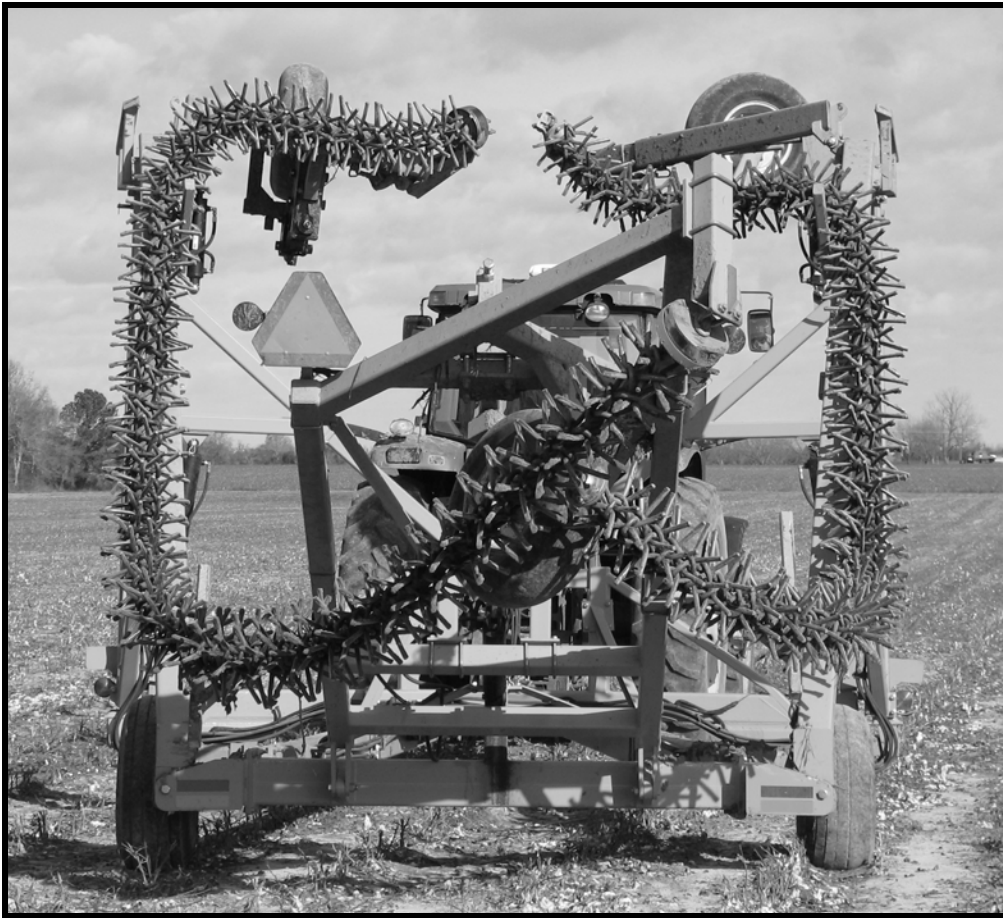


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45' Rotary Harrow



TO THE PURCHASER

This **KMC Phillips Rotary Harrow** has been carefully designed and manufactured to give years of dependable service. In order to operate the Harrow efficiently and maintain it properly, please read the instructions within this manual thoroughly.

While reading the manual you will notice that it is divided into sections which clearly explain the assembly and operation of each component of this machine. A Table of Contents is also provided for quick reference to these sections.

Some components of this machine are labeled left or right. The notations are determined facing the direction the machine will travel in use.



This safety alert symbol is used throughout this manual to identify safety messages. When you see this symbol, read the message which follows as it will advise you of possible injury.

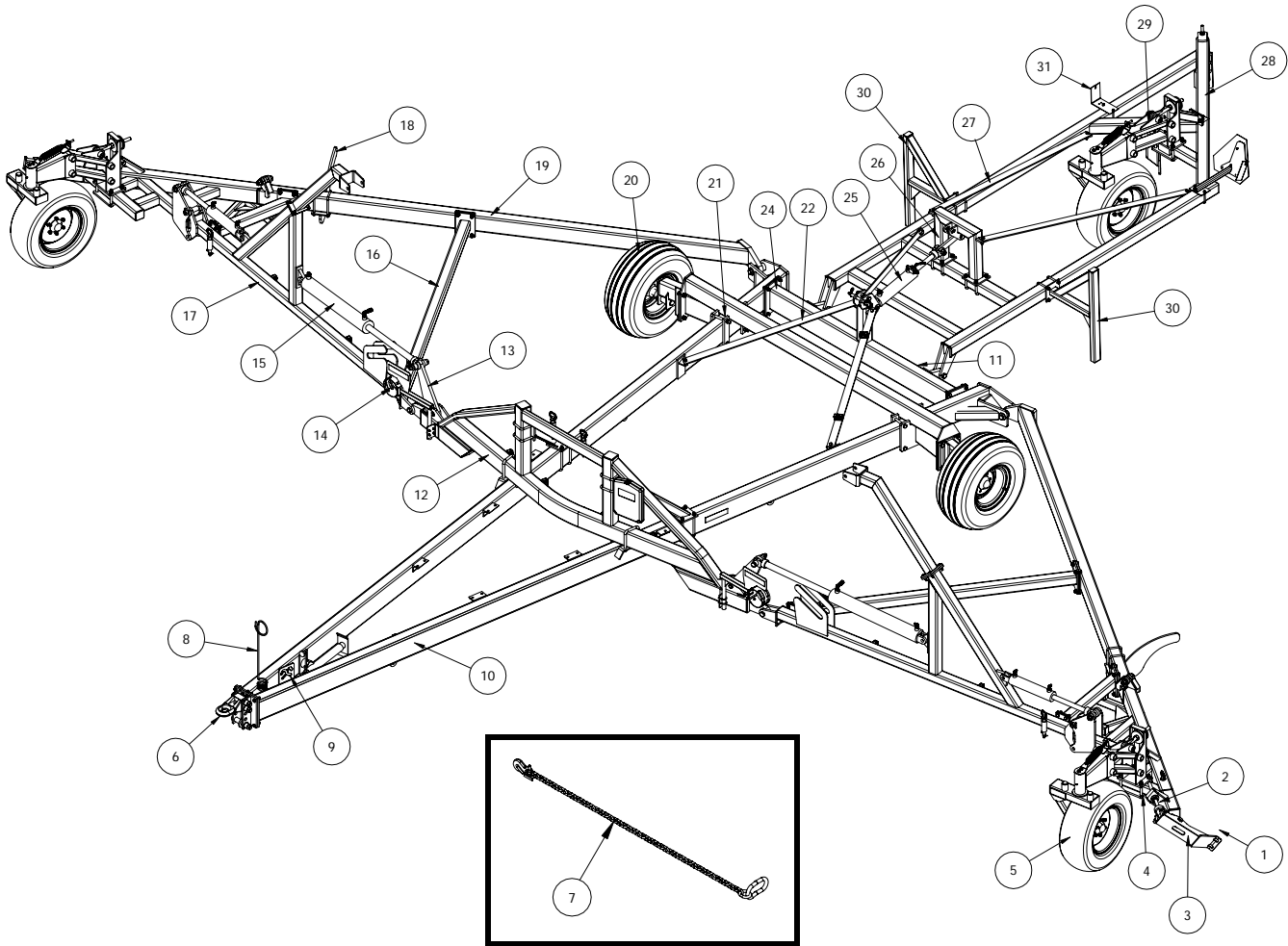
Retail Customers Responsibility Under The KMC Warranty

