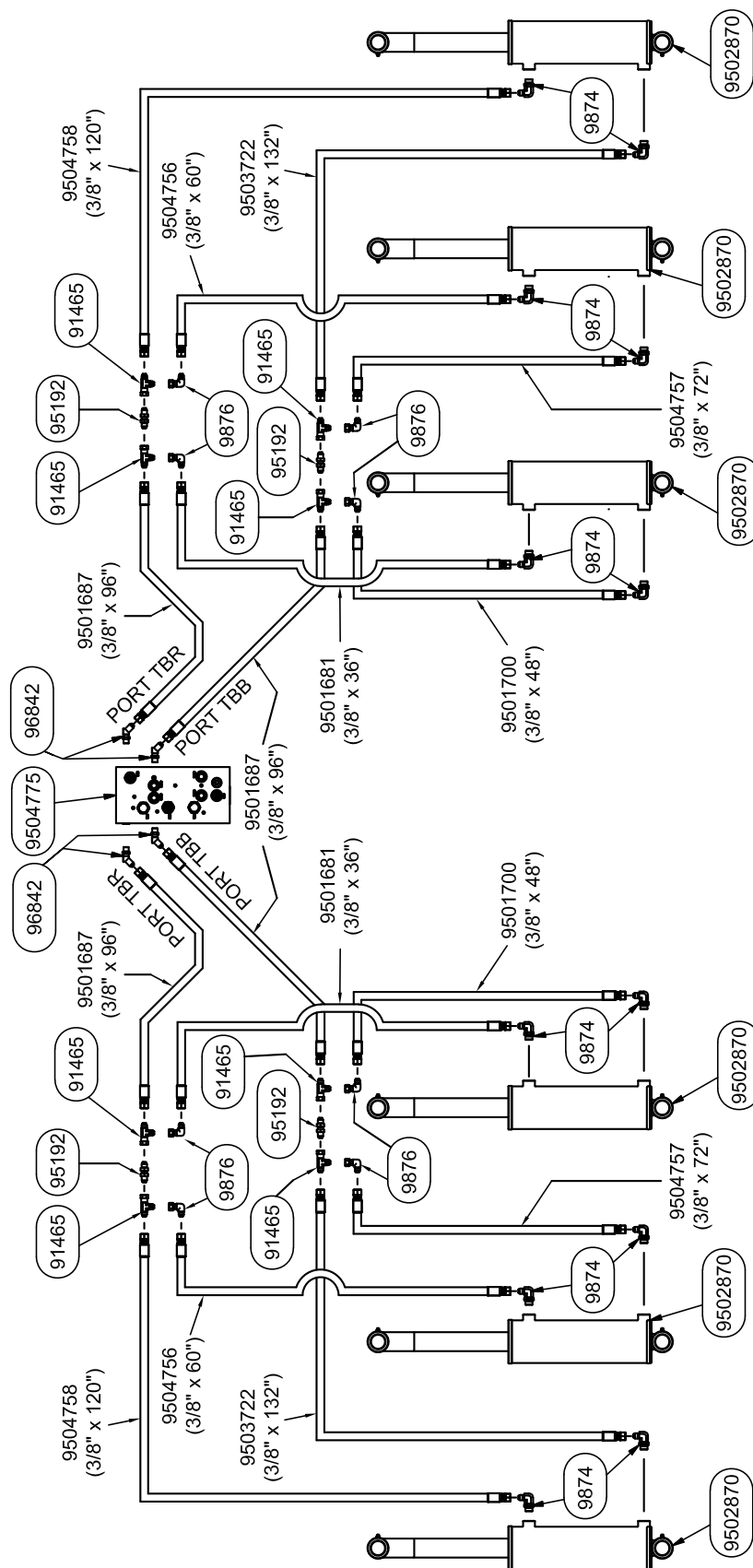
Schematics - Hydraulic (continued)

Supply Valve Assembly to Toolbar Latch



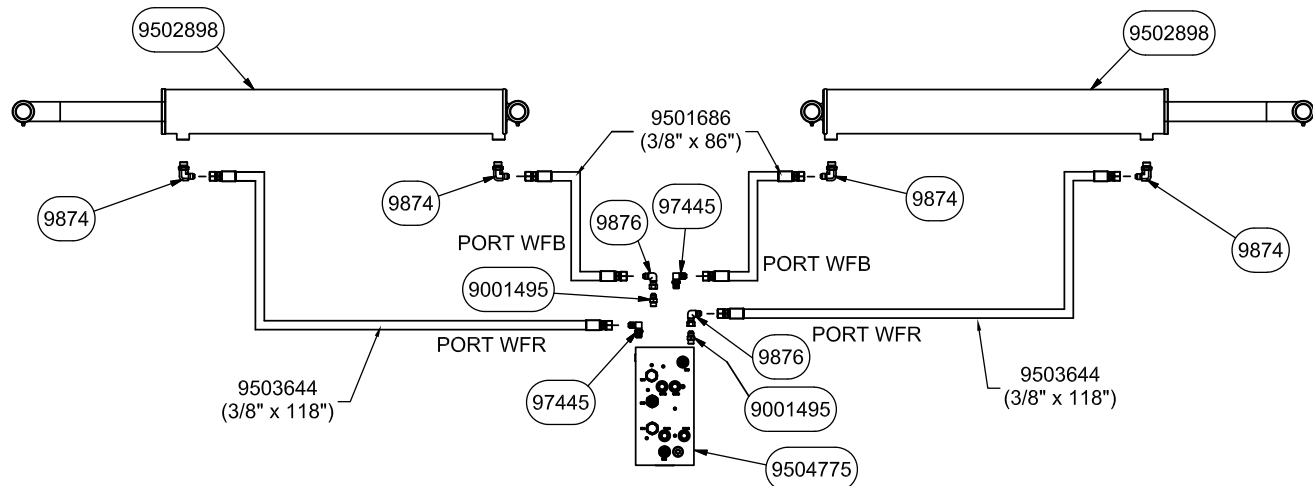
Schematics - Hydraulic (continued)

Supply Valve Assembly to Toolbar Fold



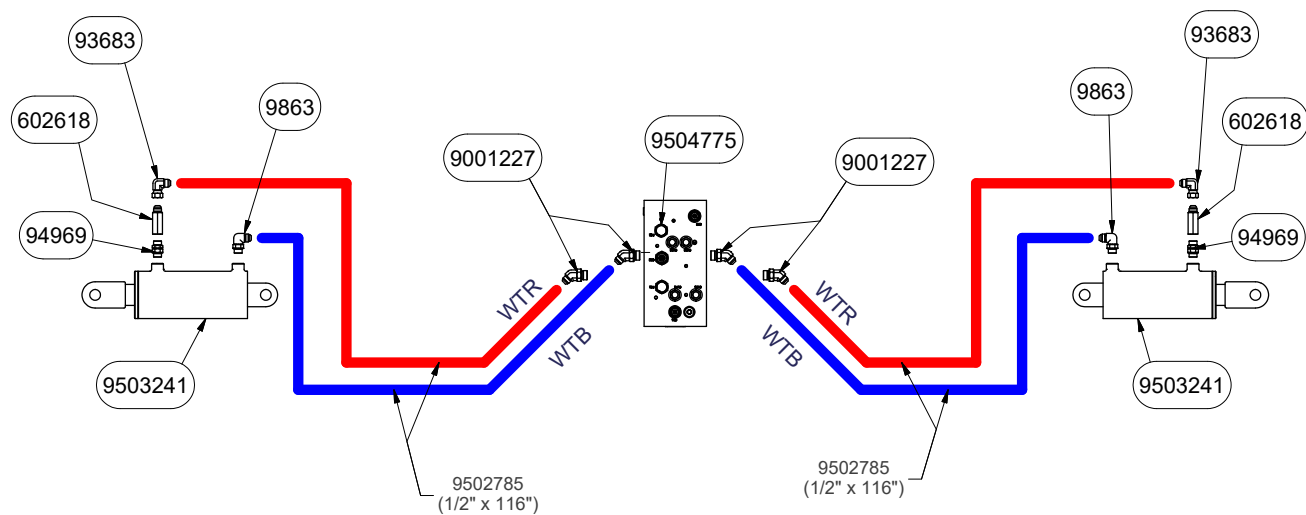
Schematics - Hydraulic (continued)

Supply Valve Assembly to Wings

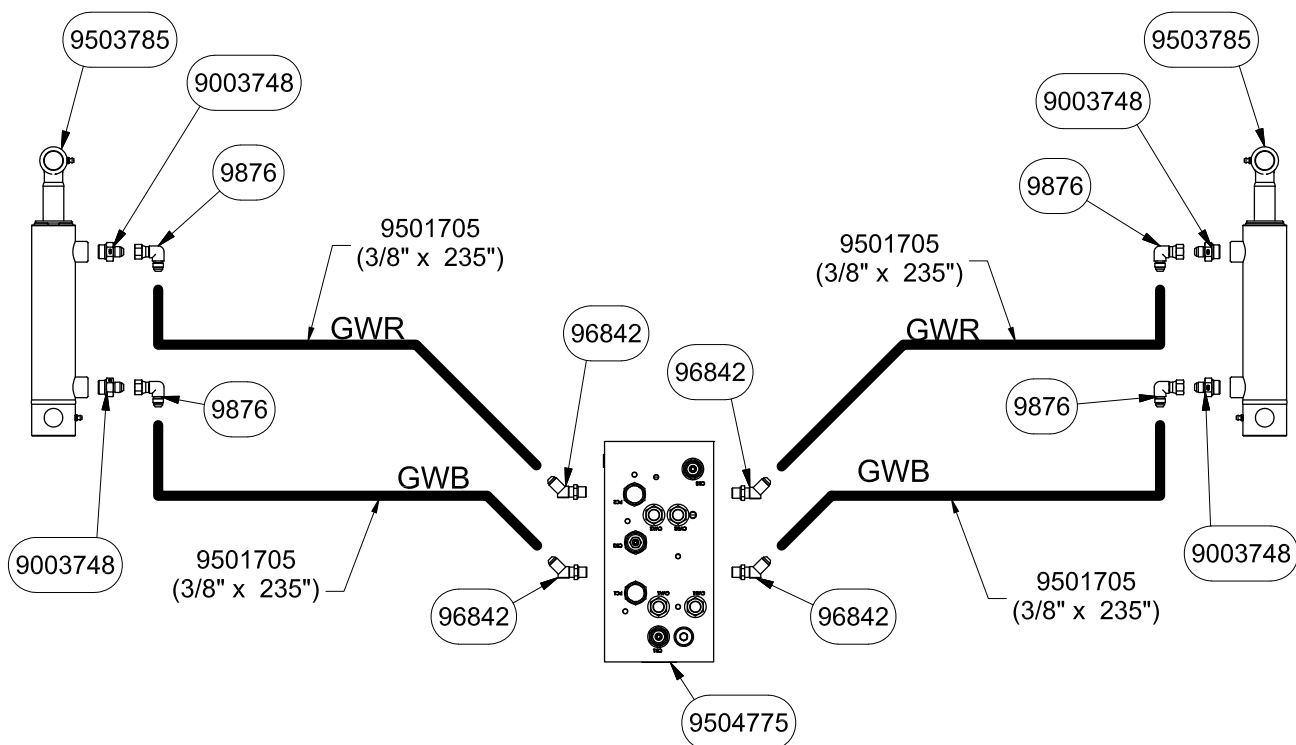


Schematics - Hydraulic (continued)

Supply Valve Assembly to Wing Tilt

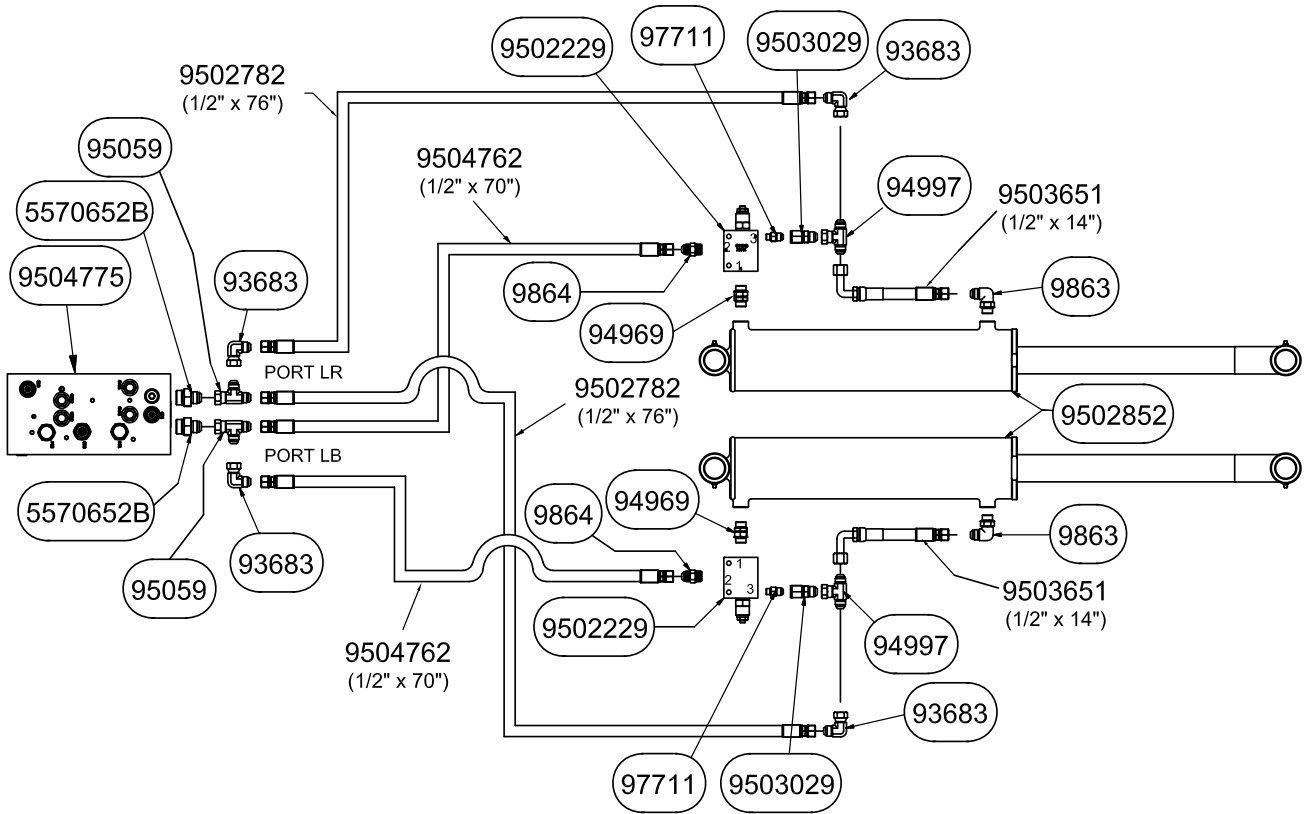


Supply Valve Assembly to Gauge Wheels



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

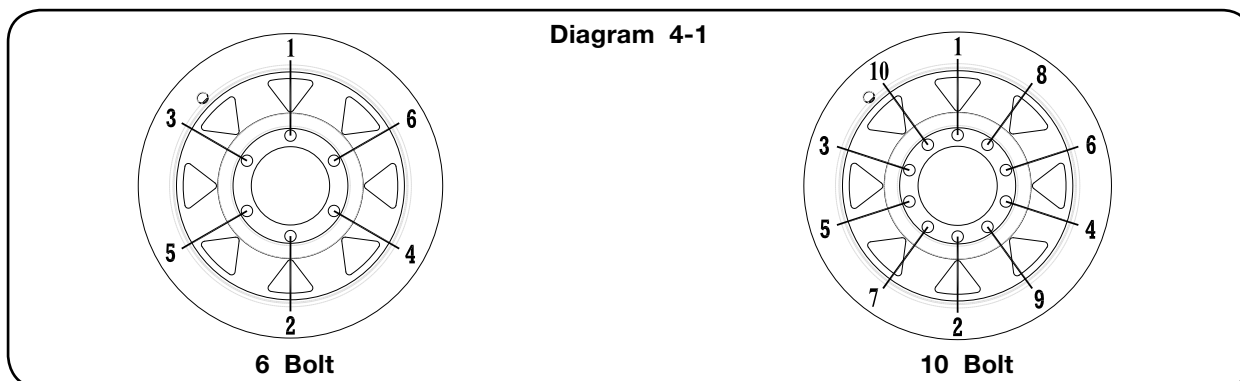
Wheel Nut Torque

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.

