KMC
KELLEY

61-SERIES

4505

PHILLIPS ROTARY HARROW

SET UP INSTRUCTIONS

THIS MANUAL TO ACCOMPANY MACHINE TO DEALER

PART NO. 61-SU-02
PRINTING DATE: SEPT. 2008

WARRANTY POLICY

KELLEY MANUFACTURING COMPANY (KMC) warrants that all goods sold to the original purchaser of any KMC product shall be free of any defects in material and workmanship if used under normal operating conditions. The warranty period begins on the date of purchase by the retail customer and ends twelve (12) months thereafter. KMC's sole responsibility is to repair and/or replace the defective part or parts at no cost to purchaser. This remedy is the **SOLE AND EXCLUSIVE REMEDY** of purchaser.

The purchaser must fill out and return the warranty registration form found in the front of the operator's manual. Failure to return the warranty registration form within 30 days shall result in the goods being sold "AS IS", and all warranties shall be excluded.

This warranty shall not apply to those items that are by nature worn in normal service, including but not limited to belts, springs, teeth, chains, etc. Items such as tires, tubes, and gearboxes and all other items warranted by the original manufacturer are warranted only to the extent of their individual manufacturer warranty, and KMC is not warranting any of said items. All warranty claims must be made through a KMC licensed dealer, and a warranty form request must be submitted to KMC within 30 days of failure or the warranty provision shall be unenforceable against KMC.

No agent or person has authority to change or add to this warranty as written.

THE ABOVE IS THE ONLY WARRANTY MADE BY KMC AND IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. KMC MAKES NO WARRANTY OF MERCHANTABILITY AS TO ANY GOODS MANUFACTURED BY KMC AND FURTHER, KMC DOES NOT WARRANT ANY SUCH GOODS AS SUITABLE FOR ANY PARTICULAR PURPOSE TO THE RETAIL CUSTOMER. THE SUITABILITY OF GOODS FOR ANY PURPOSE PARTICULAR TO THE CUSTOMER IS FOR THE CUSTOMER, IN HIS SOLE JUDGEMENT, TO DETERMINE. KMC FURTHER MAKES NO WARRANTIES WITH RESPECT TO ITS MANUFACTURED GOODS THAT WOULD NORMALLY BE DISCLOSED BY AN EXAMINATION. THIS IS THE FULL AND FINAL EXPRESSION OF ALL WARRANTY LIABILITY OF KMC. NO OTHER WARRANTY, EITHER EXPRESSED OR IMPLIED, SHALL BE ENFORCEABLE AGAINST KMC.

Kelley Manufacturing Co.
80 Vernon Drive / Zip 31794
P.O. Drawer 1467 / Zip 31793
Tifton GA

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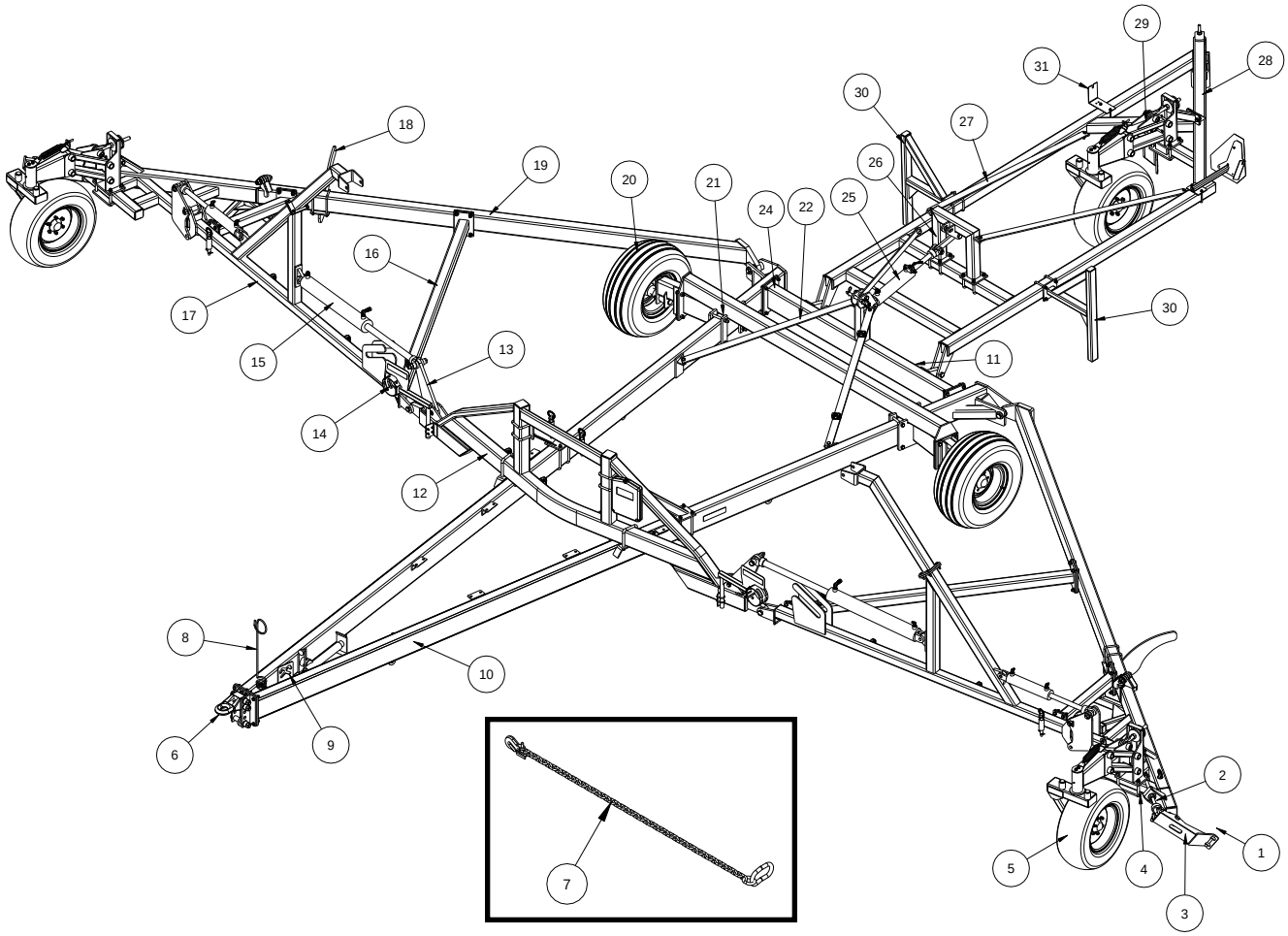
PHILLIPS 4505 ROTARY HARROW PART REFERENCE



1. Bearing Housing
2. Tooling Tension Rod
3. Tool Lever
4. Caster Bottom Plate
5. Wing Caster
6. Hitch
7. Safety Chain
8. Pig Tail Hose Holder
9. Hose Holder
10. Main Beam
11. Wrench
12. Front Wing Mount
13. Lock Lever
14. Extremity Light
15. Wing Hydraulic Cylinder
16. Wing Long Brace
17. Wing Front Beam
18. Wing Tool Catcher
19. Wing Stiff Arm
20. Main Wheel
21. Main Wheel Back Plate
22. Rear Beam Brace
23. Front Wing Mount Brace
24. Rear Beam
25. Tail Hydraulic Cylinder
26. Tail Top Bridge
27. Long Tail Brace
28. Rear Tail
29. Tail Caster
30. Tail Tool Catcher
31. Tail Lights

SECTION 1 - SAFETY

1.1 GENERAL SAFETY PRACTICES

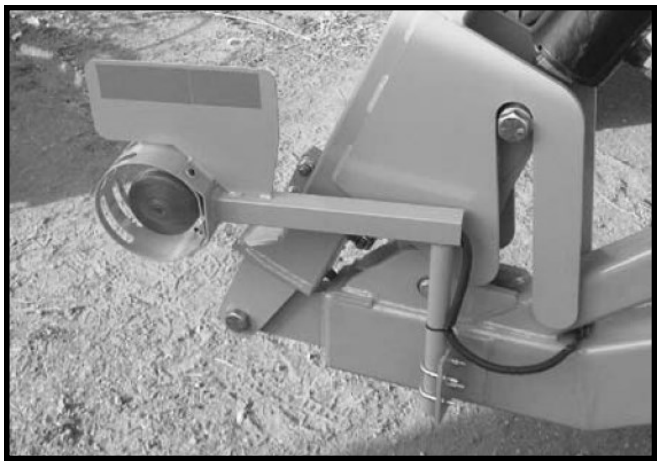
- All operators are to be instructed in the safe and proper use of this machine and must understand all safety decals as well as instructions in this manual.
- Carefully read all safety message in this manual and on your machine.
- Keep all safety signs in good condition. Replace when necessary.
- Find a spacious, clear, and level surface to perform any maintenance or adjustments.
- Never work around running machinery.
- Never remove obstructions from machinery while still running.
- **DO NOT** walk under the tool assembly when the tools are elevated.
- **DO NOT** ride on harrow frame.
- Any damage/deterioration on any parts should be repaired/replaced immediately be the authorized personnel to reduce the risk of personal injury.
- Regularly check the condition of the U-Bolts and bearing assemblies. Replace any suspect parts to prevent accidents.

1.2 SAFETY DURING TRANSPORT

A) General

- Use the safety pins provided for securing the wings and the tail during transport. See Safety locks in Section 1.4
- Check that local road regulations are adhered to when moving your harrow on public roads. Refer to Specifications section for dimensions and weight of harrow.
- Never transport the harrow over 80 km/ hour (50 miles/hour).
- Be sure that your tow vehicle is properly equipped and is capable of pulling the harrow.
- Always take precautions near overhead electrical wires.

B) Extremity/Tail Lights



Extremity Lighting (Wing)

Tail Lights

The harrow comes equipped with left, right and tail lights that work in conjunction with the flashing/signal tractor lights. Join the electrical connector to the tractor prior to use.

NOTE: Be sure to disconnect the lighting harness when disconnecting the harrow from the tractor.

1.3 SAFETY DURING SERVICING

A) General

- Never, under any conditions, service harrow while tractor is running. Shut off tractor, set parking brakes, and remove key first.
- Engage the wing and/or tail locks or lower the wings, and/or tail completely before servicing. See Section 1.4 Harrow Safety Locks.
- Take extreme caution around escaping hydraulic fluid. Release all pressure in the system before servicing or inspecting leaking lines. Hydraulic fluid under high pressure can penetrate the skin and cause serious injury. Never use your hands to inspect lines. Seek immediate medical attention if fluid is injected into the skin.
- Familiarize yourself with proper servicing procedures shown in this manual.

NOTE: When servicing, wear protective clothing and use personal safety devices when required.

B) Tire Safety

- A tire that explodes could cause serious injury. Have a qualified service technician service the tires.
- When inflating tires take extreme care. An over inflated tire can explode.
- Follow recommended tire pressures in Pre-Operational Set-Up section.
- Replace rim if overly rusted or cracks are noticed.
- Stand clear from tire when inflating. Use a clip-on air chuck and extension hose.

1.4 HARROW SAFETY LOCKS

The harrow is equipped with wing and tail section lock. These locks are to be used at all times when transporting the harrow. In addition, the harrow comes equipped with a safety chain which is also to be used in transport at all times.

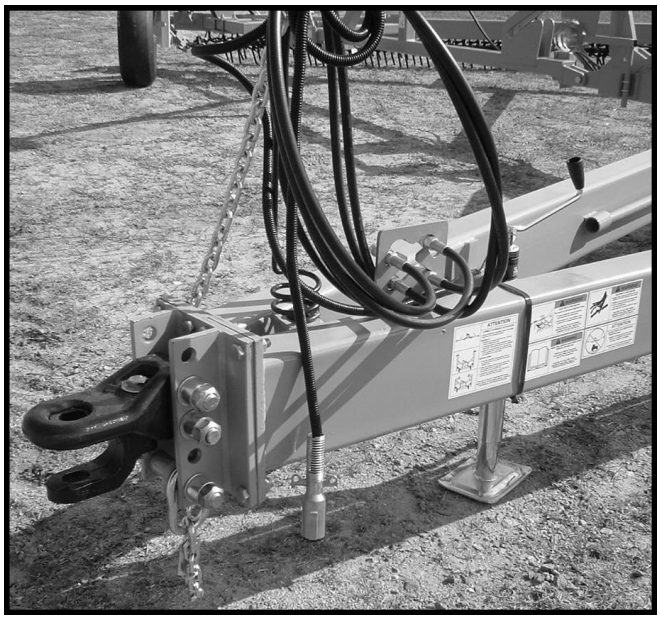
These photos show the location of the safety devices on the harrow:

LH/RH Wing Lock

Safety Pin

NOTE: Install the safety pins provided to secure the wings and tail locking bar. Failure to use the safety pins may cause damage to the frame and void your warranty.

Tail Lock & Pin



Safety Chain

1.5 SAFETY DECALS

The harrow comes with a complete set of safety decals which are to be read and thoroughly understood. Refer to Operators Manual for locations and additional information. In the event a decal is damaged during setup it should be replaced immedi-

SECTION 2 - ASSEMBLY

The following instructions are a step-by-step method of assembling a 4505 Phillips Rotary Harrow. For most owners, the harrow will come completely pre-assembled. For these owners we urge you to have a look at these instructions so you can become more familiar with the machine, how it is put together, and how it works. This will help you understand the maintenance and operation of the harrow.

Before commencing assembly, you will require the following tools and equipment:

- Ø 6 (six) 10” x 10” x 2’ long wooden blocks
- Ø Equipment capable of lifting 1000 lbs (i.e. crane hoist, forklift, etc.)
- Ø Wrenches ranging in size from 7/16” to 1 1/2”. Air impact if possible.
- Ø Hammer and measuring equipment.
- Ø Hydraulic jack.
- Ø Pry bar
- Ø Pliers

The instructions to follow will make several references to right/left/front/rear locations. For the purposes of this manual, left and right will refer to the direction viewed from behind the machine or from the tractor seat looking over your shoulder. Front will refer to the hitch end.

Throughout the instructions, detailed drawings and photos are included to show connection details, etc.

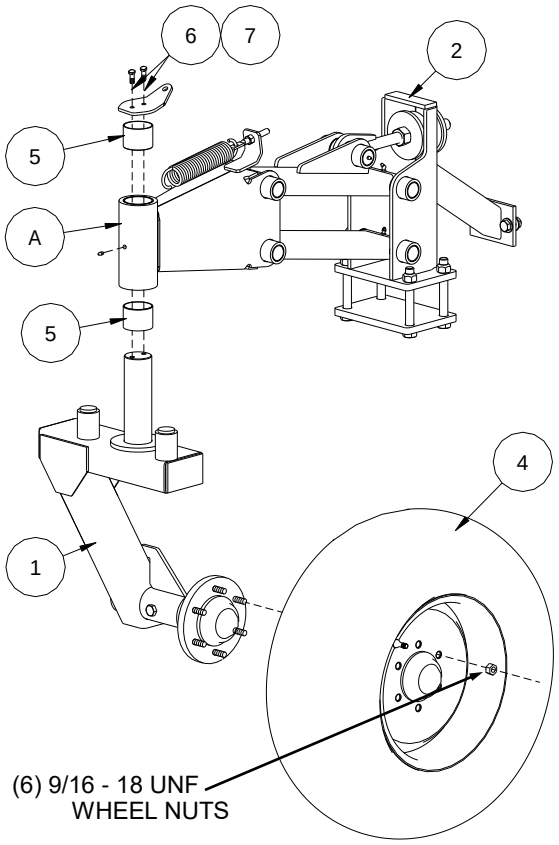
WARNING: Practice extreme caution when assembling the harrow. The harrow is made of large heavy sections that could injure or kill if dropped!

All bolts should be properly torque. Torque values are included with each step where appropriate. In some circumstances, the assembler should use his own judgment to prevent over-tightening certain joints. For example, hinged joints employing threaded fasteners should not be over-tightened.

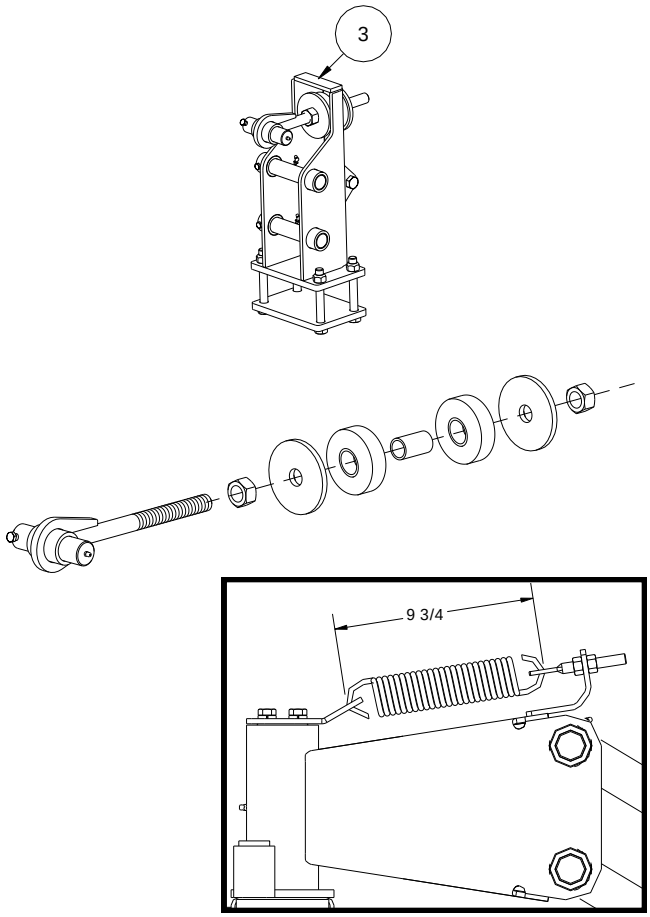
<u>NOTE</u>: LOCK-TITE SHOULD BE USED ON ALL NUTS

2.1 CASTER WHEEL ASSEMBLY - TAIL/WING

TAIL CASTER WHEEL ASSEMBLY - TAGGED
(61-081-010)



WING CASTER WHEEL ASSEMBLY
(61-082-009) (2 per Unit)