The retail customer's responsibilities are:

1. To read the Operator's Manual and operate the **KMC Phillips Rotary Harrow** in accordance with instructions given in the manual.
2. To inspect the **KMC Phillips Rotary Harrow** daily, lubricate as specified and repair or replace parts as needed, especially when continued use would cause damage or excess wear to other parts.
3. To maintain and keep in place all safety shields and devices.
4. When Warranty Service is necessary, it is the customer's responsibility to deliver the machine to the KMC dealer from which it was purchased, Warranty repairs should be submitted to the dealer within **thirty (30)** days of failure.
5. Dealer travel to the machine or hauling the machine to his shop for the purpose of performing warranty service is not allowed under KMC warranty. It is a cost to be paid for by the retail customer. Any arrangement whereby the dealer agrees to absorb all or part of this cost is strictly between the dealer and retail customer.

45' Rotary Harrow

PHILLIPS 4505 ROTARY HARROW PART REFERENCE



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

SECTION 1 - PRODUCT IDENTIFICATION

After reading this Operator's Manual, **Please** keep it for reference each season.

To insure procurement of the proper repair parts, please record your machine's Model Number, Serial Number and Purchase Date as shown below:

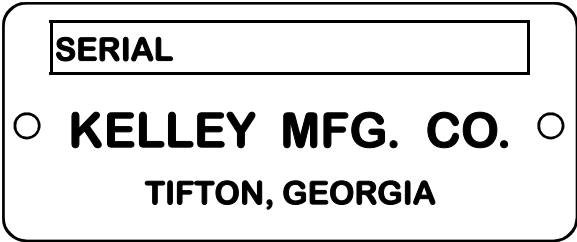
Model No. _____

Serial No. _____

Purchase Date _____



Harrow Serial Number Plate Location



SECTION 2 - SAFETY

2.1 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.

2.2 SAFETY DURING TRANSPORT

A) General

- Use the safety pins provided for securing the wings and the tail during transport. See 2.4 Harrow Safety Locks.
- 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.

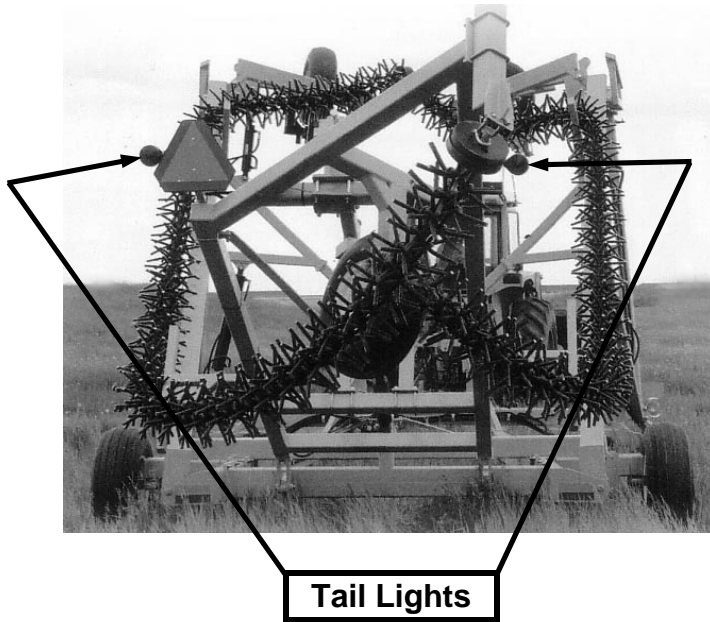
- Never transport the harrow over 80 km/hour (50 miles/hour).
- Be sure that your tow vehicle is properly equipped and is capable of pulling the harrow.
- Always take precautions near overhead electrical wires.

B) Extremity/Tail Lights



Extremity Lighting (Wing)

45' Rotary Harrow



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.

2.3 SAFETY DURING SERVICING

A) General

- Never, under any conditions, service harrow while tractor is running. Shut off tractor, set parking brake, and remove key first.
- Engage the wing and/or tail locks or lower the wings, flipovers and/or tail completely before servicing. See Section 2.4 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.
- When servicing, wear protective clothing and use personal safety devices when

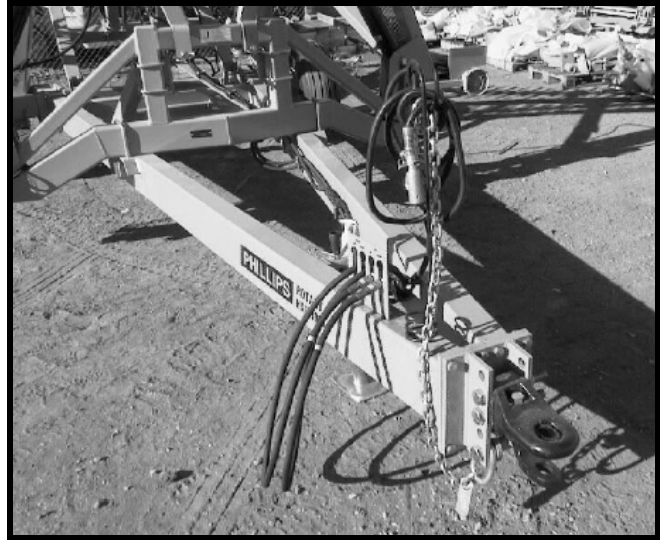
B) Tire Safety

- 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.

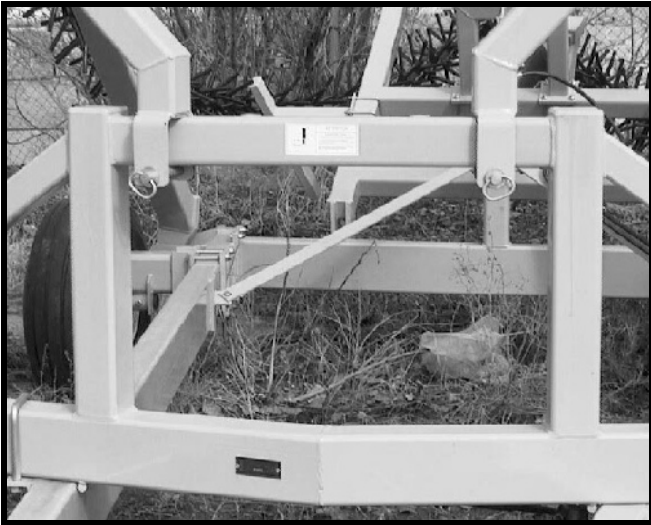
2.4 HARROW SAFETY LOCKS

The harrow is equipped with wing and tail section lock. These locks are to be used at all times when transporting the harrow. Refer to Section 3.2 for proper locking/unlocking procedures. 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:



Safety Chain



LH/RH Wing Lock

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

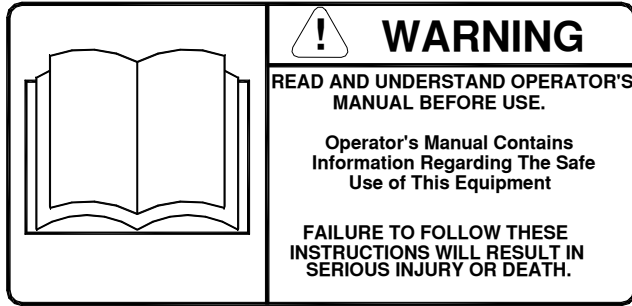


Safety Pin

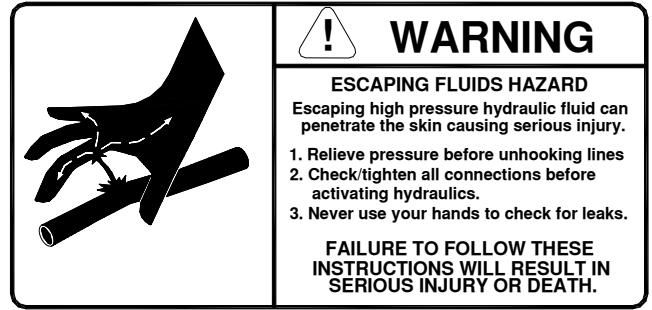
2.5 SAFETY INFORMATION/DECAL LOCATION

The types of Safety/Information Signs and locations on the harrow are shown in the illustration below. Good safety practice requires that you familiarize yourself with the various safety/Information Signs. Replacement part numbers are found in the Parts Catalog. Immediately replace all worn, damaged, peeling, or obscured decals.

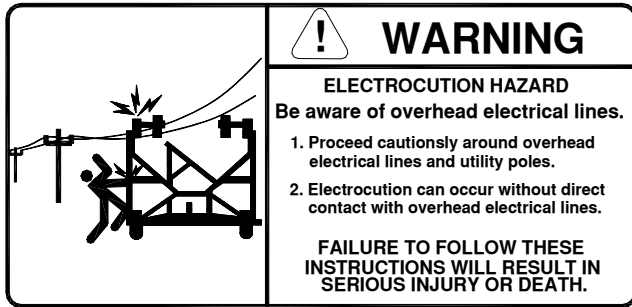
A) Part No. 31-11148-00



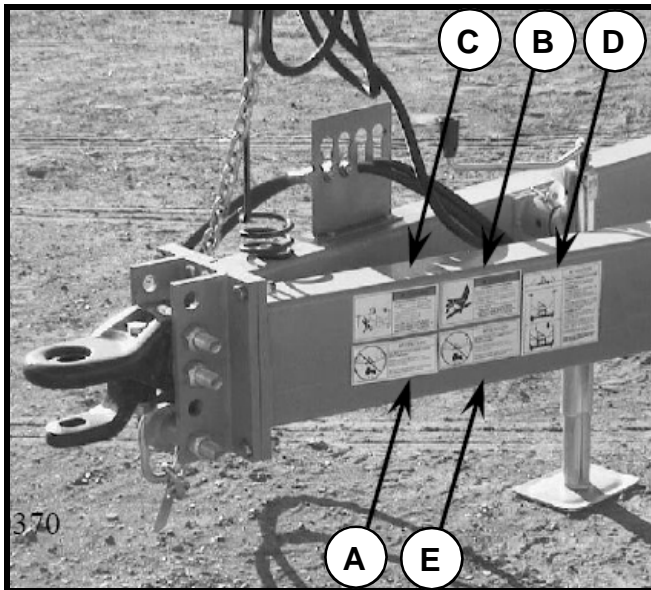
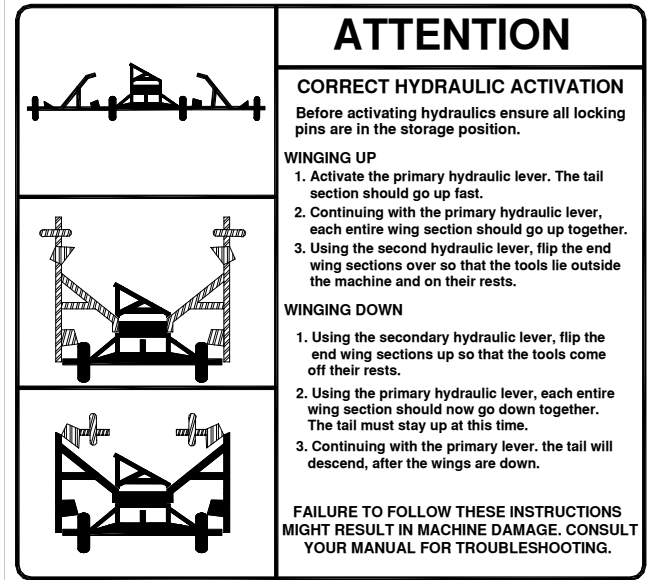
B) Part No. 31-11130-09



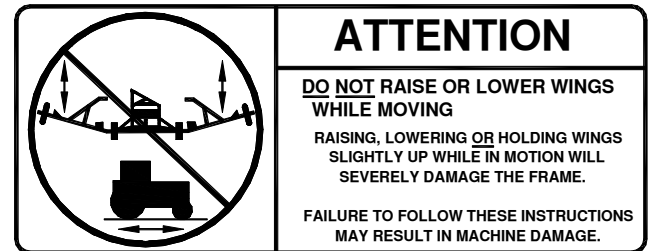
C) Part No. 31-11130-10



D) Part No. 31-11130-07



E) Part No. 31-11130-17



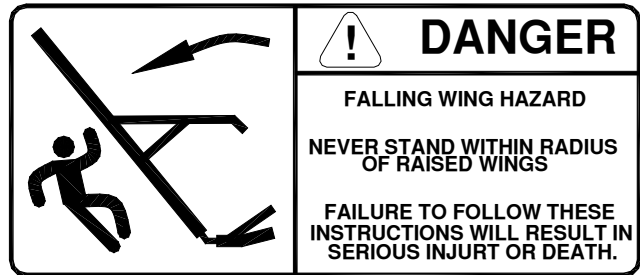
Decals located on main beam: Read Manual, Escaping Fluids, & Electrocution Hazard, Correct Hydraulic Activation, Do Not Raise or Lower In Motion.