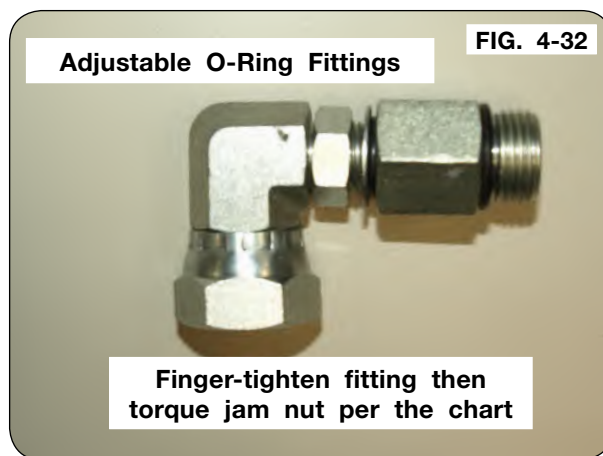
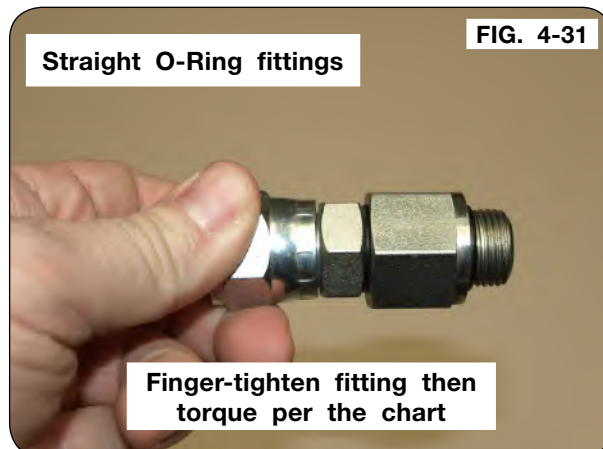
Hydraulic Fittings - Torque and Installation

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

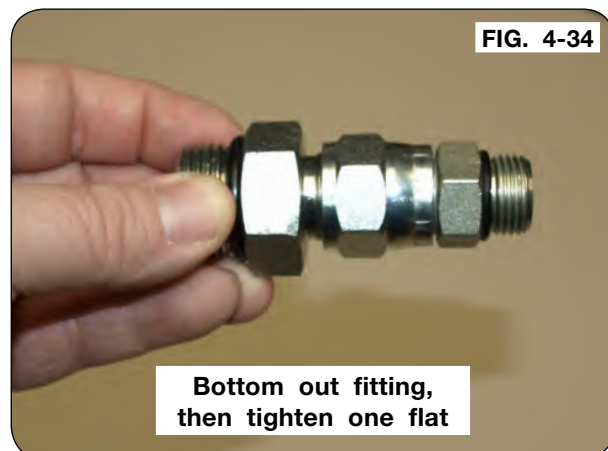


Hydraulic Fittings - Torque and Installation (continued)

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.



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Maintenance

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PULL-TYPE RAPTOR — Maintenance

Lubrication Points

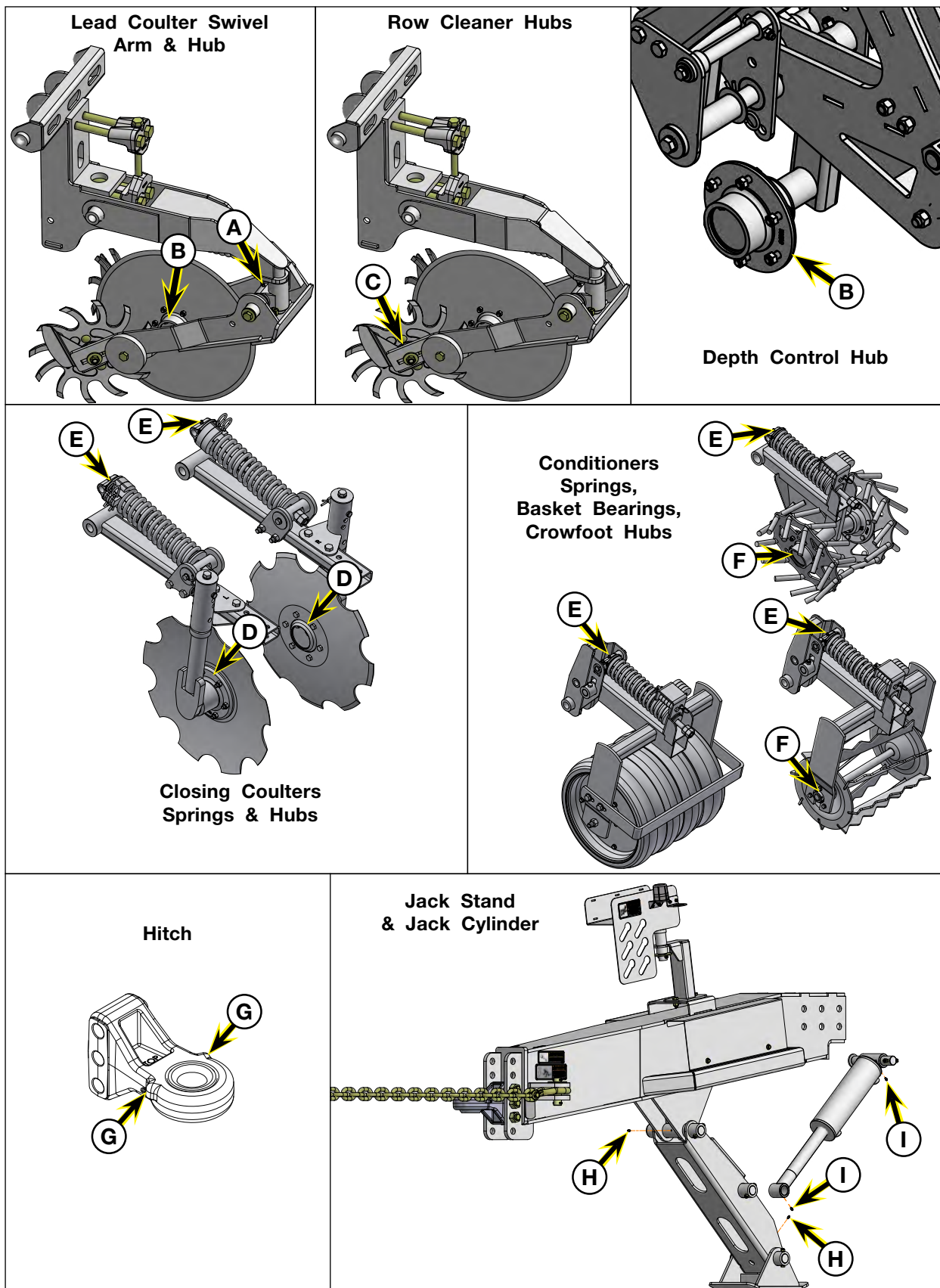
To keep your implement in top operating condition and to assure its proper performance and reliability for a long period of time, periodic inspection and lubrication is a must.

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

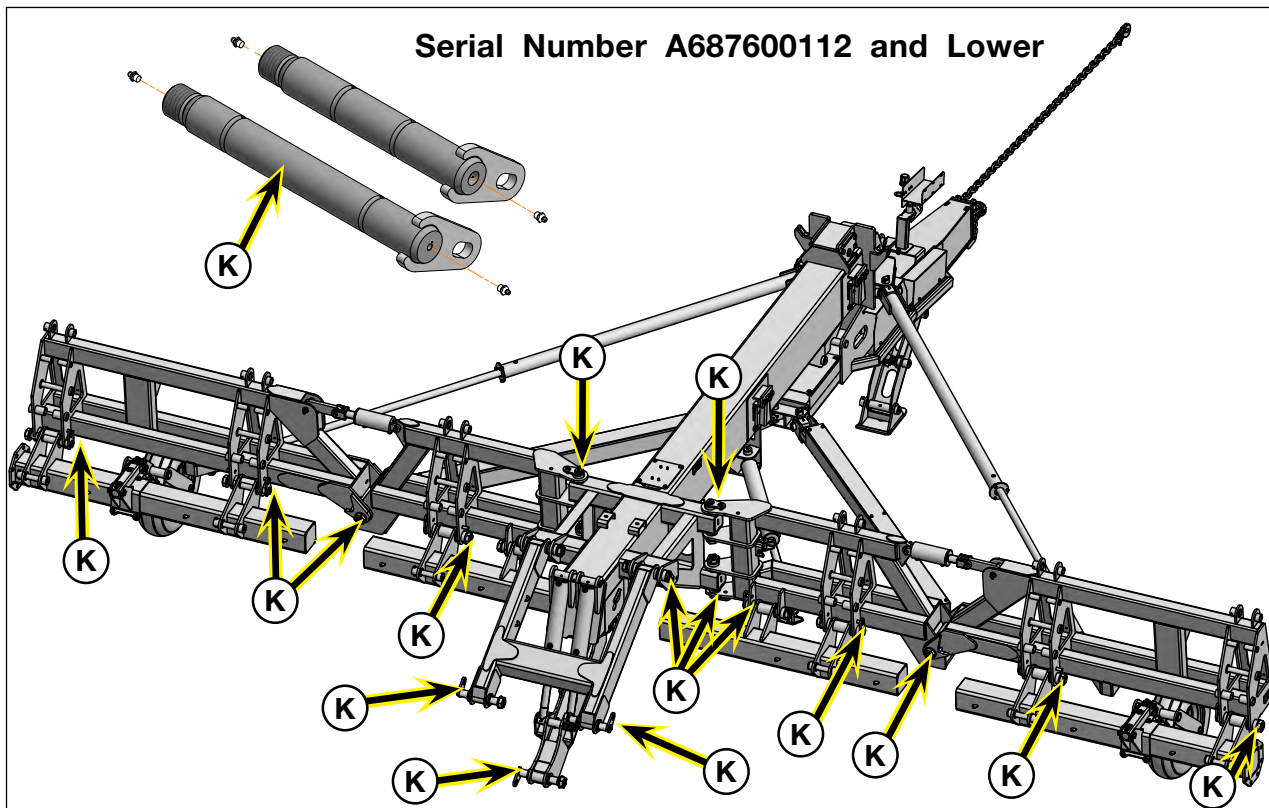
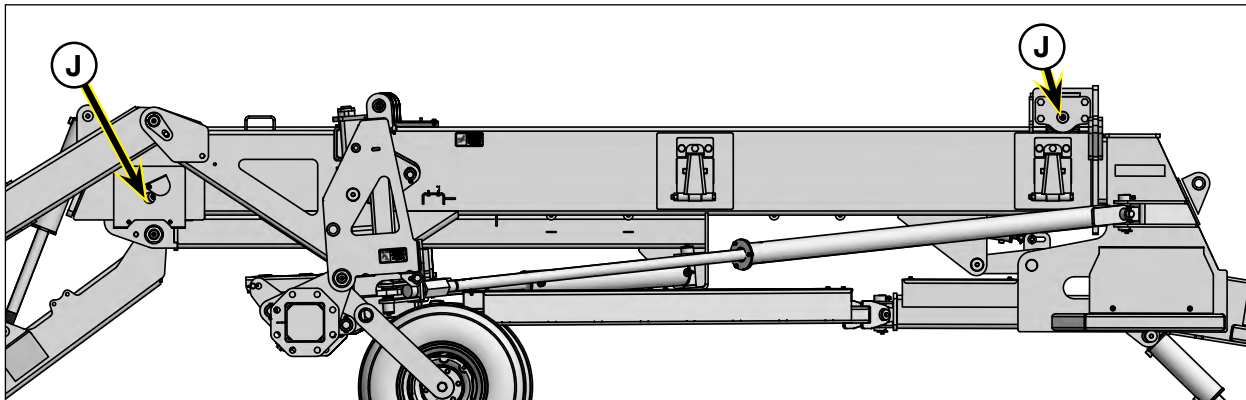
Lubrication Points (continued)



PULL-TYPE RAPTOR — Maintenance

Lubrication Points (continued)