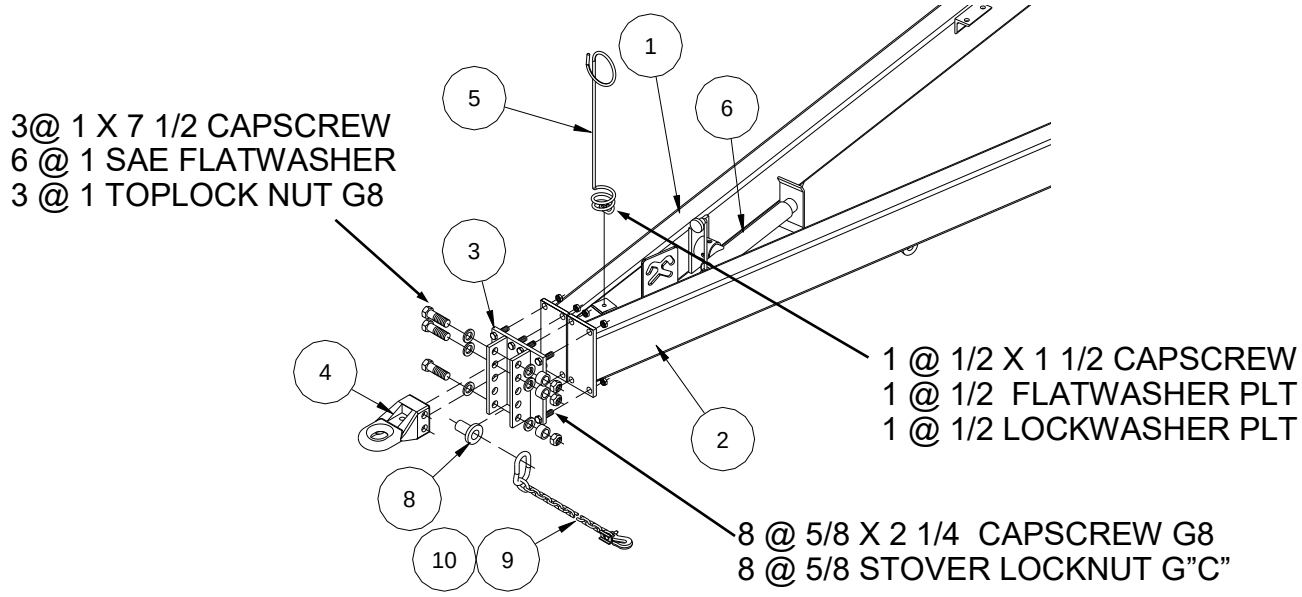


ITEM	PART NUMBER	DESCRIPTION	QTY
1	61-080-009	CASTER SWIVEL, H.D.	1
2	61-080-013	CASTER MOUNT BRKT TAIL	1
3	61-080-006	CASTER MOUNT BRKT WING	1
4	05-51081-01	TIRE AND RIM ASSY	1
5	61-050-003	CASTER BUSHING, H.D.	2
6	48-090592	CAPSCREW, 1/2 X 1 1/4 G5 PLT	2
7	66-010250	LOCKWASHER, 1/2	2

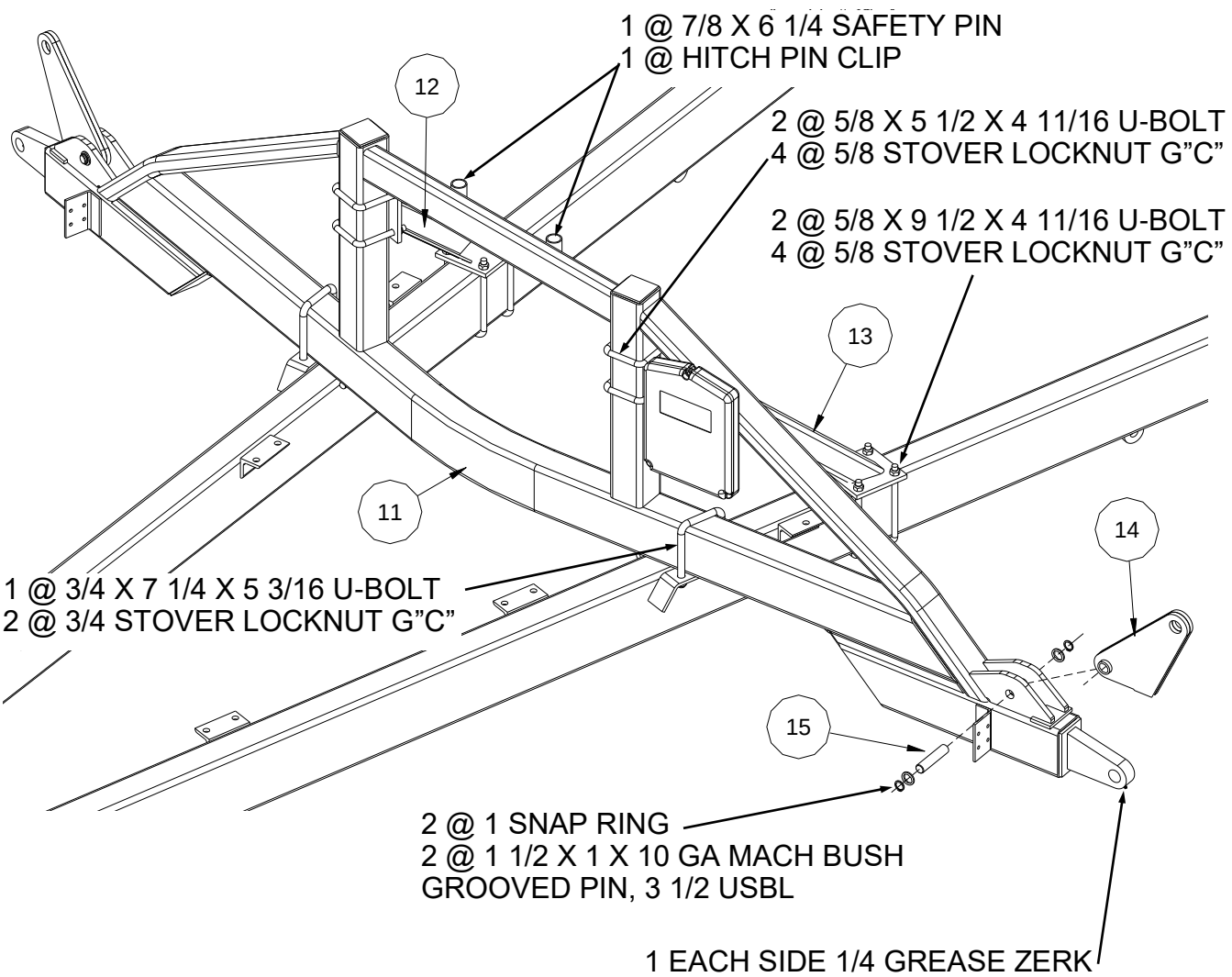
STEP 1

The caster wheel assembly comes pre-assembled from the factory.

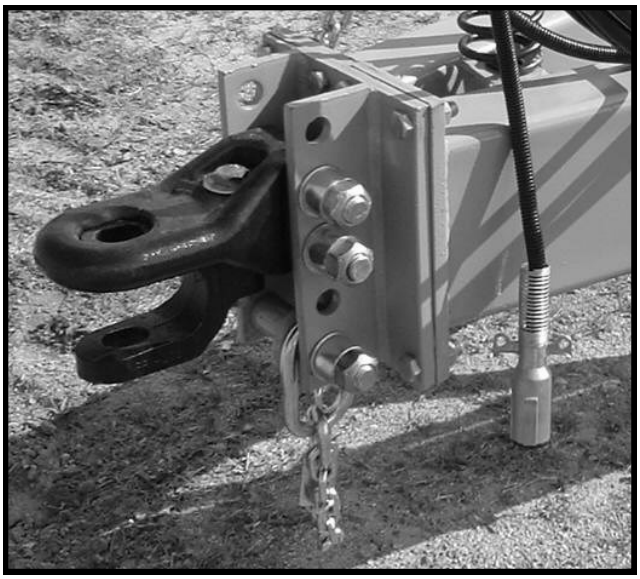
2.2 MAIN FRAME ASSEMBLY



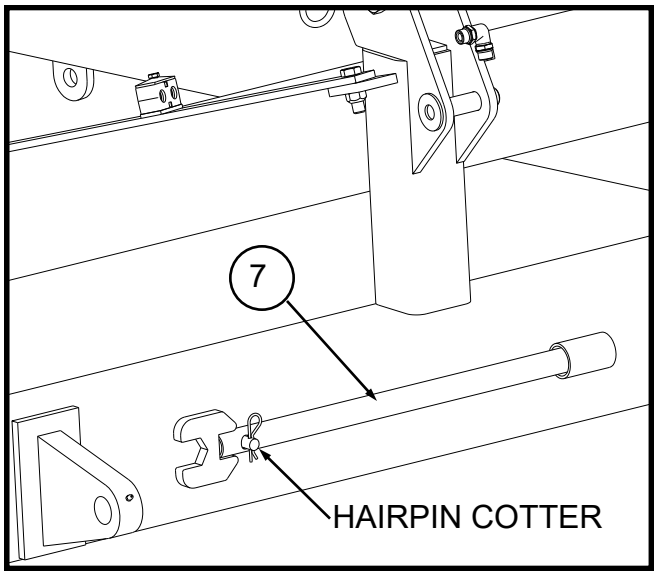
NOTE: USE LOCK-TITE ON ALL NUTS



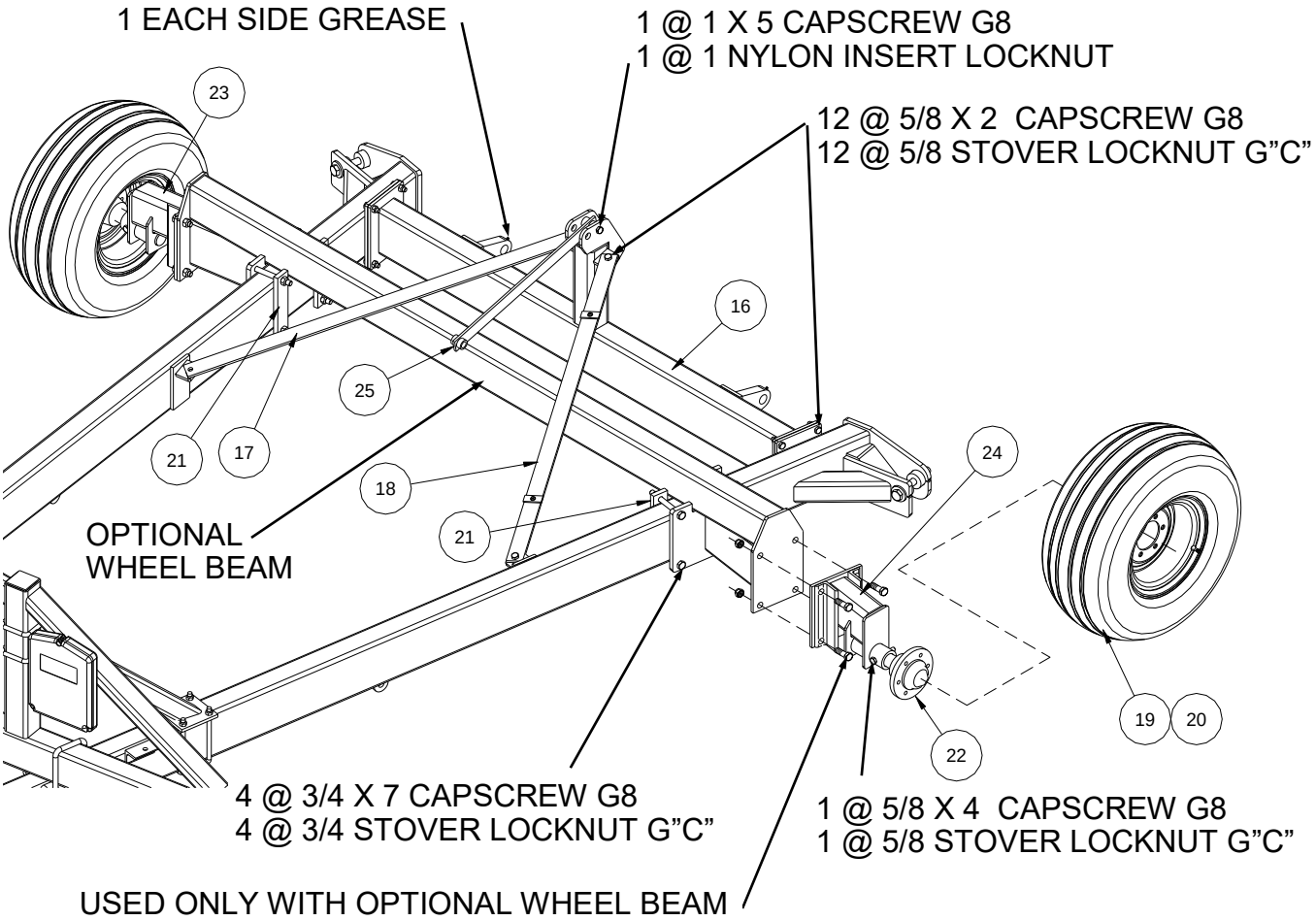
ITEM	PART NUMBER	DESCRIPTION	QTY
1	05-51116-00	MAIN FRAME (RIGHT)	1
2	05-51117-00	MAIN FRAME (LEFT)	1
3	05-51062-01	HITCH PLATE	1
4	31-10951-03	HITCH CASTING (001-301V3)	1
5	31-10307-01	PIG TAIL HOSE HOLDER	1
6	31-10950-04	HITCH JACK, 7000 LB	1
7	05-51038-01	1 1/2” WRENCH	1
8	05-51013-01	SPACER	3
9	31-10959-01	SAFETY CHAIN	1
10	05-51063-01	SAFETY CHAIN BAR	1
11	05-51118-00	FRONT WING MOUNT	1
12	05-51068-03	FRONT WING MOUNT BRACE - RH	1
13	05-51068-04	FRONT WING MOUNT BRACE - LH	1
14	05-51022-02	LOCK LEVER	2
15	05-51055-01	GROOVED PIN, 1 X 3 1/2 USBL	2



DOUBLE CLEVIS KIT
AND
SAFETY CHAIN



1 1/2” WRENCH



NOTE: USE LOCK-TITE ON ALL NUTS

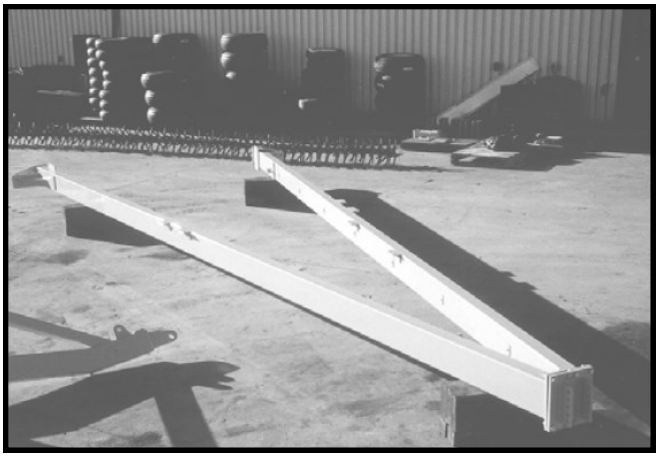
ITEM	PART NUMBER	DESCRIPTION	QTY
16	05-51099-03	REAR BEAM	1
17	05-51010-03	RIGHT REAR BEAM BRACE	1
18	05-51010-04	LEFT REAR BEAM BRACE	1
19	31-10907-05	TIRE, 12.5L - 15.8 PLY	2
20	61-058-001	RIM, 15 X 10 X 6-BOLT	2
21	05-051071-01	MAIN WHEEL PLATE	4
22	30-90541-01	H-614 HUB AND SPINDLE	2
23	05-51080-03	MAIN WHEEL (RIGHT)	1
24	05-51080-04	MAIN WHEEL (LEFT)	1
25	05-51007-01	TAIL LOCKING BAR	1

STEP 2

Place the right and left main frame (#1 & #2) Onto wooden blocks supporting each end. Place the blocks so that the front ends of the main frames will be close together and the rears will be separated by 7’ - 3”. Using 8 (eight) 5/8” x 2 1/4” bolts, and unitorque nuts, attach the front hitch plate (#3) to the main beams, connecting them together. Leave nuts loose.

NOTE: Looking from the rear Item #2 is on the LHS and Item #1 is on the RHS.

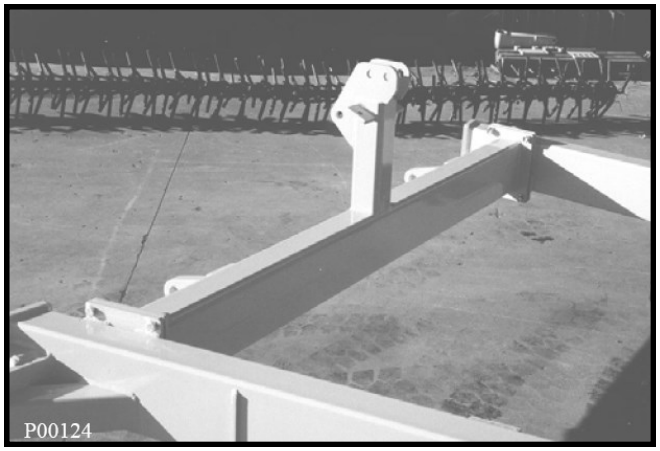
WARNING: Practice extreme caution when assembling the harrow. The harrow is made of large heavy sections that could injure or kill if dropped!



Installing the Left and Right Main Frame Beams

STEP 3

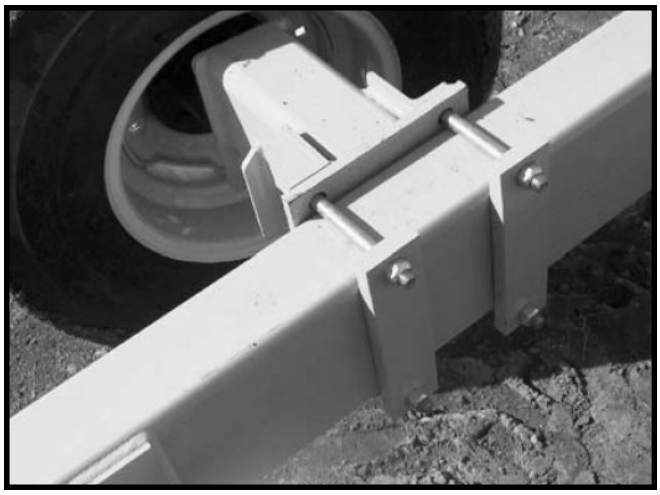
Place the rear beam (#16) at the rear of the harrow. Connect the right and left ends to (#1 & #2) using 4 (four) 5/8” x 2” UNC bolts and unitorque nuts per side. Torque the 12 (twelve) nuts from steps 2 and 3 to 100 ft lbs.



Attaching the Rear Beam

STEP 4

Connect the right wheel mount (#23) to the right main frame (#1) and the left wheel mount (#24) to the left main frame (#2) using 4 (four) 3/4” x 7” G8 bolts and 4 (four) G8 unitorque nuts per side. Two main wheel-backing plated per side are used to straddle and clamp the wheel mounts to the main frames. Use the locator tab welded to the main frames to butt the backside of the wheel mount to. Torque to 155 ft lbs.



Attaching the Right Wheel Mount

STEP 5

Place the front wing mount (#11) over top of the two-main frame beams (#1 & #2). The location of the front wing mount is very important. If it is misaligned, it will be very difficult to install the wings properly. The front wing mount beam is located near the middle of the mainframe beams where the 2 -hole brackets located on the outside of either beam. The wing mount should be centered over the main beams.

Find the centerline of the front wing mount. Measure from the centerline to the angle brackets and move the front wing mount until the measurements are equal on each side. On each side, install a 3/4” x 5 3/16” x 7 1/4” long U-bolt over the wing mount beam and through the angle bracket.