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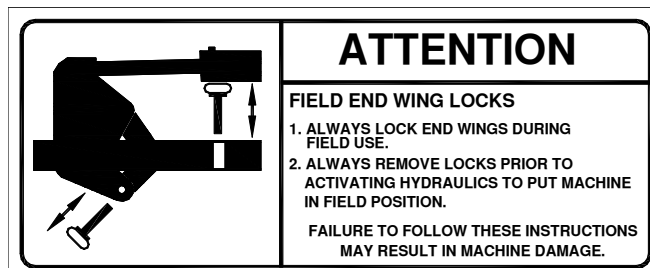
**Decals, Falling Wing Hazard
Located on Front Beam (Both Sides)**

F) Part No. 31-11130-09



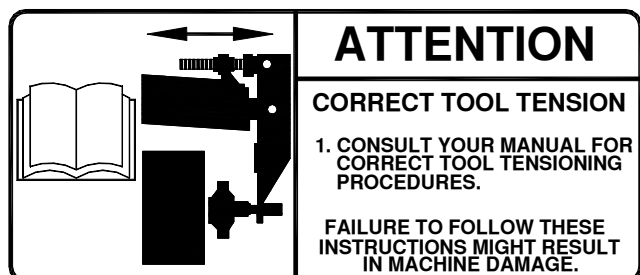
**Decals, Field End Wing Locks
Located By Flip Over (Both Sides)**

G) Part No. 31-11130-06

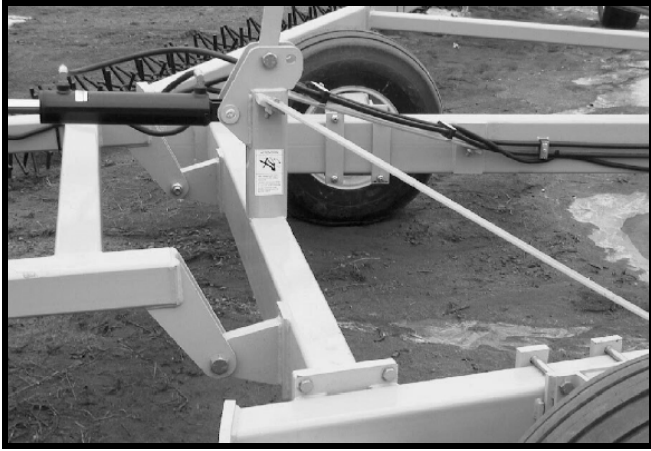


**Decals, Correct Tool Tension
Located on Wing (Both Sides)**

H) Part No. 31-11130-08

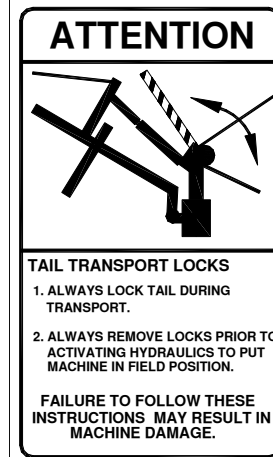


45' Rotary Harrow



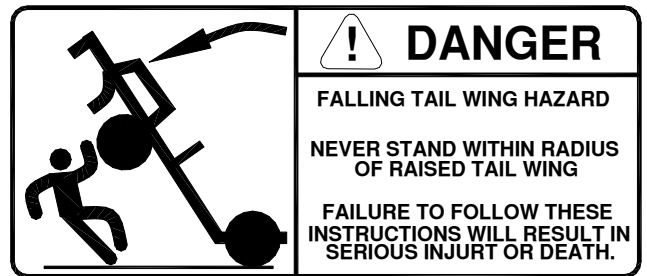
**Decals, Tail Transport Lock
Located Tail Hyd. Cyl. Support (Both Sides)**

I) Part No. 31-11130-05



**Decals, Falling Tail Wing Hazard
Located on Tail (Both Sides)**

J) Part No. 31-11130-02



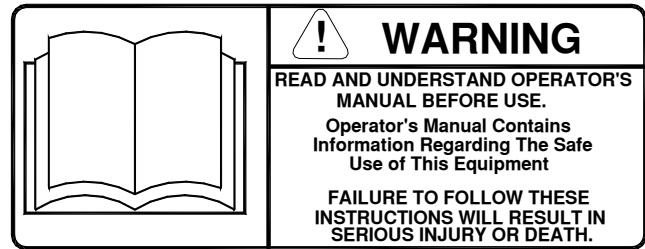
**Decals, Transport Locks
Located on Front Wing Mount**

K) Part No. 31-11130-04



45' Rotary Harrow

Part No. 31-11148-00



**Decals, Read Instruction Warning
Located on Document Holder
(Front Wing Mount)**

SECTION 3 - OPERATING INSTRUCTIONS

3.1 PRE-OPERATION SETUP

ATTENTION: It is of the utmost importance that the assembly of the harrow is in accordance with the setup instructions before proceeding.

3.1.1 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:

- 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
- 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".

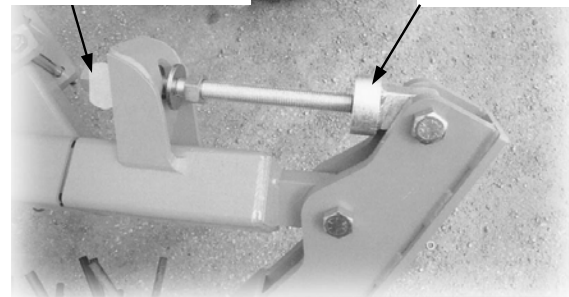
A feature on 2007 and newer models is a telescoping tool lever. This will reduce the need to remove tooling pairs as described in this section.

Adjustment Procedures:

- 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.
- Tighten or loosen the other 1" nut to apply more or less tension to the tools. Use the guide above for tool tension.
- Re-tighten the 1" locking nut.

Use this nut to tighten or loosen the tools.

Loosen locking nut first



3.1.2 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.

- Loosen the 1" locking nut located on the tool tension rod. The locking nut will be the nut closest to the tool lever.
- Loosen the other nut to reduce tool tension.
- Remove the set aside the U-bolt and 3/4" nuts holding the tool bearing housing to the tool lever.

45' Rotary Harrow

- 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.

3.1.3 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.

3.1.4 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.

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

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!

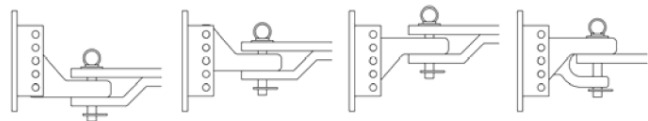
The cast hitch is held on using two (2) 1" G8 bolts. The cast hitch can be adjusted so that the harrow frame will be level. **It is important to get the harrow frame as level as possible so that proper depth control can be achieved.**

To adjust height:

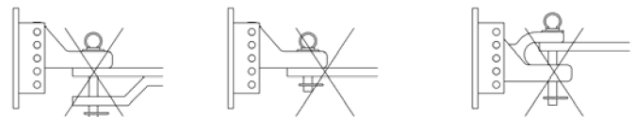
- a) Remove the 1" bolts holding the cast to the hitch plate.
- b) Move the cast hitch up or down to a location on the hitch plate where the frame will be level.
- c) Re-bolt the cast hitch in place.

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

3.1.5 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 main wings and tail. The other two are for activating the flip over wings.

Once you have determined which lines control which set of cylinders, connect the matching pairs of hose to the hydraulic hookup on your tractor (you will require 2 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. See Section 3.2 for unlocking procedure.