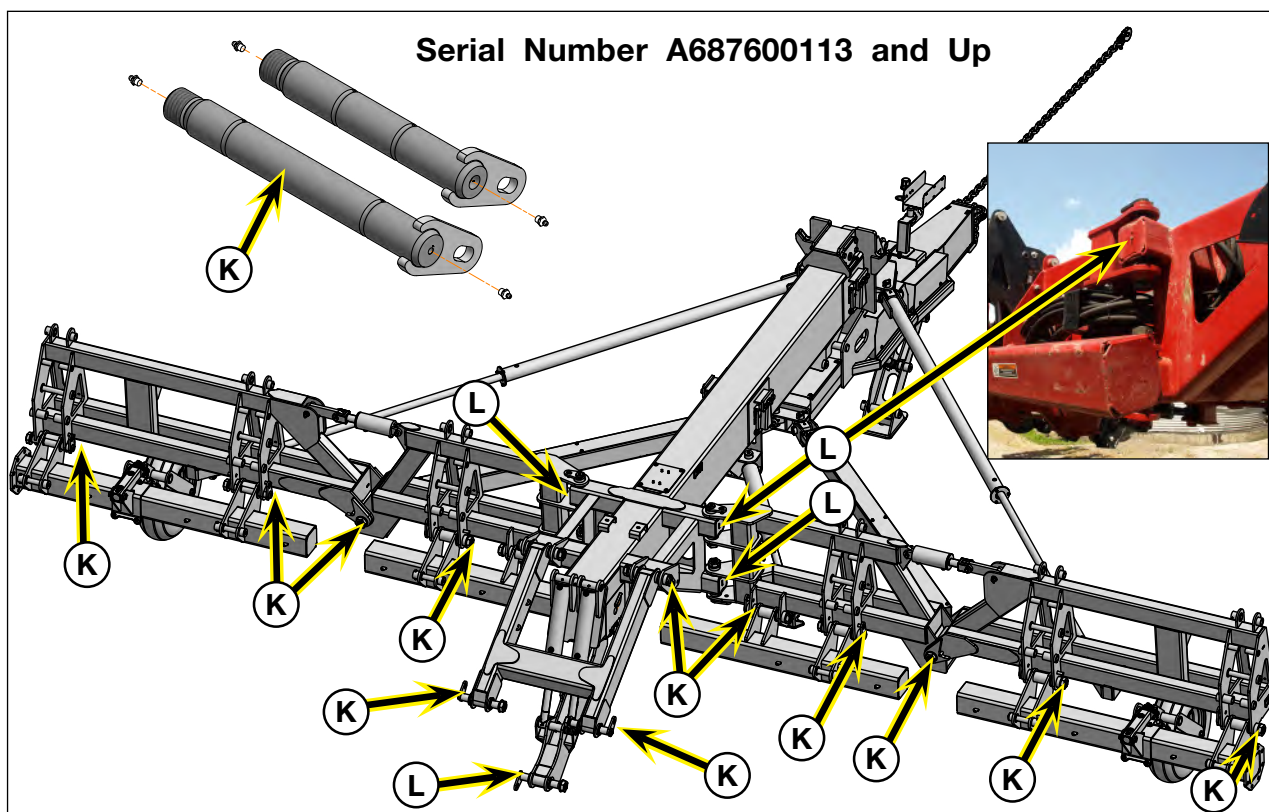
ITEM	DESCRIPTION	POINT	QTY	HOURS
J	Roller Assembly	2	1 Shot	50 Hours
K	Pin Weldments (Qty - 20; 2 Points Each) Parallel Arms, Inner Wings, & Outer Wings Serial Number A687600112 & Lower	40	2 Shots	10 Hours



PULL-TYPE RAPTOR — Maintenance

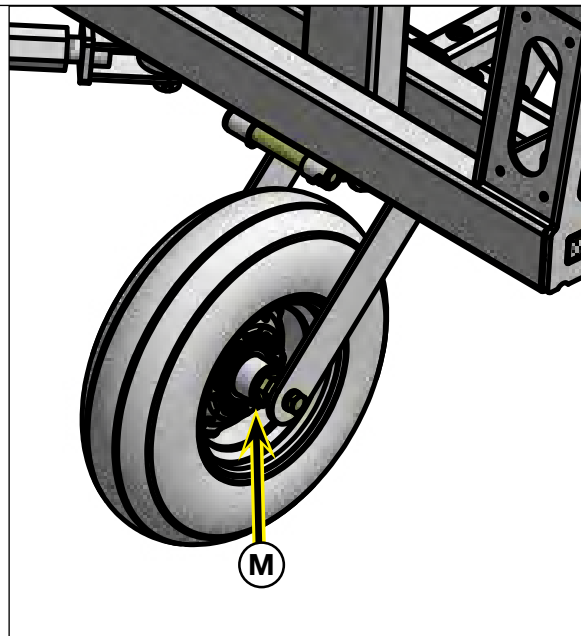
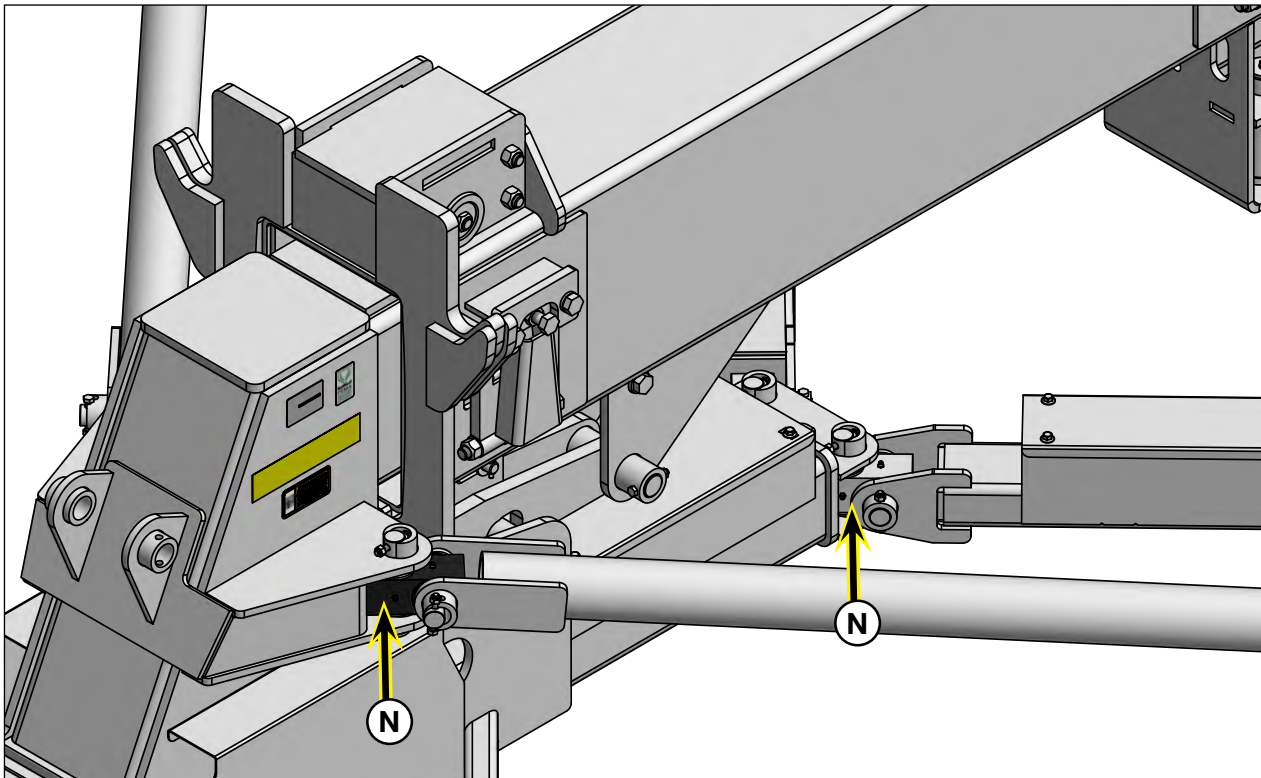
Lubrication Points (continued)

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:

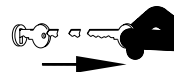
ROUTING OF ALL HYDRAULIC HOSES: Hoses should not be kinked, twisted, or rubbing against sharp edges.

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

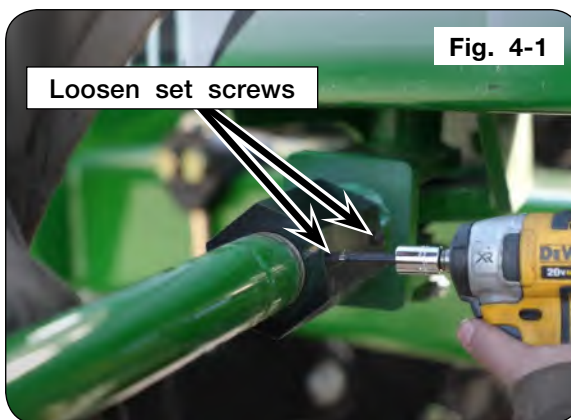
HOSES: Be sure hoses have room to "FLEX" (for folding) in hinge areas. Hoses must be secured with cable ties.

Truss Rod Adjustment

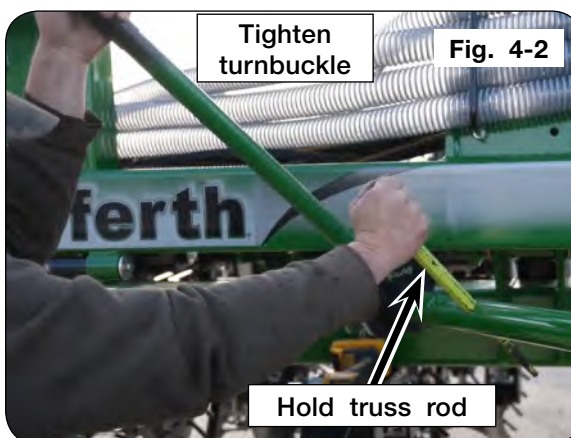
1. Park the empty Raptor on a firm, level surface. Completely unfold the wings. Block the tires on the unit to keep it from moving. Set the towing vehicle's parking brake, shut off the engine and remove the ignition key.



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)

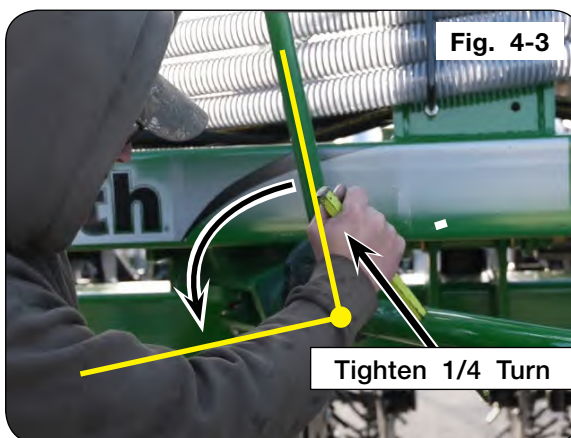


3. With the wings completely unfolded, attempt to tighten the turnbuckles while holding the truss rod stationary. (Fig. 4-2) If a turnbuckle is already tight, reinstall the set screws, torque the screws to 25-28 Ft.-Lbs. and no further action is required. If a turnbuckle is loose, tighten until it cannot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

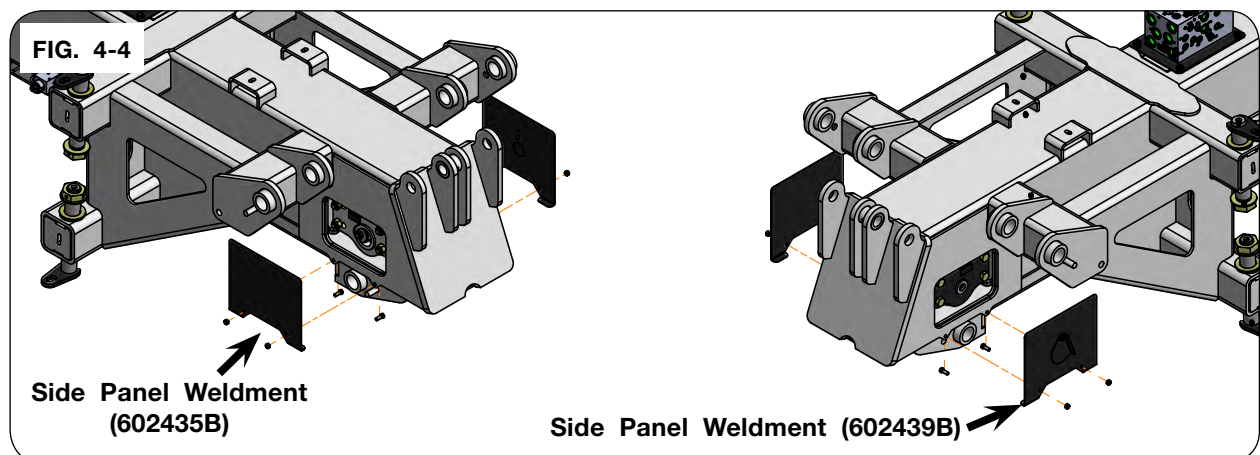
WARNING

- 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.

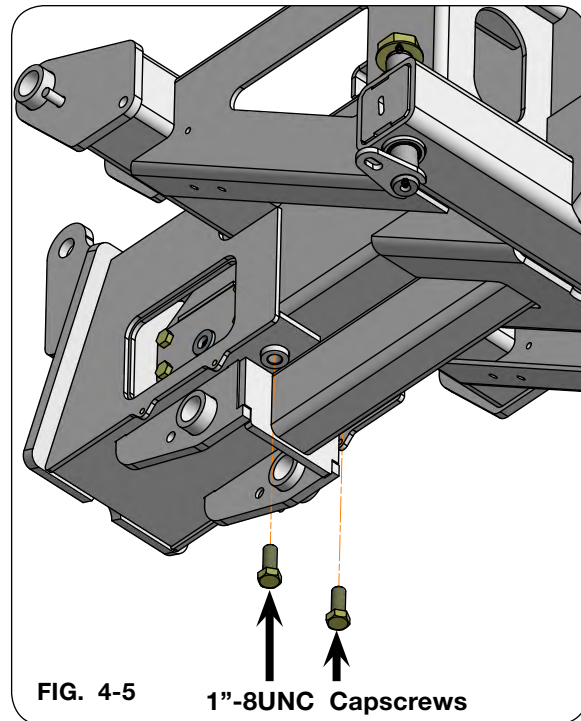
Rear Roller Assembly Replacement

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)

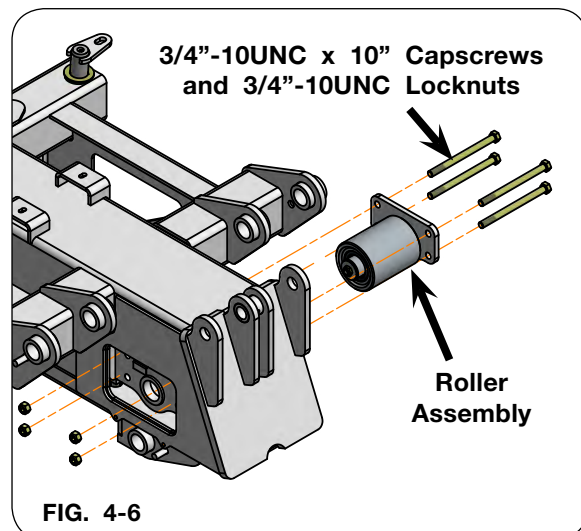


Roller Assembly Replacement (continued)

- 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.