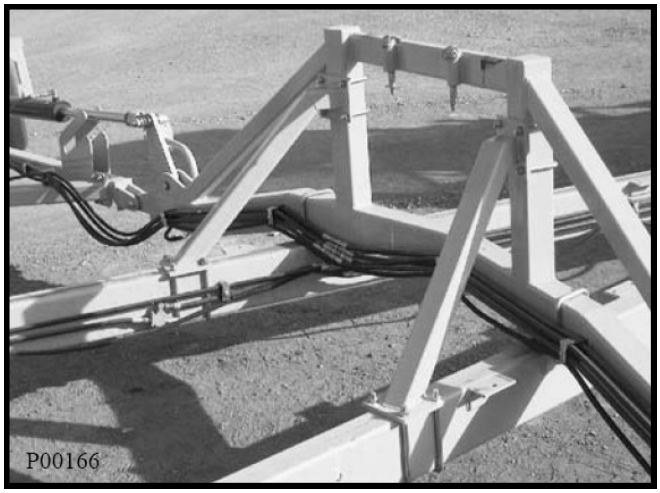
This joint may have to be loosened off and the front wing mount moved to one side or the other side slightly. If you have problems with lining up the wings, etc., this is likely the problem.

STEP 6

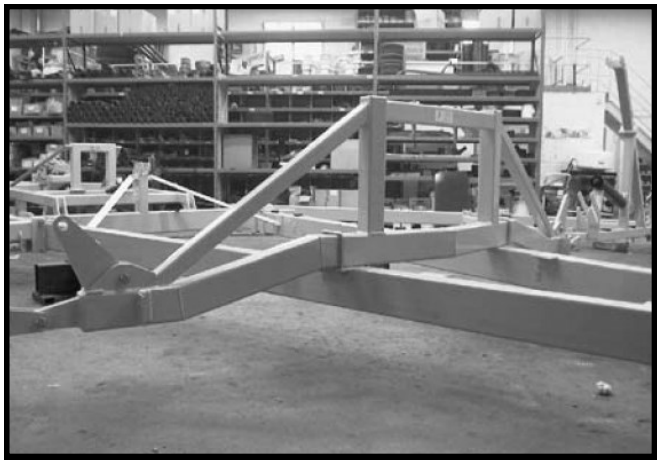
Attach the left and right front wing mount braces. These each attach to the vertical tube on the front wing mount and then down to the left and right main beams.

Attach each brace to the front wing mount using 2 (two) 5/8” x 4 11/16” x 5 1/4” long U -bolts and 4 (four) 5/8” G8 unitorque nuts. The braces are each attached to the main frame using 2 (two) 5/8” x 4 11/16” x 9 1/2” long U-bolts and 4 (four) unitorque nuts.

Square the front wing mount to the main frame and then tighten all nuts down. Torque the 5/8” U-bolts to 60 ft lbs. Torque the 3/4” U-bolts from Step 6 to 75 ft lbs.



Attaching the Wing Mount Braces



Attaching the Front Wing Mount

STEP 7

Jack up the frame to allow installation of the tires (12.5L x 15) and rims. Attach the tire/ rim to the spindle using the 9/16”-18 UNF wheel nuts located on the spindle studs. Torque to 90 ft lbs.

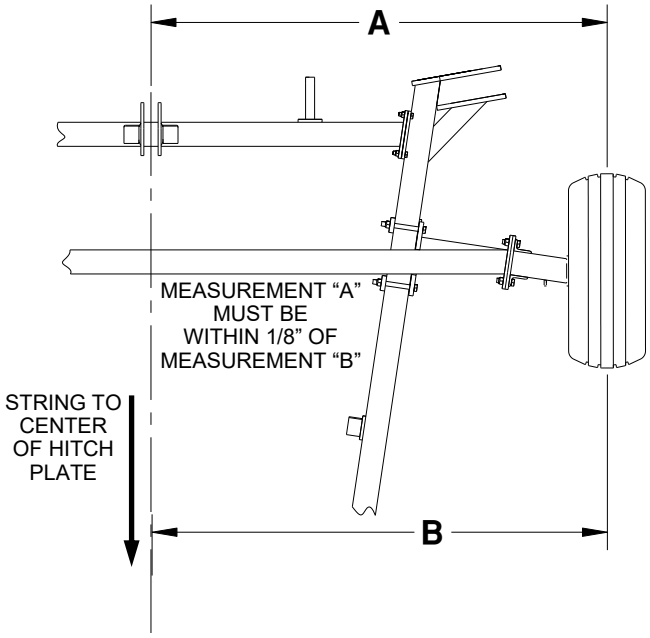
WARNING: Use caution when using a jack or other lifting device. Take measures to prevent slippage.

STEP 8

Attach the hitch jack (#6) to the boss near the front of the unit and raise until harrow is level.

STEP 9

Verify the alignment of the LH & RH wheels. Stretch a string between the center of the hitch plate (#3) to the center of the rear beam (#16). Measure the shortest distance from the string to a groove in the tire at the front and the rear of the tire as shown. Use the same groove in the tire for both measurements. These measurements must be within 1/8” of each other.



Wheel Toe Measurement

If the wheel need aligning, install the shim(s) between the wheel mount and the frame. Install the shim beneath the front pair of bolts to toe the wheel out or the rear bolts to toe it in. Notice the shim is designed to “hook” in place so it maintains proper placement while the mounting bolts are tightened.

Wheel Mount Shim (P/N - 30-90376-17)

STEP 10

Attach the 2 (two) rear beam braces (#17 & #18) between the middle beam and the main frames. Tabs are located on either side of the upright on the rear beam and on the inside faces of the main frames. Use a 5/8” x 2” bolt, and unitorque nut on each end. The left brace has two hose clamp tabs welded to it. These tabs should face up. Torque to 100 ft lbs.

STEP 11

Attach the tail-locking bar to the rear beam using the middle set of holes at the top of the rear beam. Use a 1” x 5” G8 bolt and a nylon-locking nut to form the hinge. Do not over-tighten the nut, allowing the bar to move freely. Insert one of the 7/8” diameter pins into the rear set of holes on the rear beam to lock the bar down. Secure with the hitch pin clip.

STEP 12

The 1 1/2” wrench (#7) is attached to the rear beam using the clip provided. Refer to page 9.

STEP 14

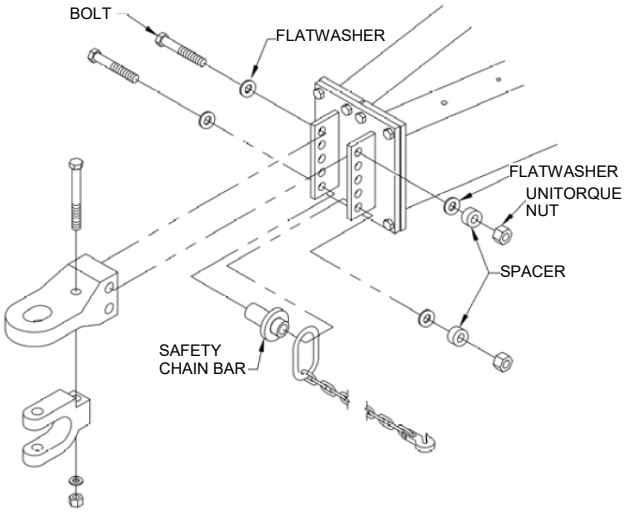
Attach the pigtail hydraulic hose holder (#5) to the front of the left mainframe beam using 1 (one) 1/2” x 1 1/2” bolt, flatwasher, lock-washer and hex nut.

STEP 15

Depending on your tractor hitch, you may require the clevis attachment for your harrow. If your tractor has a double tongue, the single cast hitch is required. If your tractor has a single tongue, you will require the clevis option. For your reference the 1” x 7 1/2” G8 bolts securing the hitch cast (#4) to the hitch plate (#3) and safety chain bar are torqued to 350 ft lbs and the 3/4” x 5” UNC bolt securing the clevis is torqued to 175 ft lbs.

<u>ATTENTION</u>: Either the tractors hitch or the harrow MUST have a double clevis arrangement. During wing folding, there will temporarily be negative weight on the hitch.

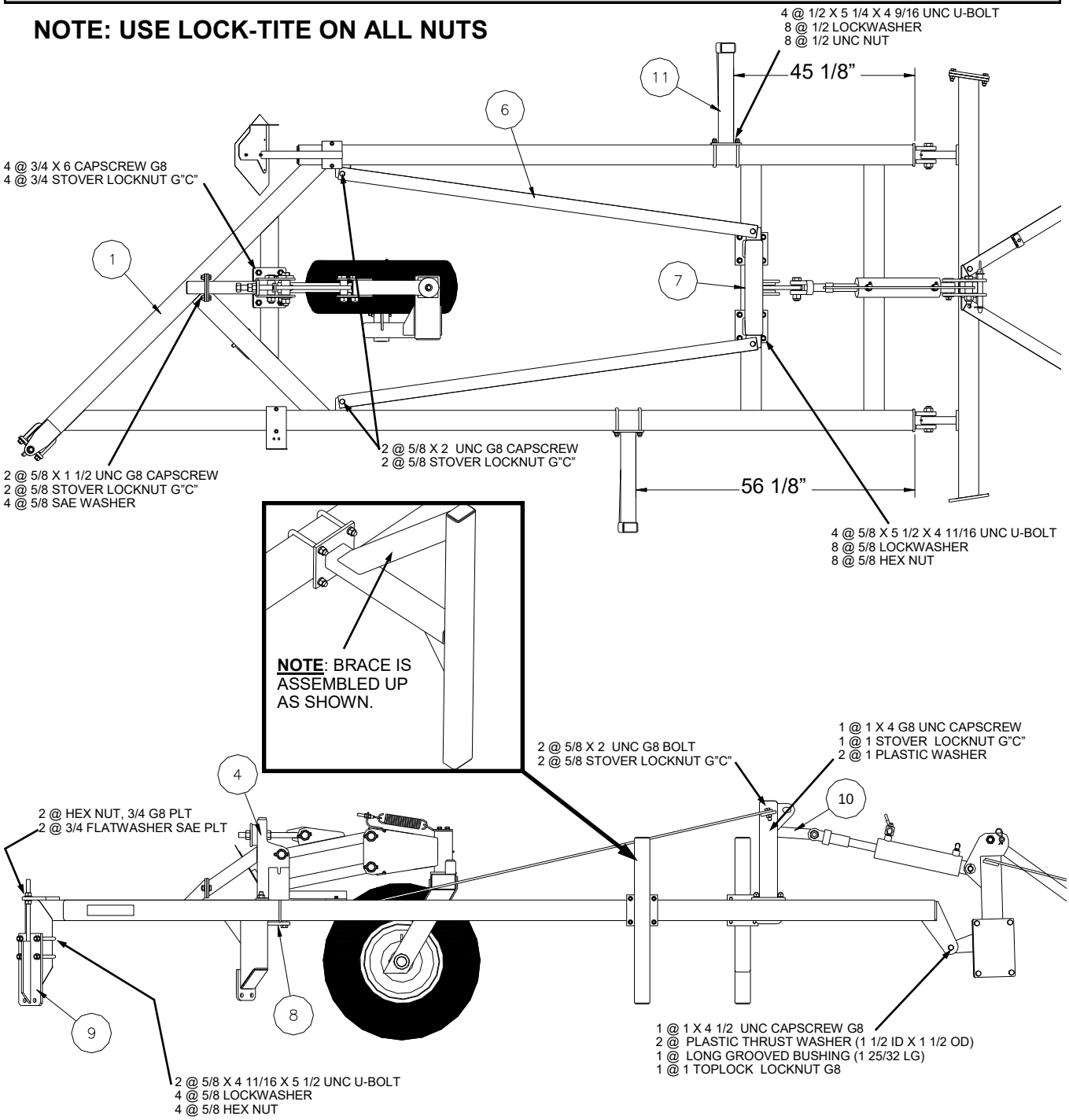
The single cast hitch is standard. If you require the add on lower clevis, order KMC option part number (61-082-003).



Tow Chain/Hitch Connection

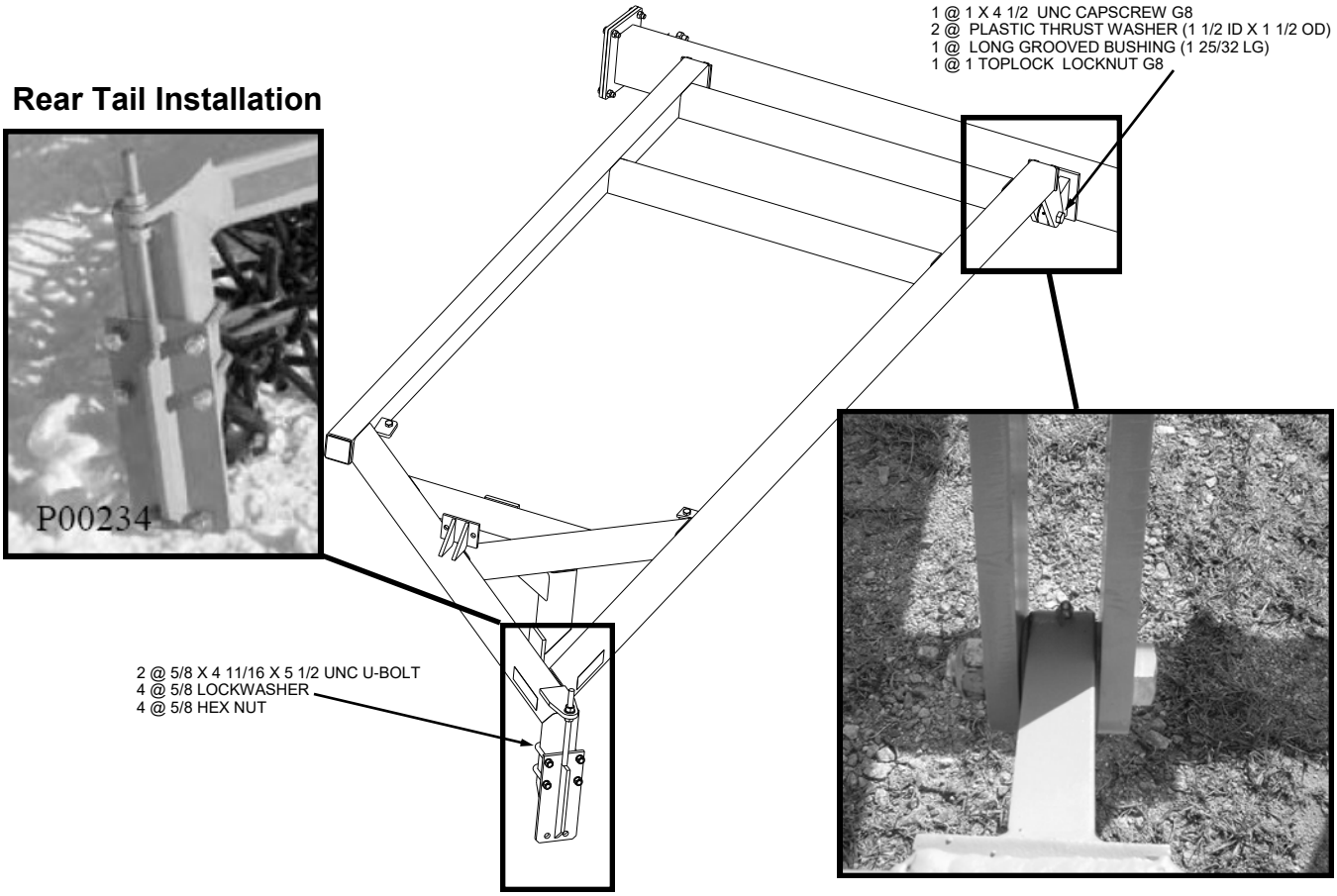
2.3 TAIL ASSEMBLY

NOTE: USE LOCK-TITE ON ALL NUTS



ITEM	PART NUMBER	DESCRIPTION	QTY
1	05-51006-02	TAIL SECTION, 45 FT	1
4	61-081-010	TAIL CASTER SUB ASSEMBLY	1
6	05-51009-02	TAIL BRACE	2
7	05-51039-02	TAIL TOP BRIDGE	1
8	30-90376-09	BOTTOM PLATE, CASTER BRKT	1
9	05-51008-01	REAR ADJUST	1
10	05-51012-01	TAIL LEVER	1
11	05-51077-01	TAIL TOOL CATCHER, TA HARROW	2

Rear Tail Installation

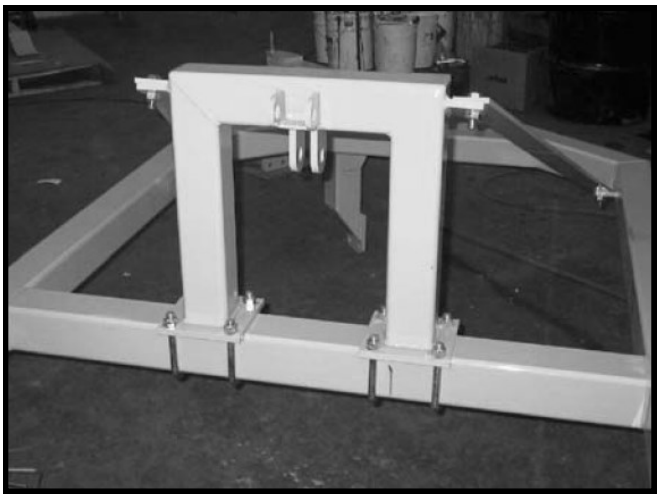


Tail Hinge Connection Detail

STEP 18

Now connect the tail to the rear beam (#16 Section 2.2). A 1” x 4 1/2” G8 bolt, unitorque nut, a long grooved bushing and two plastic thrust washers are used for each connection. This connection forms the hinge that allows the tail to float up and down. The 1” bolts can be tightened as the bushing acts as a spacer between the lugs. Torque to 350 ft lbs.

STEP 19



Tail Top Bridge Connection

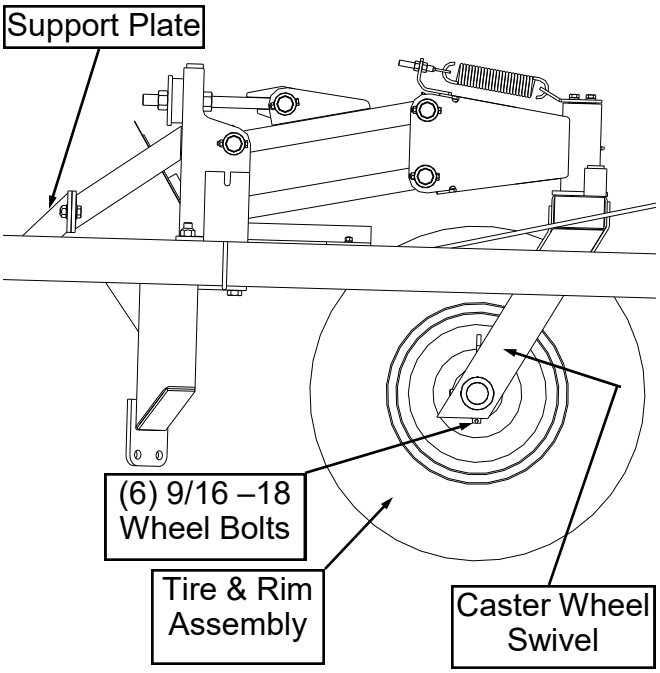
Attach the tail top bridge (#7) to the tail section (#1) using 4 (four) 5/8” x 4 11/16” x 5 1/4” long U-bolts, 8 (eight) nuts and lockwashers. Torque to 60 ft lbs. The tail top bridge is located on the rearmost of the two lateral spreader beams on the front tail section. Locate it on the center of this beam. Keep the top bridge square to the tail. The top lugs should point towards the rear beam.