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!

45' Rotary Harrow

The correct sequence of events is as follows:

NOTE: At this point, the tooling chain should be lying completely to the outside of the machine.

WING UP

1. Using the hydraulic control for the main wings and tail, the tail section goes up completely and comes to a stop.
2. Using the same hydraulic control, the right and left wings 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.

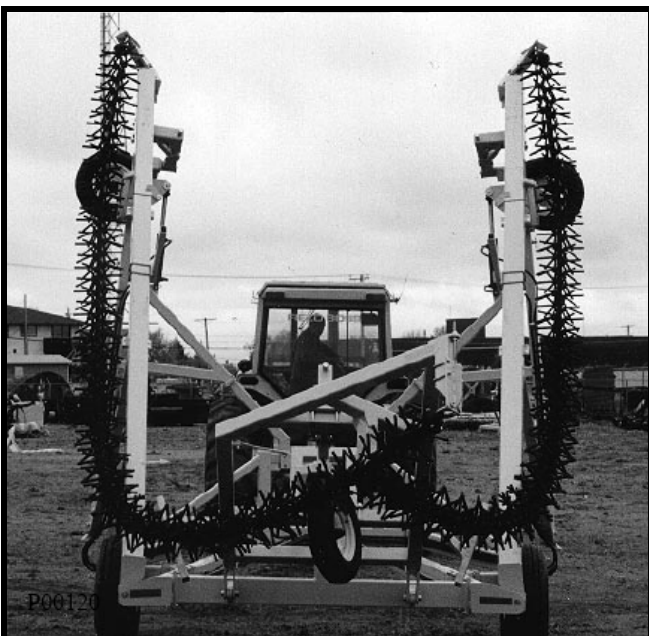
WING DOWN

1. Using the hydraulic control for the flip over wings, the end sections flip up.
2. Using the main wings/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. The figure are placed in order for folding up but can be used in reverse 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. Two 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 is 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 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-S-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 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. (See Section 3.2.1 for proper locking/unlocking instructions).
- 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.

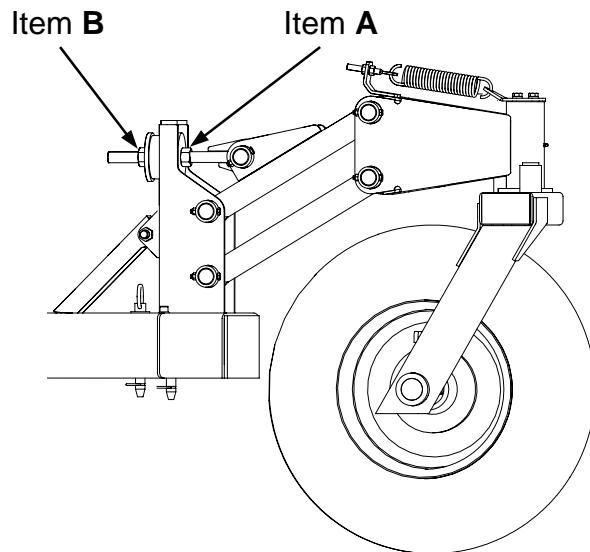
The other possibility is that the sequence valve was over tightened either at the factory or by trying to correct Problem 1.

- 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 position into 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. These must be in place or the wings will not go up and down together and will descend rapidly. Check the parts catalogue 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 (6) 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 the 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 catalogue.

Wing Caster Height Adjustment

The caster wheel height is adjusted as follows:

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

3.1.6 Tool Assembly Bearing Height

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.

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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 3.1.6 A.
- b) The rear bearing height is adjusted using the rear adjust. Using a 15/16" wrench, loosen the two U-bolts, 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.
- d) Turn the remaining nut to either raise or lower the tool section.
- e) Re-tighten all the nuts.



Rear Bearing Housing Height Adjustment

3.1.7 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.

3.1.8 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 VALUES 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

3.2 OPERATON

The Phillips Rotary Harrow can be used for several applications.

1. Incorporating chemicals and fertilizers. The harrow can easily be fitted with a granular applicator. (Your dealer can assist you in mounting granular applicators.)
2. Cover crop installation. Small seeds can either be broadcast or seed applicators can be mounted to the frame. The shallow working depth of the harrow is ideal for this application.
3. Residue management. Fluffs up the residue and works just the top inch or so of the soil beneath it. This aids in drying and warming of the soil.
4. Knocks down standing corn stalks. Works best when the stalks are dry and brittle. If stalks wrap, the tooling will clean itself automatically as the machine moves forward.
5. Pasture working. The tines work near the surface to scratch up dead material and rejuvenate the root zone. Also helps level hills left by moles, gophers, or ants.
6. Post-seeding weed control and crust breaking.

3.2.1 Putting Unit into Field Mode



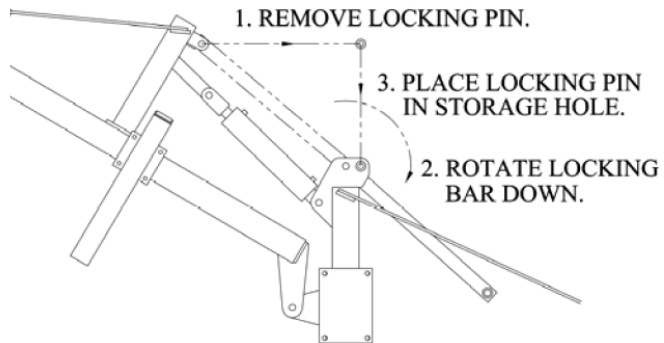
WARNING: The transport locks must be employed during all transport conditions. They must be removed before the hydraulics is operated. Failure to follow these instructions could result in accidental damage, injury or death!

A) Tail Unlocking

- a) Locate the pin, which attaches the tail locking bar to the top bridge of the tail.
- b) Remove the pin.
- c) Swing the bar forward all the way, so it rests completely on the rear beam upright.

- d) Secure the bar down by placing the pin above it in the holes provided and securing the pin with the clip.

NOTE: If the pin is hard to remove from the tail top bridge, activate the hydraulic slightly so that any creep in the cylinder is removed.



Tail Lock

B) Main Wing Unlocking

- a) Locate the pin holding the main wings to the front wing mount.
- b) Remove the pins and store them in the receiver pipes on top of the front wing mount.

C) Hydraulic Activation

The hydraulic operation of the harrow utilizes two separate circuits to put the harrow in and out of transport. The order in which these circuits are used is very important.

The first circuit operates the cylinders, which are used to extend and retract the flip over wing tips.

The second circuit controls the lifting of the main wings and the tail section. Within this circuit, a valve is used to control the order in which the two main wings and the tail section move up and down. The order that the tail and wings fold up and down is very important.

- a) Activate the flip over wing tip hydraulic lever. Observe that the wing tips have been fully extended.
- b) Activate the main wing/tail hydraulic lever. Observe that the wings go down together then the tail goes down.