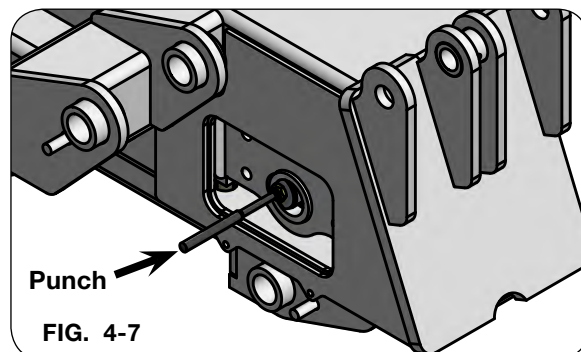


- Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-6)



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)

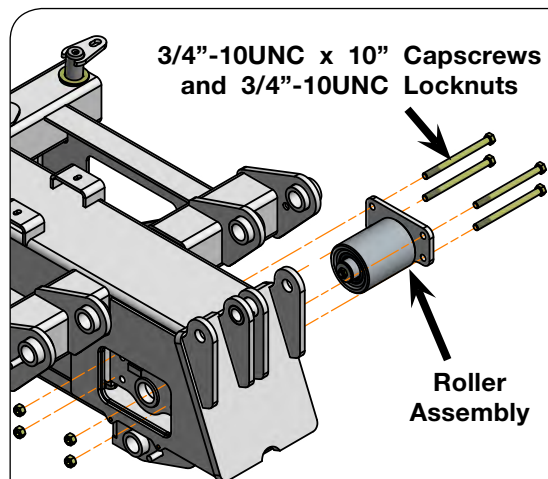


FIG. 4-8

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

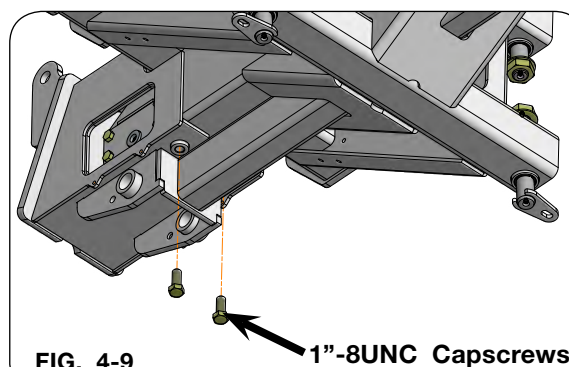
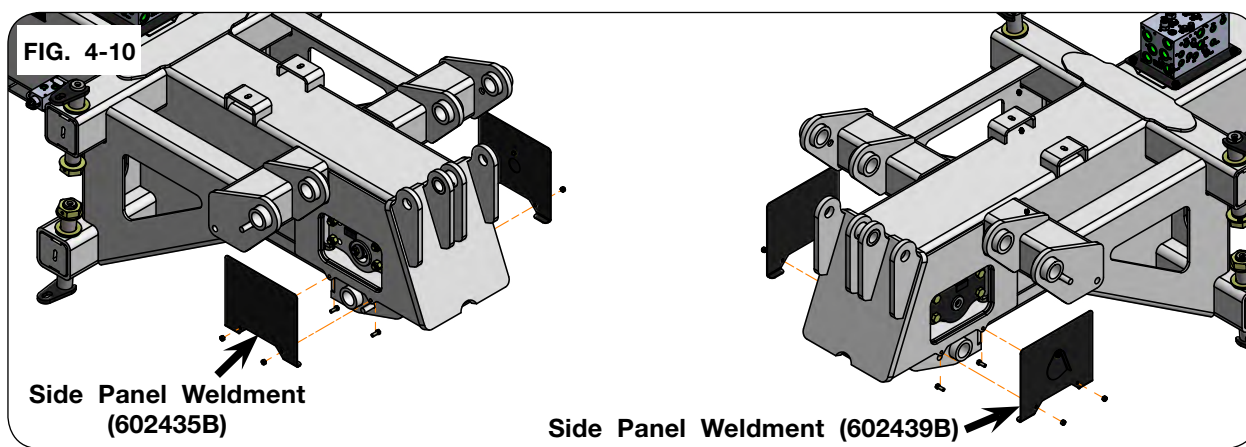


FIG. 4-9

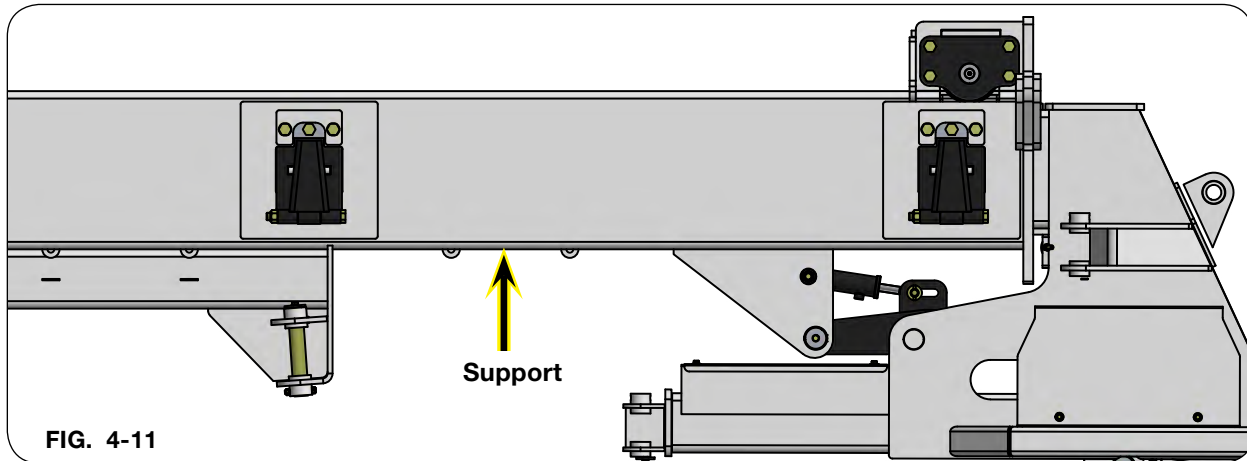
6. Reattach the side panel weldments (602435B and 602439B) with the 3/8"-16UNC x 1" capscrews (9390-055) and 3/8"-16UNC locknuts (9928) previously removed. (FIG. 4-10)



Roller Assembly Replacement (continued)

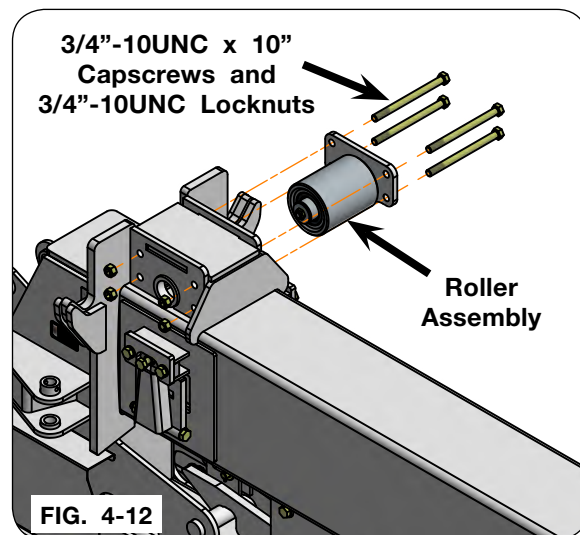
Front Roller Assembly Replacement

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.

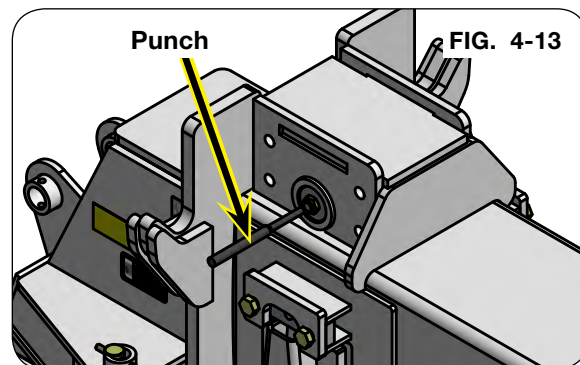
2. Remove and save the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) retaining the roller assembly (602186B). (FIG. 4-12)



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".

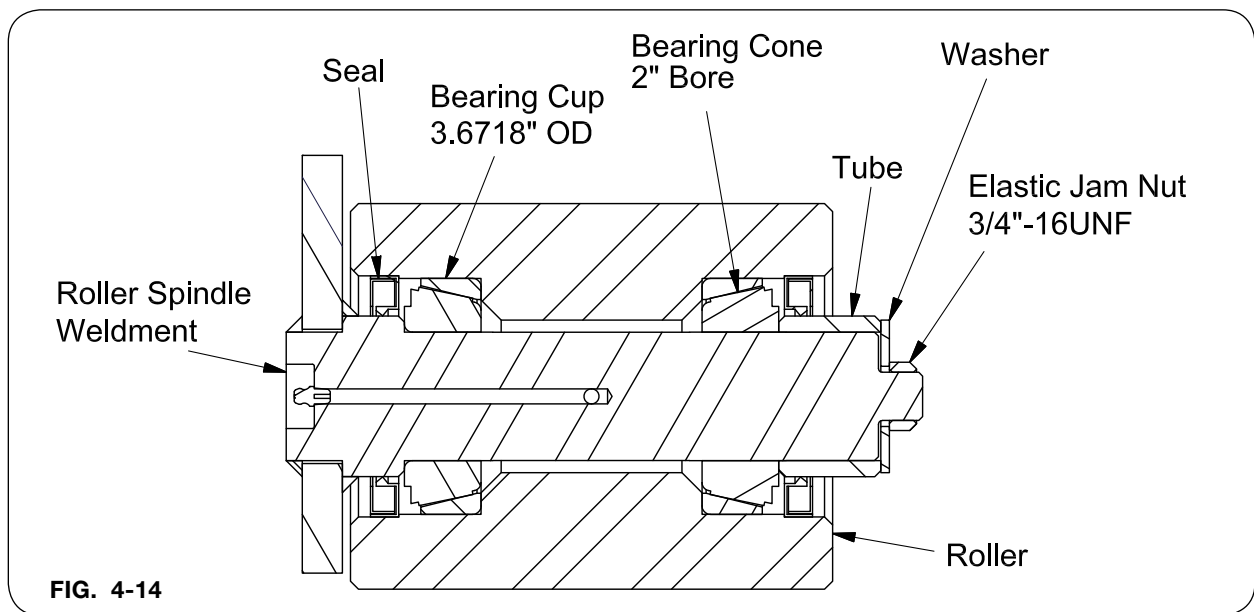
3. Replace roller assembly (602186B) and retain into position with the 3/4"-10UNC x 10" capscrews (9390-450) and 3/4"-10UNC locknuts (9802) previously removed. (FIG. 4-12)



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)

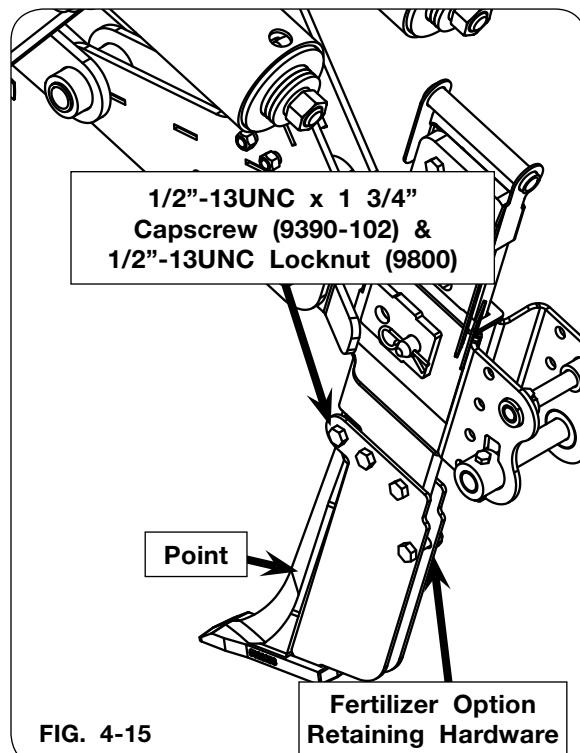


FIG. 4-15

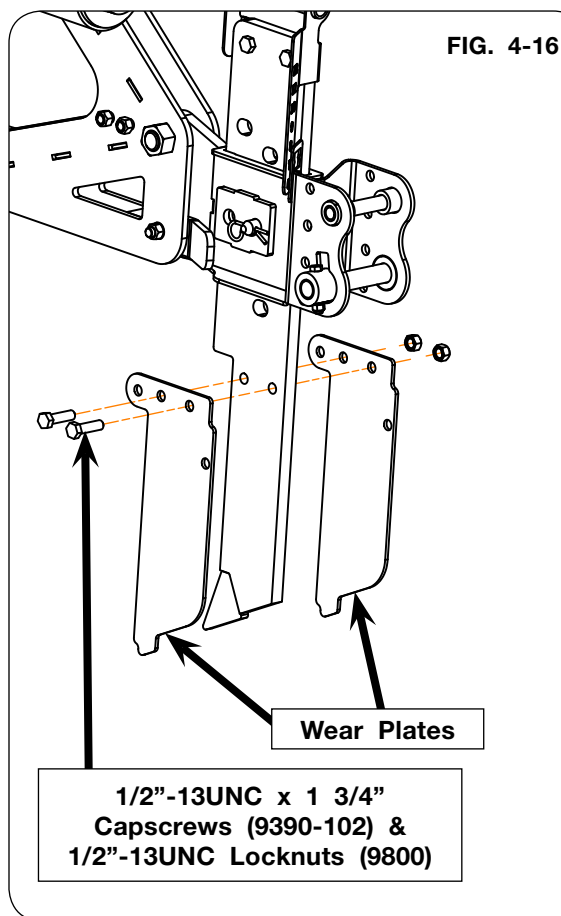
TerrainPro Row Unit (continued)

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)

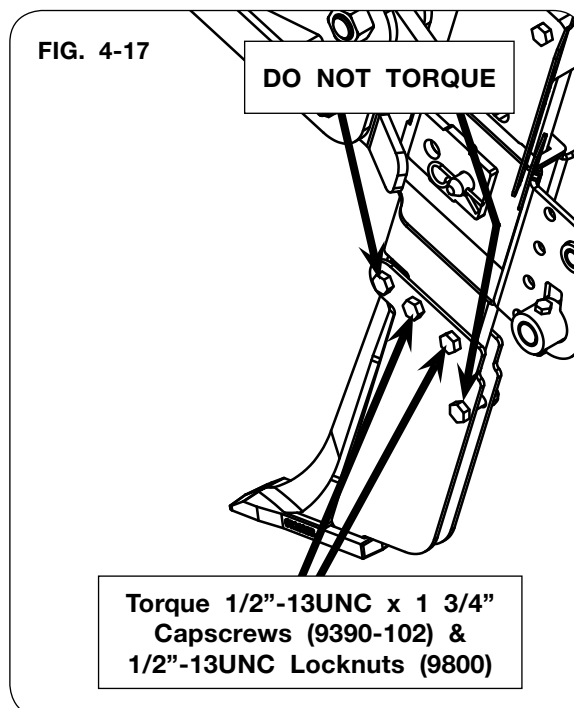
8. Replace wear plates (603758B) and loosely secure with previously removed 1/2"-13UNC x 1 3/4" capscrews (9390-102) and 1/2"-13UNC locknuts (9800). (FIG. 4-16)