STEP 20

Attach the 2 (two) tail braces (#6) between the tail top bridge (#7), and the tail using 4 (four) 5/8" x 2" bolts, and unitorque nuts. Tabs are located on either side of the tail top bridge and on the inside edge of the tail side beams. Torque to 100 ft lbs.

STEP 21

Jack and block the tail up and install the tail caster wheel assembly (#4). The tail caster is tagged and marked "Tail Caster". The tail caster wheel is attached to the tail on the 3 1/2" and 3 1/2" beam as shown in "Tail Caster Wheel Connection" below. Align the caster wheel assembly so that the caster mount bracket support lines up with the support plate welded onto the tail frame using the 2 (two) 5/8" x 1 1/2" G8 bolts, 4 (four) 5/8" SAE flatwashers, and stover locknuts. Torque to 100 ft lbs. The caster wheel is then attached using a 4 hole backing plate (#8) and 4 (four) 3/4" x 6" G8 bolts, and stover locknuts. Torque to 130 ft lbs. The backing plate is used to clamp the caster wheel around the 3 1/2" x 3 1/2" tubing. Once the installation is complete, the blocking can be removed



Tail Caster Wheel Connection

STEP 22

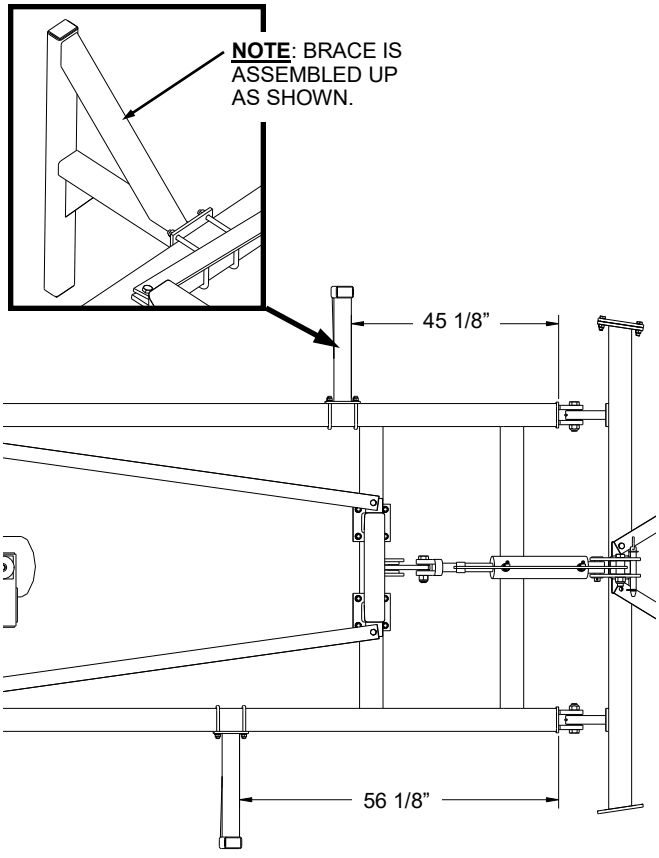
Install the tire and rim assembly to the hub on the caster wheel swivel. Secure into place using the 6 (six) 9/16 - 18 UNF wheel bolts. Torque to 90 ft lbs.

NOTE: The caster assembly for the tail section is tagged with "Tail Caster" written on it.

STEP 23

The 2 (two) tail tool catchers (#11) can be installed to the tail using 2 (two) 1/2" x 4 9/16" x 5 1/4" long U-bolts, 4 nuts and lockwashers per side. Torque to 40 ft lbs. See diagram "Tail Tool Catcher Location".

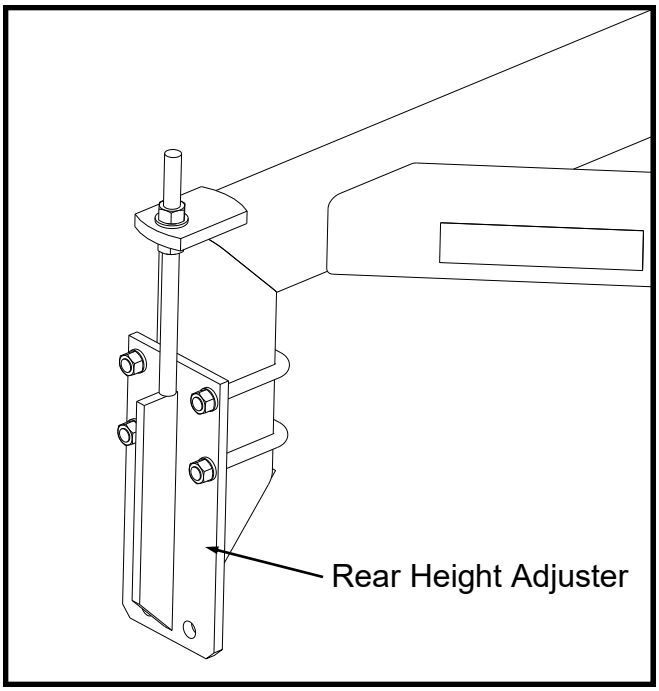
NOTE: The tool catchers can be removed around later to better keep the tooling away from the tail section.



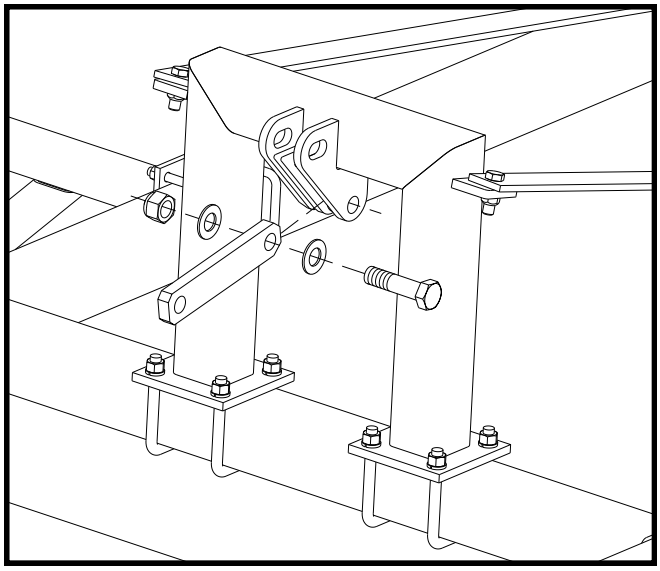
Tail Tool Catcher Location

STEP 24

Attach the rear height adjuster (#9) to the back end of the tail. It is clamped to the tail using 2 (two) 5/8” x 4 11/16” x 5 1/4” long U -bolts, 4 (four) nuts and lockwashers. Torque these to 60 ft lbs.



Rear Height Adjust Connection

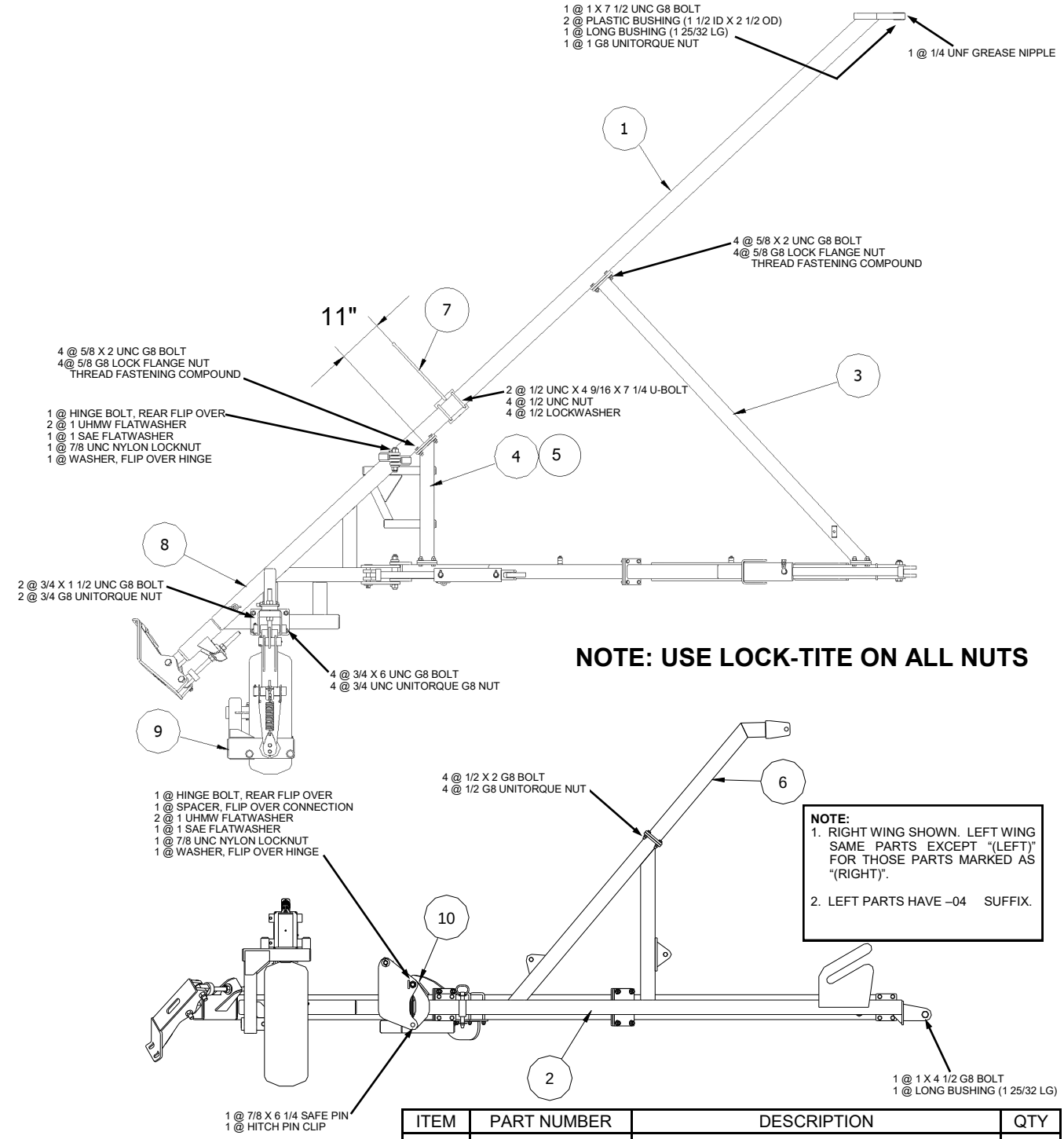


Tail Lever Installation

STEP 25

Ensure the 1” x 4” G8 bolt, 2 (two) 1” plastic washers and a 1” stover locknut G“C” are not over tightened for the bolt forms a hinge for the lever. Tighten only enough to be snug leave the joint with motion.

2.4 WING ASSEMBLY



NOTE: USE LOCK-TITE ON ALL NUTS

NOTE:
1. RIGHT WING SHOWN. LEFT WING SAME PARTS EXCEPT "(LEFT)" FOR THOSE PARTS MARKED AS "(RIGHT)".
2. LEFT PARTS HAVE –04 SUFFIX.

ITEM	PART NUMBER	DESCRIPTION	QTY
1	05-51025-03	WING STIFF ARM (RIGHT)	1
2	05-51028-03	WING FRONT BEAM (RIGHT)	1
3	05-51026-02	WING LONG BRACE	1
4	61-080-034	SLIDE, LH TOOL	1
5	61-080-035	SLIDE, RH TOOL	1
6	05-51034-02	WING TRANSPORT SUPPORT	1
7	61-080-053	WING TOOL CATCHER	1
8	05-51115-00	WING FLIP OVER (RIGHT)	1
9	61-081-009	WING CASTER ASSEMBLY	1
10	05-51015-01	SPACER, FLIP OVER CONNECTION	1
11	05-51097-00	TOOL LEVER. LONG STROKE	1
12	05-51098-00	TENSION ROD, LONG STROKE PL	1
13	71-51004-00	BUSHING, TENSION ROD	1

STEP 26

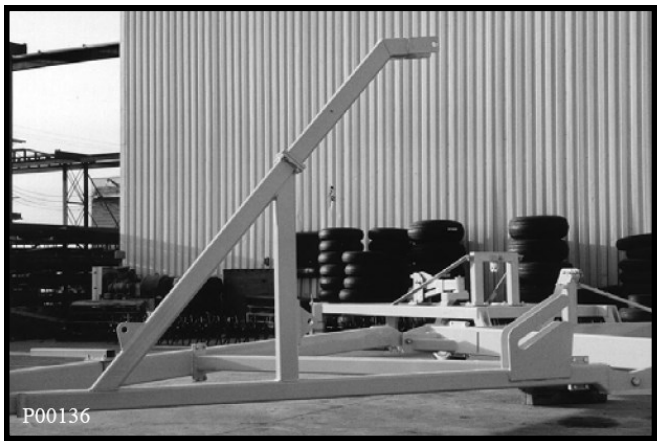
The wing is assembled by first forming the outer triangle of the wing. Attach the right wing stiff arm (#1) to the rear hinge clevis on the main frame of the harrow. This connections uses a 1” x 7 1/2” G8 bolt, unitorque nut, a long grooved bushing, and two plastic washers. Torque to 350 ft lbs. The arrangement is identical to the Tail Hinge Connection from Step 18. Block the other end of the beam up about one foot.

Stiff Arm Attachment

STEP 27

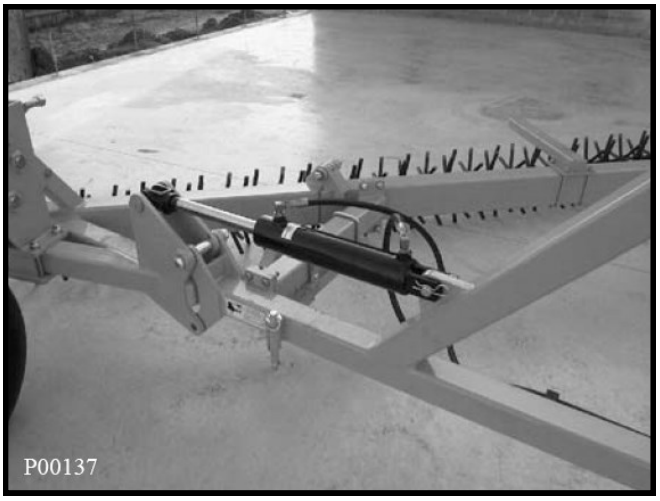
Attach the right wing front beam (#2) to the front wing mount (#11 Section 2.2) using a 1” x 4 1/2” G8 bolt, unitorque nut and a long grooved bushing. Torque to 350 ft lbs. Again, this is identical to the connections made in steps 18 and 26 except plastic washers are not used. The front wing beam should be placed in-line with the arm on the front wing mount and blocked up about a foot on the opposite end. Attach the wing transport support (#6) to the top of the wing front beam using 4 (four) 1/2” x 2” bolts, and unitorque nuts Torque to 55 ft lbs.

STEP 28



Front Wing Beam

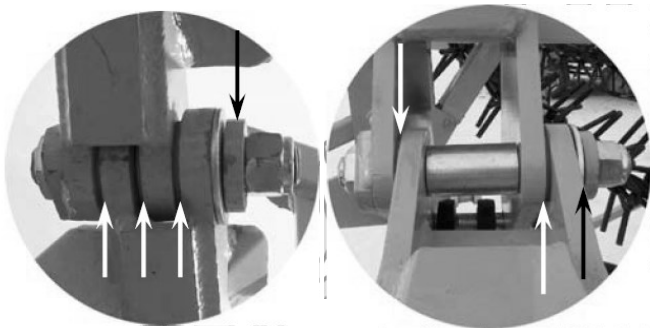
Attach the right side wing flip-over (#8) to the wing stiff arm (#1) and the front wing beam (#2). The flip-over joints the stiff arm using 1 (one) hinge bolt, 3 (three) 1” plastic washers, spaced between the lugs, 1 (one) 1” SAE flatwasher, 1 (one) flip over hinge flatwasher and 1 (one) 7/8 UNC nylon locknut. Torgue to 200 ft lbs. The flip-over joins the front wing beam using 1 (one) hinge bolt, 1 (one) flip-over connection spacer, 2 (two) 1” plastic washers, 1 (one) 1” SAE flatwasher, 1 (one) 7/8” UNC nylon locknut. Torque to 200 ft lbs. The flip-over is further joined to the front beam using 1 (one) 7/8” x 6 1/4” pin. This pin is placed in the lower set of holes in-line between the two sections. The pin serves as a field lock and is removed before the unit is put into transport.



Right Wing Flip-Over

White arrows denote plastic washers, Black arrows denote flip-over hinge washer

Rear **Front**



Flip-Over Connection

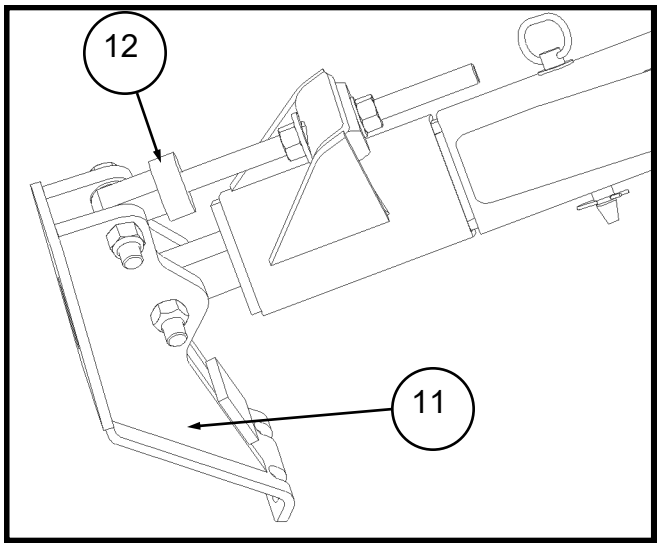
STEP 29

The long brace (#3) and the short brace (#4) and (#5) are now connected to the wing. There are 2 plates on both the stiff arm and the front wing beam. The wing braces connect between these plates. At each of the four connection points, 4 (four) 5/8” x 2” bolts, and lock flange nuts are used. Apply thread-fastening compound (Loctite 262) to all of these 5/8” bolts. **Once the wing assembly has been loosely put together**, fold onto the front wing mount, to ensure proper alignment of the wing transport cradle. Adjust if necessary and then go around and torque all 5/8” bolts to 100 ft lbs. Then unfold.

STEP 30

The tool lever (#11) and the tool tension rod (#12) can now be attached to the flip-over. The tool lever is attached using the lug on the end of the wing. A 1” x 5” G8 bolt, nylon-locking nut, a short grooved bushing, and two plastic washers are used to make the connection. Torque to 350 ft lbs. The holes near the middle of the tool lever are used for the connection.