NOTE: Observe the sequence of events as the wings fold down. Refer to Section 3.1.5 for the proper sequence. If the machine is not lowering in the sequence described, stop the descent immediately and reverse the lever to raise the unit again.

NOTE: Observe the sequence of events as the wings and tail fold up. Refer to Hydraulic Function Testing for the proper sequence. If the machine is not rising in the sequence described, stop the ascent immediately and reverse the lever to lower the unit.

- c) Keep the hydraulic lever activated after the wings and tail are down to fully extend the cylinders. The cylinders need to be fully extended for the floatation linkages to work properly.
- d) Go to the hinge locations at the flip over wing tips and remove the pins from the keeper pipes along the front wing.
- e) Insert the pins through the bottom four lugs below the hinge to lock the wing tip in position. This prevents the wing tips from sagging if there is any creep in the cylinder.

- d) Observe that the tools have neatly been wrapped around the outside of the machine. The tools should be on the outside of the wings, held by the tool catchers halfway up the main wing. On the tail, they should be resting against the tool catchers on the outside of the tail.

- e) Remove the pins from the keepers on the front wing mount and place the safety pins through the clevis lug, which secures the wing to the top of the front wing mount. Secure these with the hitch pins provided.

- f) From inside the main frame of the machine, remove the pin holding the tail-locking bar in place and swing the locking bar around to the tail top bridge.

- g) Secure the bar with the pin.

- h) Check the tail caster wheel. If it has not swung around and the tooling is resting on the tire, then pull the tooling back and swing the wheel around so it is hanging toward the front of the tail.

- i) Walk around the machine ensuring that all locks are in place and that transport tires are properly inflated.

3.2.2 Putting Unit into Transport Mode

The order of events for putting the unit into transport will be exactly reversed from the previous section.

- a) Remove the pins, which lock the wing tips. Place the pins in the keeper pipes located on the front wing. If the pin is tight, the cylinder likely crept so activate your wing tip circuit to fully extend the cylinder.
- b) Activate the hydraulic lever that controls the main wings and tail.
- c) Once the wings and tail have been fully raised, activate the hydraulic lever controlling the wing tips. Ensure that these fully retract.

3.2.3 Travel Speed

Depending on operating conditions, the harrow has a normal operating speed of 7 - 9 mph. However, in heavy conditions such as heavy pea stubble, the unit operates more effectively at 10 - 12 mph. Running at these higher speeds increases the drag of the harrow. This may cause the harrow to dig deeper and so it is recommended that you adjust the wing caster wheels as well as the tail section and rear adjust.

45' Rotary Harrow

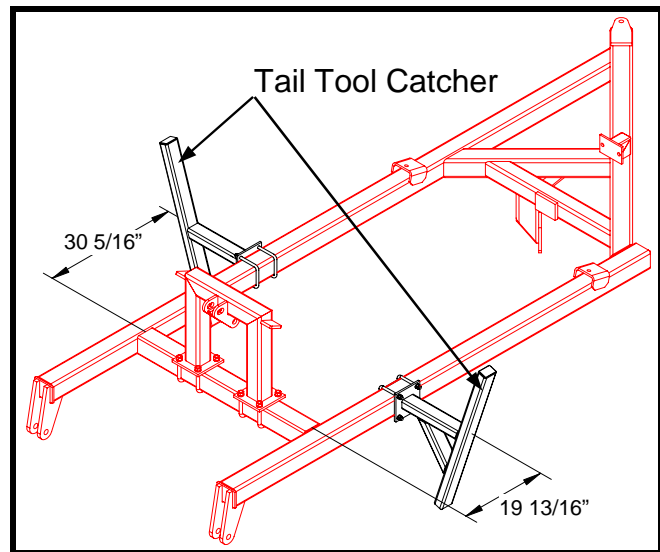
Please use appropriate caution while pulling the harrow. While built of heavy-duty materials, the harrow will not last if driven too fast for field conditions or driven over terrain that is extremely rough. The wings on the harrow have been designed to flex up about 30 degrees and flex down about 15 degrees. If you drive on terrain that exceeds these angles, damage may occur to the frame, caster wheels or hydraulic cylinders.

3.2.4 Fine Tuning the Performance

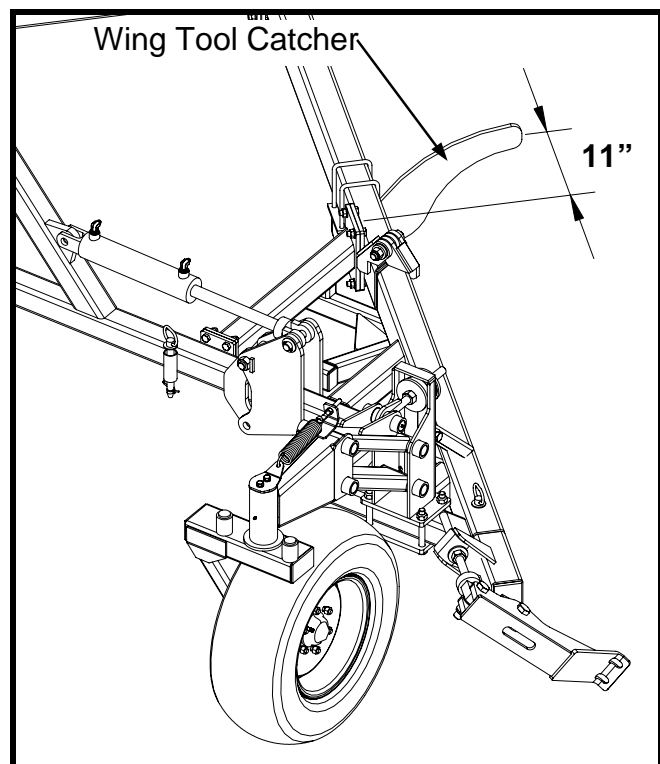
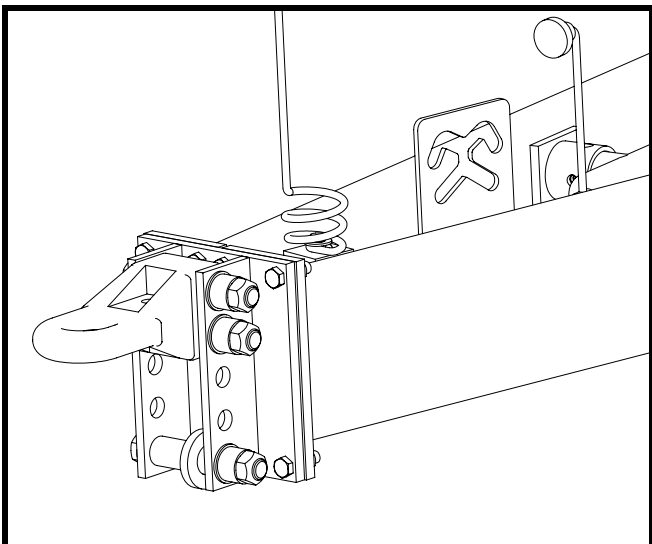
Ideally, the harrow should leave a very smooth flat surface. If the height of the tool sections is improperly set, there may be small ridges either at the front bearing or at the rear bearings. In order to correct these problems follow the directions in Section 3.1.6 for setting the heights of the bearing assemblies. With experiment, the correct height can be obtained for your field condition, which will produce a nice flat surface. In some conditions, especially in loose straw, it may appear that the harrow is missing a thin strip of ground in the middle where the tool sections overlap. Normally this is misleading. The rotary action of the harrow pulls material and debris slightly away from the center of the machine and moves it outwards. The strip has been worked but may not contain as much trash as the areas beside it.