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)

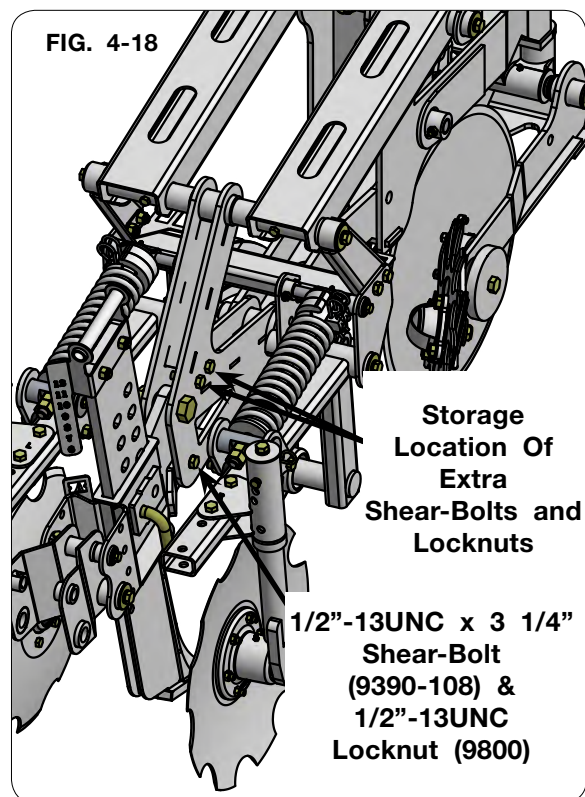
Shear-Bolt Replacement

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.

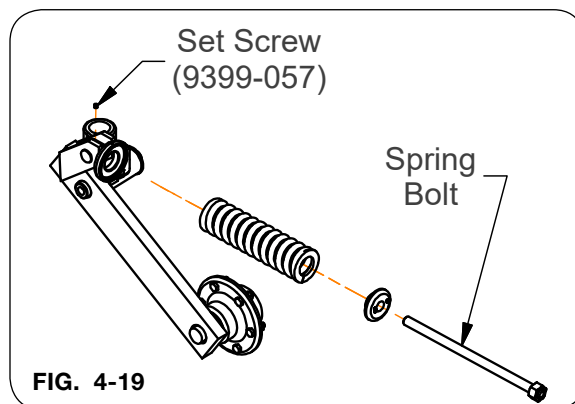
CAUTION

- 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.

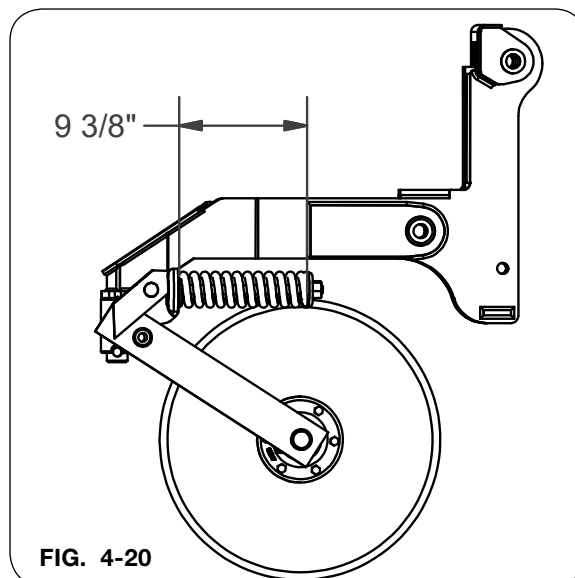


4. Tighten bolt until the spring is compressed to 9 3/8" (FIG. 4-20).

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.

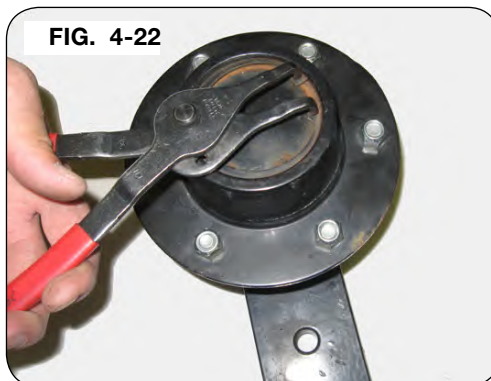


FIG. 4-22

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.

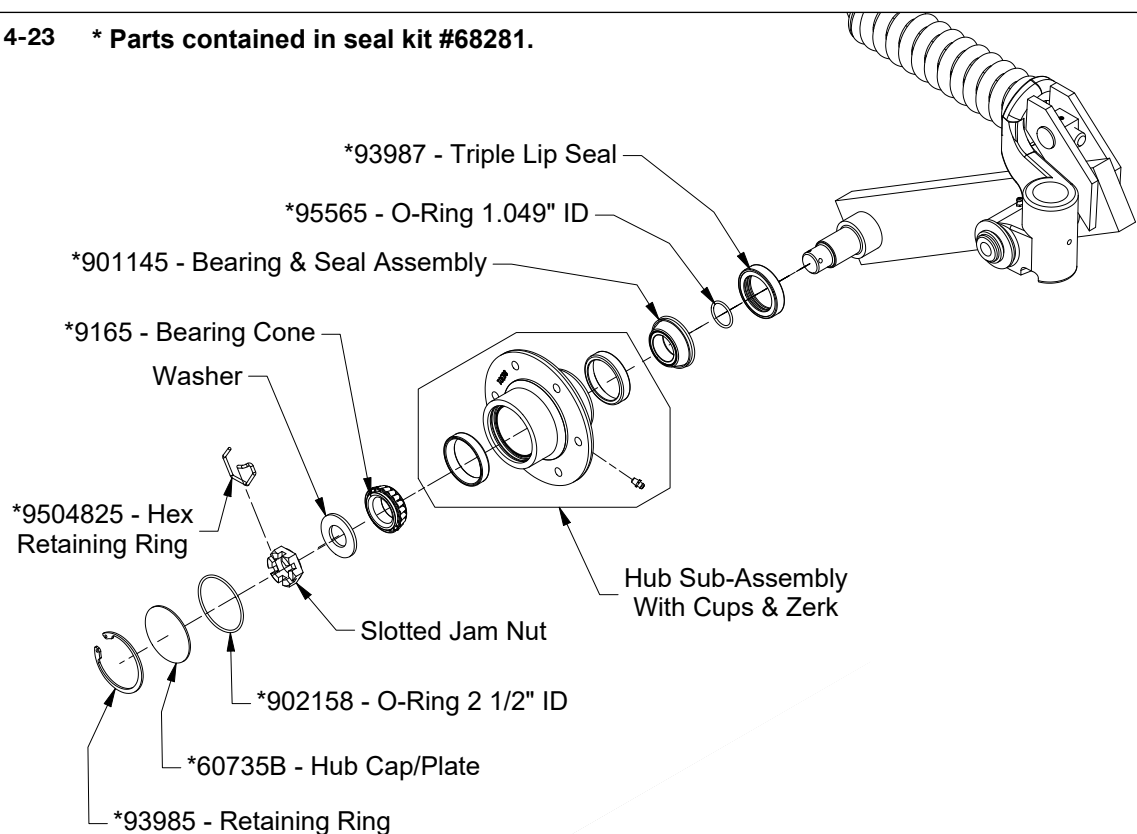
5. Unscrew the nut and carefully remove the hub from the spindle.

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 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 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.

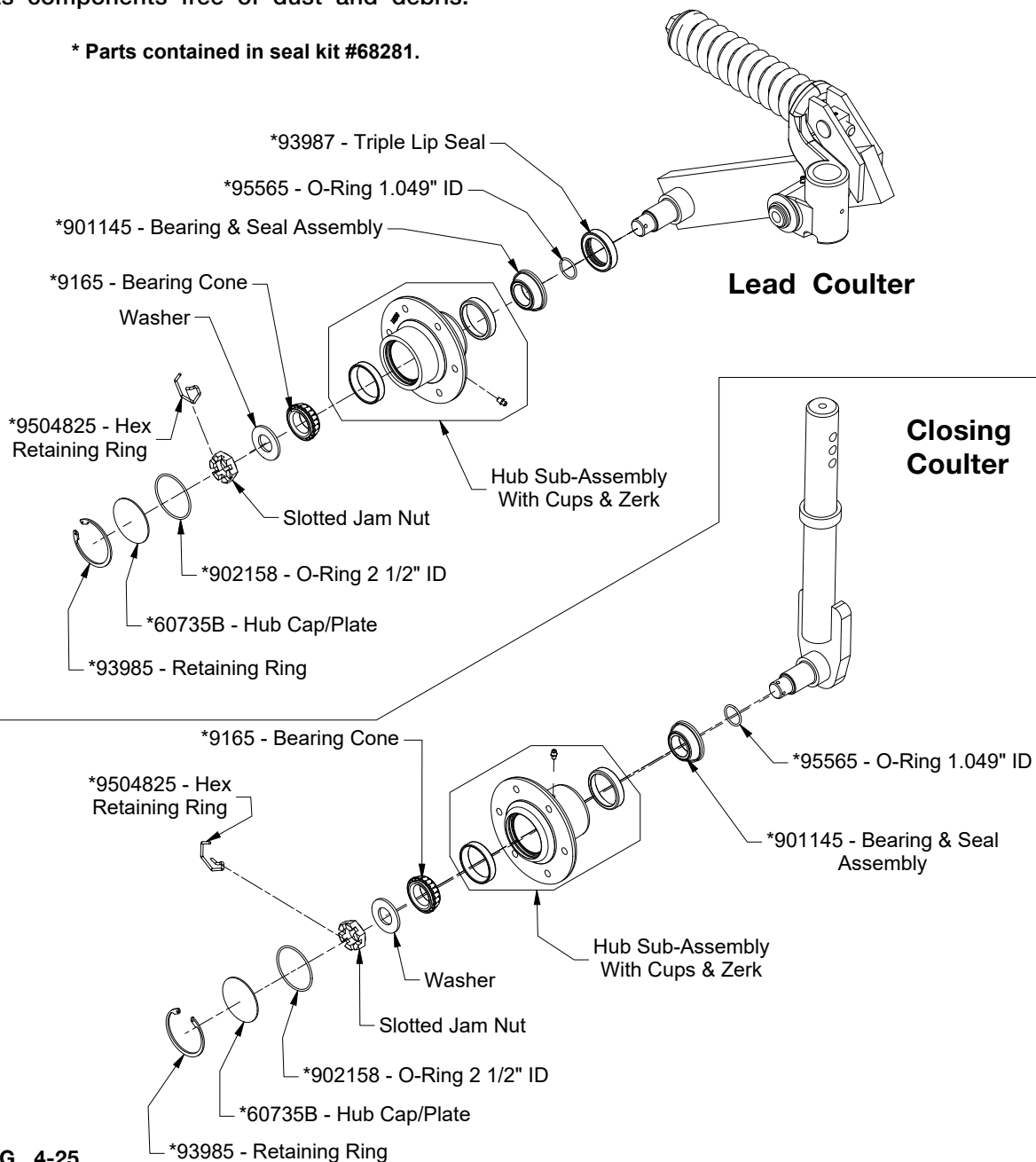


FIG. 4-24

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.



Replacing Bearings In Conditioner Rolling Harrow Baskets

WARNING

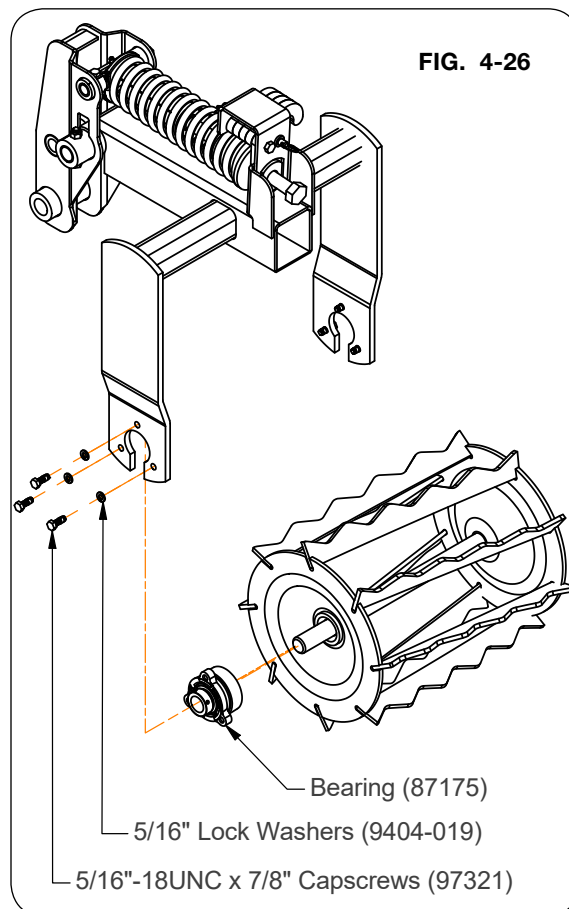
- EYE PROTECTION AND OTHER APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT MUST BE WORN WHILE SERVICING THE IMPLEMENT.
- KEEP HANDS CLEAR OF PINCH POINT AREAS.

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.