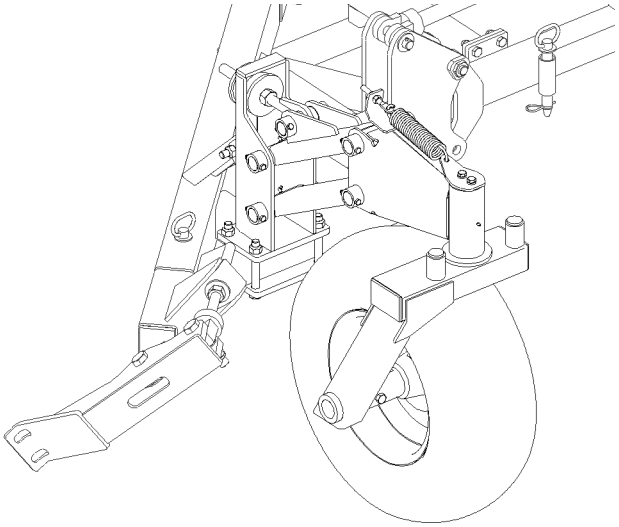
The tool tension rod is first connected to the flip-over by threading a 1” G8 nut and rod support washer onto the threaded rod. The tension rod bushing is placed between the plates on the flip-over. Insert the 1” threaded rod though the corner plate and the tension rod bushing. Another 1” nut and a hardened washer are placed the other side of the plate. The other end of the tool tension rod is connected to the top of the tool lever using a 1” x 5” G8 bolt, two 1” plastic washers, and a 1” nylon-locking nut. Each of the plastic washers is placed between the tool tension rod and the tool tension lever. **DO NOT** over-tighten the nylon-locking nut. It is used to make a hinged connection.



Tool Tension Lever and Tool Tension Rod Connection

STEP 31

The wing caster assembly (#9) is now attached to the flip-over. The wing caster wheels are attached in an identical manner as the tail caster wheel from Step 21. Use 4 (four) 3/4” x 6” G8 bolts, stover locknuts and a backing plate to clamp the caster wheel to the 3 1/2” x 3 1/2” tubing across the front of the flip-over. Torque to 130 ft lbs. Fasten the wing caster assembly to the wing frame using 2 (two) 3/4” x 1 1/2” G8 bolts, and stover locknuts. Torque to 200 ft lbs.



Wing Caster Assembly Installation

STEP 32

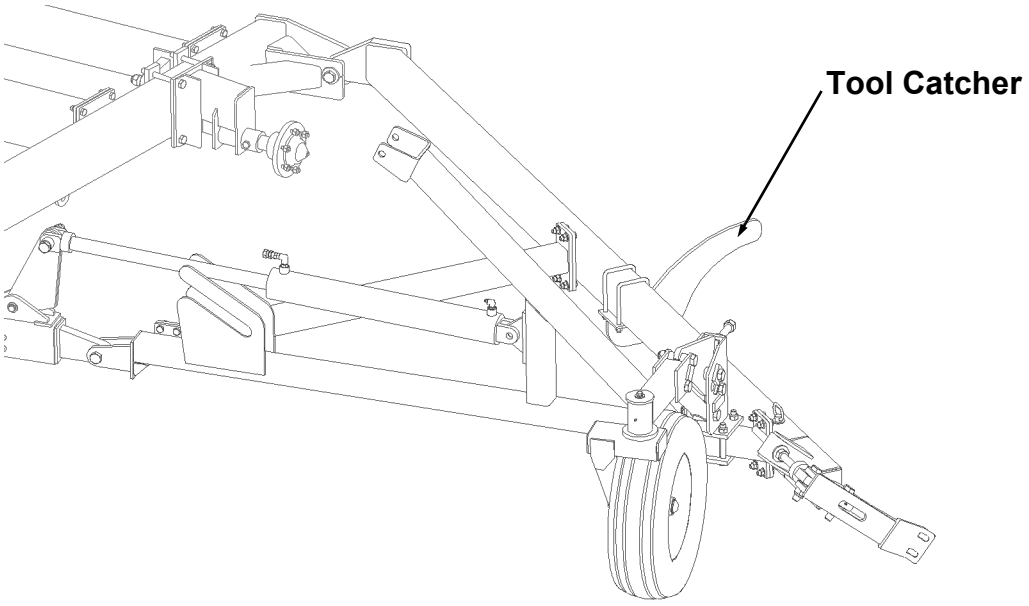
Install the tire and rim assembly to the hub on the caster wheel swivel. Secure into place using the 6 (six) 9/16-18 UNF wheel bolts. Torque to 90 ft lbs.

NOTE: The caster assembly for the tail section is tagged with “Tail Caster” written on it.

STEP 33

The wing tool catcher (#7) can be attached to the wing. The wing tool catcher is installed using 2 (two) 1/2” x 4 9/16” x 7 1/4” long U-bolts and 4 (four) nuts and lockwashers. Torque to 40 ft lbs. It is placed on top of the 6” x 4” tubing on the wing stiff arm. The location is shown below.

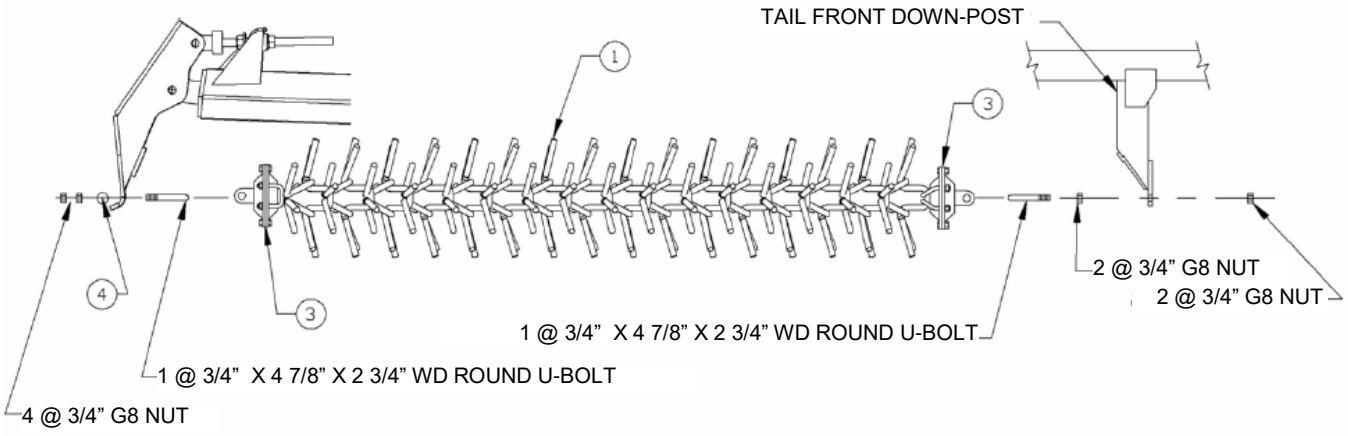
Wing Tool Catcher Attachment



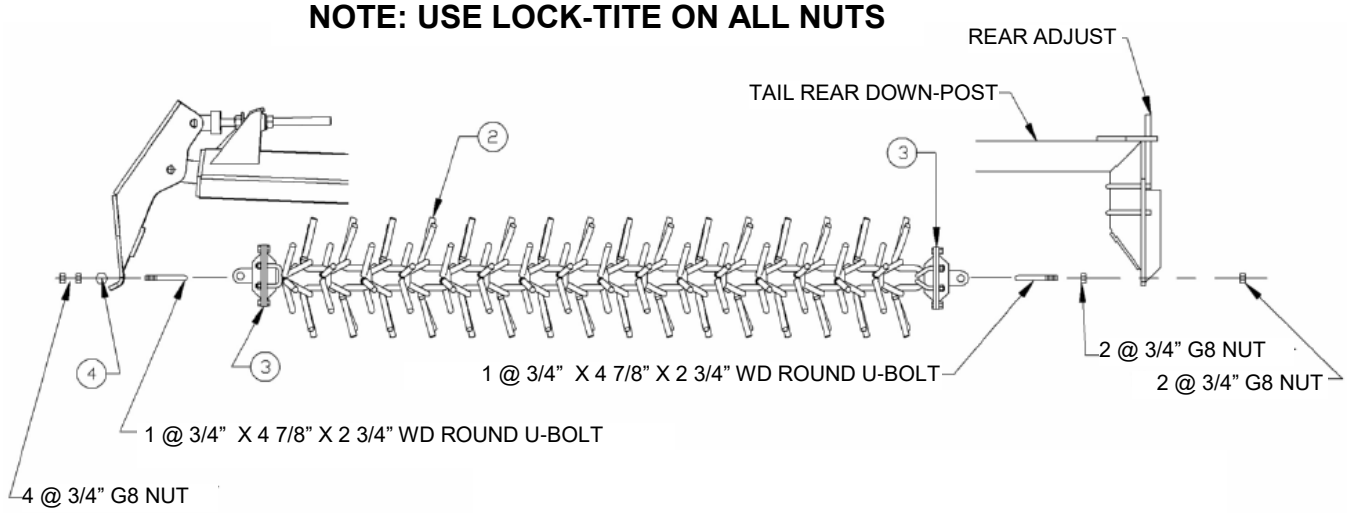
2.5 TOOLING INSTALLATION

The tooling assemblies can now be connected to the tail section and the tool tension lever. The tooling is pre-assembled to the bearing housings. The tooling should be aligned between the tail and the tool tension lever. The correct tooling assembly must be used on the correct side and these must be facing the correct direction. Keep these three things in mind;

1. The tooling section, which goes to the left side, is slightly longer than the right side section.
2. The tooling end at the tail is connected to the bearing housing using two U-bolts, which have a kinks near the squared end.
3. The tines themselves should point slightly toward the rear.



NOTE: USE LOCK-TITE ON ALL NUTS



ITEM	PART NUMBER	DESCRIPTION	QTY
1	N/A	TOOLING ASSEMLBY, RIGHT SIDE (SHORT)	1
2	N/A	TOOLING ASSEMLBY, LEFT SIDE (LONG)	1
3	N/A	BEARING ASSEMBLY	4
4	71-41500-00	BEARING HOUSING MOUNT SHAFT	2

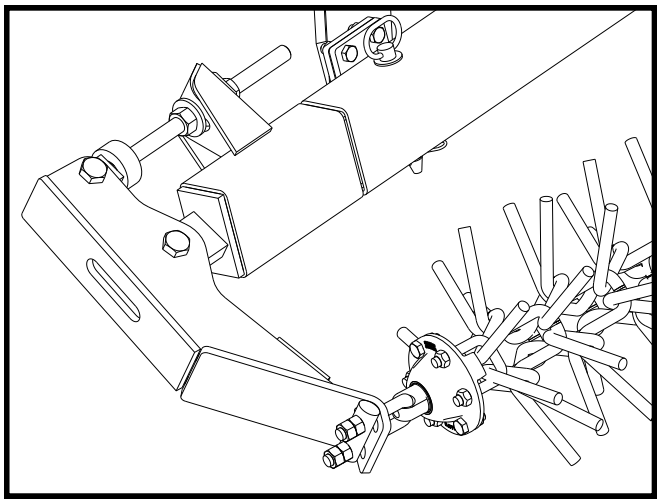
STEP 34

Connect to the tail section first. The left side tooling assembly (#2) attaches to the rear height adjuster (#9 - Section 2.3). The right side tooling assembly (#1) attaches to the solid plate just behind the tail caster wheel. At each connection, use a 3/4” x 2 3/4” x 4 7/8 “ long round U-bolt. Thread the U-bolt through the hole in the bearing assembly shaft. A 3/4” nut is placed on both ends of the U-bolt runs down to the ends of the threads. The U-bolt is then placed through the connection plates, another 3/4” nut is applied to each end of the U-bolt, and the two nuts are used to jam the U-bolt in place. **Use permanent thread locking compound on all nuts to keep them tight.**

Tooling Connection at the Tail

STEP 35

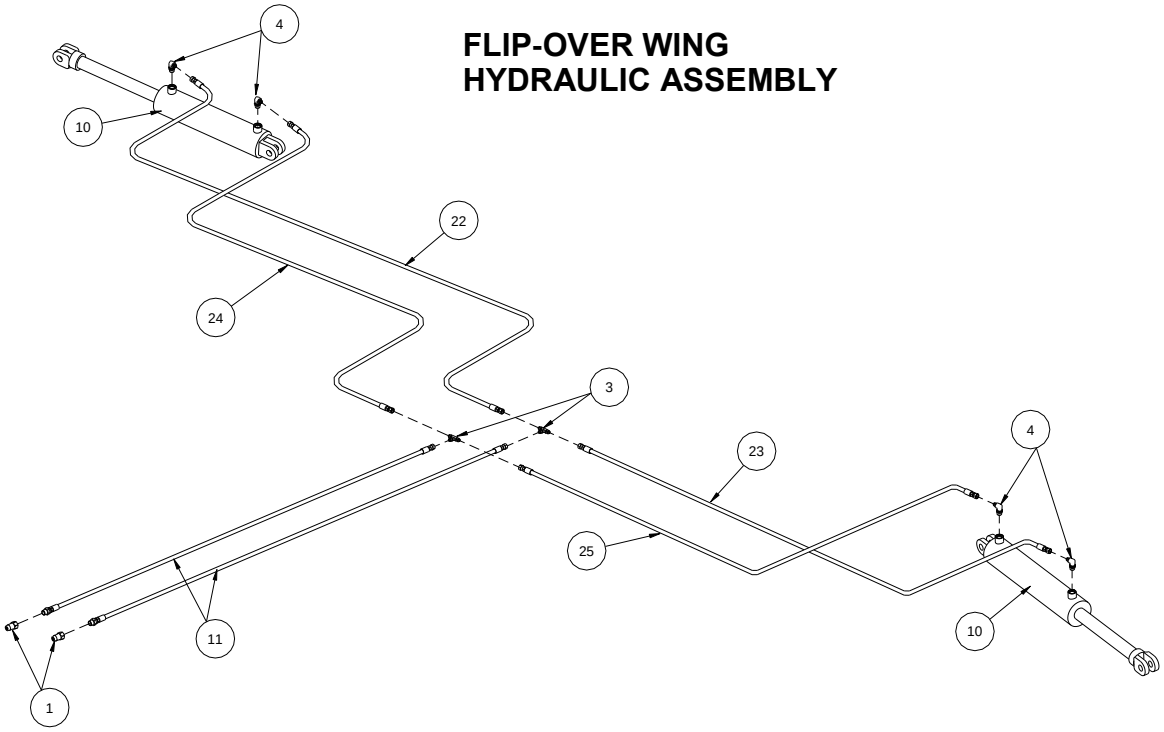
Connection to the tool tension lever is slightly different. Place the U-bolt through the tool levers’ connection plate and the bearing housing mount shaft (#4) that sits in the curved part of the connection plate. Two 3/4” nuts are applied to the outside of the mount shaft. **Tighten the nuts and secure with permanent thread locking compound.** This allows the connection to tilt.