In some conditions, especially in loose straw, it may appear that the harrow is missing a thin strip of ground in the middle where the tool sections overlap. Normally this is misleading. The rotary action of the harrow pulls material and debris slightly away from the center of the machine and moves it outwards. The strip has been worked but may not contain as much trash as the areas beside it.

Tool Catcher Locations



Hitch Height Adjustment



SECTION 4 - MAINTENANCE/LUBRICATION

The nature of the use of the harrow is such that some parts may eventually wear out. It is a good idea to inspect and replace damaged or worn machine parts.

4.1 DAILY MAINTENANCE/LUBRICATION (10 hours)

- Inspect tires for wear.
- Inspect the wheel bolts for tightness.
- The tools should be inspected periodically checking for severe wear on the tooling ends as well as the areas where the tools contact each other. If the tools are showing excessive wear at these contact points, they must be replaced. Tools worn in this manner present a safety hazard. Tools may wear prematurely in these locations if the tools have not been pre-tensioned enough.
- Periodically inspect all U-bolts and other bolted connections. Ensure that the connections are tight and that there is no excessive wear.
- Check the square U-bolts that connect the tooling to the bearing housings and the round U-bolts that connect the bearing housings to the tail and tool tension lever. These U-bolts need to be tightened regularly, every 2 hours for the first 30 hours. If they show signs of wear, replace them as soon as possible. Refer to the parts catalogue for part numbers.
- Inspect harrow frame for structure fractures.
- Check all bearings for signs of seal damage or excessive wear.
- Inspect all hydraulic hoses and fittings for leaks and signs of wear.



CAUTION: 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. Seek immediate medical attention if fluid penetrates your skin.

- Lubricate tooling bearing housing. Use one shot of grease. (4 Fittings)
- Lubricate Caster Wheels. (3 Fittings)

4.2 WEEKLY MAINTENANCE/LUBRICATION (50 hours)

- Lubricate Left Wing Hinge. (2 Fittings)
- Lubricate Right Wing Hinge (2 Fittings)
- Lubricate Tail Section Hinge (2 Fittings)
- Lubricate Tool Tightening Levers (2 Fittings)

4.3 YEARLY/POST OPERATIONAL OR BEFORE STORAGE

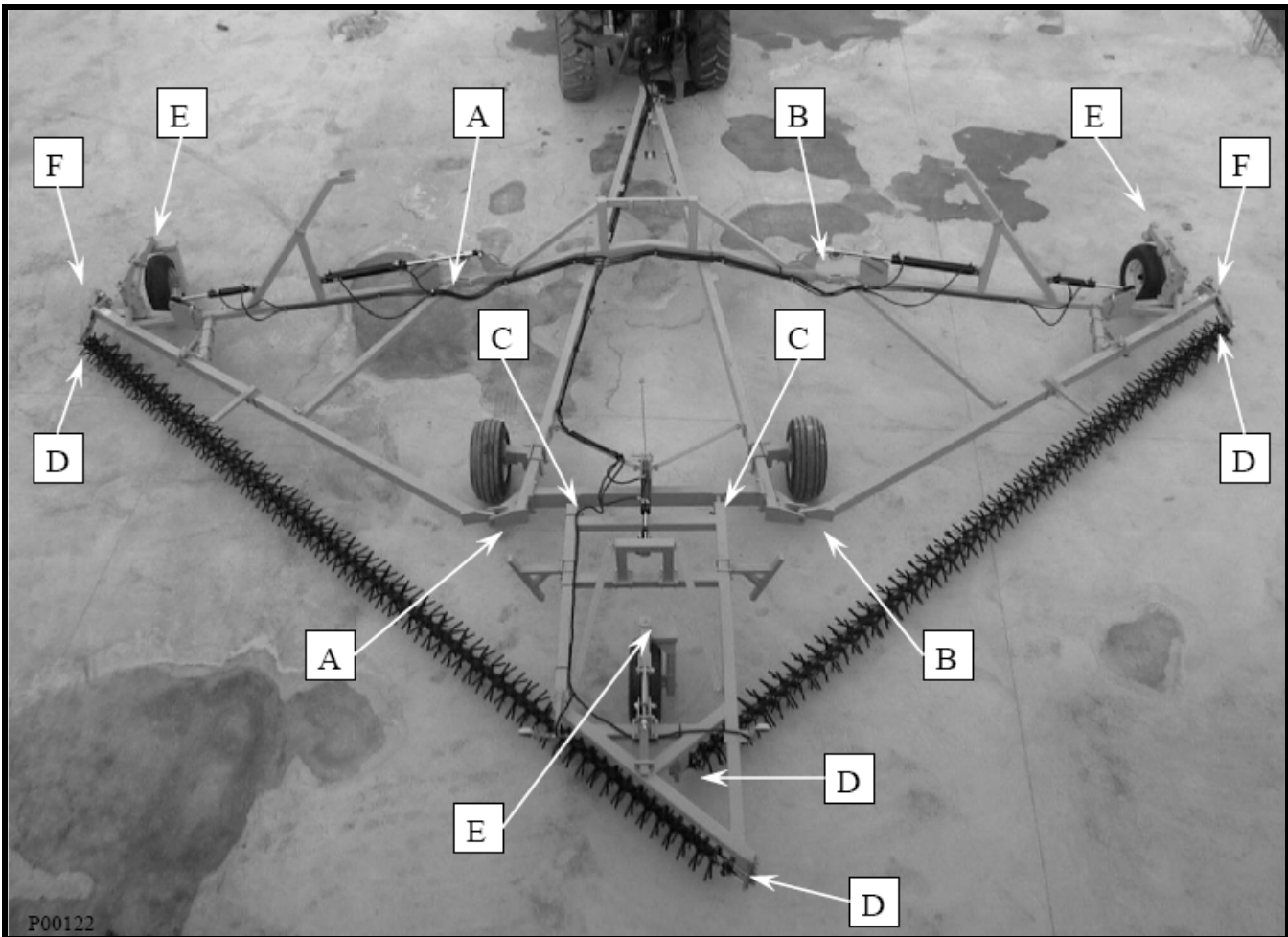
Perform daily and weekly maintenance checks.

Check the frame for any signs of structural problems. Check all bearings for signs of seal damage or excessive wear.

Clean all debris from unit. Pressure wash if possible. Do not pressure wash bearings.

Apply a light coat of Caterpillar yellow paint to surfaces where paint has been worn off to prevent excessive corrosion.