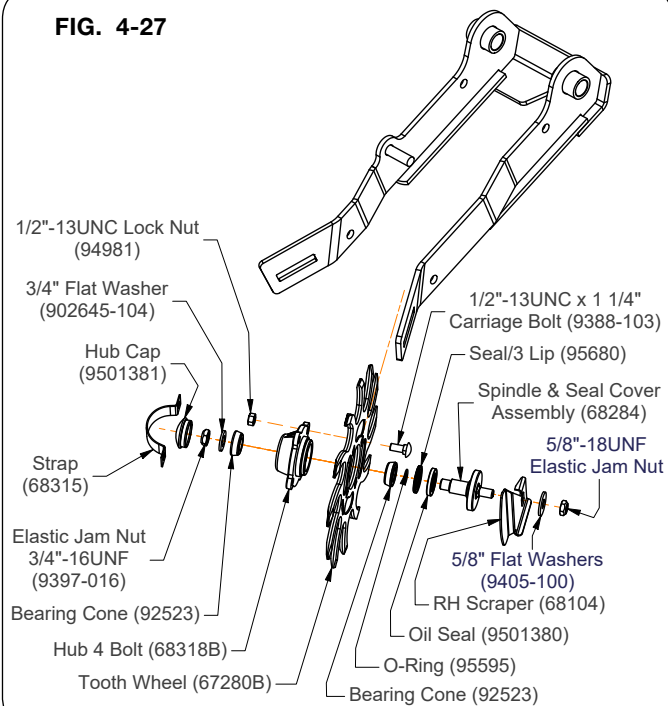
Row Cleaner Wheel Hub Adjustment (continued)

- 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.*

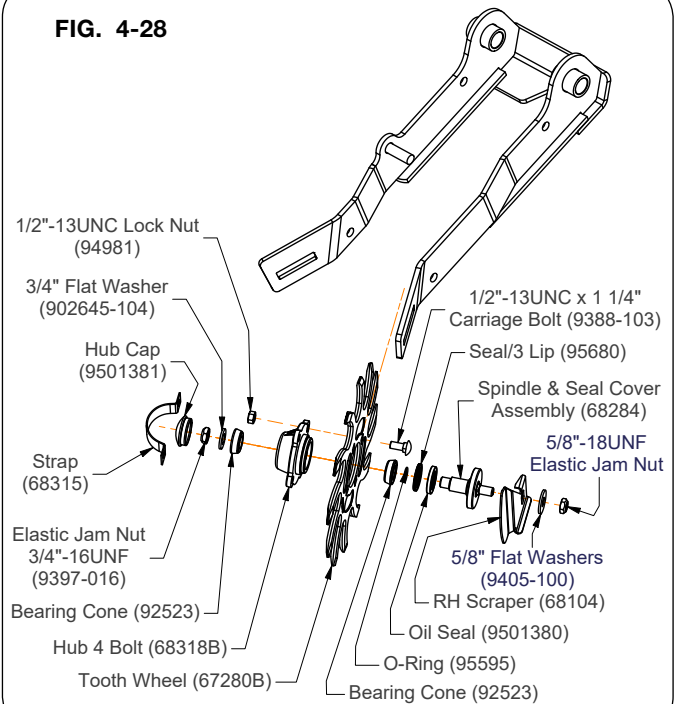
FIG. 4-27



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"

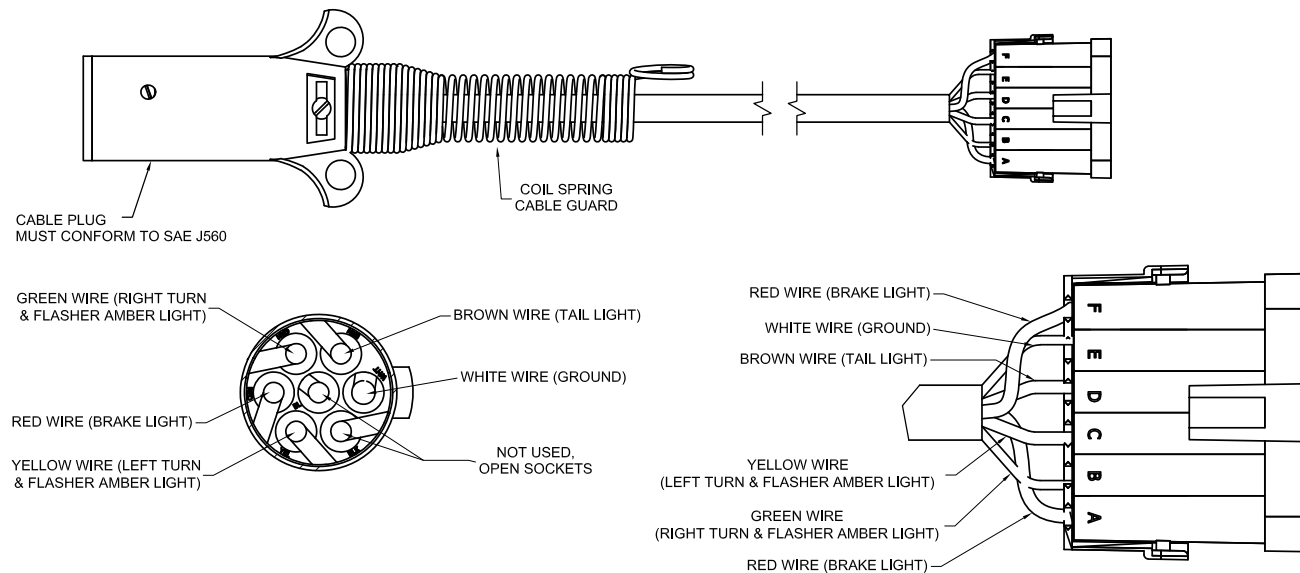
PULL-TYPE RAPTOR — Maintenance

Troubleshooting (continued)

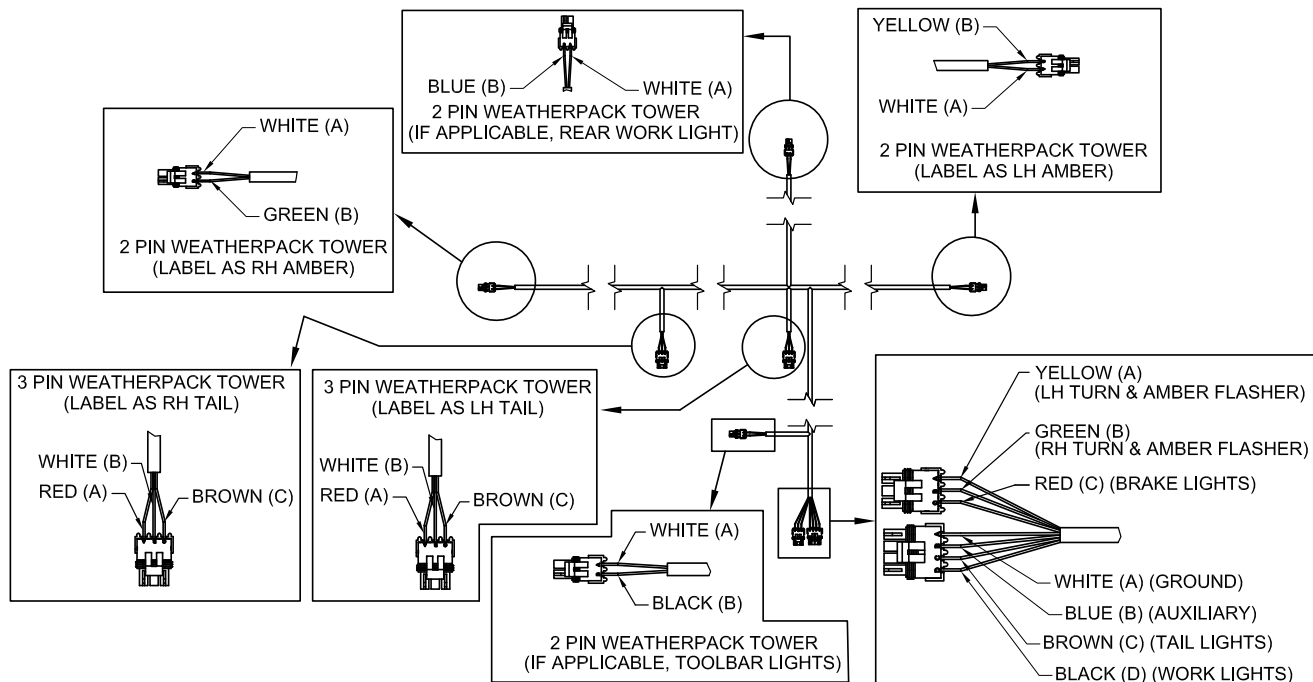
PROBABLE CAUSE	CORRECTION
Shanks Not Resetting Into Ground After Tripping	
Ground conditions hard or the unit is being operated very deep	While moving, raise Raptor slightly to reset, then lower and resume operation
Excessive Soil Disturbance	
Main frame not level, running downhill	Level main frame
Dry 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)

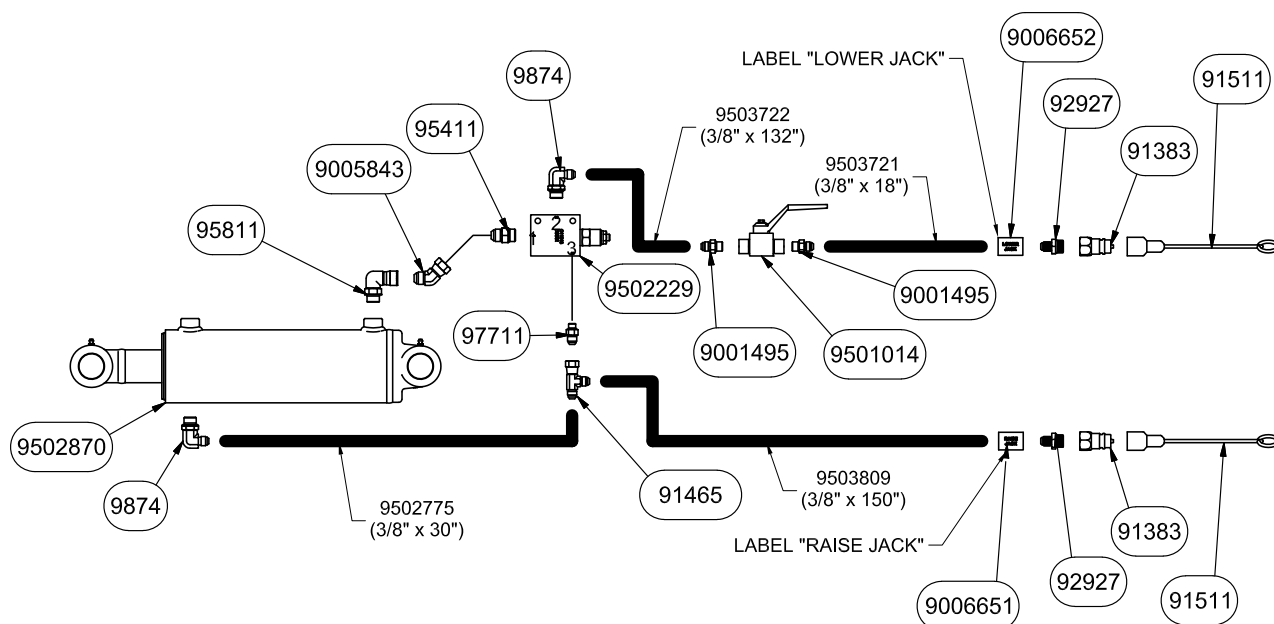


Electrical Harness - Light 418" (44999)