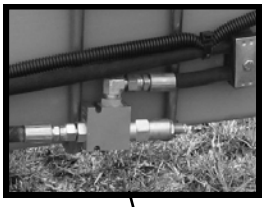


Front Tooling Connection

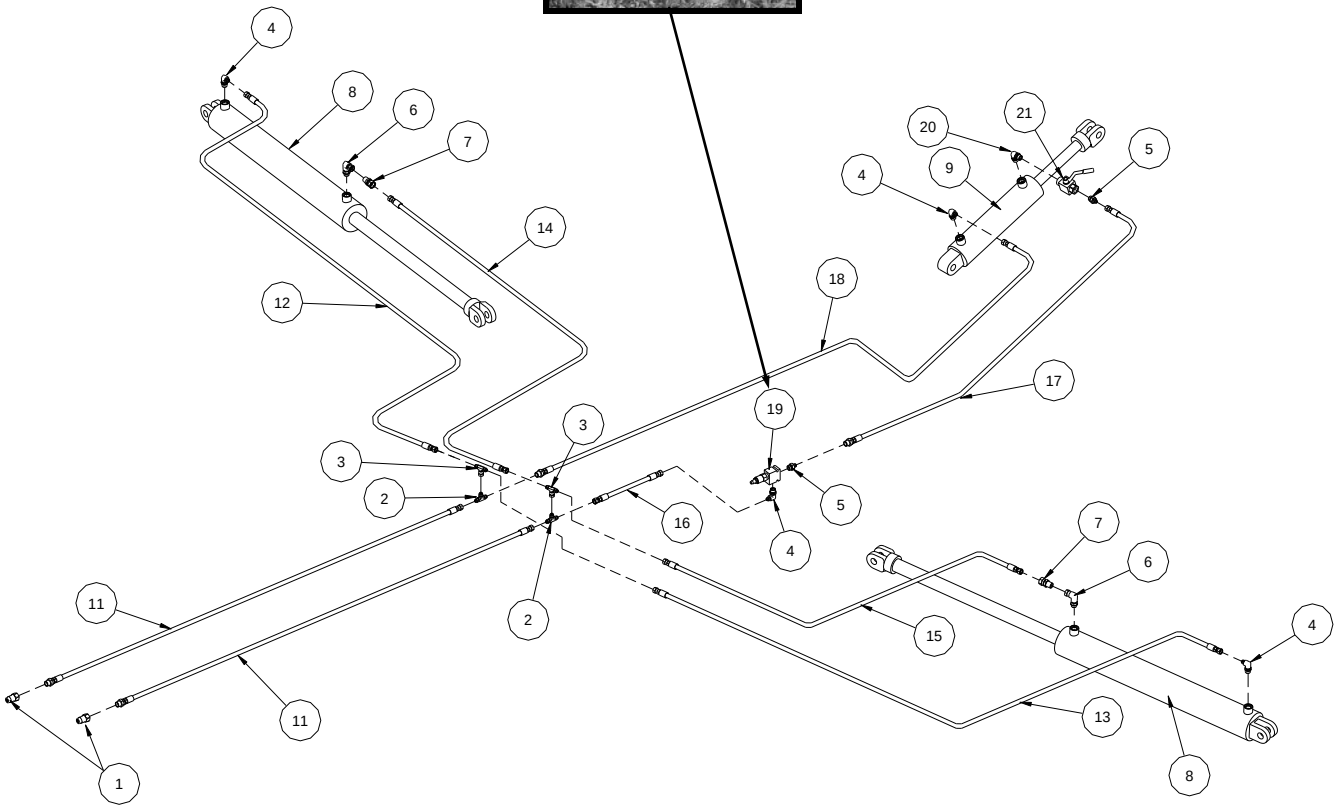
2.6 HYDRAULIC INSTALLATION

FLIP-OVER WING
HYDRAULIC ASSEMBLY





MAIN WING & TAIL
HYDRAULIC ASSEMBLY

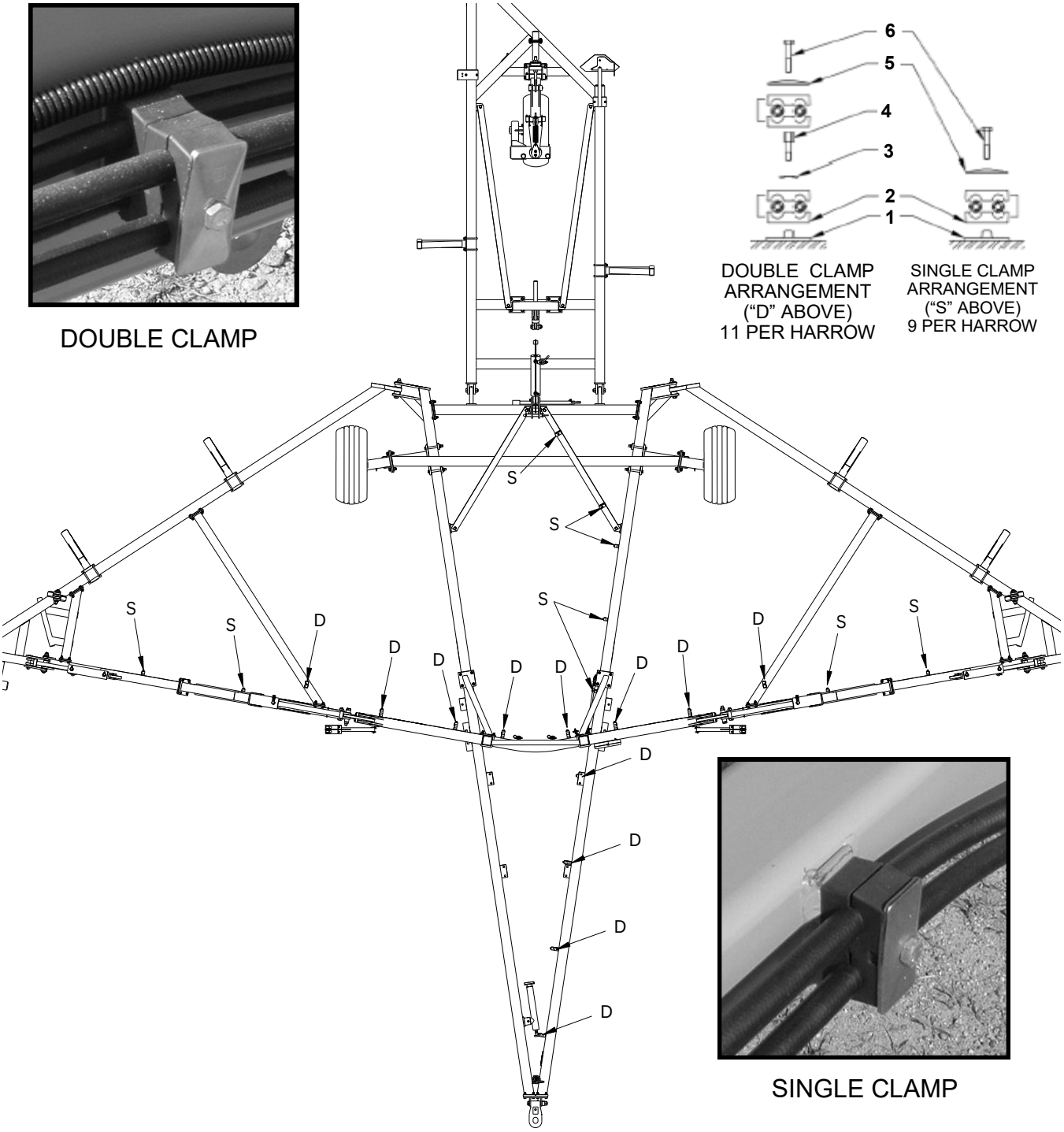


ITEM	PMF PART NO	KMC PART NO	DESCRIPTION	QTY
1	31-10530-01	47-059-002	COUPLER, M-PIONEER X 1/2 F-NPT	4
2	31-10503-16	-	TEE, #6 MJIC X #6 MJIC X #6FJIC	2
3	31-10503-17	-	TEE, #6 MJIC X 3	4
4	31-10503-15	-	ELBOW, #8 MORB X #6 MJIC	8
5	31-10503-06	-	#8 MORB - #6MJIC	2
6	31-10503-18	42-059-022	ELBOW, #8 MORB X 1/2 F-NPT	2
7	31-10551-00	21-059-002	ORIFICE BLANK, 1/2 MNPTX A 1/2 FNPT	2
8	31-10517-04	-	4 X 30 HYD CYLINDER, C/W PIN & CLIPS	2
9	31-10520-01	-	3.5 X 12 STROKE CYLINDER	1
10	31-10517-03	-	3. X 12 STROKE CYLINDER	2
11	05-51021-01	-	HOSE, 3/8 X 211, 1/2 MNPTF-6JICX	4
12	05-51021-09	-	HOSE, 3/8 X 177, 6FJICX-6FJICX	1
13	05-51021-10	-	HOSE, 3/8 X 139, 6FJICX-6FJICX	1
14	05-51021-12	-	HOSE, 3/8 X 151, 6FJICX-1/2 MNPT	1
15	05-51021-11	-	HOSE, 3/8 X 93, 6FJICX-1/2 MNPT	1
16	05-51021-06	-	HOSE, 3/8 X 24, 6FJICX-6FJICX	1
17	05-51021-08	-	HOSE, 3/8 X 152, 6FJICX-6FJICX	1
18	05-51021-07	-	HOSE, 3/8 X 165, 6FJICX-6FJICX	1
19	31-10543-01	-	SEQU. RV2-10-S-8T-35	1
20	-	33-059-123	ADAPTER, 8MB-8MB-90	1
21	-	33-061-149	BALL VALVE, TANK CYL	1
22	05-51021-02	-	HOSE, 3/8 X 241, 6FJICX-6FJICX	1
23	05-51021-04	-	HOSE, 3/8 X 195, 6FJICX-6FJICX	1
24	05-51021-03	-	HOSE, 3/8 X 226, 6FJICX-6FJICX	1
25	05-51021-05	-	HOSE, 3/8 X 183, 6FJICX-6FJICX	1

DOUBLE CLAMP

DOUBLE CLAMP ARRANGEMENT (“D” ABOVE) 11 PER HARROW

SINGLE CLAMP ARRANGEMENT (“S” ABOVE) 9 PER HARROW



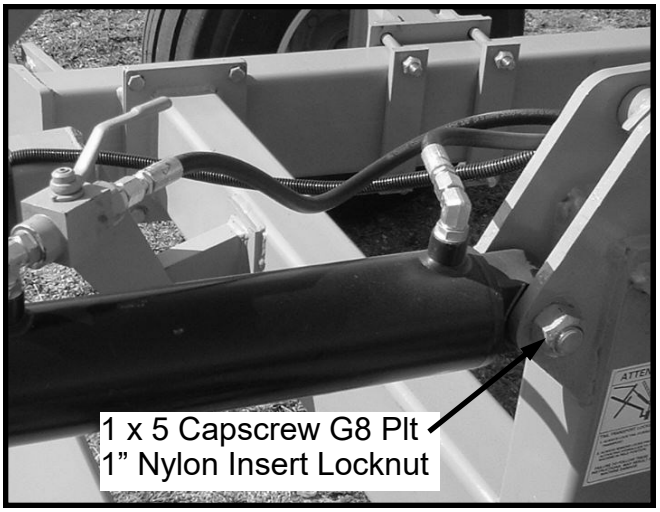
SINGLE CLAMP

CLAMP LAYOUT

ITEM	PART NUMBER	DESCRIPTION	QTY
1	48-050-022	CLAMP BASES (PREWELDED)	22
2	33-050-158	PLASTIC INSERT PAIR	31
3	30-90550-05	SAFETY/LOCKING PLATE	11
4	30-90550-04	STACKING BOLT, 5/16 X 1 3/4	11
5	33-050-160	TOP PLATE	20
6	48-090033	BOLT, 5/16 X 1 3/4 UNC	20

STEP 36

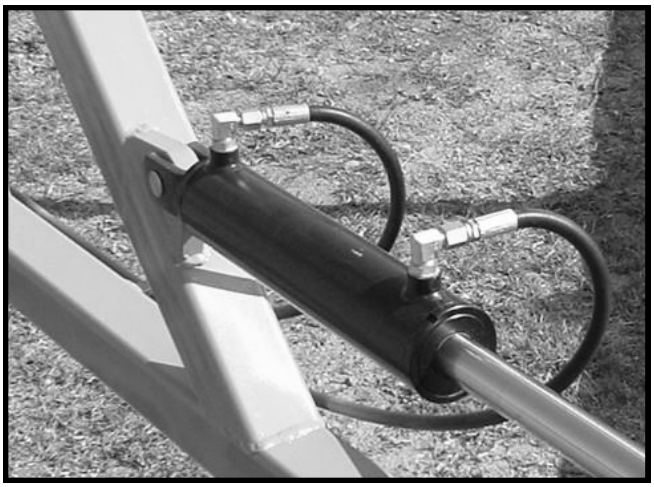
First, attach the tail-lifting cylinder (#18). A 3 1/2” bore x 12” stroke cylinder is used. Attach the butt end of the cylinder to the lower pair of holes on the rear beam upright post. A 1” x 5” capscrew G8 and 1” Nylon Insert locknut are used to attach the butt. **Do not attach the rod end of the cylinder at this time.**



Tail Cylinder Attachment

STEP 37

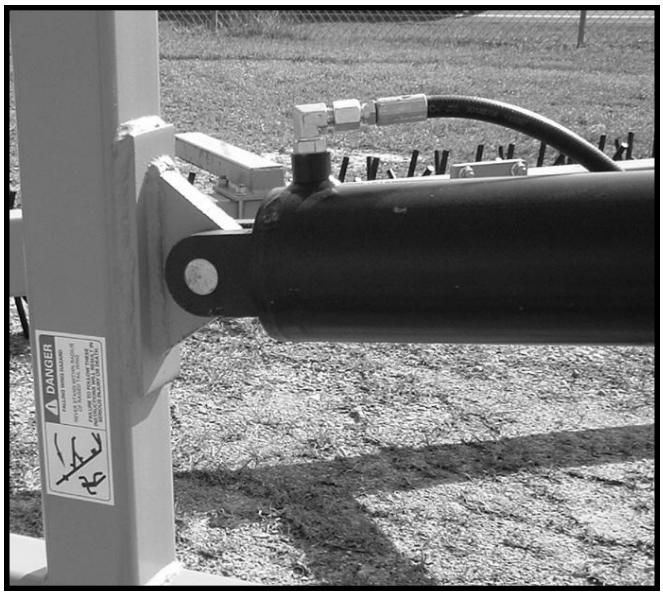
Attach the flip-over cylinder (#2). A 3” bore x 12” stroke cylinder is used. Attach the butt end of the cylinder using a 1” x 3” clevis pin and two hairpin clips. **Do not attach the rod end of the cylinder at this time**.



Flip-Over Cylinder Attachment

STEP 38

Attach the main wing lift cylinder (#1). This is a 4” bore x 30” stroke cylinder. Attach the butt end of the cylinder to the front wing using a 1” x 3 5/8” clevis pin and 2 hairpin clips.

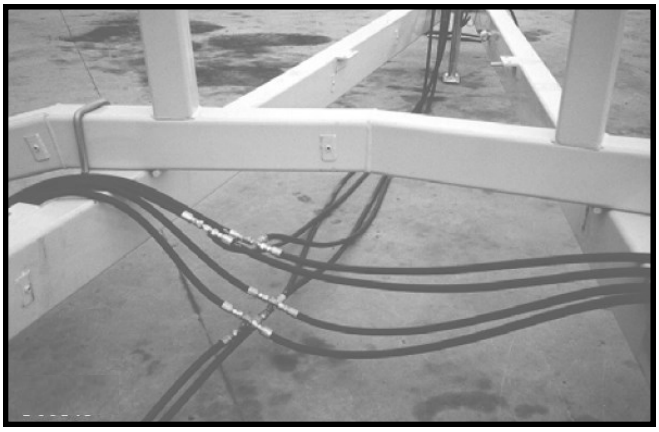


Main Cylinder Attachment

Begin attaching the hydraulic hoses. The diagram at the start of this section shows the relationship between the hose ends and the location. There are two circuits on the machine and so there are two sets of hoses.

STEP 39

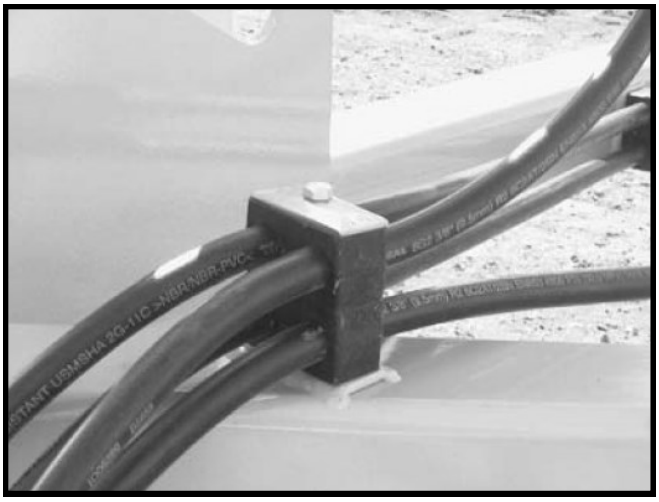
Arrange the hoses underneath the machine so that the branches in the hoses are just behind the front wing mount #11. There should be 4 (four) hoses going towards the hitch, 4 (four) hoses (#12, #14, #22 & #24) going towards the right wing, 4 (four) hoses (#13, #15, #23 & #25) towards the left wing and 2 (two) hoses (#17 & #18) towards the tail section. Hose #16 is an intermediate hose that also goes towards the tail section and ties into the system sequence valve.



Branches Located at the Front Wing Mount

STEP 40

Attach the hoses to the main frame using a double clamp arrangement as depicted below. Follow along the main frame underneath the front wing mount attaching the four hoses until you reach the hitch. Leave the clamps somewhat loose so that the hoses can be adjusted later.



Double Clamp Arrangement

STEP 41

Using a single clamp arrangement attach the hoses along the main frame and up the rear beam brace to the tail cylinder. There should be about 1 1/2 to 2 feet of slack on each line.

STEP 42

Using double clamps run the four lines along the front wing mount and on to the long wing brace. There should be downward sag of about 5” as the four hoses go past the wing hinge point. From here, two lines branch off to the main lift cylinder and the other two lines run along the wing back to the flip-over lift cylinder. Use the single clamp arrangement on the last two.

Hoses Passing the Hinge Point

STEP 43

Attach the hoses to the appropriate ports using the numbers on the hoses and the drawing at the start of this section.

STEP 44

<u>WARNING</u>: Hydraulic fittings are hand tightened only. Ensure all hydraulic fittings are tightened before charging system

Go over the system adjusting the hoses for slack and securing the hose clamps when the hoses seem to fir properly. Re-check the connections on all the cylinders.

STEP 45

Block all the cylinders up so the shafts will not interfere with anything as they are extended. Make sure **none** of the rod ends are attached at this time. The main lift cylinders have the lock lever attached to the rod ends. **DO NOT** attach the lock lever at this time.

STEP 46

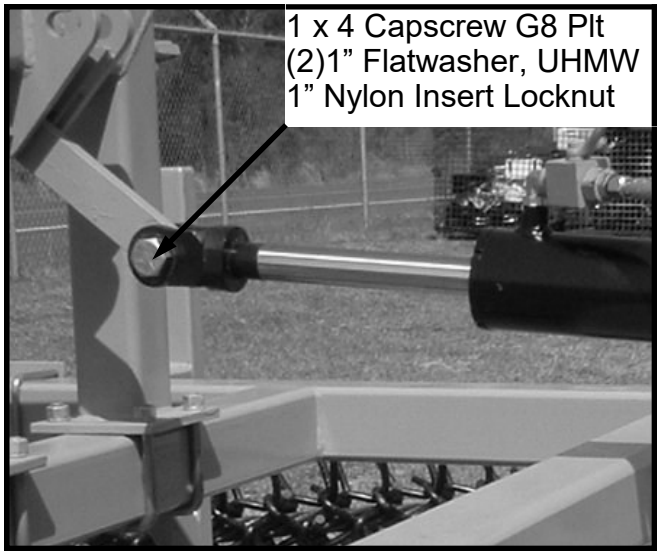
The hydraulic system must now be charged and the air purged from the system. Connect the 4 (four) hoses at the hitch to your tractor.

<u>ATTENTION</u>: Ensure that the tractor’s hydraulic system is full at this time. Check regularly during the charging process so that the level does not drop too low.

Starting with the flip-over circuit, begin forcing hydraulic oil into the lines. You will need to extend and retract the cylinders several times to purge all the air from the system. Repeat the process with the three cylinders on the main wings and tail. The last cylinder to be purged should be the tail cylinder as it is controlled by a valve. Make sure it is fully extending before you finish charging the system. Leave all the cylinders fully extended at this time so that they can be connected.

STEP 47

Attach the rod end of the tail cylinder to the tail lever hanging from the tail top bridge. Use a 1” x 4” bolt, 2 (two) 1” plastic washers, and a nylon insert lock nut. Again, **DO NOT** over-tighten the lock nut, as this must be a free moving hinged connection.



Rod End Connection of Tail Cylinder

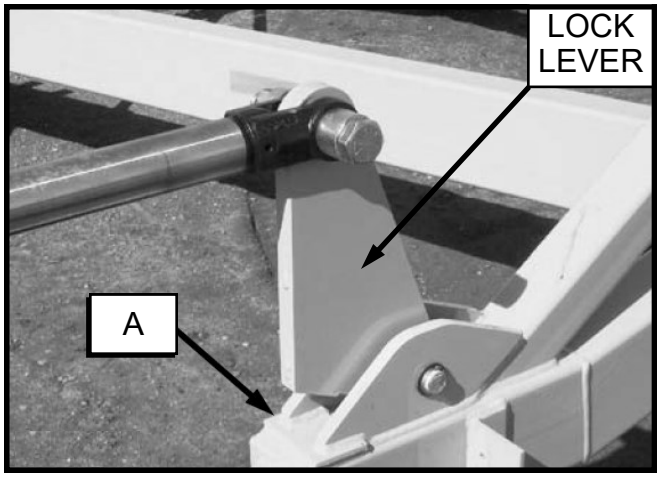
STEP 48

Attach the rod ends of the flip-over cylinders to the flip-over using a 1” x 5 1/2” plated pin, a 1” SAE flatwasher and a 1/4” x 1 1/2 roll pin.