4.4 **LUBRICATION POINTS**



Lubrication Points

- A. Left Wing Hinge (2 Fittings)
- B. Right Wing Hinge (2 Fittings)
- C. Tail Section Hinge (2 Fittings)
- D. Tooling Bearing Housing (4 Fittings)
- E. Caster Wheels (3 Fittings)
- F. Tool Tightening Levers (2 Fittings)

4.5 LUBICATION/MAINTENANCE CHART

Read Section 4 for proper lubrication/maintenance procedures. Use these charts as a quick reference only. Copies of the following pages can be taken to continue the charts.

A. Lubrication/Maintenance Chart

See Photo Section 4.4 "Lubrication Points" for locations.

	# of Points	Service to Perform	Frequency In Hours			
			Grease	Check	Clean	Repair
1	4	Tooling Bearing Housing	10			
2	3	Caster Wheels	10			
3	2	Left Wing Hinge	50			
4	2	Right Wing Hinge	50			
5	2	Tail Section Hinge	50			
6	2	Tool Tightening Levers	50			
7	n/a	Tooling Wear		10		
8	5	Tire Wear		10		
9	n/a	Hydraulic Hoses/Fittings		10		
10	n/a	Harrow Frame For Wear		10		
11	5	Wheel Bolt Tightness		10		
12	n/a	Bolt Tightness		10		
13	n/a	Debris on Harrow			100	
14	n/a	Worn Paint				100
15	5	Bearing Damage/Wear		100		

All services above are to be completed at the year-end or prior to start up.
 10 hrs=daily, 50 hrs=weekly, 100 hrs=yearly

SECTION 5 - TROUBLESHOOTING

5.1 TROUBLE SHOOTING CHART

CONDITION	POSSIBLE CAUSE	CORRECTION
Tail Section goes down before wing when lowering Unit.	<ol style="list-style-type: none"> 1. Improperly installed sequence valve 2. Improperly adjusted sequence valve. 	<ol style="list-style-type: none"> 1. Re-install the sequence valve as outlined in Section 3.1.5 2. Re-adjust valve (see Operating Instructions Section 3.1.5)
The Tail and/or Wings will not go down when trying to lower unit.	<ol style="list-style-type: none"> 1. Sequence valve is improperly adjusted. 2. Safety pins have not been removed. 	<ol style="list-style-type: none"> 1. Re-adjust sequence valve (see Operating Instructions in Section 3.1.5) 2. Remove safety pins.
Main Wings DO NOT go up together or wings descend too fast.	<ol style="list-style-type: none"> 1. Restrictors not installed. 	<ol style="list-style-type: none"> 1. Check if the Orifices are present in the correct spot (see parts catalog). If they are missing obtain from your dealer and install.
There is a ridge in the field located on the outside of wings.	<ol style="list-style-type: none"> 1. The outside portion of the wing is digging in. 	<ol style="list-style-type: none"> 1. Raise the caster wheel height as explained in the Operating Instructions Section 3.1.6
There is a ridge left in the field in the center of the harrow.	<ol style="list-style-type: none"> 1. Tail frame is too low. 2. Rear adjust is too low. 3. Ridge is just material being pulled away from center of harrow. 	<ol style="list-style-type: none"> 1. The tail frame can be raised as described in the Operating Instructions Section 3.1.6 2. The rear bearing height can be raised as described in the Operating Instructions Section 3.1.6 3. Natural result of rotary Action.
Wing and/or Tail bounced in field.	<ol style="list-style-type: none"> 1. Improper tire inflation 2. Excessive speed for field conditions. 	<ol style="list-style-type: none"> 1. Check tire inflation based on the recommendations in Section 3.1.8 2. Slow down to proper speed. See Section 3.2.3 for speed recommendations

SECTION 6 - SPECIFICATIONS

6.1 GENERAL SPECIFICATIONS

45' Rotary Harrow

Overall Working Width	45'
Overall Length.....	40'
Transport Height	13'-6"
Transport Width (with lights)	14'-9"
Transport Length.....	38'-3"
Overall Weight	9500 lbs
Transport Hitch Weight	1900 lbs
Transport Axle Weight	7600 lbs
Harrow Angle of Attack	45°
Main Frame Size	8" x 4" H.S.S.
Wing Flotation	30° up 15° Down
Tail Flotation	33° up 14° Down
Main Lift Cylinders	4" Bore x 30" Stroke x 2" Shaft
Wing Tip Cylinders.....	3" Bore x 12" Stroke x 1 1/2" Shaft
Tail Lift Cylinders	3 1/2" Bore x 12" Stroke x 1 1/2" Shaft
Main Tires	12.5L x 15 Highway Service
Caster Tires	11L x 15
Required Drawbar Horsepower	150-180 H.P.
Required Tractor Hydraulics	2500 p.s.i.
Hydraulic Operation	2 set of Hookups Required
Granular Applicator Attachment.....	Built to Accommodate 2055 Valmar

Additional Features

- Fold time, about 40 seconds.
- Over center folding wings allow for compact transport size.
- Can be teed directly into the folding circuit of a cultivator for use in tandem (Harrow requires one control for transport folding).
- Linkage design on wings and tail section provide high degree of flotation up and down.
- Main pivot points (6) have steel bushing, thrust washers and are greaseable.
- Convenient and accessible depth controlling gauge wheels on all three floating sections.
- Wrench supplied for tightening of tool assemblies and adjusting gauge wheels.
- Marker lights and safety tow chain.

SECTION 7 - STORAGE

7.1 STORAGE OF HARROW

After all fieldwork is complete for the season and the harrow is ready for storage there are a number of maintenance procedures to perform properly maintaining your equipment will provide years of trouble free product.

Always store your equipment in dry and protected place. Leaving equipment unprotected will shorten the service life of harrow.

ATTENTION: When storing the harrow during off-season, be sure to lower the wings to the ground thus relieving pressure in the hydraulic system. A loaded hydraulic system can cause damage to the cylinders.



WARNING: DO NOT begin to service the unit unless all machinery is shut off, the parking brake is set and the key is removed.

The following are procedures that are to be performed before storage:

- Clean entire unit with compressed air or pressure washer. Be sure to **ALWAYS** use the necessary protective equipment and keep unnecessary people or pets away during servicing.

NOTE: Avoid spraying high-pressure water/steam or cleaning solvents on bearings or seals.

- Paint any worn out areas. This will prevent excessive corrosion.
- Check frame for any signs of structural problems.

- Replace all missing hardware and check torque of hardware.
- Perform daily, weekly, and yearly lubrication and maintenance procedures.
- Apply a light coat of grease to all cylinder shafts to prevent rust.
- Store inside or cover up with tarp to extend component life.

7.2 REMOVING FROM STORAGE

- Perform procedures listed under daily and weekly lubrication and maintenance.
- Inspect harrow to ensure all components are ready for the field. Check the frame for any signs of structural problems. Check all bearings for signs of seal damage or excessive wear.
- Check unit over while operating at a low speed. Be sure that the tooling is working properly, bearings are not overheating, and there is no evidence of loose parts.
- Read Operators Manual to familiarize yourself with all safety and operational procedures.