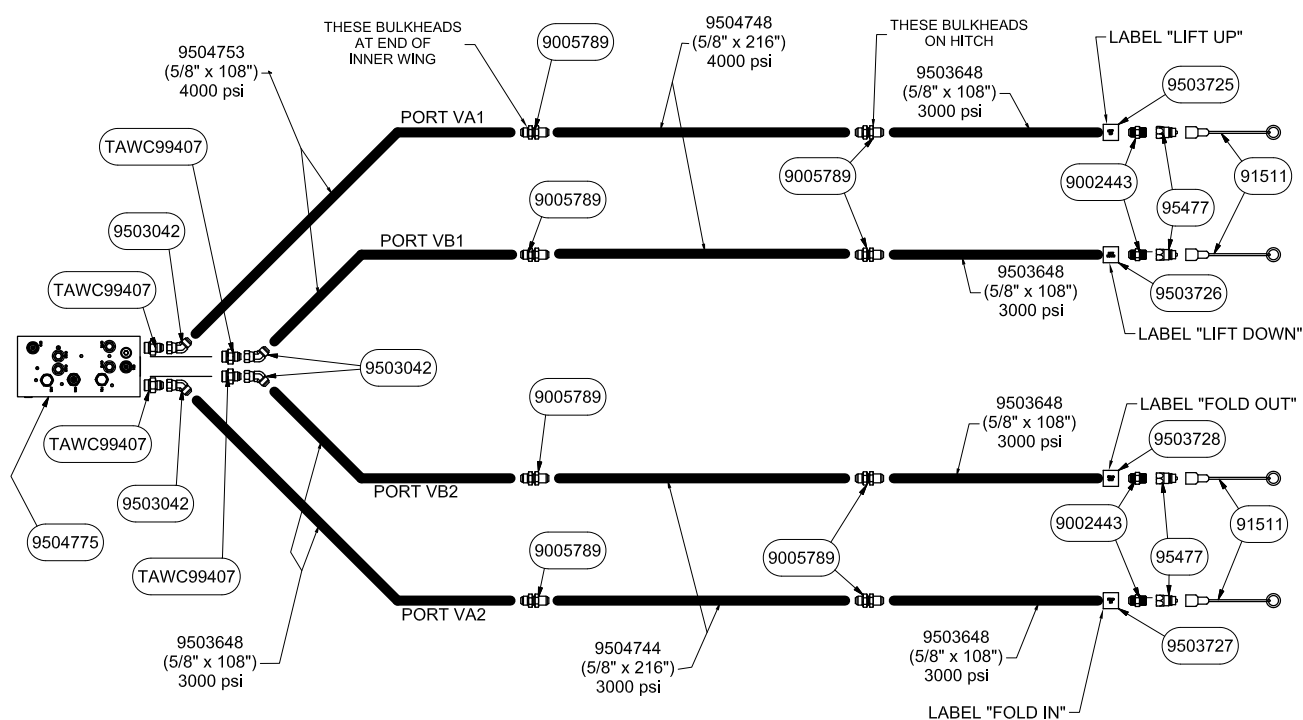


Schematics - Hydraulic

Tractor To Hydraulic Jack

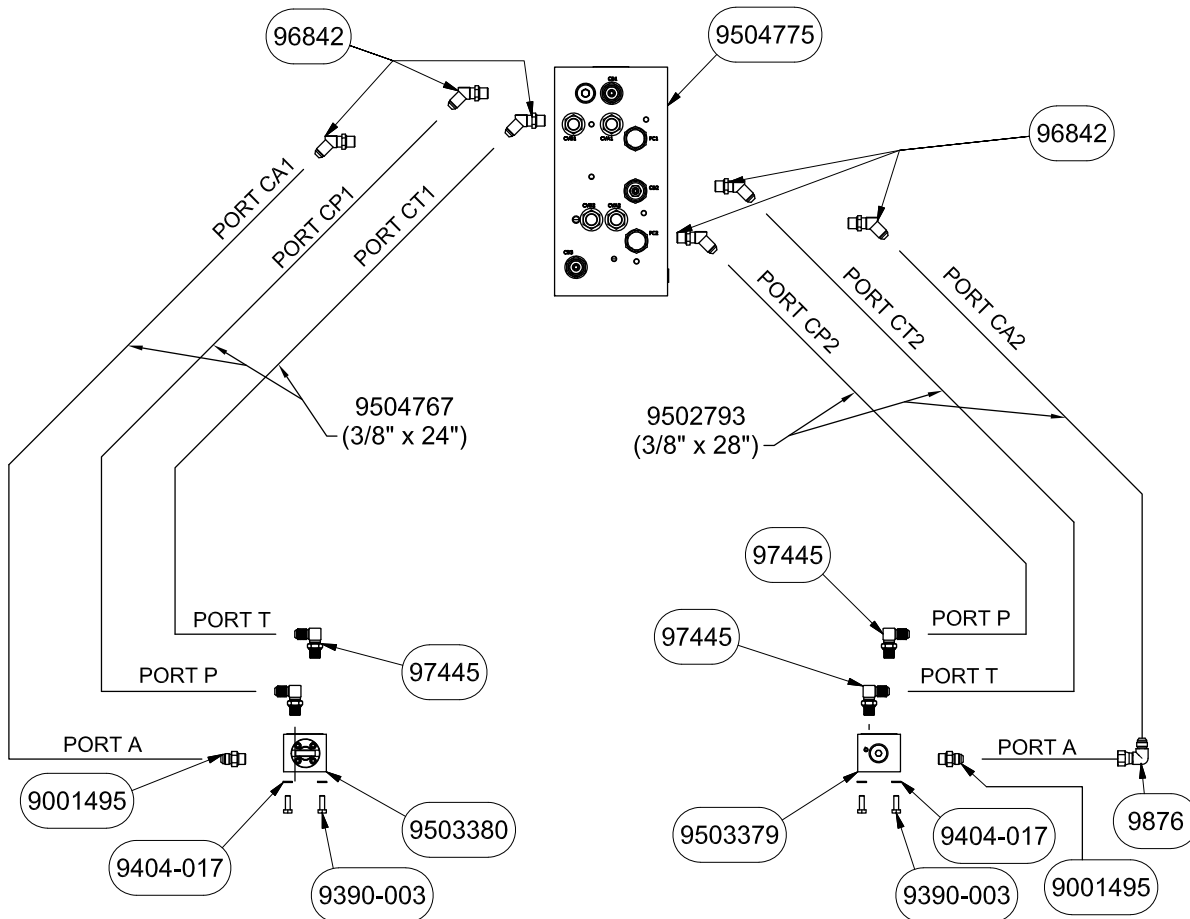


Tractor To Supply Valve - Serial Number A70040100 & Up



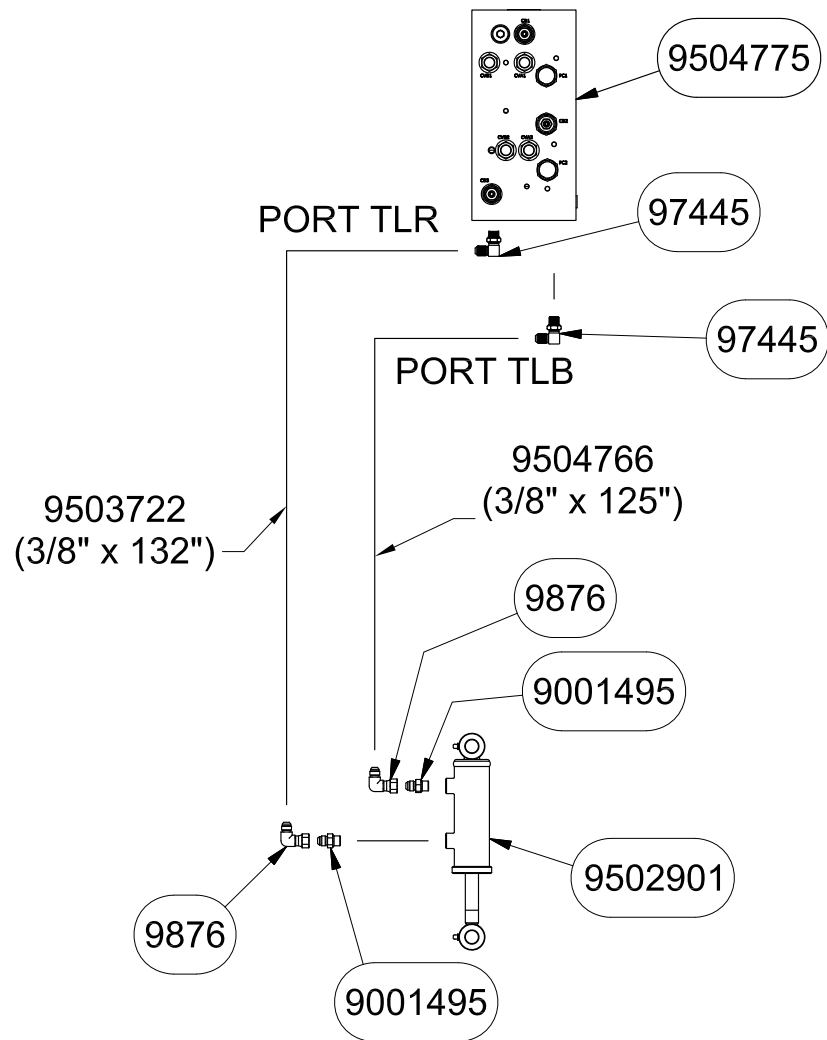
Schematics - Hydraulic (continued)

Supply Valve Assembly To Sequence Valves Serial Number A70040100 & Up



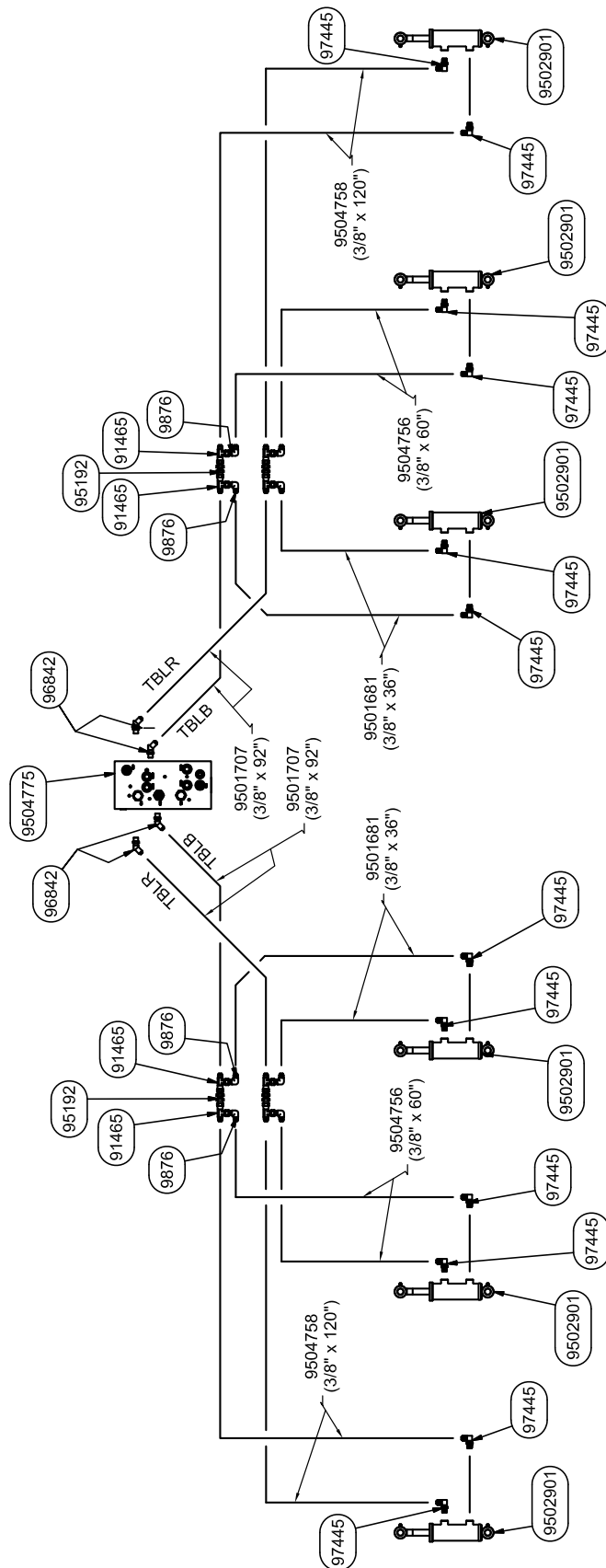
Schematics - Hydraulic (continued)

Supply Valve Assembly to Tongue Latch Serial Number A70040100 & Up



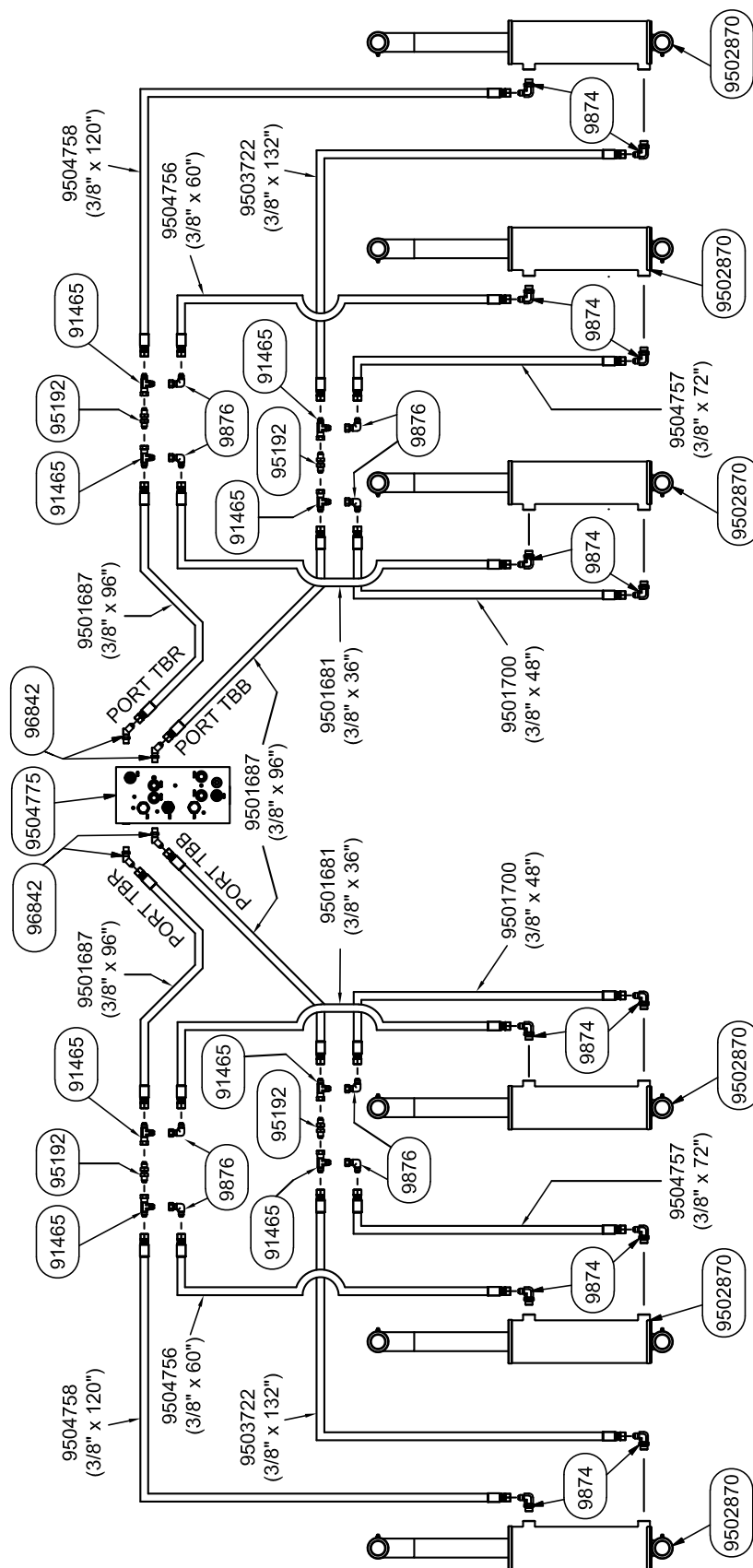
Schematics - Hydraulic (continued)

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



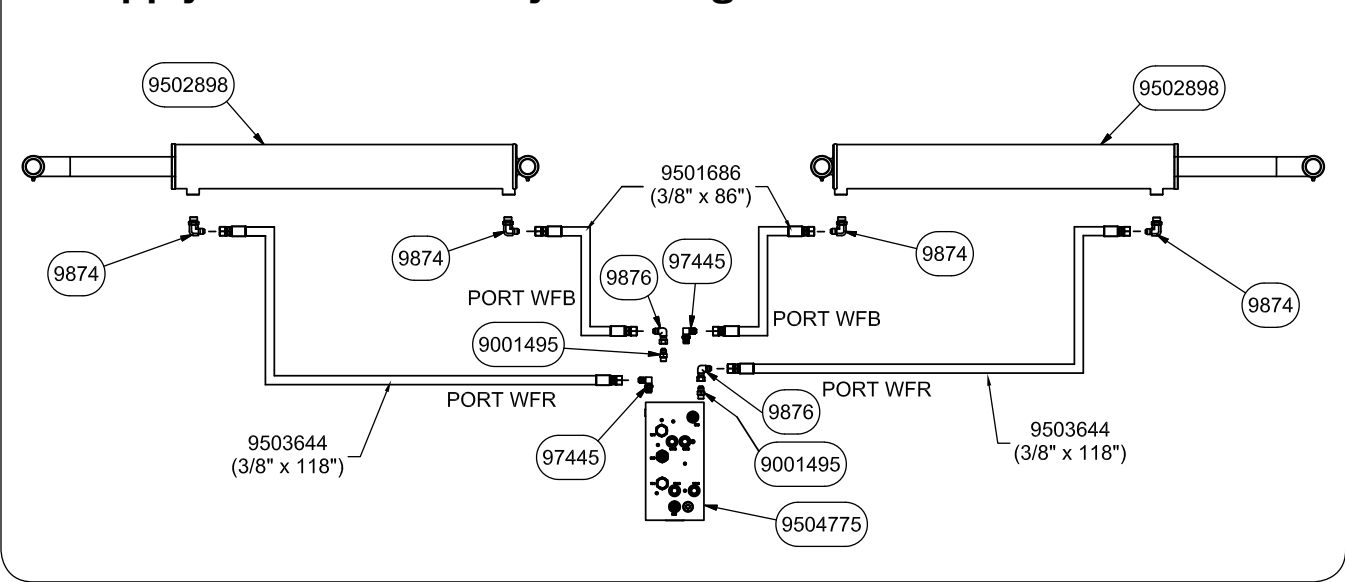
Schematics - Hydraulic (continued)