Rod End Connection of Flip-Over Cylinder

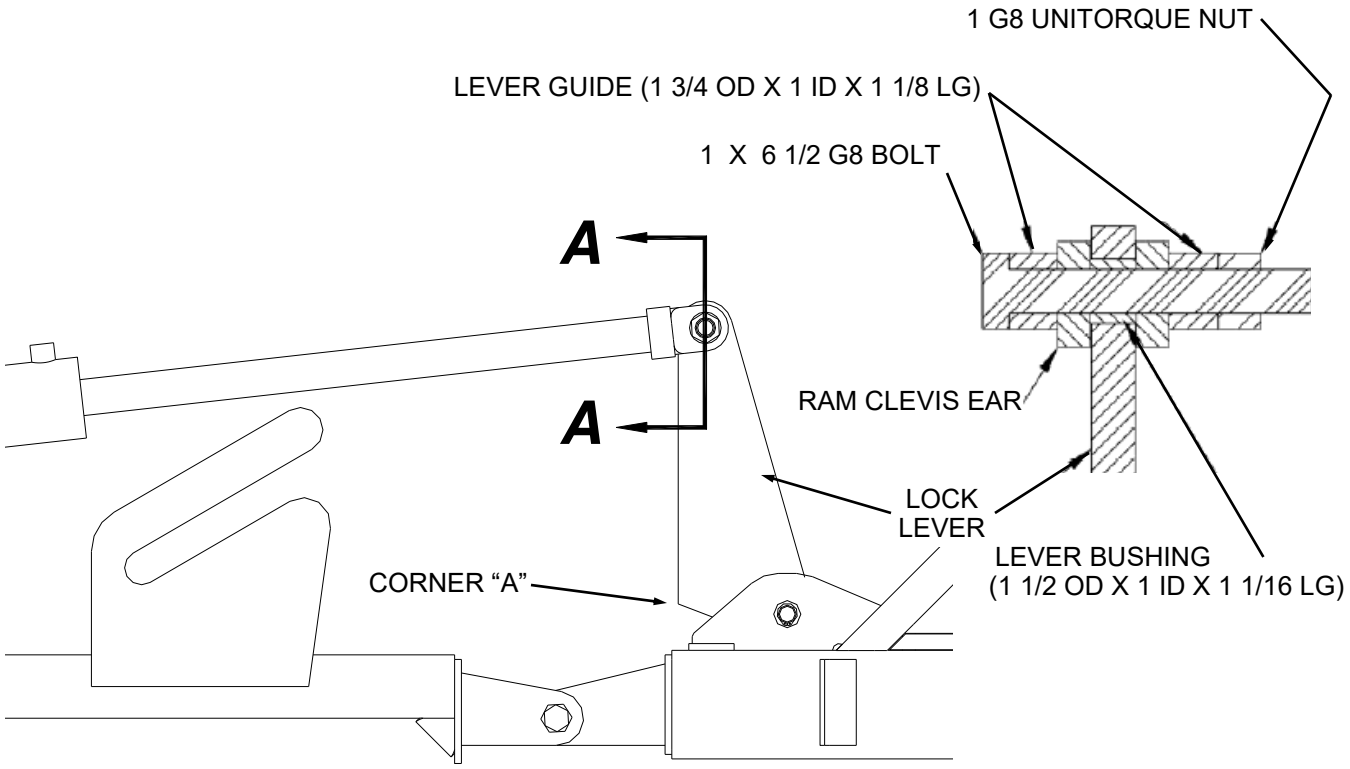
STEP 49

On each side of the front wing mount, attach a lock lever. **Be sure the lock lever is oriented with "Corner A", indicated below, facing the base end of the hydraulic cylinder. Failure to orient the lock lever properly will result in damage.** Place a 1" x 3 1/2" useable length grooved pin through the two tabs and machinery bushing near end of the front wing mount and through the pipe welded to the bottom of the lock lever. Secure with a 1" snap ring and machined bushing on either side of the lugs.



Lock Lever Installation

Attach the rod end of the main lift cylinder to the front lock lever. This connection is depicted below. Tighten the bolt securely to ensure this connection stays in place. Torque to 350 ft lbs.



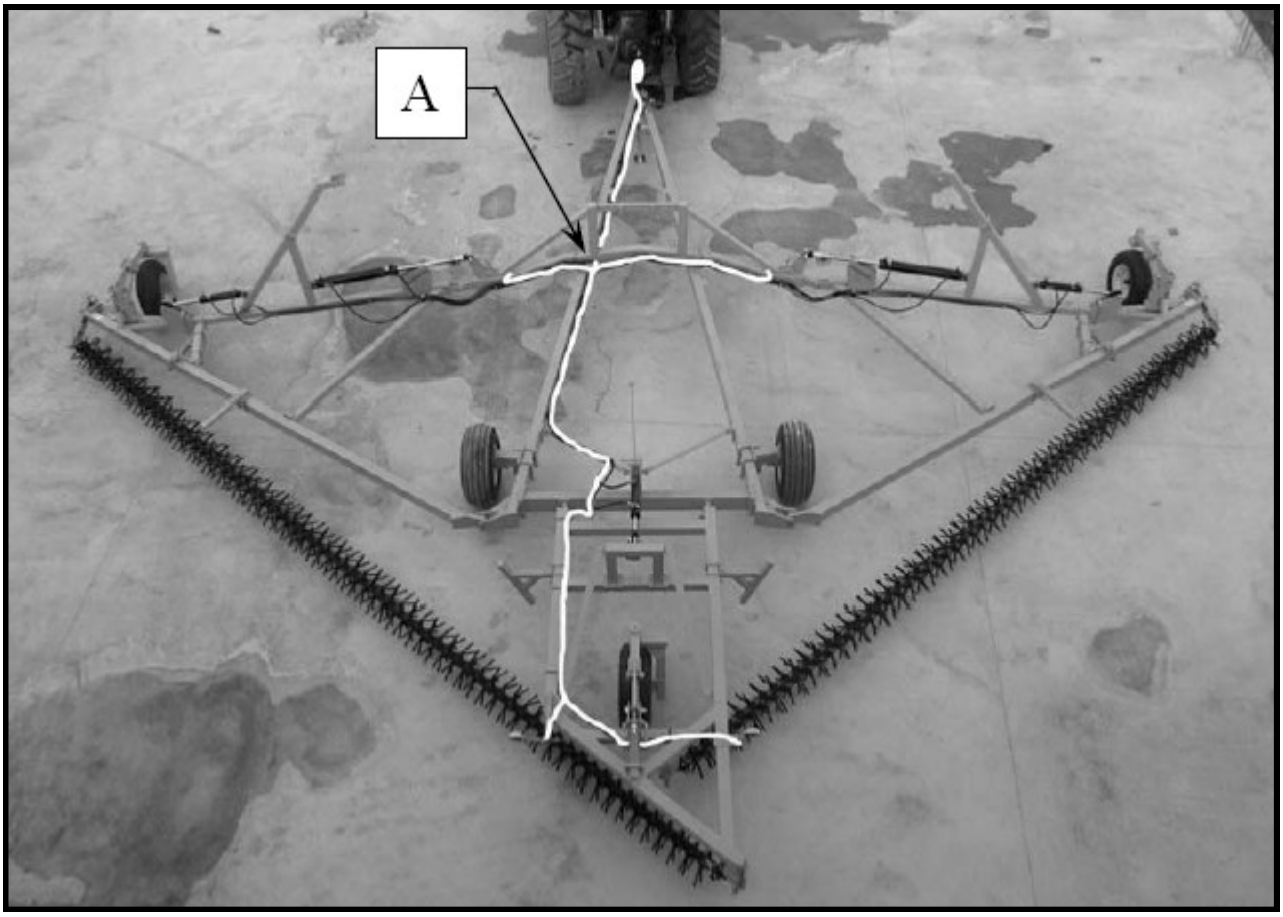
Main Cylinder Rod End Connection

2.7 WIRING HARNESS

WARNING: Place harrow into field position before laying out wiring harness. Failure to do so could result in injury or death.

STEP 50

The electrical wiring harness (Item #1) installed onto the harrow is shown in white in photo “Wiring Harness Routing”. The majority of the wiring harness is installed along side of the hydraulic hoses. Where possible, tuck the wiring in behind the hoses. Start by roughly laying out the wiring harness as shown in photo “Wiring Harness Routing”. The harness is strapped to the harrow using the supplied black nylon tie straps at approximately the same locations as the hydraulic hose clamps. There are some specific instructions on routing the harness through particular areas, which will be explained, in the next few steps.



Wiring Harness Routing

ITEM	PART NUMBER	DESCRIPTION	QTY
1	05-51065-02	WIRING HARNESS	1
2	02-050-088	BLACK NYLON TIE STRAP	30

STEP 51

Start strapping the wiring harness to the harrow at point (A) shown in photo “Wiring Harness Routing”. Starting at this point will ensure that the harness will reach all the required areas of the harrow. The section of the harness that goes toward the hitch of the harrow is to be routed under the front wing mount as shown in photo “Routing Under Front Wing Mount”. The two other sections of the harness are to be routed above the left and right main beams following the hydraulic hoses toward the two extremity lights, which will be installed in later steps. The remaining section of the harness is to run along side the hydraulic hose going to the tail section of the harrow. See photo “Routing Along Hydraulic Lines”.

Harness Routed Under Front Wing Mount

Routing Along Hydraulic Lines

STEP 52

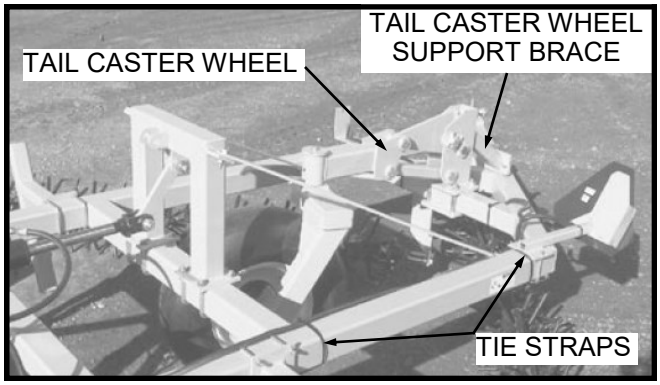
The sections of the harness that go to the extremity lights are routed along the hydraulic hoses to the location of the extremity lights and through the front wing mount as shown in photo “Extremity Light Harness Routing”. Left and right routings are the same. The harness and extremity light electrical connectors can now be connected. Be sure to lock the connector in place to ensure a seal.

Extremity Light Harness Routing

STEP 53

The section of the harness that continues to the rear taillights is to run across the rear left beam brace and along the left side of the tail frame. The harness is run over the top of all tail section members. See photo “Routing on Tail Frame”.

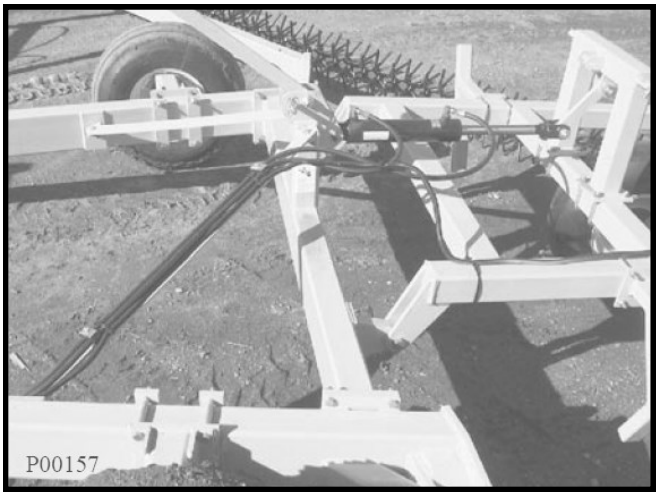
Before laying out the harness, ensure that the tail section is in field position. Leave a small amount of slack in the harness at the pivot point of the main beam and tail frame. This is to prevent stretching of the wiring harness when the tail section is put in and taken out of field position. See photo “Slack in Wiring Harness”. Run the longer section of the wiring harness between the tail caster wheel assembly and the tail caster wheel assembly support brace to the right taillights as shown in photo, “Routing On Tail Frame”.



Routing on Tail Frame

STEP 54

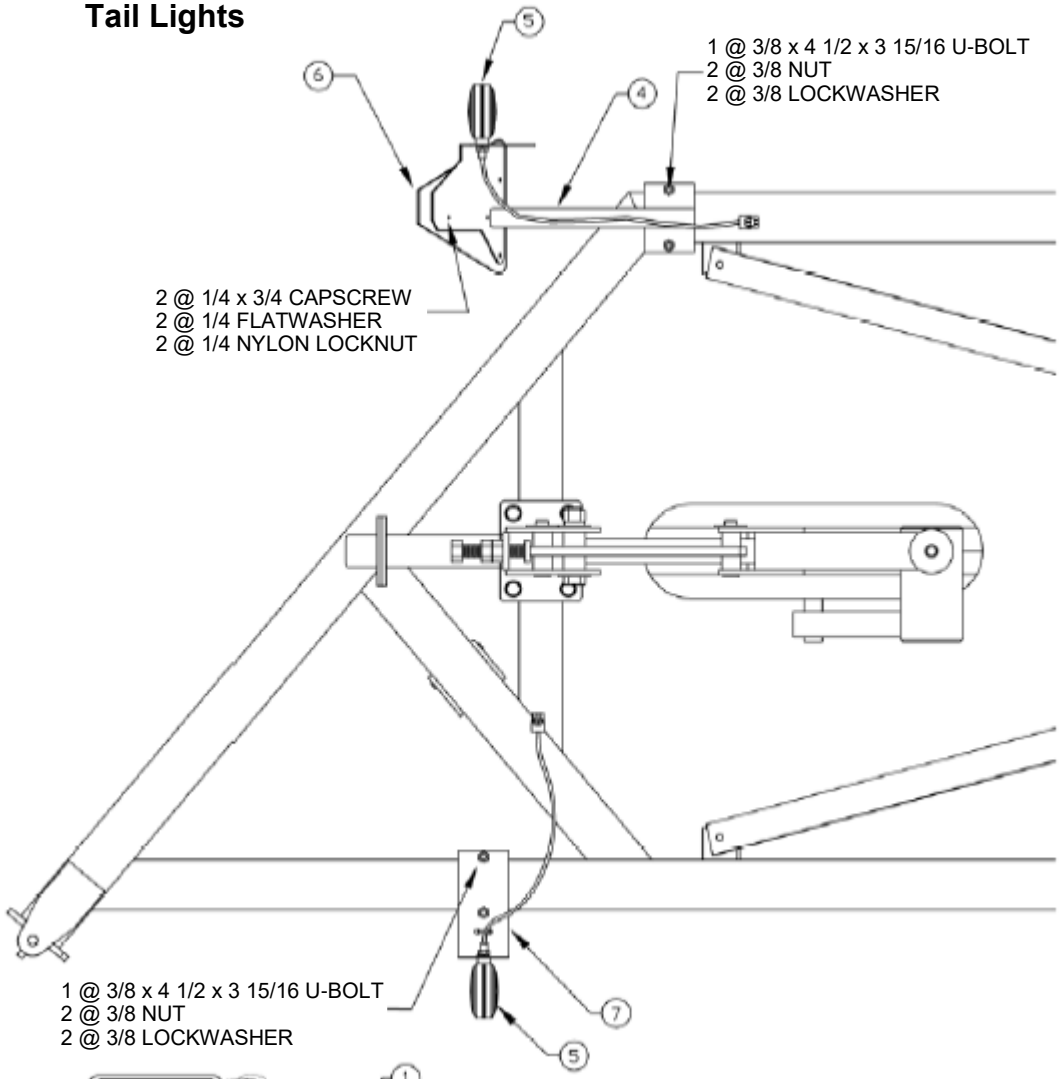
Now that the wiring harness is laid out as explained above, the supplied tie straps (#2) can be attached. The straps are to be positioned approximately at the same locations as the hydraulic hose clamps and as seen fit. There is to be no sag or slack in the harness except for the main beam and tail frame pivot frame point.

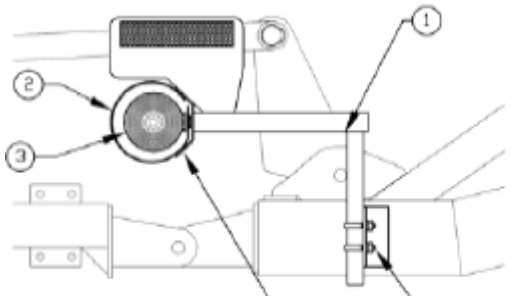


Slack in Wiring Harness

2.8 LIGHTS

Tail Lights





Extremity Lights

3 @ 1/4 x 3/4 CAPSCREW
3 @ 1/4 FLATWASHER
3 @ 1/4 NYLON LOCKNUT

2 @ 5/16 x 2 3/16 x 1 11/16 U-BOLT
4 @ 5/16 UNITORQUE NUT
4 @ 5/16 LOCKWASHER

ITEM	PART NUMBER	DESCRIPTION	QTY
1	07-51072-01	EXTREMITY LIGHT BRACKET, HARROW	2
2	07-10068-00	EXTREMITY LIGHT SHIELD	2
3	07-10058-00	LAMP AND WIRE ASSEMBLY	2
4	05-51066-01	TAIL LIGHT SMV SIGN MOUNT	1
5	05-51064-01	RED TAIL LIGHT ASSEMLBY	2
6	03-050-068	WARNING SIGN, SMV	1
7	30-90376-40	RIGHT TAIL LIGHT MOUNT	1

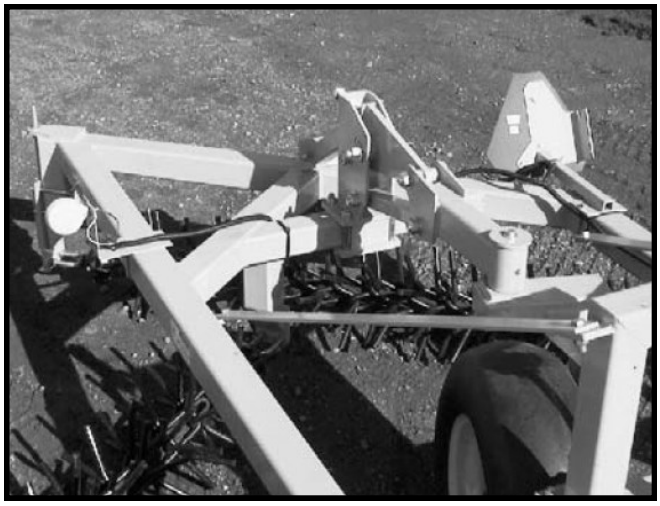
STEP 55

The two extremity lights, (each consisting of items #1, #2, & #3) are now to be installed. Attach the extremity lights with the supplied 5/16” x 1 11/16” x 2 3/16” U-bolts, and nuts. The extremity light is to extend outward. See photo “Extremity Light” for proper orientation.

Extremity Light

STEP 56

Install the left taillight (items #4, #5, & #6) using the 3/8” x 4 7/16” x 4 3/4” U-bolt, lockwashers and nuts. Position and fasten the light approximately as shown in photo “Tail Lights”. Orient the light so that when the tail is lifted it will be square to the rear.



Tail Lights

STEP 57

Install the right taillight (items #5 & #7) using the 3/8” x 4 7/16” x 4 3/4” U-bolt, lockwashers, and nuts. Position the right tail light in line with the left taillight and fasten. See assembly illustration and photo “Tail Lights”.

SECTION 3 - OPERATIONS

3.1 TOOLING TENSIONING

It is impossible to keep the harrow tool assemblies perfectly straight during field use. In fact, over-tightening the tools may cause premature bearing failure or damage the frame. However, if left too loose the tool assembly will not do its job properly and the individual tools may rub against each other and wear out prematurely.

The recommended tool tension guideline is:

a) When the machine is stationary, take the 1 1/2" wrench that's supplied with the unit and hook it onto the middle of the tooling assembly. Using the wrench as a lever, pull the tooling rearward approximately 4" and, if it springs back to the original centerline, the tools are tensioned correctly.
b) During operation, rearward sag of no more than 12" from the original centerline should be observed.

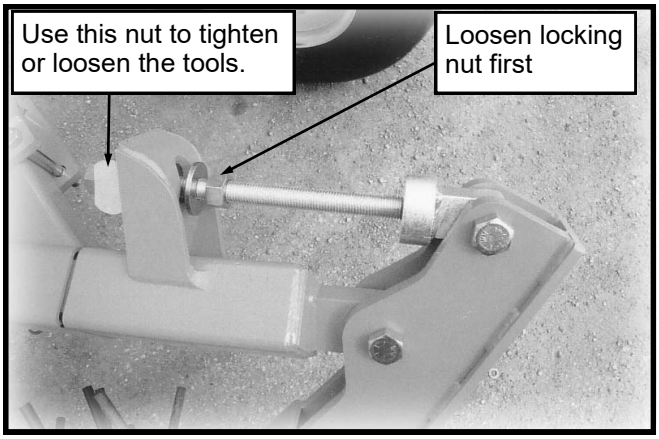
The tension is adjusted using the tool tension lever and the tool tension rod. These are located at the end of the wing. A 1 1/2" wrench has been supplied which will perform most of the adjustments on the machine. It is located on the inside of the middle frame beam.

NOTE: It is expected that, under normal operating conditions, the tooling assemblies will stretch. If the tool tension rod does not allow for any further adjustment, the operator can remove tools to achieve the desired tension. Tools must be removed in pairs (2 tools). Each pair will reduce the length of the tool assembly by approximately 2".

A feature on 2007 and newer models is a telescoping tool lever. This will reduce the need to remove tooling pairs as described in this section.

Adjustment Procedures:

a) Using the 1 1/2" wrench, loosen the 1" locking nut located on the tool tension rod. The locking nut will be the nut closest to the tool lever.
b) Tighten or loosen the other 1" nut to apply more or less tension to the tools. Use the guide above for tool tension.
c) Re-tighten the 1" locking nut.



Tightening the Tools

3.2 TOOL REMOVAL/REPLACEMENT

NOTE: There are Left Hand (LH) and Right Hand (RH) tools. For the harrow tool assemblies to function properly, the tools must be installed correctly. The repeating pattern of 4 LH tools followed by 4 RH tools must be maintained.

NOTE: Prior to tool removal, it is recommended to wire together the last pair of tools that are NOT being removed. This will assist in maintaining the required tooling pattern.

a) Loosen the 1" locking nut located on the tool tension rod. The locking nut will be the nut closest to the tool lever.
b) Loosen the other nut to reduce tool tension.
c) Remove the set aside the U-bolt and 3/4" nuts holding the tool bearing housing to the tool lever.
d) Remove the 5/8" unitorque nuts on the 2

U-bolts. This will free the tools from the bearing housing.

e) Remove and separate the left and right tools until the damaged tools are reached, or the desired length is achieved.

3.3 TOOL INSTALLATION

a) Re-install the length of tools, maintaining the pattern as outlined above.
b) Using the 2 U-bolts and unitorque nuts, attach the last set of tooling to the bearing housing.
c) Using the U-bolt and 3/4" nuts, attach the shaft of the bearing housing to the tool lever.
d) Loosen the 1" locking nut located on the tool tension rod.
e) Tighten or loosen the other 1" nut to apply more or less tension to the tools.
f) Re-tighten the 1" locking nut.

3.4 CONNECTING THE HARROW TO THE TRACTOR

A clevis style bolt-on cast hitch is standard equipment on the harrow. The clevis portion can be removed only if your tractor is equipped with a double tongue on the drawbar. If your tractor has a single tongue, you will need the clevis style double tongue arrangement.

ATTENTION: Either the tractor hitch or the harrow MUST have a double clevis arrangement. During wing folding, there will temporarily be negative weight on the hitch!

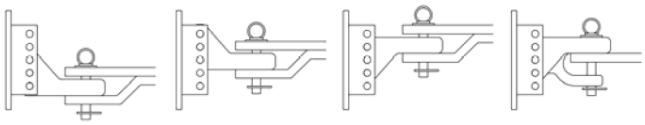
The cast hitch is held on using two (2) 1" G8 bolts. The cast hitch can be adjusted so that the harrow frame will be level. **It is important to get the harrow frame as level as possible so that proper depth control can be achieved.**

To adjust height:

a) Remove the 1" bolts holding the cast to the hitch plate.
b) Move the cast hitch up or down to a location on the hitch plate where the frame will be level.
c) Re-bolt the cast hitch in place.

With a single tongue cast hitch, the hitch can also be inverted to achieve more height combinations. With the double clevis arrangement, the large part of the casting must be on top and sit on top of the tractor drawbar.

Some examples of correct and incorrect hitching are shown below:



CORRECT HITCHING METHODS

INCORRECT HITCHING METHODS

3.5 HYDRAULIC FUNCTION TESTING

There are four hydraulic lines on the harrow that must be connected to your tractor hydraulics. Two of these lines are for activating the flip-over wings

Once you have determined which lines control which set of cylinders, connect the matching pair of hoses to the hydraulic hookups on your tractor (you will require two hydraulic control to operate the cylinders for the harrow). Make sure that the quick coupler ends are clean to prevent contamination of your hydraulic system.

When storing the hydraulic lines, there is a keyhole hose holder on the left main frame.

ATTENTION: Before activating any of the hydraulics, ensure that all locking devices have been removed and placed in the storage position.

The harrow has five folding sections and five cylinders controlling them. Because of this high number of sections, the harrow uses two separate hydraulic circuits to move the unit in and out of transport. **The operator must activate the circuits in the right order** to achieve successful folding and unfolding!

ATTENTION: Read this section very carefully! The responsibility is on the operator that the harrow hydraulics be operated in the correct order!

One circuit controls the three cylinders on the main wings and the tail. These three cylinders must activate in the correct order so that the harrow wings up and down properly. Within this circuit, a sequencing valve is used to control the timing of these cylinders.

The other circuit controls the flip-over wing tips.

NOTE: It is important that the two circuits are activated in the correct order! The correct sequence of events is as follows:

WING UP

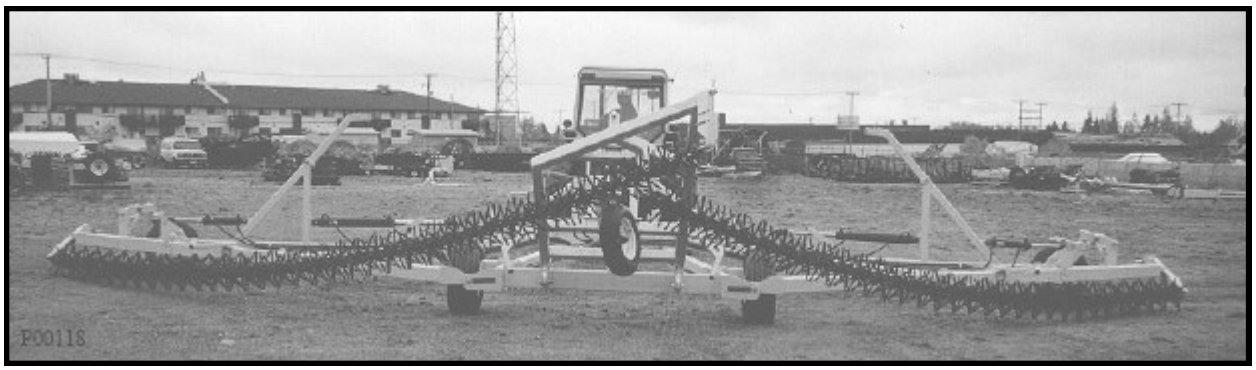
1. Using the hydraulic control for the main wing and tail, the tail section goes up completely and comes to a stop.
2. Using the same hydraulic control, the right and left wing raise together and come to rest on the transport locks.
3. Using the hydraulic control for the flip-over wings, the end sections flip over.

NOTE: The tooling chain should be lying completely to the outside of the machine.

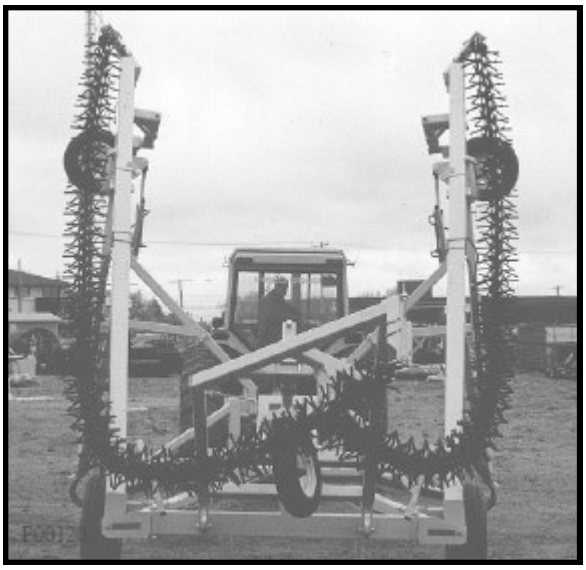
WING DOWN

1. Using the hydraulic control for the flip-over wings, the end section flip up.
2. Using the main wing/tail hydraulic control, the right and left wings go down together.
3. Using the same hydraulic control, the tail section goes down last. The sequencing valve will allow the wings to go down first.

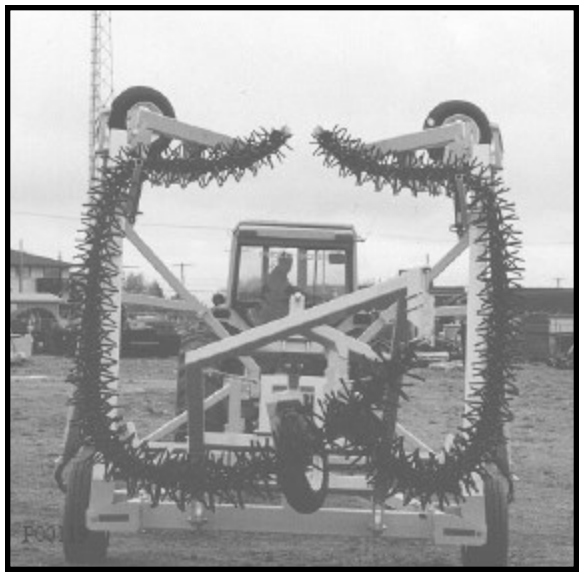
The photos below illustrate the folding/unfolding of the harrow wings. They are placed in order, for folding up. Reverse the order for folding down.



Tail Goes Up



Main Wings Go Up Together (Slowly)



Flip-Overs Fold in Together (Slowly)

If these functions do not happen in the prescribed order, it is possible to damage your harrow. Three likely things could cause this sequence to not operate in the correct order;

1. Sequence valve setting is not correct.
2. Restrictor not performing.
3. Operator error in activating the two circuits in the correct order.

It may be necessary to adjust the hydraulic valves, check the orifices or re-examine the order of activating the two circuits. Some common problems and their solutions follow:

PROBLEM 1: Tail Goes Down Before Wing

The most common occurrence is for the tail section to go down before the wings are down. This is usually a problem with the setting or installation of the sequence valve. The sequence valve is marked with model number RV2-10-5-8T-35 and is located on the left main frame beam, behind the front wing mount. This valve has an adjustable pressure activation setting, which will hold the weight of the tail until the system pressure overcomes the setting.

a) Check that the port on the valve opposite to the stem is connected to the hose going to the tail cylinder.
b) If the valve is improperly installed, lower the unit as well as possible to the ground, make sure all the pressure is off the hydraulics and re-install the valve in the correct position.

To increase the holding power of this valve:

a) First, loosen the locking nut on the top of the valve.
b) Next, take a hex socket wrench and tighten the stem of the valve, in, a revolution or so.
c) Re-tighten the locking nut and try the hydraulics again.

PROBLEM 2: The Tail and/or Wings Will Not Go Down

Another common problem is when the tail or the wings will not go down. There are two possible causes. The first and most obvious is that the locking mechanisms have not been removed.

a) Check the tail and make sure that the bar that locks the tail section to the rear beam has been disconnected from the tail and has been swung all the way forward and locked down with the locking pin. If you cannot remove the pin easily, activate the hydraulics to take any weight off the bar.
b) Check the pin locks at the top of the front wing mount. Make sure that they are not pinning the wing down and that they have been placed in their storage pipes.

The other possibility is that the sequence valve was over tightened either at the factory or by trying to correct Problem 1.

a) First, loose the locking nut on the top of the valve.
b) Next, take a hex socket wrench and loosen the stem of the valve, out, a revolution or so.
c) Re-tighten the locking nut and try the hydraulics again.
d) Repeat as required.

If neither of these solutions help, check for any other obstructions, which could be binding the sections. Check the tools to make sure they have not become bound. Check the tractor hydraulic pressure. You will require about 2000 PSI to fully put the unit from transport to field position.

PROBLEM 3: The Main Wings Do Not Go Up and Down Together/Descend Too Fast

The harrow uses a pair of matching orifices on the main lift cylinders to cause the main wings to go up and down together and to slow the descent of the wings. If these have been inadvertently removed or not installed, the wings will not go up and down together and will descend rapidly. Check the parts catalog for location of these orifices.

PROBLEM 4: The Harrow Tooling Seems To Bind or Go Over onto the Wings.

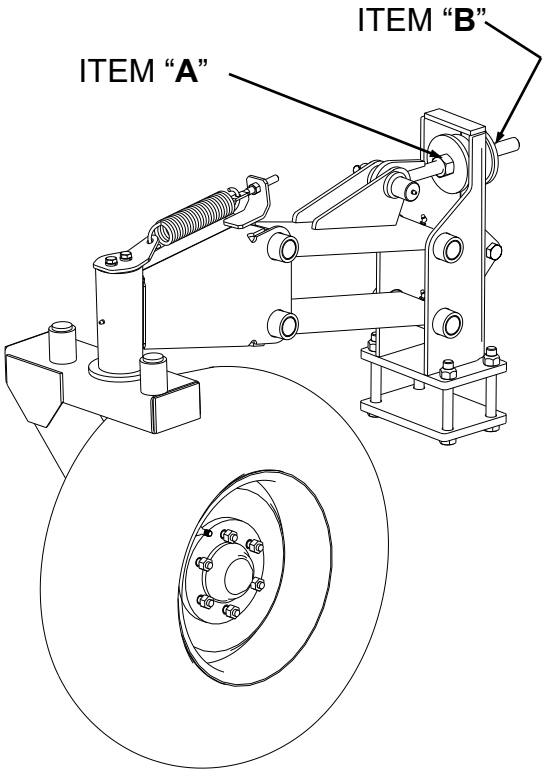
If the operator does not activate the hydraulic controls in the order stated above, the tools will not end up in the right places on the machine. Six tool catchers on the machine keep tools to the outside of the machine and prevent serious damage to the tool and the frame. These only work if the hydraulics is activated correctly. If you feel that you have activated the controls correctly and the problem persists, check the location of the tool catchers as outlined in the set-up instructions and the parts catalog.

3.6 TOOL ASSEMBLY BEARING HEIGHT ADJUSTMENT

There is provision to adjust the height of each tool assembly bearing.

A) Wing Caster Adjustment for Front of Tooling Assembly

It is desirable to slightly raise the front bearings above the natural centerline of the tool assemblies. This will feather out any ridge that would normally be caused by tool action. Ideally, you would like the first couple of tines just into the ground depending on field conditions. The adjustment is made by adjusting the height of the caster wheels.



Wing Caster Height Adjustment

The caster wheel height is adjusted as follows:

a) Using the 1 1/2" wrench loosen item **A**.

b) Using the 1 1/2" wrench turn item **B** so that the wheel moves up or down as desired.

c) Re-tighten item **A**.

B) Tail Bearing Assembly Height Adjustment

The rear bearing assemblies have two means of height adjustment. The entire tail section can be adjusted up or down to change the height of both bearing assemblies and the rear most bearing can be further adjusted. The height of both bearings should be adjusted so that their centers are on the natural centerline of the tool assemblies.

It is recommended that the height of the front most of the rear bearings be adjusted first with the tail caster wheel. The rear most bearing is then given its final adjustment using the rear adjust assembly at the rear of the tail.

The tail section can be adjusted as follows:

a) Adjust the tail caster wheel so that the forward most of the bearing housings is on its natural center-line. Use the same procedure for adjustment as the wing caster wheel in Section 3.4.

b) The rear bearing height is adjusted using the rear adjust. Using a 15/16” wrench, loosen the two U-bolts, which attach the rear adjust to the rear of the tail.

c) Using 1 1/8” wrench, loosen one of the nuts securing the threaded rod portion of the rear adjust to the tail. If you want to move the bearing housing up, loosen the lower nut and if you want to lower the bearing housing, loosen the top nut.

Rear Bearing Housing Height Adjustment

d) Turn the remaining nut to either raise or lower the tool section.

e) Re-tighten all the nuts.

3.7 LUBRICATION

There are 15 grease points on the harrow. Before initial use, make sure these points are supplied with grease. The points are as follows:

Left Wing Hinge (2)
Right Wing Hinge (2)
Tail Section Hinge (2)
Tool Tightening Levers (2)
Caster Wheels (3)
Tool Bearing Housings (4)

Refer to the Maintenance/Lubrication section for the grease schedule and additional information for these grease points.

3.8 TIRE INFLATION

It is important that the inflation of all tires be set properly for maximum safety and performance. Use the following guide to adjust the inflation pressure in the tires to match the application of the machine.

COLD INFLATION PRESSURE VALVES IN PSI

TIRE SIZE	TRANSPORT	FIELD USE	FIELD USE WITH GRANULAR APPLICATOR	TRANSPORT WITH GRANULAR APPLICATOR
12.5L X 15 (F-PLY) (Main Wheels)	65 PSI MIN.	35 PSI MIN.	45 PSI MIN.	80 PSI MIN.
11L x 15 (Caster Wheels)	N/A	20 PSI MIN. 22 PSI MAX.	20 PSI MIN. 22 PSI MAX.	N/A

3.9 FINAL INSPECTION

Before operating the machine or testing the wing up of the machine, you should run through the Pre-Operating Set-up in the Operators Manual. You should also:

1. Go over all the connections on the machine and make sure that they are tightened as required.
2. Check that there is not interference or potential interference between any moving parts.
3. Ensure that all grease fittings have been lubricated (See the Maintenance/Lubrication Section of the Operators Manual).
4. Ensure that there are no leaks in any of the hydraulic fittings.
5. Ensure that the tooling is tightened as required. (See "Tool Tensioning" in this manual).
6. Ensure that the tires are inflated as required. (See "Tire Inflation" in this manual).
7. Ensure that the hitch connection is the proper one for your tractor hitch (single or double). There will be negative load on the tractor hitch briefly as it is being winged up. There must be a clevis arrangement either on the tractor hitch or on the harrow hitch. Use a hitch pin appropriate to the tractor.
8. Before operating the hydraulics, make sure that all the locking pins holding the wings and the tail are removed from the locking positions.

The following is a list of serial numbers issued to our machines at the beginning of each year. To determine when a unit was made, find the range within which the particular serial number falls. It would have been produced between January 1 to Decem-

YEAR	SERIAL NUMBERS
2007	76369-76368
2008	77884-79891
2009	79892-80944
2010	80945-81775
2011	81776-83453
2012	83454-85092
2013	85093-86418
2014	86419-87790
2015	87791-89096
2016	89097-90089
2017	90090-

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