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



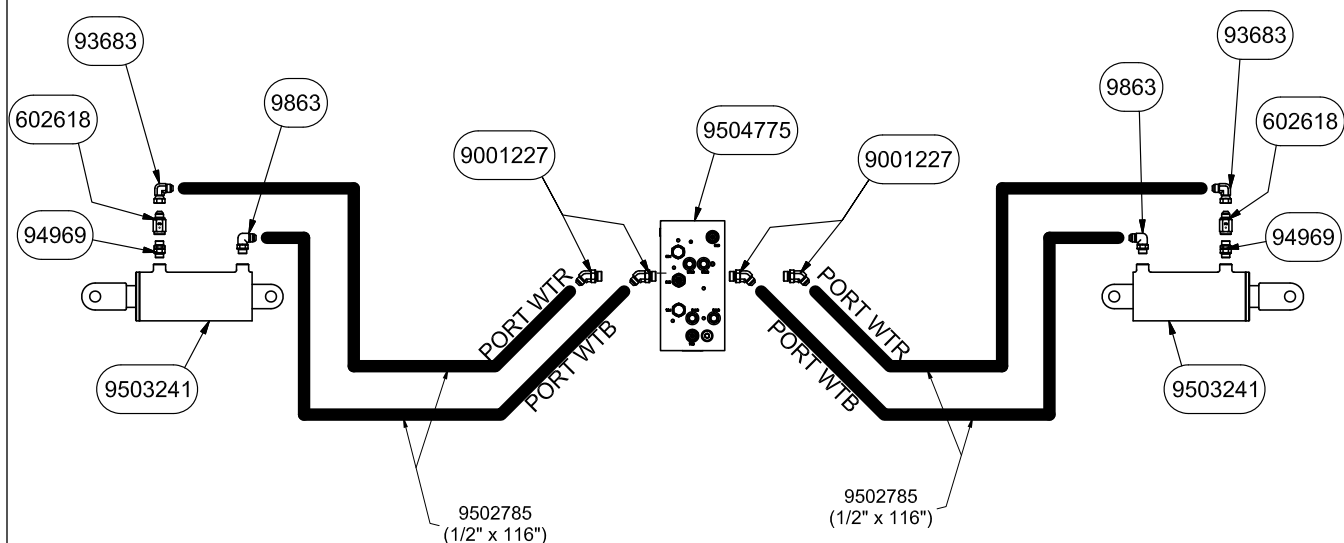
Schematics - Hydraulic (continued)

Supply Valve Assembly to Wings

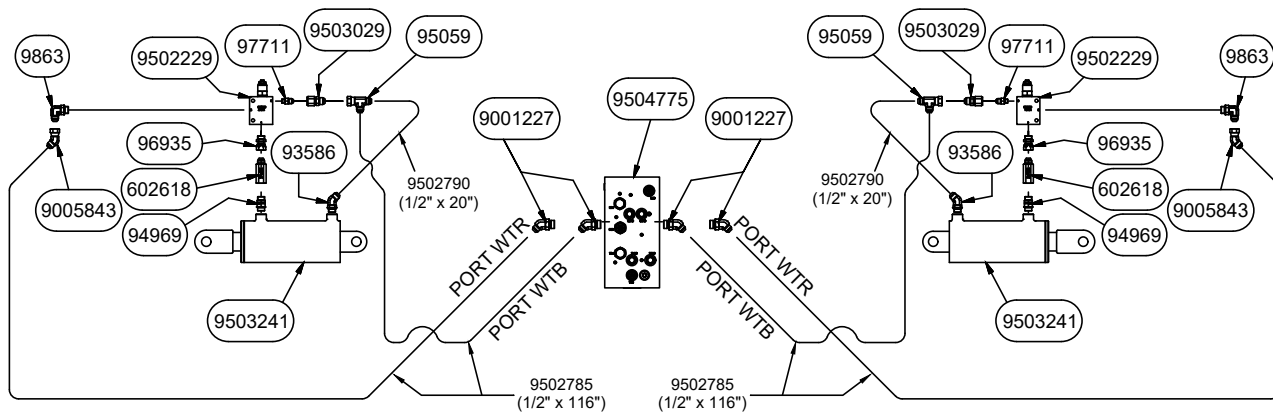


Schematics - Hydraulic (continued)

Supply Valve Assembly to Wing Tilt

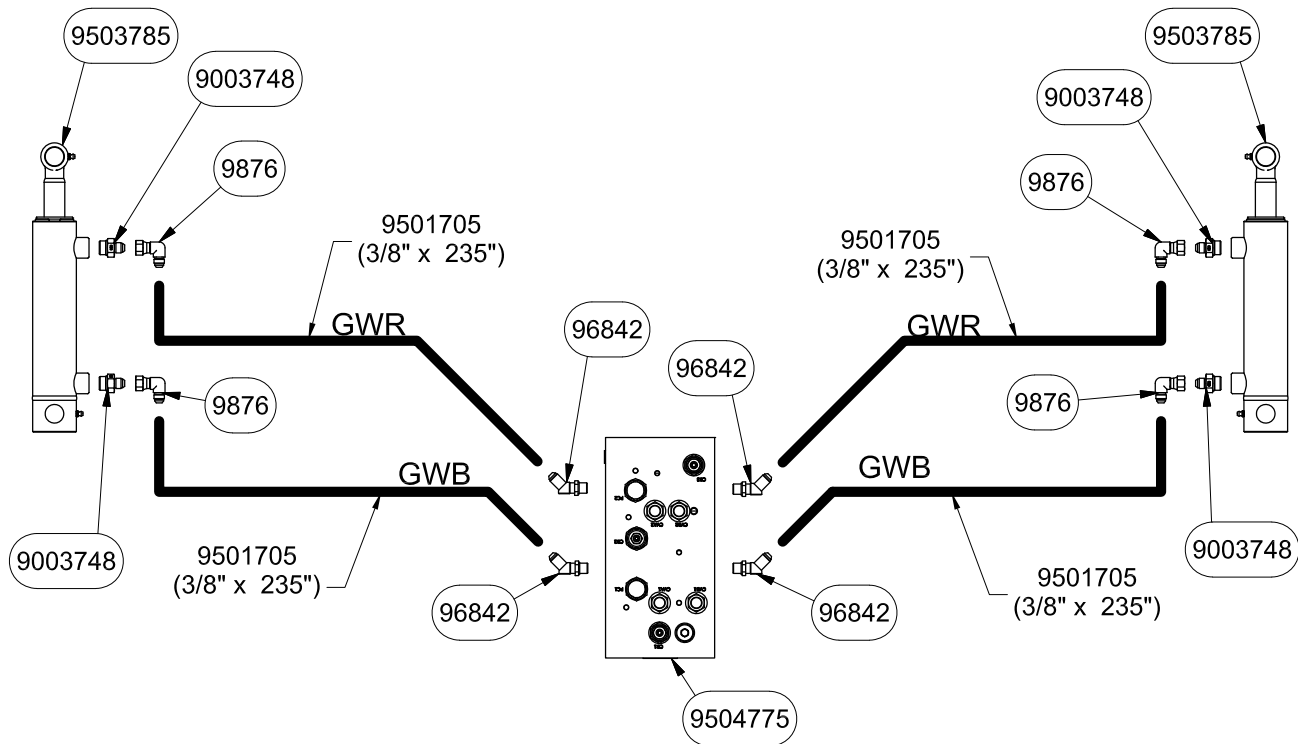


Supply Valve Assembly to Wing Tilt with Counterbalance Kit



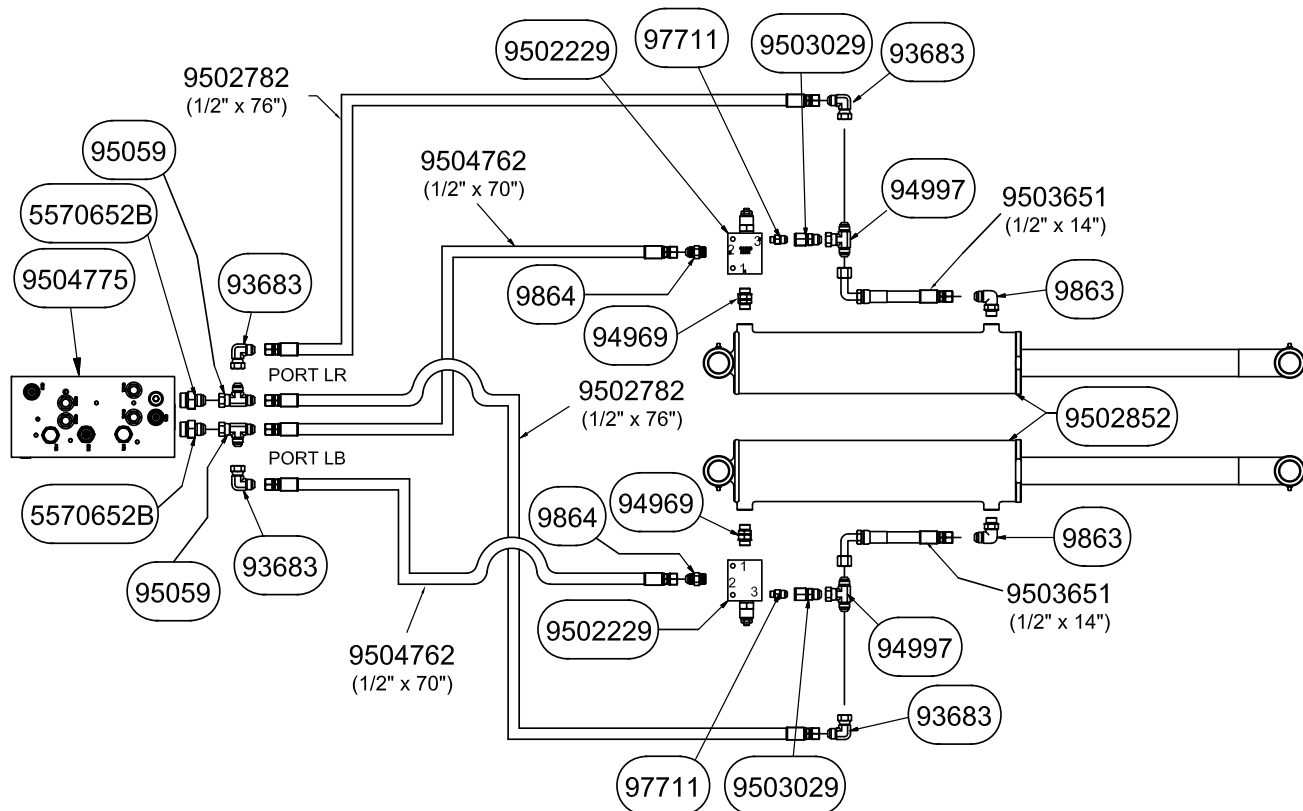
Schematics - Hydraulic (continued)

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

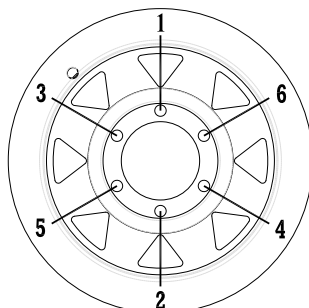
CAUTION

- 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.

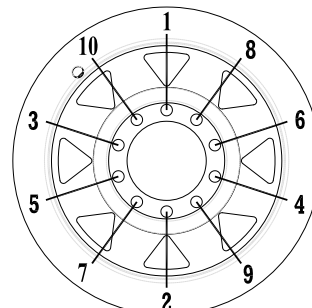
Failure to check torque before first use may damage wheel nut/bolt seats. Once seats are damaged, it will become impossible to keep nuts/bolts tight. Tighten nuts/bolts to applicable torque value shown in table. Start all nuts/bolts by hand to prevent cross threading. Torque nuts/bolts in the recommended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

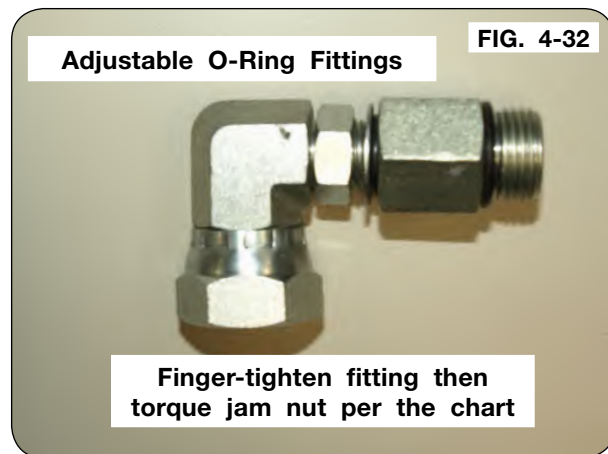
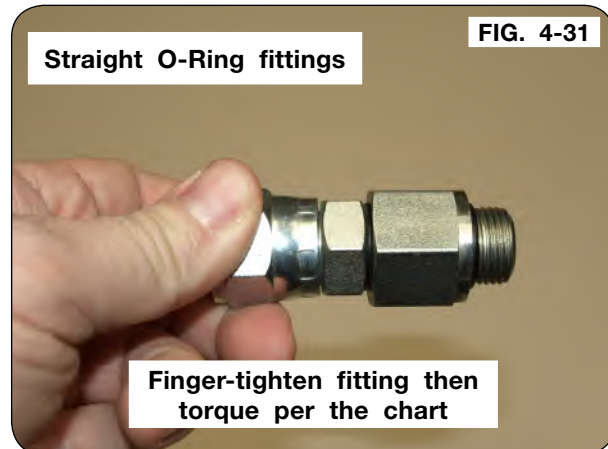
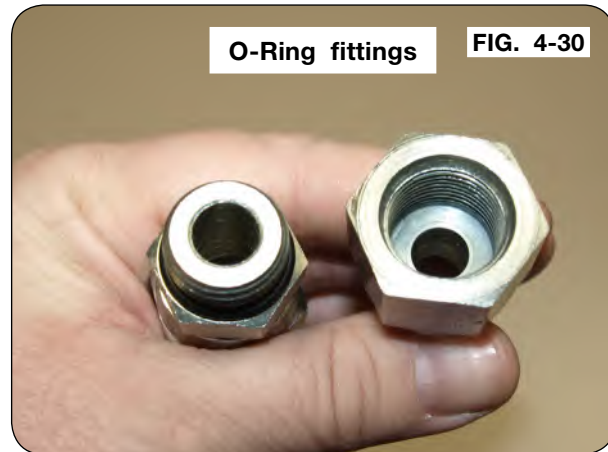
Hydraulic Fittings - Torque and Installation

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.

